
Observational Study of Superoutbursts in Long Period AM CVn Stars

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Abstract

AM CVn stars are ultra-compact close binary stars with a white dwarf primary and a white dwarf or helium star with a Roche lobe-filled secondary, and a helium-dominated accretion disk around the primary. They provide an important laboratory for studying accretion physics in the extreme regime of compact binaries. In AM CVn systems with long orbital periods, the accretion disk is theoretically expected to be cool and thermally stable, yet the extent to which the thermal–tidal instability (TTI) and enhanced mass transfer (EMT) operate in such outbursts in helium disks has remained uncertain. This thesis aims to clarify the outburst mechanisms and long-term variability of long-period AM CVn stars by combining a time-resolved photometry campaign, modern survey observations, and more than a century of digitized photographic plates from the DASCH project.

In Chapter 2, I identify the first recorded superoutburst (SO) in the historical archive of GP Com, which occurred between 1950 and 1951, using the DASCH photographic-plate archive and modern survey data. Although GP Com lies near the theoretical boundary between the dwarf-nova state and the cool-stable state, the amplitude and duration of the outburst confirm that it was indeed a genuine SO. Monte Carlo simulations of missed events indicate that its supercycle (SC) is likely longer than 70 yr, yielding an upper limit on the mass-transfer rate of $\dot{M}_{\text{tr}} \lesssim 1.8 \times 10^{-12} M_{\odot} \text{ yr}^{-1}$, and reaffirming that the system resides close to the cool-stable regime. A historical outburst of the long period AM CVn star SDSS J152509.57+360054.5 was also newly identified, extending the continuity of the empirical orbital period (P_{orb})–SC relation into the long period domain.

In Chapter 3, I analyze nine SOs from six long-period AM CVn stars observed between 2014 and 2021. Four events exhibit double SO profiles. The duration of the 1st SO shows significant variability, while the duration of the 2nd SO in systems that exhibit a preceding 1st SO is consistently around 5 days. In contrast, the 2nd SO durations of SDSS J090221.35+381941 and ASASSN-21au are approximately 10 days. According to the TTI model, this uniformity in 2nd SO duration can be explained by the normalization of the remaining disk mass by the preceding 1st SO. If the preceding outburst is a precursor outburst rather than a 1st SO, such normalization may not occur, leading to longer and more variable 2nd SO durations. I found that the fading tail following the SO can be divided into three distinct phases (tails A, B, and C), each characterized by different fading rates. The durations of these fading phases are roughly consistent among systems. Tail A lasts for approximately 70 – 100 days after the end of the 2nd SO, showing little decline in brightness. It exhibits stepwise fading associated with rebrightenings,

during which the superhump period becomes shorter. This suggests a decrease in the disk radius during these events. Tail B continues until around 200 days after the 2nd SO, while tail C can last for over 1000 days in some systems. The brightness during tails A and B appears to be dominated by the accretion disk, whereas in tail C, the WD likely becomes the dominant contributor. Tail A is thought to be sustained by an accretion disk with a viscosity higher than in quiescence. Tail B may represent a phase in which the disk viscosity gradually decreases. Tail C is interpreted as the cooling phase of the WD that had been heated during the SO. In short-period AM CVn systems, the SO duration typically lasts about 5 days, and the SC is usually shorter than one year. In contrast, long-period systems exhibit SO duration lasting around 10 days, and their SCs often exceed 2 to 5 years. Moreover, the combined duration of tails A and B, which implies elevated disk viscosity, extends to roughly 200 days. These observations imply that in systems with short SCs, the next outburst may occur before the accretion disk has fully returned to a quiescent (low-viscosity) state. As a result, the high viscosity may prevent sufficient mass accumulation in the disk, potentially explaining the shorter duration of SOs in these systems.

Taken together, these results provide a coherent and unified picture of accretion-disk behavior in long-period AM CVn systems. The presence of double SOs demonstrates that the same physical instability responsible for WZ Sge-type SOs in hydrogen-rich cataclysmic variables also operates in helium-dominated disks. The historical SO of GP Com shows that SOs similar to those of other systems can occur even near the stability limit of the mass-transfer rate, thereby strengthening the continuity between dwarf-nova-state AM CVn systems and those in the cool-stable regime. By integrating short-timescale photometric monitoring with century-scale archival records, this thesis establishes long-period AM CVn stars as important testbeds for accretion-disk instability theory. Future high-cadence all-sky surveys and intensive photometric and spectroscopic campaigns will be essential to refine the parameters of known AMCVn objects, discover new outbursts of AM CVns, and deepen our understanding of disk instability models.

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¹<https://www.cosmos.esa.int/gaia>

²<https://www.cosmos.esa.int/web/gaia/dpac/consortium>

³<https://www.aavso.org/vsx/>.

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Chapter 1

General Introduction

1.1 Scientific Background

1.1.1 Cataclysmic variables and accretion disk instabilities

Cataclysmic variables (CVs) are close binary systems consisting of a white dwarf (WD) primary and a late-type main-sequence secondary that fills its Roche lobe (an illustrative diagram is shown in Fig. 1.1; see Warner 1995b for a review). When the outer layers of the secondary overflow its Roche lobe, matter is transferred toward the primary through the inner Lagrangian point (L1). Because the transferred material possesses angular momentum, it does not fall directly onto the white dwarf but instead forms an accretion disk around it. Within the disk, viscosity transports angular momentum outward, allowing matter to flow inward, releasing gravitational energy in the process. This released energy constitutes the main observable light source of CVs. Therefore, CVs serve as natural laboratories for studying the formation, evolution, and instabilities of accretion disks. In particular, in many CVs, the magnetic field of the primary is weak and relativistic effects are negligible, making them ideal targets for testing the fundamental physics of accretion disks.

The orbital periods of CVs typically range from 1.5 to 8 hours, with secondary masses of approximately $0.1\text{--}0.6 M_{\odot}$, corresponding to a binary separation of approximately $1 R_{\odot}$. The activity of the accretion disk and the nature of outbursts mainly depend on the mass-transfer rate and the mechanisms of angular momentum loss in the system. Among these accretion phenomena, dwarf novae (DNe), which exhibit sudden increases in luminosity, are believed to be caused by thermal instabilities in the disk (see below) and play a central role in understanding both CV evolution and the physics of accretion disks.

1.1.1.1 Evolution of Cataclysmic Variables

The evolution of CVs is primarily driven by angular momentum loss (AML). In systems with a mass ratio of $q < 1$, conservation of angular momentum dictates that mass transfer from the secondary star can increase the separation between the binary stars, potentially causing the secondary star to separate from its Roche lobe. When the increase in separation due to mass transfer and the contraction of separation due to AML are

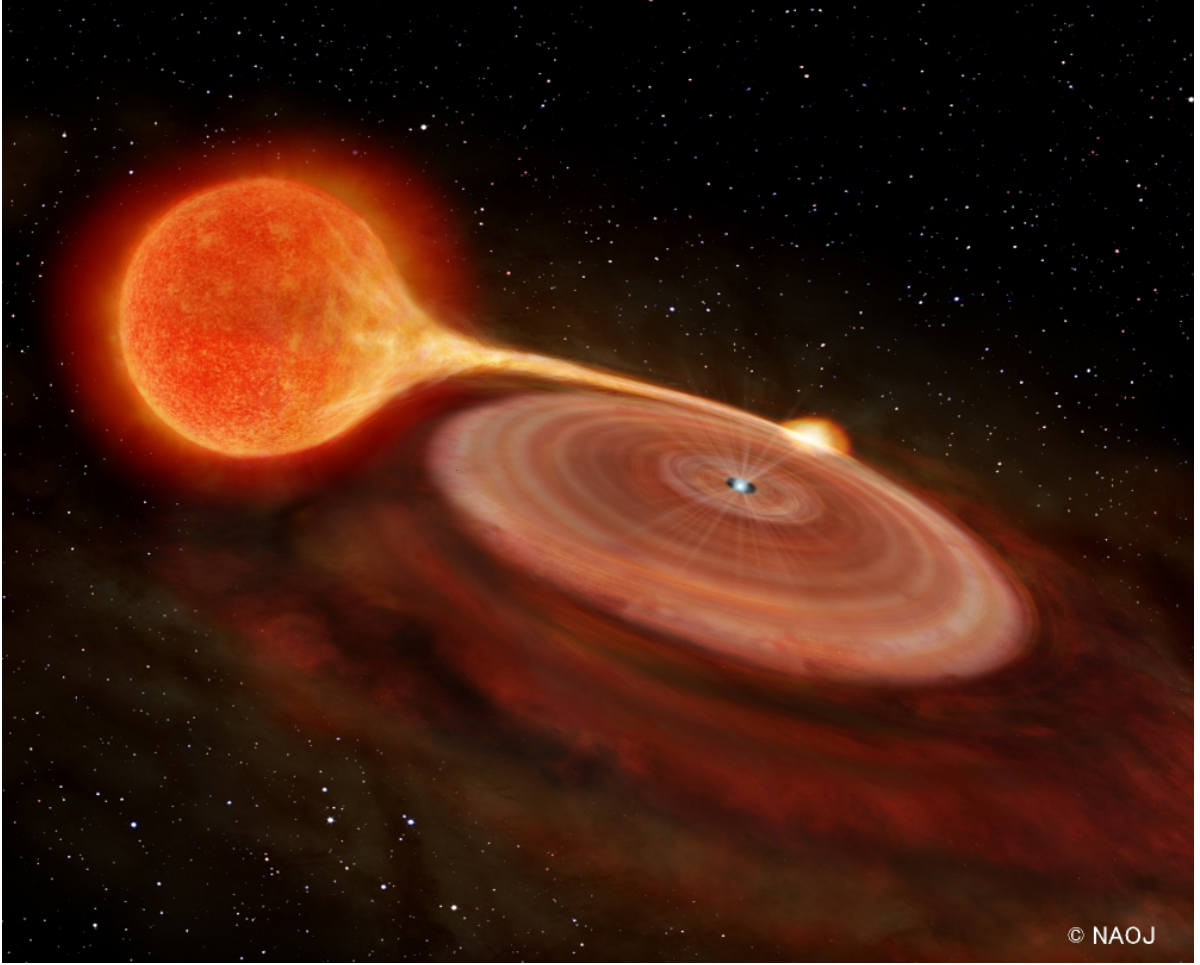


Figure 1.1: Illustration of a DN, a subclass of CV. Taken from <http://www.oao.nao.ac.jp/public/research/suuma/>.

balanced, a stable mass transfer occurs, allowing the secondary star to continuously fill its Roche lobe. Such systems are standard CVs. On the other hand, in systems with a mass ratio of $q > 1$, mass transfer from the secondary star can reduce the separation between the binary stars, potentially causing runaway mass transfer. Such systems are observed, for example, as supersoft X-ray sources.

Observationally, CVs exhibit a pronounced dearth in the 2–3 hr orbital period range, known as the period gap. This gap is understood as follows: in long-period systems ($P_{orb} \gtrsim 3$ hr), the secondary possesses a radiative envelope, and AML is dominated by magnetic braking. As the secondary loses mass and becomes fully convective, magnetic braking weakens abruptly, causing the secondary to detach from its Roche lobe and mass transfer to cease. The system then continues to lose angular momentum gradually via gravitational wave radiation, and mass transfer resumes once the orbital period drops below ~ 2 hr (Knigge et al. 2011).

At the late stages of evolution, CVs may host a degenerate secondary. The orbital period reaches a minimum of approximately 80–90 min, referred to as the period minimum

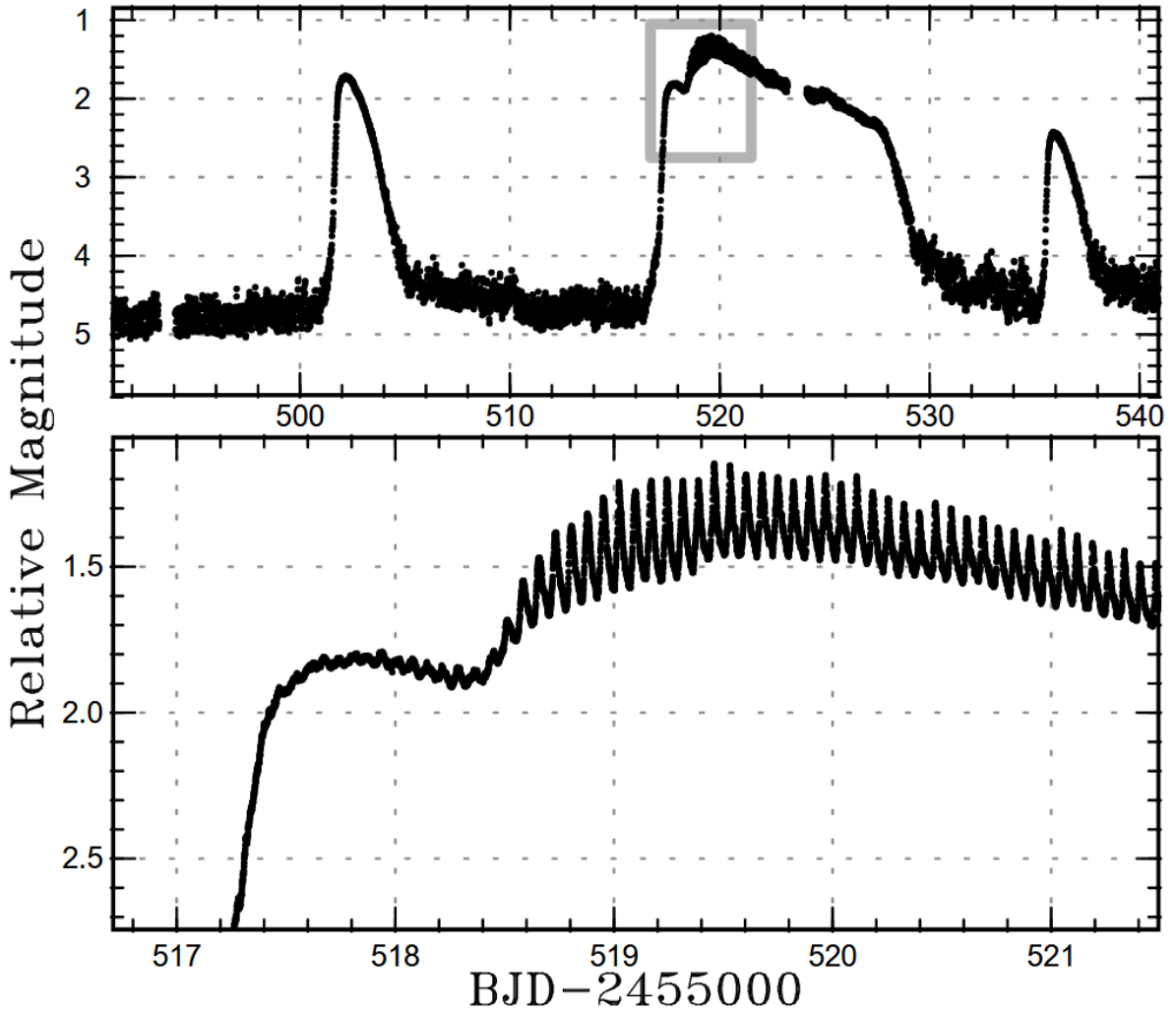


Figure 1.2: (Upper): light curve of outbursts and a SO of 1504 Cyg observed by Kepler mission. (Lower): superhumps in the SO. Taken from Osaki & Kato (2013a).

(Kato 2022b, Knigge et al. 2011). Subsequently, as the secondary becomes a brown dwarf, the orbital period increases again, and the system evolves into a so-called period bouncer. WZ Sge-type DNe are thought to reside near or beyond the period minimum, making them key objects for studying the final stages of CV evolution.

1.1.2 Dwarf Nova Outbursts

DNe are a subclass of CVs characterized by recurrent optical outbursts caused by instabilities in the accretion disk. DNe show quasi-periodic increases in disk brightness, known as outbursts (see Figure 1.4), with amplitudes of 2–8 mag and durations of a few to tens of days.

DN outbursts are generally classified into two types: normal outbursts and superoutbursts (SOs). Normal outbursts have amplitudes of about 2–5 mag and last for several

days (see e.g., Hellier 2001, Warner 1995b). Two models have historically competed to explain the mechanism of normal outbursts: the mass-transfer burst (MTB) model (Bath 1973) and the thermal instability (TI) model, also known as the disk instability model (DIM) or plain DIM (Hōshi 1979, Meyer & Meyer-Hofmeister 1981, Osaki 1974).

Figure 1.3 shows the S-shaped thermal equilibrium curve in the Σ – T plane at a given disk radius. The lower branch corresponds to the cool state and the upper branch to the hot (ionized) state, with an intermediate unstable branch in between.

In the lower branch, the inflow volume is more than the outflow volume, so the local surface density increases and exceeds the upper critical value $\Sigma_{\max}$ (point A in the figure), the region becomes thermally unstable and heats up rapidly, moving to the hot, ionized branch (point B).

At high temperature state, viscosity increases, resulting in efficient outward transport of angular momentum. This causes the outer disk to expand and inner disk material to accrete onto the white dwarf. As the mass outflow rate becomes larger than the mass inflow rate, the surface density of the hot branch eventually falls below a lower critical value, $\Sigma_{\min}$ (point C). The disk can then no longer sustain the hot branch and cools down to the cold branch (point D). Thus, in the disk instability framework, if the mass inflow rate at a particular radius is between the critical rates corresponding to $\Sigma_{\max}$ and $\Sigma_{\min}$, repeated outbursts will occur, causing the disk to cycle along an S-shaped curve. The recurrence time of outbursts depends on the mass-transfer rate from the secondary star (Ichikawa & Osaki 1994).

Another explanation for DN outbursts is given by the MTB model. In this scenario, an instability in the donor star causes a sudden increase in the mass-transfer rate, thereby producing an outburst. It is known that VY Scl stars, a subclass of nova-like variables (NLs), show brightness variations due to fluctuations in the mass-transfer rate (Wu et al. 1995). If the mass-transfer rate increased significantly during a DN outburst, strong orbital modulations would be expected; however, the flux from the orbital hump remains nearly constant throughout the outburst cycle, which argues against this scenario.

Normal outbursts are further categorized into Type A and Type B outbursts, characterized by rapid and slow rises, respectively. In the DI model, these are interpreted as outside-in and inside-out outbursts, depending on whether the instability is triggered at the outer or inner edge of the disk. Because the gravitational potential is deeper in the inner disk, a heating wave triggered there (inside-out outburst) requires a longer time to propagate outward and heat the disk. Conversely, an outside-in outburst, triggered at the outer radius, can heat the inner region more rapidly. Observationally, variations in the disk radius during outbursts support the thermal instability model (Smak 1984), and empirically estimated mass-transfer rates of DNe and NLs are consistent with the theoretical values predicted by the DIM (e.g., Dubus et al. 2018a). Therefore, it is now widely accepted that DN outbursts are primarily driven by thermal instability in the accretion disk (e.g., Hellier 2001, Warner 1995b).

1.1.3 SU UMa-type Dwarf Novae

SU UMa-type DNe are characterized by the presence of SOs in addition to normal outbursts. SOs exhibit larger amplitudes and longer durations compared to normal outbursts (Fig. 1.4). During an SO, superhumps—periodic photometric modulations

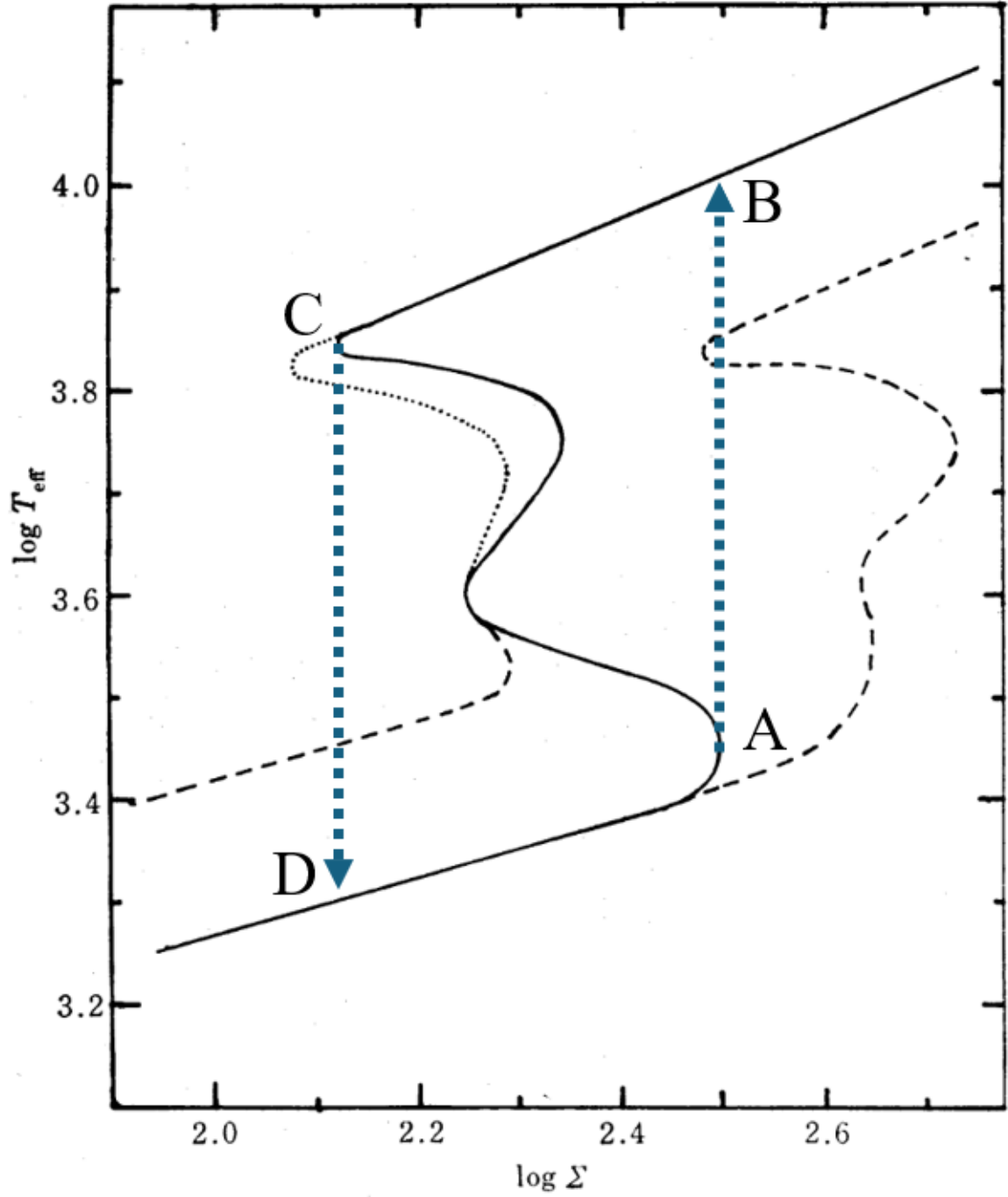


Figure 1.3: The S-shaped limit cycle of the accretion disk. Horizontal and vertical axes respectively represent the surface density Σ of a disk at a certain radius and the mass transfer rate $\dot{M}$ to the inner radius, which corresponds to the disk temperature. The S-shaped curve indicates the thermal equilibrium. Blue dotted arrows and labels A, B, C, and D are added to the original figure for clarification. Taken from Mineshige & Osaki (1985).

These phenomena are comprehensively explained by the thermal–tidal instability (TTI) model (Lubow 1991a,b, Osaki 1989, Whitehurst 1988, ?). First, thermal instability within the accretion disk triggers a normal outburst. Subsequently, when the outer disk radius reaches the 3:1 resonance, tidal torques from the secondary induce disk eccentricity and initiate precession. The periodic photometric modulation due to the eccentric disk corresponds to the superhump. As the secondary interacts with the outer eccentric disk, tidal forces remove angular momentum from the outer disk, causing dissipation of energy and an increase in disk brightness. The 3:1 resonance radius is given by $r_{3:1} \simeq 0.46 a$, where a is the binary separation, and the maximum disk radius is limited by the tidal truncation radius (Paczynski 1977). SOs occur only in systems with sufficiently low mass ratios ($q \lesssim 0.25\text{--}0.30$), where the disk can reach the 3:1 resonance. The deviation of the radial gravitational field from the inverse-square law due to tidal effects induces precession in the disk (Lubow 1991a).

Superhumps exhibit three evolutionary stages—stage A, stage B, and stage C—corresponding to different phases of growth (e.g., Kato et al. 2009). Figure 1.5 shows the period variations of superhumps during an SO using an O–C diagram. Stage A represents the initial growth phase with the longest period, corresponding to the dynamical precession at the 3:1 resonance radius. Stage B corresponds to the fully developed superhumps, during which the period derivative ($P_{\dot{}}$) becomes prominent. Stage C represents the decay phase, in which the period tends to shorten again. These observational features reflect pressure variations within the accretion disk, as described in the TTI model.

Osaki & Kato (2013a,b, 2014) systematically re-examined the TTI model using Kepler observations of SU UMa-type DNe, including the presence of negative superhumps, and demonstrated that nearly all observed behaviors of SU UMa-type DNe can be consistently explained within the TTI framework. Negative superhumps are thought to arise from slight tilts in the disk undergoing retrograde precession, with periods slightly shorter than P_{orb} . Their period variations reflect changes in the disk radius and mass distribution. The simultaneous observation of positive and negative superhumps naturally supports a unified explanation based on the geometric precession of the disk and indicates that this precession governs the timing and recurrence of SOs. Consequently, models such as DIM + EMT or plain DIM are largely disfavored, and the TTI model has been established as the standard framework for explaining SOs in SU UMa-type DNe and, more generally, DN accretion disks.

Nonetheless, skepticism toward the TTI model remains (e.g., Hameury 2020, Smak 2008). In particular, SOs in AM CVn-type systems—helium accreting binaries—often exhibit more complex behavior than H-rich CVs, and frameworks based on DIM + EMT or plain DIM continue to be actively considered (e.g., Cannizzo & Nelemans 2015, Kotko et al. 2012, Rivera Sandoval et al. 2022). These discussions provide a critical test for the universality of the TTI model and highlight theoretical challenges in extending the well-established TTI framework from H-rich to helium accretion disks.

1.1.4 WZ Sge-type Dwarf Novae

WZ Sge-type DNe are an extreme subclass of SU UMa-type systems. They are characterized by very long recurrence times of several years to decades, large outburst amplitudes of 5–8 mag, and the complete absence of normal outbursts, exhibiting only SOs (Kato

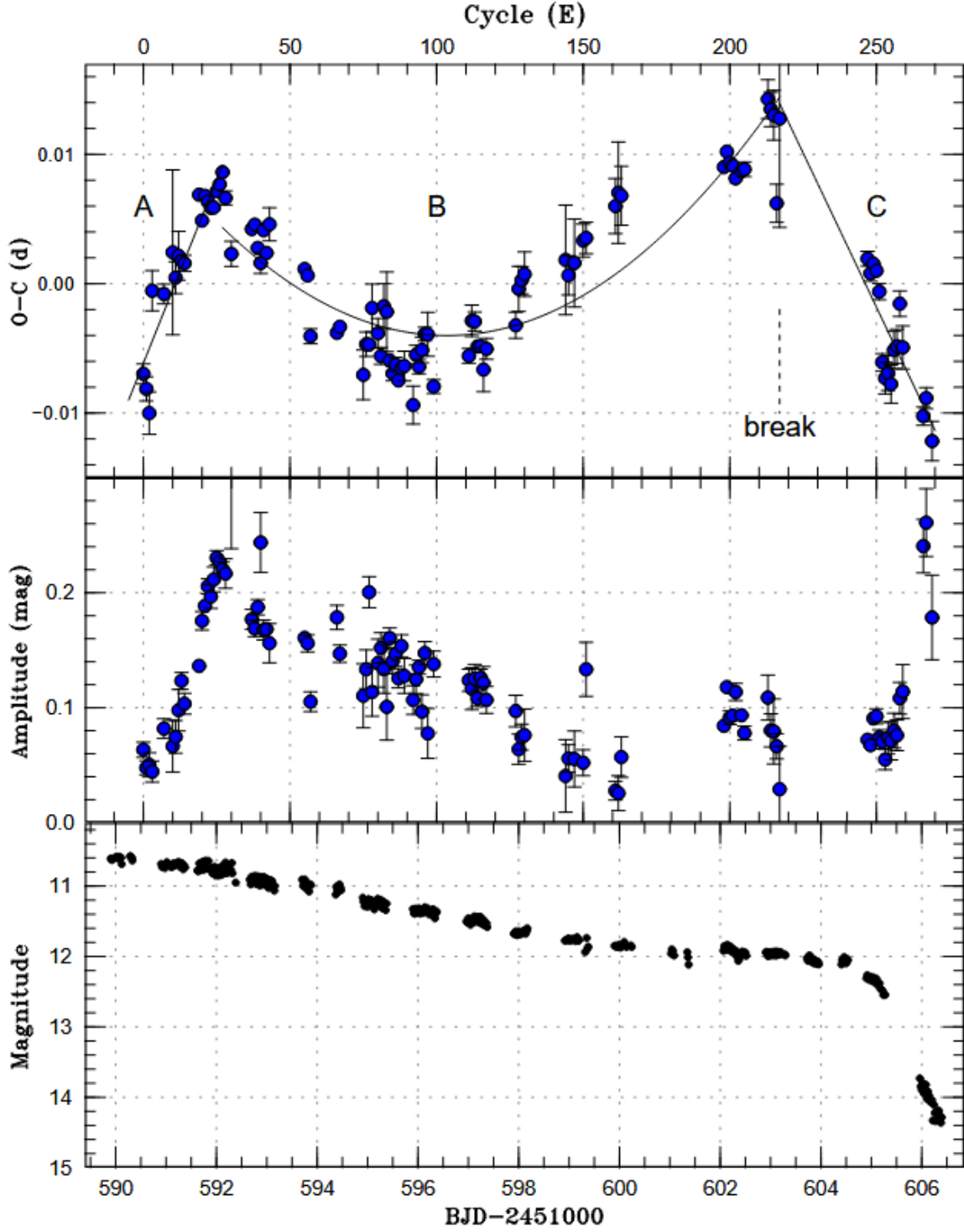


Figure 1.5: Representative O — C diagram showing the stages A, B, and C variation. (Upper) O — C diagram. (middle) Amplitude of superhumps. (Lower) Light curve. Taken from Kato et al. (2016b)

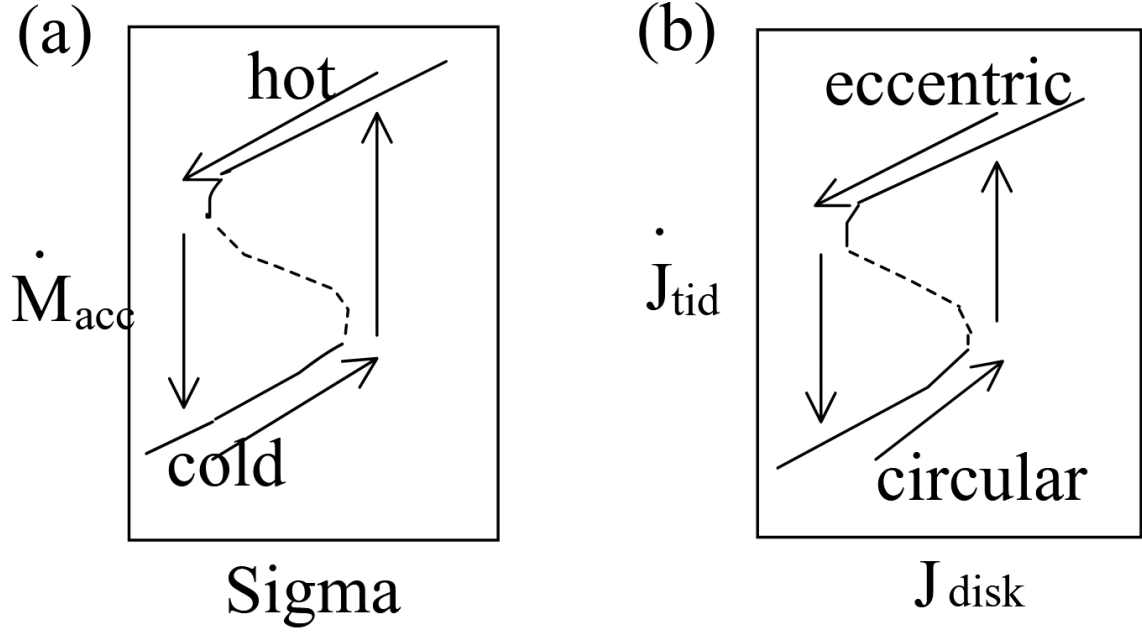


Figure 1.6: Schematic picture about the thermal-tidal instability. (a): The thermal limit cycle oscillation for the normal outburst of U Gem stars. Here $\dot{M}_{\text{acc}}$ is the mass accretion rate onto the central object. (b): the tidal-torque relaxation oscillation for the supercycle of SU UMa stars. Here, J_{disk} is the total disk angular momentum and $\dot{J}_{\text{tid}}$ is the angular momentum loss by tidal forces exerted by the secondary. Taken from Osaki (2005)

2015). At the early stage of a SO, a photometric modulation called an *early superhump* sometimes appears, showing a double-peaked waveform with a period nearly equal to the P_{orb} (Kato 2002, Osaki & Meyer 2002). In the middle to late stages of the SO, ordinary superhumps develop.

WZ Sge-type systems typically have short orbital periods of 1.3–1.5 hr and very small mass ratios of $q = M_2/M_1 \lesssim 0.08$ (Knigge et al. 2011, Patterson et al. 1998). From the evolutionary point of view, they are located near the terminal stage of hydrogen-rich CV evolution. Their secondary stars are expected to be partially degenerate objects with masses close to or below the hydrogen-burning limit.

The early superhumps are believed to be excited when the accretion disk expands to the 2:1 resonance radius (Lubow 1991a, Osaki & Meyer 2002). However, the 2:1 resonance radius lies inside the tidal truncation radius only for systems with $q \lesssim 0.02$, implying that the resonance may be suppressed in systems with higher mass ratios. This suggests that the tidal torque becomes significantly weaker in the very low- q regime. The system with the largest q among those showing early superhumps is ASASSN-16eg ($q = 0.166(2)$), which poses a significant challenge to the theoretical constraints (Wakamatsu et al. 2017).

After the SO, many WZ Sge-type systems show a prolonged stage called the *fading tail*, during which the system remains slightly brighter than quiescence. During this stage, the accretion disk gradually cools and the mass accretion rate decreases (Kato 2015). This slow fading is considered to reflect the thermal relaxation of the accretion disk and

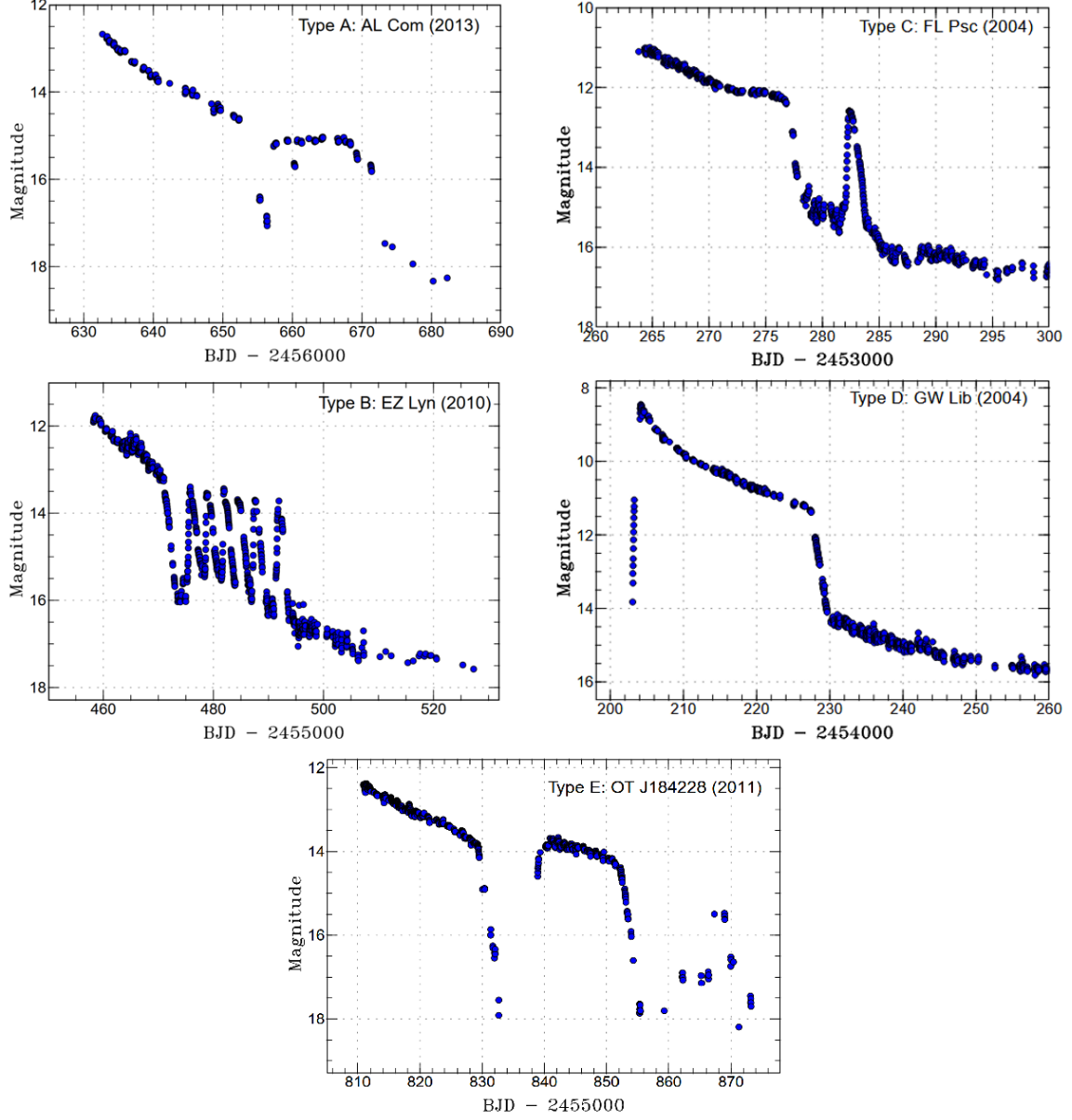


Figure 1.7: Classification of rebrightenings by their morphology. Taken from Kato (2015).

the cooling of the white dwarf heated during the SO (Godon et al. 2006, Szkody et al. 2013). In many cases, one or multiple *rebrightenings* follow immediately after the main SO, producing a characteristic light curve morphology (Kato 2015, Katysheva et al. 2014). The behavior of these rebrightenings varies significantly among systems and is commonly classified into five types (A–E) based on their duration and number (see Fig. 1.7): Type A – long and flat rebrightening, Type B – multiple short rebrightenings, Type C – single short rebrightening, Type D – no rebrightening, and Type E – SO with a temporary dip, and double SO (Kato 2015). Placing these subclasses on the evolutionary sequence suggests a possible trend of Type C $\rightarrow$ D $\rightarrow$ A $\rightarrow$ B $\rightarrow$ E (Kato 2015).

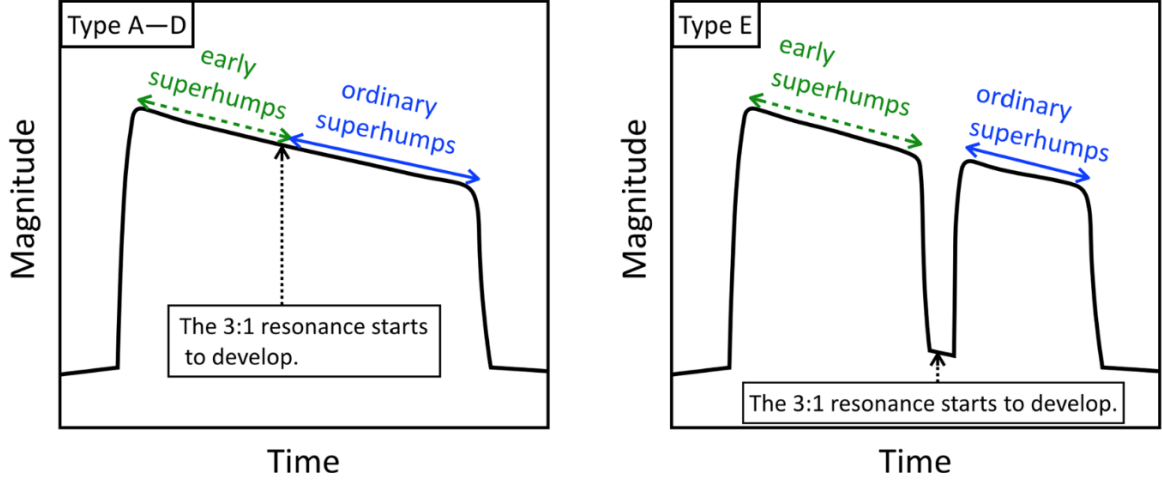


Figure 1.8: (Left): Schematic figure of SOs with type A-D rebrightening. (Right): Schematic figure of type E rebrightening. Taken from Kimura et al. (2016a).

The dip observed during the SO of type-E rebrightening systems—or equivalently, the short quiescent phase between the first and second SOs in double SO events—shows a distinct observational feature. In the early part of the outburst and during the first SO, neither early superhumps nor any significant periodic modulations are detected. Ordinary superhumps start to emerge only around the dip and become clearly visible just before the onset of the second SO (see Fig. 1.8). Such a sequence has also been observed in WZ Sge-type DNe with extremely low mass ratios (Kato 2015).

Therefore, type-E rebrightening systems can be naturally interpreted within the TTI model (Kimura et al. 2016a). In this framework, the growth time of ordinary superhumps is expected to scale as q^{-2} (Lubow 1991a,b). At the onset of the SO, the outburst is initially driven by the early superhump stage, but because the superhumps take a long time to develop in such low- q systems, a cooling front can propagate inward from the disk rim before the superhumps fully grow. This produces the temporary dip (or the short low state between two consecutive SO). Once the superhumps have sufficiently developed, a heating front is triggered from the outer disk, leading to the rebrightening. Hence, the dip observed during the SO and the brief bright phase slightly above the quiescent level between two SOs in double SOs are interpreted as manifestations of the same physical process.

Representative examples include WZ Sge itself, AL Com, EG Cnc, and GW Lib. In recent years, modern time-domain surveys such as ASAS-SN and ZTF have discovered numerous new candidates of this class (Kato 2022b).

The prototype WZ Sge and other WZ Sge-type DNe have long been the subject of theoretical debate on how they realize extremely long SO intervals, long outburst durations, and very rapid rise times. Although these systems are known to have very low mass-transfer rates, the standard DIM predicts inside-out outbursts under such conditions, which cannot reproduce the observed fast rise or long recurrence times. To explain these features, two main models have been proposed: (1) the *extremely low- α viscosity model*, and (2) the *cool stable disk + enhanced mass transfer (EMT) model*.

In model (1), the viscosity parameter in quiescence, α_{cold} , is assumed to be as low as ~ 0.001 , so that viscous heating is significantly reduced and the disk remains stable for a long time (Meyer & Meyer-Hofmeister 1999, Osaki 1995a). Although this model naturally explains the long recurrence intervals and the accumulation of a large disk mass, the resulting low viscosity may fail to reproduce the observed quiescent accretion rates.

In model (2), α_{cold} is assumed to be moderately low (~ 0.02), and magnetic truncation of the inner disk allows the formation of a “cool stable disk,” in which the mass transfer rate from the secondary ($\dot{M}_{\text{tr}}$) balances the accretion rate onto the white dwarf ($\dot{M}_{\text{acc}}$), suppressing inside-out outbursts. A temporary increase in $\dot{M}_{\text{tr}}$ (EMT) from the secondary then triggers an outside-in outburst at the disk edge, accounting for both the long recurrence time and rapid rise (Hameury et al. 1997, Osaki & Meyer 2003). However, since the secondaries in WZ Sge-type systems are likely to be brown-dwarf-like stars, it remains uncertain whether they can produce such EMT via magnetic or stellar activity. Furthermore, because the cool stable disk cannot store a sufficient amount of mass by itself, the additional supply from EMT is required to sustain the observed SO.

As discussed later, long-period AM CVn-type systems are also suggested to harbor cool stable disks, and thus they provide valuable analogs for testing the cool stable disk + EMT model.

1.1.5 AM CVn stars as Helium analogues

Among the various subclasses of CVs, AM CVn-type stars form a distinct group of ultracompact interacting binaries. An AM CVn system consists of either two white dwarfs or a white dwarf and a helium star, characterized by extremely low hydrogen abundances (or even completely hydrogen-deficient) in their spectra (e.g., Warner 1995b). Their orbital periods range from about 5 to 65 minutes, making them among the shortest-period binary systems known. In these systems, the white dwarf accretor receives helium-rich material from its donor star via Roche-lobe overflow, forming a helium accretion disk.

Three main evolutionary channels have been proposed for the formation of AM CVn binaries (e.g., Nelemans et al. 2010): (1) The double-degenerate (white-dwarf) donor channel: the system evolves from a detached pair of white dwarfs whose orbit shrinks via gravitational-wave radiation, eventually leading the less massive component to fill its Roche lobe and start mass transfer. (2) The helium-star donor channel: a binary in which the initially more massive component evolves into a helium-burning star before filling its Roche lobe, subsequently becoming a semi-degenerate helium donor. (3) The evolved-main-sequence donor channel: a system in which the donor star begins mass transfer after losing most of its hydrogen envelope during late main-sequence evolution, thereby exposing its helium-rich core.

All of these pathways involve common-envelope evolution and strong binary interactions in their early stages, which leave clear imprints on the systems’ present-day orbital periods, donor compositions, and chemical signatures. A schematic diagram illustrating the relationship between orbital period and mass-transfer rate for each evolutionary pathway is shown in Figure 1.9.

The evolution of AM CVn systems is strongly governed by AML through gravitational-wave radiation. Immediately after the onset of mass transfer, the donor star is degenerate and the continuous loss of angular momentum causes the binary orbit to shrink further.

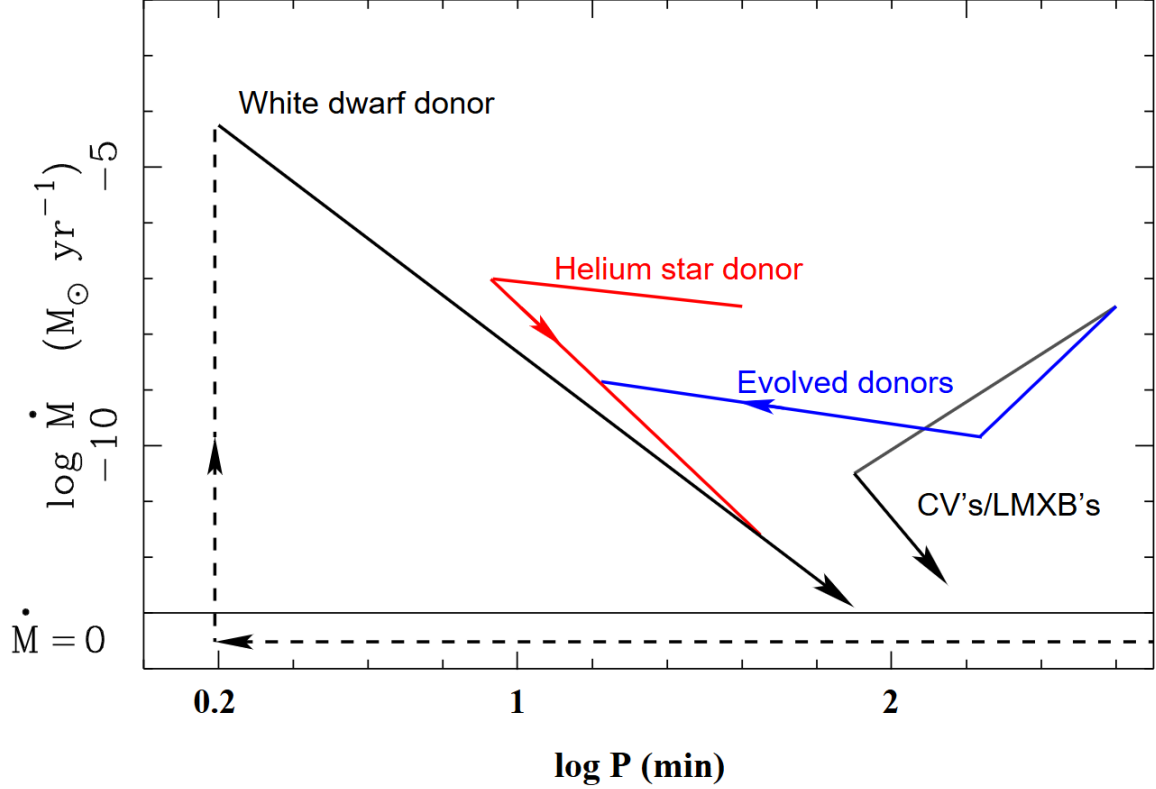


Figure 1.9: The three evolutionary channels of AM CVn stars. Horizontal axis is P_{orb} (min) and vertical axis is the mass transfer rate $\dot{M}$. The dashed lines of WD channel means no mass-transfer phase. Finally, each channel reaches the same path in which the secondary is fully degenerate. Taken from Nelemans et al. (2010).

After the system reaches its minimum orbital period (typically around ~ 5 minutes), the degenerate donor expands as it loses mass to the accretor. Consequently, the binary separation increases, the mass-transfer rate gradually decreases, and the orbital period lengthens over time. During this evolutionary sequence, the mass-transfer rate $\dot{M}$ is expected to change by several orders of magnitude, from approximately 10^{-8} to $10^{-12} M_{\odot} \text{ yr}^{-1}$ (e.g., Nelemans et al. 2010).

Figure 1.10 illustrates the thermal-equilibrium curves of hydrogen-rich and helium (hydrogen-deficient) accretion disks. Because helium is more difficult to ionize than hydrogen, a helium accretion disk requires a surface density higher by a factor of approximately six—under otherwise identical parameters—to reach the ionized state. For this reason, even without truncation of the inner disk by magnetic fields or coronal evaporation, a cool, stable disk may be realized in helium accretion disks (Tsugawa & Osaki 1997).

When the mass transfer rate is sufficiently high, the disk remains in a hot, stable state. As the transfer rate decreases, the disk becomes thermally unstable and undergoes DN-type outbursts. As the mass transfer rate decreases further, the disk is thought to settle into a cool, stable state (Tsugawa & Osaki 1997, Solheim 2010, Kotko et al. 2012).

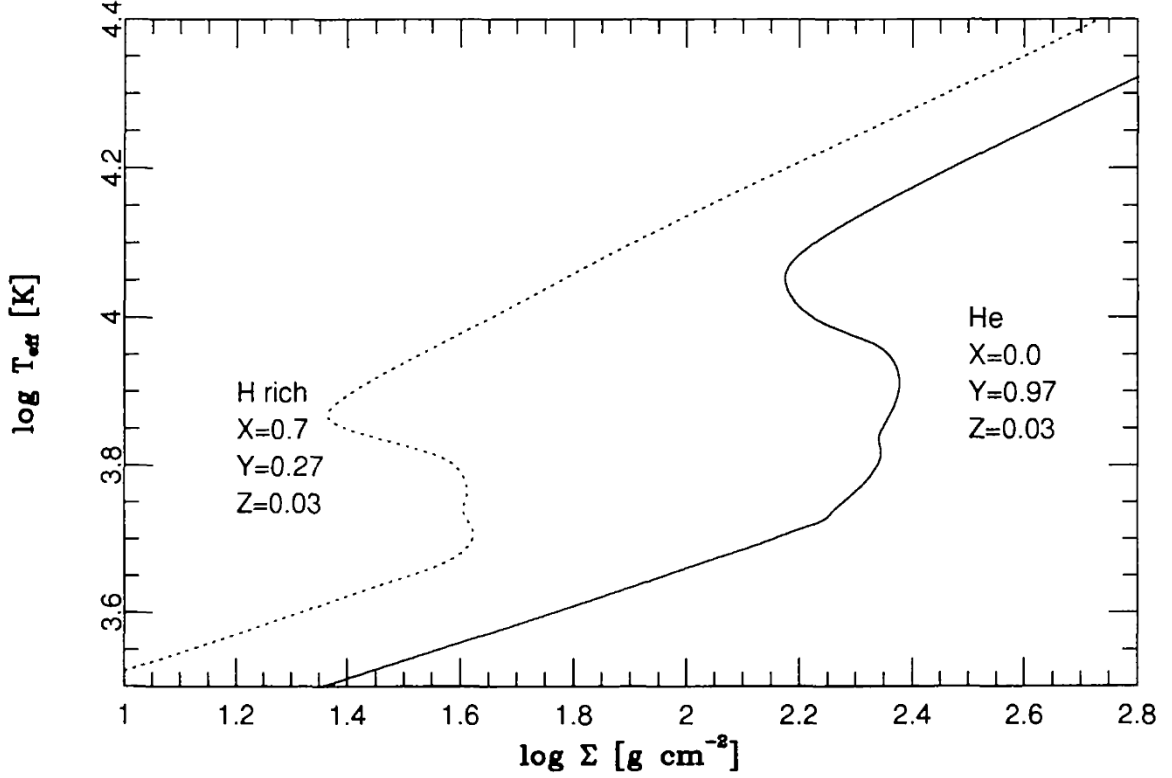


Figure 1.10: Comparison of the thermal-equilibrium curves for hydrogen-rich disks and helium accretion disks. Taken from Tsugawa & Osaki (1997).

Figure 1.11 shows the relation between the orbital period and the mass-transfer rate, $P_{\text{orb}}-\dot{M}_{\text{tr}}$, for AM CVn systems. Based on this diagram, it has been considered that DN outbursts occur in systems with orbital periods of approximately 20–50 minutes (e.g., Tsugawa & Osaki 1997; Levitan et al. 2015a; Green et al. 2025). More recently, DN-type outbursts have been observed even in longer- P_{orb} systems (e.g., ASASSN-21au, $P_{\text{orb}} \sim 58$ min: Rivera Sandoval et al. 2022). In addition, some long P_{orb} systems exhibit faint, long-lasting brightening events which are distinct from ordinary DN outbursts (NSV 1440, $P_{\text{orb}} = 36.3$ min: Kato & Stubbings 2023; SDSS J080710.33+485259.6, $P_{\text{orb}} \sim 53$ min: Kupfer et al. 2019; Rivera Sandoval et al. 2020; SDSS J113732.32+405458.3, $P_{\text{orb}} \sim 59.6$ min: Rivera Sandoval et al. 2021, Wong et al. 2021).

Outbursts in AM CVn stars are theoretically understood in terms of the thermal-tidal instability model, similar to hydrogen-rich DNe. AM CVn systems typically have very low mass ratios ($q < 0.25$; See e.g., Green et al. 2025), enabling the accretion disk to reach the 3:1 resonance radius and produce SOs (Hirose & Osaki 1990, Lubow 1991a,b, Whitehurst 1988). Their behavior is complex, often exhibiting features such as dips and rebrightenings (e.g., Isogai et al. 2019, 2016, Kato & Kojiguchi 2021, Kato et al. 2014, Pichardo Marcano et al. 2021, Rivera Sandoval et al. 2022, Rivera Sandoval & Maccarone 2019). Therefore, there are efforts to explain the outburst profile using thermal instability and EMT (Kotko et al. 2012).

A noteworthy case is the similarity to the WZ Sge-type DNe among hydrogen-rich

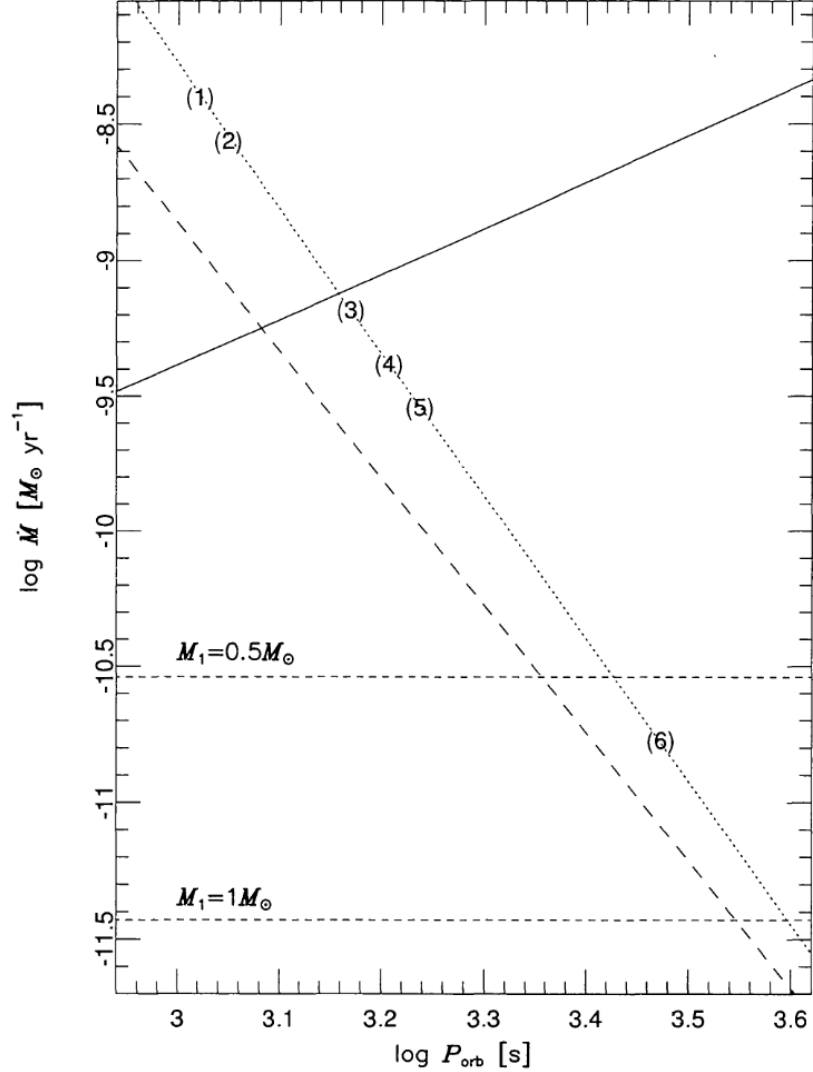


Figure 1.11: AM CVn stars on the $P_{\text{orb}} - \dot{M}_{\text{tr}}$ plane. The solid curve shows $\dot{M}_{\text{crit,cool}}$ below which the disks are thermally stable on cool branch for two different masses of the primary white dwarf for $1 M_{\odot}$ and $0.5 M_{\odot}$. The dotted line shows the mass-transfer rate estimated from the binary evolutionary scenario in which mass transfer is driven by a gravitational wave radiation, and in which the secondary star is assumed to be a semi-degenerate helium star out of thermal equilibrium. The long dashed line shows the mass-transfer rate in the case of a completely degenerate secondary in thermal equilibrium. The numbers in the figure indicate the orbital periods and the mass-accretion rates thus estimated for six AM CVn stars: (1) AM CVn, (2) EC 15330-1403, (3) CR Boo, (4) V803 Cen, (5) CP Eri, and (6) GP Com. Taken from Tsugawa & Osaki (1997).

CVs (Kato 2015). NSV 1440 was the first confirmed WZ Sge-type object among AM CVn stars and candidates (Isogai et al. 2019). At the beginning of its SO, The early stage of the SO showed an early superhump characterized by a clear double modulation (Isogai

et al. 2019). This was followed by a rapid fading, after which ordinary superhumps emerged, leading to the second SO. This phenomenon, known as double SOs, is observed in WZ Sge-type DNe with extremely low mass ratios (Kato 2015). According to Isogai et al. (2019), $q < 0.07$ is expected for AM CVns with $P_{\text{orb}} > 35$ min, consistent with the observational characteristics of WZ Sge-type DNe in H-rich CVs. The dip between the double SOs is explained by the thermal–tidal instability model (Kimura et al. 2016a), where the superhump growth time is proportional to q^{-2} (Lubow 1991a,b), causing the disk to temporarily fade before the superhumps fully develop. Early superhumps are thought to be caused by the 2:1 resonance (Lin & Papaloizou 1979), while ordinary superhumps are associated with the 3:1 resonance (Lubow 1991a,b, Whitehurst & King 1991). The amplitude of early superhumps is known to depend on the inclination and is not always observed during the 1st SO (Kato 2015, Osaki & Meyer 2002). After the rapid fading following the second SO, the system enters the so-called fading tail phase. In this phase, it remains brighter than quiescence and gradually fades. It often shows multiple short rebrightenings, which is a characteristic feature of WZ Sge-type systems.

AM CVn systems exhibiting these phenomena, thought to arise under low mass ratio, are expected to have relatively long orbital periods (e.g. Wong & Bildsten 2021a). In fact, the known AM CVn system SDSS J141118.31+481257.6, with an orbital period of 46 minutes, has also shown a double SO with a fading tail (Rivera Sandoval & Maccarone 2019), making this feature a useful indicator for identifying AM CVn candidates (e.g. Kato & Kojiguchi 2021).

Many efforts have been made to estimate the outburst durations of AM CVn stars in order to better understand their SOs (e.g. Cannizzo & Nelemans 2015, Cannizzo & Ramsay 2019, Levitan et al. 2015b). However, the short durations and rapid rise and decay times of these events make it difficult to determine their profiles, highlighting the importance of continuous monitoring (e.g. Pichardo Marcano et al. 2021).

In addition to the SO durations, fading tails are also particularly important diagnostics. WZ Sge-type SOs in hydrogen-rich CVs, as well as SOs in long-period AM CVns, are known to show a fading tail. Fading tail remains brighter than quiescence, sometimes shows infrared excess, follows an exponential or power-law decay, and can persist for hundreds of days to several years. It is also often accompanied by rebrightenings (Kato 2015, Kato & Kojiguchi 2021, Neustroev et al. 2017).

In hydrogen-rich CVs, the fading tail has generally been attributed to the cooling process of the white dwarf. However, Kato & Stubbings (2023) pointed out that this interpretation does not hold for AM CVns: (1) the amount of accreted mass is significantly smaller, $\sim 10^{-10} M_{\odot}$ for SO of AM CVns compared to $\sim 10^{-9} M_{\odot}$ for SO of WZ Sge stars (Kojiguchi et al. 2025, Meyer-Hofmeister et al. 1998), and (2) the fading tail in AM CVns ends abruptly, in contrast to the smooth decline as expected from white dwarf cooling. They concluded that the fading tail in AM CVns is more likely caused either by a change in the mass-transfer rate or viscosity.

There is another unsolved problem which may be related either to a change in the mass-transfer rate or in viscosity, that is the active state observed in NSV 1440 (Kato & Stubbings 2023). That active state showed "superposed normal outbursts" having a short duration of ~ 1 day and a small amplitude up to that of the normal outburst (see Fig. 2 in Kato & Stubbings (2023)). A change of the supercycle after the active state would provide a test between EMT and viscosity-driven scenarios.

Although individual cases of double SOs and fading tails in long-period AM CVn systems have been reported, a systematic observational study has not yet been carried out. In particular, it remains unclear whether profile of the fading tail is a universal property of long-period AM CVn stars, and how the durations of double SOs are related to the mass ratio and secular evolution of these binaries.

1.2 Open Questions and Key Issues

In recent years, a growing number of outbursting AM CVn systems have been discovered; nevertheless, the physical mechanism driving their SOs remains an active topic of debate (Baptista & Schlindwein 2022, Duffy et al. 2021, Kato & Kojiguchi 2021, Pichardo Marcano et al. 2021). While SOs in H-rich CVs are successfully explained by the TTI model, it remains unclear whether the same mechanism operates in helium accretion disks.

Some studies suggest that SOs in AM CVn-type systems may be explained by the plain DIM or a combination of DIM and EMT models, rather than by the TTI model (e.g., Cannizzo & Nelemans 2015, Kotko et al. 2012, Levitan et al. 2015a). A fundamental open question is whether the observed outburst shapes, durations, and supercycle lengths of helium disks can be reproduced within the TTI framework, or whether additional effects such as irradiation-driven EMT are required.

For instance, in some short-period systems, SOs have been reported to exhibit phenomena resembling the type B + A rebrightenings (multiple short rebrightenings followed by a long-flat rebrightening) seen in WZ Sge-type DNe (e.g., Pichardo Marcano et al. 2021). It is still uncertain whether these rebrightenings are caused by irradiation-induced EMT or by processes intrinsic to the disk.

Tsugawa & Osaki (1997) predicted that helium disks in the 40–60 min orbital period range should transition to a cool, stable state. However, recent observations have detected SOs in several systems within this period range. It remains unclear whether these systems are still in a DN state, or whether outbursts arise in a cool, stable disk with episodic EMT. If the latter is the case, it is unknown whether the outbursts result from a sudden increase in the mass-transfer rate $\dot{M}$ or from a temporary return of $\dot{M}$ to an unstable disk level. Observationally distinguishing these scenarios is challenging, especially because long-period AM CVn systems are extremely faint during quiescence and eclipsing systems are rare, making parameter determination difficult. If EMT does occur in long-period AM CVn systems, the physical trigger remains unknown. Given that the secondaries in these systems are extremely low-mass, it is unclear whether magnetic activity or irradiation can induce significant variations in $\dot{M}$.

The 2015 SO of NSV 1440 represents the first clear example of a double SO in a long-period AM CVn system (Isogai et al. 2019), providing a starting point for systematic studies of such phenomena. Nevertheless, observational samples remain small, and statistical coverage of long-period AM CVn systems is still insufficient. Furthermore, basic statistical properties such as outburst recurrence times, amplitudes, and durations vary between studies due to differences in sample selection and analysis methods (Cannizzo & Nelemans 2015, Cannizzo & Ramsay 2019, Duffy et al. 2021, Levitan et al. 2015a, Pichardo Marcano et al. 2021, Rivera Sandoval et al. 2022, Rivera Sandoval & Maccarone

2019), complicating direct comparisons.

The origin of the long-lasting fading tails observed in several AM CVn systems also remains unresolved (Kato & Kojiguchi 2021). It is unclear whether these gradual declines reflect emission from residual disk material, slow decay of an enhanced mass-transfer rate, or the relaxation of the disk structure following the outburst.

These open questions highlight that, although the TTI model is a well-established standard for H-rich accretion disks, its applicability to helium disks is still under verification. Continued discovery and long-term monitoring of AM CVn systems are essential to disentangle the contributions of thermal instability, tidal interactions, and mass-transfer variations, thereby improving our understanding of the physics of these unique compact binaries.

1.3 Research Goals and Scope

The primary goal of this study is to elucidate the physical mechanism driving SOs in long-period AM CVn systems. In particular, I aim to test whether the TTI model, well established for hydrogen-rich accretion disks, also operates effectively in helium disks, or whether additional effects such as enhanced mass-transfer (EMT) or the plain DIM must be considered.

To this end, I systematically examine the observational characteristics of outbursts in long-period AM CVn systems, and compare them with the physical parameters and disk states of individual systems, with the aim of generalizing the outburst-driving mechanism in helium disks.

Of particular interest are AM CVn systems with orbital periods of 40–60 min, which theoretically fall within the possible cool stable disk regime (Tsugawa & Osaki 1997). However, recent observations have revealed multiple systems in this period range that exhibit outbursts. A central question is whether these systems host truly DN-like unstable disks, or whether the observed phenomena arise from transient EMT triggers in otherwise cool stable disks.

Addressing this question will allow a quantitative evaluation of the applicability limits of the TTI model, and will also inform a reassessment of the stability conditions and critical mass-transfer rates in helium disks.

Furthermore, this study conducts a statistical comparison of supercycles, outburst amplitudes, and outburst durations across multiple long-period AM CVn systems. This analysis aims to evaluate how the thermal–tidal instabilities in helium disks differ from those in H-rich disks, to refine the definition of SO duration in helium disks, and to assess consistency with the TTI model. In addition, the mechanisms producing the prominent fading tails observed in several SOs are examined in the context of viscous relaxation and variations in the mass-transfer rate.

Through these analyses, this study seeks to answer the following key questions:

- Are the outbursts of GP Com driven by a cool stable disk with transient EMT, or by a DN-like unstable disk?
- Can SOs in long-period AM CVn systems be explained by the TTI model as in H-rich disks, or is an external trigger and an increase in mass-transfer rate during

the SO required?

- What physical processes are reflected in the fading tails observed in helium disks? Are they due to viscous relaxation, residual effects of mass-transfer variations, or both?

The ultimate goal of this study is to address these questions from an observational perspective, and thereby establish a unified understanding of the outburst mechanism in helium accretion disks. The results are expected to provide a foundation for extending the TTI theory, developed for H-rich disks, to helium accretion disks.

1.4 Structure of This Thesis

In Chapter 2, I report the discovery of outbursts in the AM CVn system GP Com, which has been considered a candidate for a cool stable disk. Chapter 3 presents a comparative analysis of the outburst profiles of long-period AM CVn systems during SOs. In Chapter 4, I summarize the main findings of this study, and in Chapter 5, I discuss future work.

Since chapters 2 and 3 are based on my first-author papers including many co-authors, “we” is used as the term for the first person in these chapters.

Chapter 2

First-Ever Discovery of a Superoutburst in GP Com Buried in Archival Data

This thesis chapter was originally published in PASJ as Kojiguchi et al. (2025).

We report the first detection of the only recorded outburst in the AM CVn star GP Com in archival historical data taken in 1950 - 1951. The detected outburst is likely a WZ Sge-type superoutburst. Both observational and theoretical studies have suggested that GP Com cannot undergo outbursts, like other long-period AM CVn stars. Our discovery demonstrates that outbursts can occur even given the binary parameters of GP Com. We develop a novel algorithm assuming quasi-periodic superoutbursts to estimate the probability of missing a superoutburst in the past 140 yrs recorded in archival survey data including the Digital Access to a Sky Century @ Harvard (DASCH). Our results indicate a low probability of missing a superoutburst, leading to the constraint that the supercycle (SC) of GP Com is > 70 yrs. We succeed in setting the upper limit of the mass transfer rate $\dot{M}_{tr} < 1.8 \times 10^{-12} \text{ M}_{\odot} \text{ yr}^{-1}$ by comparing the derived SC value with the accreted mass from the disk during a superoutburst of other AM CVn stars. Our findings would contribute significantly to understanding the activity of long orbital-period AM CVn stars and the unknown mechanisms dominating their quiescent accretion disks.

2.1 Introduction

AM CVn-type objects are a hydrogen-deficient and helium-rich class of cataclysmic variables (CVs). They are composed of an accreting white dwarf (primary star) and a mass-transferring helium white dwarf or helium star (secondary star). The orbital period P_{orb} of known AM CVn-type objects is in a range of 5 min to 65 min and comprises the population of the shortest- P_{orb} CVs (e.g., Nelemans 2005, Solheim 2010, Warner 1995a).

The mass transfer in AM CVn-type objects is considered to be driven mainly by the angular momentum loss due to the gravitational wave radiation. In these systems, mass transfer to the primary star causes the binary separation and orbital period to increase because the secondary star is degenerate, while the mass transfer rate decreases rapidly (Nelemans et al. 2001, Tsugawa & Osaki 1997).

As with hydrogen-rich CVs, AM CVn stars exhibit many disk phenomena, including

dwarf nova-type outbursts. This activity is thought to be due to the thermal instability of the helium accretion disk, similar to that of hydrogen-rich CVs (for a review of the disk instability model (DIM) in hydrogen-rich CVs, Hameury 2020, Osaki 2005). However, the critical surface density for jumping to a high temperature state in a helium accretion disk is about an order of magnitude larger than that of hydrogen-rich CVs. Due to the difficulty of undergoing an outburst, it has been considered that AM CVn systems having extremely low mass transfer rates may have a cool, thermally stable disk (Kotko et al. 2010, Lasota et al. 2008, Tsugawa & Osaki 1997). The dwarf nova-outburst state has been generally observed in systems with orbital periods between 20 and 40 min (e.g., Nelemans 2005). The boundary between outbursting objects and cool stable objects remains unclear. Moreover, it is still uncertain whether the cool stable state exists.

A kind of dwarf nova-type outburst is called a superoutburst, which is bright, flat-topped, long-duration (5-10 days) and shows a rapid fading followed by rebrightenings (see e.g. Kato & Kojiguchi 2021, Pichardo Marcano et al. 2021). Most AM CVns produce outbursts as well as superoutbursts. Superoutbursts occur in objects with low mass ratios and are explained by thermal-tidal instability model which is originally proposed for hydrogen-rich dwarf novae (TTI; see e.g. Osaki 1996). There are also attempts to explain these phenomena based on the enhanced mass transfer (EMT) scenario (Smak 2004, 2009a,b, 2017). Superoutbursts in objects with extremely low mass ratios show a temporary dip and a fading tail (> 100 days) that slowly fades after a rapid fading, and are called WZ Sge-type superoutbursts named after outbursts in a hydrogen-rich dwarf nova WZ Sge (Isogai et al. 2019, Kato 2015, Kato & Kojiguchi 2021).

In recent years, outbursts have been discovered in AM CVn-type systems with orbital periods longer than 40 min, and almost all of them have the characteristics of the WZ Sge-type superoutburst (e.g., Kato & Kojiguchi 2021, Levitan et al. 2015b, Ramsay et al. 2018). The longest period system known to exhibit such an outburst is ASASSN-21au, which has a superhump period of $P_{\text{SH}} = 58.4$ min (Rivera Sandoval et al. 2022)¹. This discovery has led to discussion suggesting that objects with a cool stable disk may experience outbursts triggered by EMT (Rivera Sandoval et al. 2022). If an outburst in a cool stable disk is triggered by EMT, it is suggested that the disk lacks sufficient mass, resulting in a shorter outburst duration (Meyer-Hofmeister et al. 1998). However, another theory proposes that irradiation of the secondary star during the outburst enhances the mass transfer rate, leading to a superoutburst (see e.g. Hameury 2020, Pichardo Marcano et al. 2021). There are also discussions that the faint and long-duration brightening events observed in other long-period systems, SDSS J080710.33+485259.6 (J0807; $P_{\text{orb}} = 53.3$,min) and SDSS J113732.32+405458.3 (J1137; $P_{\text{orb}} = 59.6$,min), may be attributed to enhanced mass transfer (EMT) (Rivera Sandoval et al. 2021, 2020). Long-term and detailed observations are required to understand the outburst mechanisms of these long-period AM CVns.

GP Com, one of the AM CVn objects, has a long-orbital period of 46.5 min. Furthermore, since no outbursts have been reported so far, it has been expected to be a candidate for having a cool stable disk, where the mass transfer rate is lower than the cool critical mass transfer rate (e.g., Marsh et al. 1991, Roelofs et al. 2007). In this paper,

¹Superhumps are known to show periodic variations of about 0.2 mag, and P_{SH} is typically a few percent longer than the orbital period.

Table 2.1: Physical Parameters of GP Com.

Parameter	Value	Ref.
parallax (mas)	13.73(5)	(1)
distance (pc)	72.7(3)	(2)
proper motion (mas yr ⁻¹)	346.68	(1)
transverse velocity (km s ⁻¹)	119.5(5)	(3)
P_{orb} (min)	46.52	(4)
Mass ratio q ($= M_2/M_1$)	0.018	(4)
	0.020 – 0.028	(5)
Primary WD mass M_1 ($M_{\odot}$)	0.5 – 0.68	(6)
	> 0.54	(5)
Secondary star mass M_2 ($M_{\odot}$)	0.009 – 0.012	(6)
	0.009 – 0.04	(5)
inclination i ($^{\circ}$)	33 — 78	(5)
V_{rot} of primary WD (km s ⁻¹)	< 46	(5)
Mass-transfer rate $\dot{M}_{\text{tr}}$ ($M_{\odot} \text{ yr}^{-1}$)	$\leq 3.6(5) \times 10^{-12}$	(6)
	2.3×10^{-11}	(7)
Mass-accretion rate $\dot{M}_{\text{acc}}$ ($M_{\odot} \text{ yr}^{-1}$)	$\approx 8.7 \times 10^{-13}$	(8)

References – (1) Gaia Collaboration et al. (2021); (2) Bailer-Jones et al. (2021); (3) calculated values based on Gaia Collaboration et al. (2021) and Bailer-Jones et al. (2021); (4) Marsh et al. (1991); (5) Kupfer et al. (2016); (6) Roelofs et al. (2007); (7) Ramsay et al. (2018); (8) Strohmayer (2004)

we report the first detection of an outburst in GP Com between 1950.9 and 1951.1 by the comprehensive investigation into the Digital Access to a Sky Century @ Harvard (DASCH: Grindlay et al. 2012) data² of this object obtained from 1880 to 1990 and publicly available data to 2024.

We organize this paper as follows. In section 2.2, we summarize literature research of GP Com. In section 2.3, we describe the used dataset and analyze the light curve here. In section 2.4, we focus on the nature of the detected outbursts. In section 2.5, we discuss the probability of missing a superoutburst and the upper limit of the mass-transfer rate, based on the lower limit of the supercycle (the cycle length of the superoutburst). We summarize this work in section 2.6.

2.2 The nature of GP Com

GP Com was identified as a white dwarf candidate at 16.2 mag with a high proper motion, as reported by Giclas et al. (1961), and was referred to as G61-29 at the time. Burbidge & Strittmatter (1971) performed optical spectroscopy toward GP Com to characterize this object, and found a broad helium line. Furthermore, Warner (1972) found that similarly to other CVs; the continuum spectrum in optical wavelengths can be fitted by a single

²(<http://dasch.rc.fas.harvard.edu/project.php>)

Table 2.2: Cool critical mass-transfer rates of GP Com.

M_1 ($M_\odot$)	Tsugawa & Osaki (1997) [*] ($M_\odot \text{ yr}^{-1}$)	Kotko et al. (2012) ^{†,‡} ($M_\odot \text{ yr}^{-1}$)
0.5	1.4×10^{-11}	2.0×10^{-12}
0.68	7.8×10^{-12}	8.9×10^{-13}
1	3.6×10^{-12}	2.8×10^{-13}

^{*} $Y=0.9996$, $Z=0.0004$. [†] $Y=1$. [‡] The white dwarf radius is estimated from figure 1 of Hamada & Salpeter (1961).

Planck function and displays strong helium line emission overlaying it. Following these studies, Nather et al. (1981) performed time-resolved optical spectroscopy to GP com, and found the central wavelength of helium emission lines changing over time. This result strongly indicates that GP Com would harbor a companion star, i.e., this object is a binary star. Nather et al. (1981) also successfully determined its orbital period to be 46.5 min. Thus, GP Com was classified as an AM CVn-type star. Marsh et al. (1991) demonstrated through X-ray observations that GP Com has low metallicity, suggesting that GP Com is an old system like halo objects and has a fully degenerate secondary star. We summarize the physical parameters of GP Com in table 2.1.

Although more characteristics of GP Com have been revealed, a problem regarding this object remains unresolved: why has no outburst ever been observed since its discovery? Are outbursts extremely rare for this object? For these issues, Warner (1995a) and Tsugawa & Osaki (1997) proposed two possible explanations: (1) the outburst cycle is extremely long, similar to enigmatic hydrogen-rich CVs known as WZ Sge-type (for a review of WZ Sge-type stars, see Kato 2015), or (2) the system might have a cool stable disk that does not undergo outbursts.

The critical cool stable mass transfer rate of GP Com is listed in table 2.2. The cool critical mass-transfer rates of GP Com estimated by Tsugawa & Osaki (1997) and Kotko et al. (2012) differ by nearly an order of magnitude. This discrepancy arises because Tsugawa & Osaki (1997) included the effect of the boundary layer, whereas Kotko et al. (2012) did not (Cannizzo & Nelemans 2015, Wong & Bildsten 2021b). Extensive efforts have been made in both observational and theoretical studies to determine the mass transfer rate and mass accretion rate required to assess whether GP Com has a cool stable disk. However, significant uncertainties remain, and no definitive conclusion has been reached. We think that studies of GP Com would provide valuable insights into the understanding of other long outburst cycle objects. Therefore, we address issues on GP Com outburst using the historical archival data.

2.3 Dataset

We searched for the photometric data of GP Com in the DASCH Data Release 6. We found the light curve of the object with ID ATLAS2_786467079, whose coordinates match those of GP Com, in the “ATLAS refcat2 g -band” reference catalog (Tonry et al. 2018b). The ATLAS catalog in the DASCH takes into account the proper motion of

each object, and is suitable for the photometry of high-proper motion objects such as GP Com. We calculated the typical accuracy of the astrometry around GP Com to be $1-\sigma = 7.8''$ using nearby brighter stars. There are several objects within the $3-\sigma$ radius centered on the coordinates of GP Com according to SDSS DR16 catalog (York et al. 2000). However, even the brightest star among them is more than four magnitudes fainter than GP Com. Furthermore, we confirmed that no objects have crossed the coordinates of GP Com within the past century (figure 2.1). Additionally, according to MPCChecker, there is no information that the known minor planets or comets were located around GP Com. Therefore, the detections of GP Com can be interpreted as real if two or more consecutive detections exist.

We used the following archive data to estimate the probability of missing superoutbursts (discussed in section 2.5.3): All-Sky Automated Survey (ASAS-3: Pojmański 2002), All Sky Automated Survey for Supernova (ASAS-SN: Kochanek et al. 2017, Shappee et al. 2014), Asteroid Terrestrial-impact Last Alert System (ATLAS: Heinze et al. 2018, Smith et al. 2020, Tonry et al. 2018a), Catalina Real-time Transient Survey (CRTS: Drake et al. 2009), *Gaia* epoch photometry (Gaia Collaboration et al. 2023), Variable Star Network (VSNET: Kato et al. 2004b), American Association of Variable Star Observers (AAVSO) International Database³, Variable Star Observers League in Japan (VSOLJ) Variable Star Observation database⁴, Transiting Exoplanet Survey Satellite (TESS: Ricker et al. 2015), Zwicky Transient Facility (ZTF: Masci et al. 2019). These data are complementary to DASCH data, which do not cover the post-1990 period.

2.4 Results

Figure 2.2 represents the long-term light curve of GP Com obtained from DASCH. We identify for the first time an outburst of GP Com in the DASCH light curve recorded between 1950 and 1951, reaching an observed amplitude of ~ 6 mag (figure 2.2 lower panel). The plateau stage at 10 mag is observed from JD 2433624 to 2433626 (1950 December 8 to 10), followed by a slightly brighter phase possibly lasting ≥ 150 days. This long-lasting bright phase is brighter than $g = 15.7$, which is the bright limit of the 95 % confidence interval of the ASAS-SN g -band data in quiescence. The fading rate during the rapid fading is $2.4(1) \text{ mag d}^{-1}$, while that of the fading tail is $0.010(2) \text{ mag d}^{-1}$. Using the *Gaia* EDR3 distance of $72.7(3) \text{ pc}$ (Bailer-Jones et al. 2021, Gaia Collaboration et al. 2021), the absolute brightness at the observed maximum is 5.7 mag. In addition, bright data points were detected in 1919 and 1978, one in each year. These events are discussed in detail in the section 2.5.1.

³<https://www.aavso.org/data-download>

⁴http://www.cetus-net.org/cgi-bin/obs_search.cgi

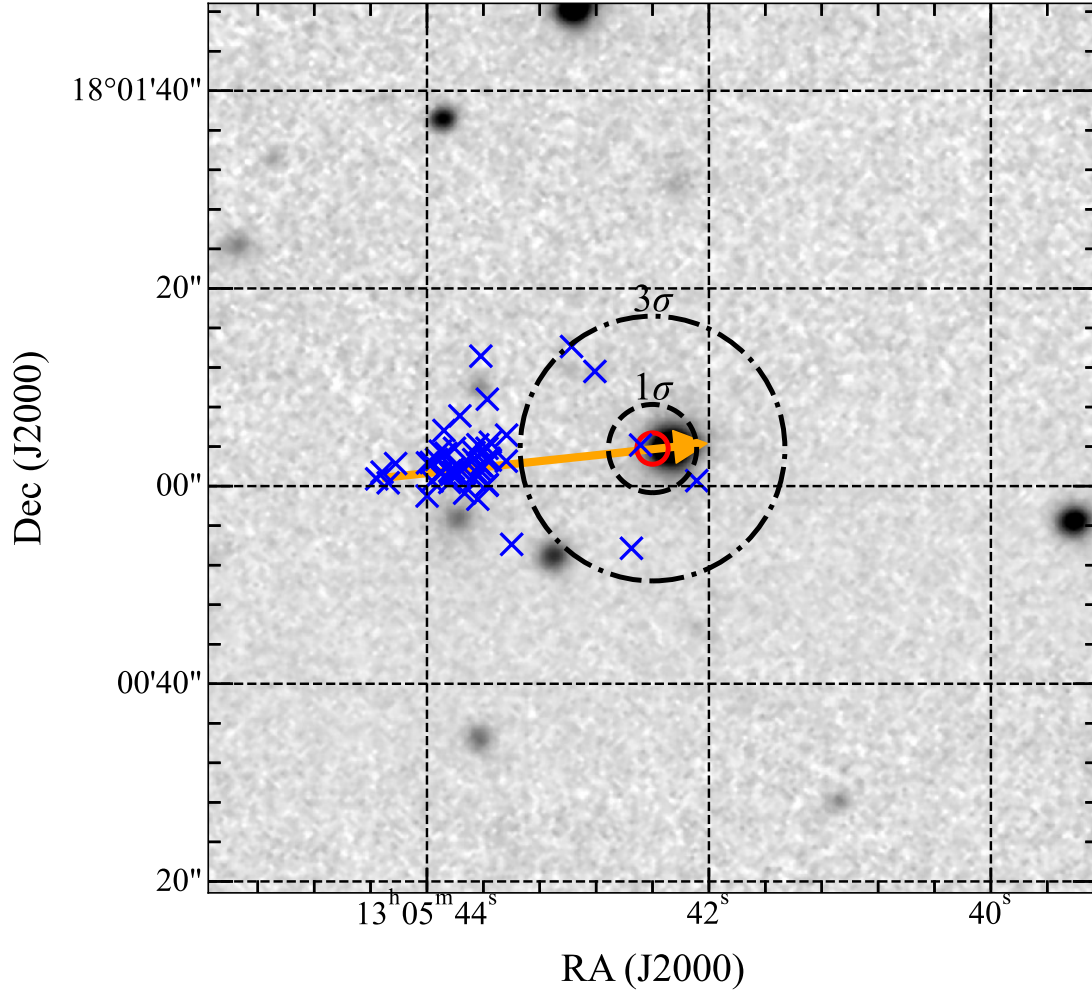


Figure 2.1: The spatial distribution of all available detections of GP Com in the DASCH catalog (blue crosses), shown against SDSS *g*-band image for reference. Red open circle indicates the position of GP Com at epoch J2000.0 (JD 2451545.0). The orange arrow indicates its predicted positions from 1916 to 2016, based on *Gaia* DR3 proper motion measurement. The DASCH detections cover from 1890 to 1989. The distribution is elongated along the GP Com’s proper motion, with a high concentration of detections during 1937-1952. Two dashed circles represent the $1\text{-}\sigma$ and $3\text{-}\sigma$ positional uncertainties in the DASCH catalog determined from nearby stars with negligibly small proper motions.

2.5 Discussion

2.5.1 Nature of 1950 – 1951 outburst

We here discuss the nature of the 1950-1951 outburst. Possible interpretations of this outburst are: (1) a normal outburst (e.g., Pichardo Marcano et al. 2021, Smak 1999); (2)

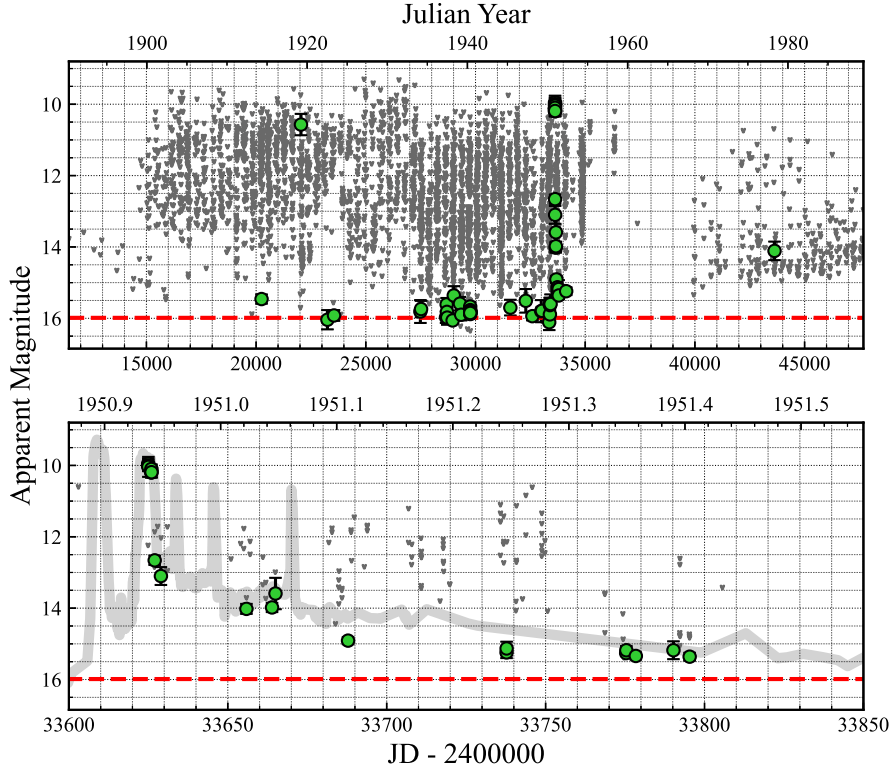


Figure 2.2: (*upper panel*): Light curve of GP Com from the DASCH data. (*lower panel*): Close-up view of the 1950-1951 outburst from the light curve above. Filled green circles indicate detections in the DASCH data with $1\text{-}\sigma$ photometric uncertainties. The V-shape points indicate upper limits from the DASCH catalog. Red dashed lines show the g -band quiescent magnitude of GP Com from Pan-STARRS1 (Chambers et al. 2016). Gray solid line shows the superoutburst profile of V451 Boo in g -band scaled at the distance of GP Com (Isogai et al. in prep). The time shift was determined by visually inspecting the point where the outburst profiles including the fading tail of GP Com and V451 Boo align.

a faint long-duration brightening event (Rivera Sandoval et al. 2021, 2020); (3) a faint long-duration active state with bright short outbursts (Kato & Stubbings 2023); and (4) a (double) superoutburst with a fading tail (e.g., Kato & Kojiguchi 2021);.

During the 1950–1951 outburst of GP Com, the outburst amplitude reached approximately 6 magnitudes, with the peak absolute magnitude of $M_g \sim 6$. The peak was flat and lasted for at least three days. The system remained brighter than its quiescent magnitude for ≥ 150 days following a rapid fading.

Normal outbursts in AM CVn systems typically have a sharp profile and short duration of less than 3 days. These outbursts also lack a fading tail. Given these differences, interpretation (1) is unlikely to match the features of the GP Com event.

A faint long-duration brightening event (Interpretation 2) is characterized by a small

amplitude, faint peak absolute magnitude, and a prolonged period during which the system remains brighter than quiescence. J0807 showed a brightening amplitude of about 2.5 mag and remained brighter than its quiescent level for approximately 550 days (including a slow fading phase lasting about 450 days), reaching a peak absolute magnitude of $M_g = 7.8^{+0.9}_{-1.6}$ according to the ZTF data and the Gaia distance (Bailer-Jones et al. 2021). Similarly, J1137 exhibited a brightening amplitude of about 2 mag according to the ATLAS data, stayed brighter than quiescence for around 650 days (with a slow fading phase of about 450 days), and reached a peak absolute magnitude of $M_o = 10.9(1)$ using the ATLAS data and the Gaia distance (Bailer-Jones et al. 2021). Since these characteristics significantly differ from the outburst in GP Com in terms of the amplitude, duration and peak absolute magnitude, this interpretation is ruled out.

Interpretation (3), a faint long-duration active state with bright short outbursts, is also unlikely. These short outbursts typically last only ~ 1 day and are not flat-topped. The flat-topped structure observed in GP Com, lasting at least 3 days, is inconsistent with this profile.

In contrast, a (double) superoutburst with a fading tail (Interpretation 4) exhibits several features that are consistent with the GP Com event. These superoutbursts often reach absolute magnitudes of $M_g \sim 4 - 6$ and show flat-top phases, often occurring twice, followed by a fading tail lasting for 100 – 200 days (Kato & Kojiguchi 2021). In the case of the 1950–1951 outburst of GP Com, the observational record includes data gaps and upper-limit constraints, making it difficult to determine whether one or two flat-top phases occurred, or how long the flat-top phase actually lasted. Nevertheless, the overall characteristics are consistent with this interpretation.

To further support the classification, we compared this event with the superoutburst of V451 Boo (SDSS J141118.31+481257.6), an AM CVn system with a similar orbital period of ~ 46 minutes (Ramsay et al. 2012; Anderson et al. 2005; Rivera Sandoval & Maccarone 2019), compared to 46.52 minutes for GP Com (Marsh et al. 1991). The comparison, shown in the lower panel of figure 2.2, displays the observed light curve of V451 Boo scaled by the distance of GP Com. The fading rate during the rapid fading in GP Com is $2.4(1) \text{ mag d}^{-1}$, while the fading tail shows a slower decline of $0.010(2) \text{ mag d}^{-1}$. For comparison, V451 Boo exhibited a similar rapid decline rate of $2.44(3) \text{ mag d}^{-1}$, but a steeper fading tail at $0.0275(6) \text{ mag d}^{-1}$. Both systems exhibit remarkably similar fading rates in both the rapid fading and the fading tail.

These similarities suggest that the 1950–1951 outburst in GP Com was a superoutburst with a fading tail, as commonly seen in long- P_{orb} AM CVn systems (Kato & Kojiguchi 2021).

We also considered the possibility of a helium nova, such as observed in V445 Pup. However, helium novae are much more luminous, and in the case of a low-mass white dwarf like GP Com, a longer flat-topped bright phase than the ~ 250 days seen in V445 Pup would be expected (Kato & Hachisu 2003). Since such features are not observed in our case, the helium nova interpretation is unlikely.

2.5.2 Nature of 1919 and 1978 outburst

We compared the superoutburst light curve template of V451 Boo with the detections and upper limits around 1919 and 1978, and found no agreement. This result argues

against the presence of a fading tail associated with double superoutbursts, as commonly seen in long-period AM CVn systems. This suggests that these detections are unlikely to be superoutbursts of GP Com, and are more plausibly attributed to short-duration normal outbursts (typical duration $\sim 1\text{--}2$ days, amplitude $\sim 3\text{--}5$ mag; e.g., Kato et al. 2000, Levitan et al. 2015b) or to non-astrophysical events such as cosmic rays.

2.5.3 Probability of missing superoutburst and lower limit of supercycle

We calculated the missing probability of a superoutburst to discuss the supercycle of GP Com. We used the interpolated light curve of the V451 Boo superoutburst as a template for the profile of the GP Com outburst. The almost same P_{orb} of GP Com and V451 Boo suggests the light curve of GP Com has a similar profile. In fact, the profile of GP Com matches with the one of V451 Boo (figure 2.2).

We estimated the annual probability of missing a superoutburst as a measure of yearly observational coverage using time-series data from DASCH and recent time-domain surveys, including both detection limits and upper limits (figure 2.3, upper panel). To do this, we randomly generated 10^8 hypothetical superoutburst dates between the 1890 and 2024. For each simulated event, we applied the template light curve of V451 Boo and determined whether the predicted brightness at the times of actual observations would have exceeded the detection limit or the reported magnitudes. This allowed us to assess whether the superoutburst could have been missed during the observational window. The vertical red dotted lines in figure 2.3 upper panel represent the duration of the 1950–1951 superoutburst. The average probability is 34 %. The missing probability after 2001 is 0 % because of the modern time-domain survey projects.

Then, we estimated the probability of missing a superoutburst by considering the supercycle (the lower panel of figure 2.3). In Vogt et al. (2021), the average value of $1\text{-}\sigma$ uncertainty of the supercycles, including WZ Sge-type stars, is estimated to be approximately 7 %. According to table 1 of Vogt et al. (2021), the average value of $1\text{-}\sigma$ uncertainty of the supercycles for WZ Sge-type stars alone is also about 7 %, consistent with the value obtained when SU UMa-type stars are included. However, most WZ Sge-type stars have only about three observed superoutbursts, which may lead to an underestimation of uncertainty of the supercycles. Therefore, we adopt the value of 11 %, derived from SU UMa-type stars with long-term and frequent observations of superoutbursts, as a conservative estimate of the uncertainty in the supercycle of GP Com. We assumed quasi-periodic supercycles ranging from 1 to 100 years, in steps of 0.1 year. Using the Monte Carlo method, we generated artificial light curves starting from the superoutburst observed in 1950–1951. For each assumed supercycle, we simulated 10^4 trials of hypothetical superoutbursts and evaluated whether the modeled brightness at the times of actual observations would have exceeded the detection limit (or reported magnitudes). These simulations incorporated the assumed supercycle length and a Gaussian 1σ uncertainty. We then assessed the probability that archival data would have failed to detect these superoutbursts.

The lower panel of figure 2.3 indicates that the supercycle is longer than 33 years, which also rules out the possibility that the bright detections in 1919 and 1978 were part of a superoutburst. If GP Com does not initiate the next superoutburst in 10, 20,

and 30 yrs after 2024, the probability of a supercycle of about 45 yrs will decrease. We simulated such cases and plotted the missing probabilities by green, yellow, and red lines in figure 2.3 lower panel, respectively.

2.5.4 Estimation of mass transfer rate from supercycle

Based on the supercycle probability estimated in section 2.5.3, we investigate a possible relationship between the mass transfer rate and the mass accretion rate in GP Com.

We defined the disk mass stored from a superoutburst to the next, M_{SO} . According to Osaki (1996) and Cannizzo & Nelemans (2015), M_{SO} is roughly equal to the disk mass consumed during each superoutburst and the superoutburst greatly clears the disk mass in plain DIM and TTI. For example, in the case of figure 8 of Osaki (1996), we estimated that the rate of the disk mass consumed in normal outbursts in one SC is 17% of M_{SO} and the disk mass just after the superoutburst is reduced to 25% of its pre-superoutburst value. We then ignore that disk mass consumed in normal outbursts in the following. Levitan et al. (2015b) estimated the critical disk mass for superoutburst occurrence by using the mass transfer rate estimated from their model and the observed supercycle length. They found that the critical disk mass for superoutburst occurrence is $\approx 10^{-10} M_{\odot}$ with $P_{\text{orb}} = 20 - 37$ min. From these considerations, we infer that the accumulated disk mass M_{SO} during one supercycle is approximately $10^{-10} M_{\odot}$ and does not strongly depend on the orbital period.

We estimate the relationship between $\dot{M}_{\text{tr}} - \dot{M}_{\text{acc}}$, supercycle SC , and M_{SO} based on the well-studied AM CVn star KL Dra and YZ LMi that undergo superoutbursts without a novalike state. We adopted the primary mass, secondary mass, and orbital period from Solheim (2010), and the X-ray luminosity (L_{X}) from Begari & Maccarone (2023). The radius of the primary white dwarf was estimated from figure 1 of Hamada & Salpeter (1961). Using these parameters, we calculated $\dot{M}_{\text{acc}}$ by applying equation (1) in Strohmayer (2004). The parameter values used to estimate M_{SO} for KL Dra and YZ LMi are summarized in table 2.3.

Then, we obtain a relationship expressed as:

$$M_{\text{SO}} = SC \times (\dot{M}_{\text{tr}} - \dot{M}_{\text{acc}}) \approx (7.3 \pm 1.6) \times 10^{-11} M_{\odot}. \quad (2.1)$$

Figure 2.4 shows the relationship between the orbital period (P_{orb}) and the supercycle (SC), with a secondary vertical axis indicating the corresponding values of mass transfer rate ($\dot{M}_{\text{tr}}$) - mass accretion rate ($\dot{M}_{\text{acc}}$).

In many outbursting AM CVn systems, the quiescent X-ray luminosity is approximately $10^{31} \text{ erg s}^{-1}$ (Begari & Maccarone 2023), from which equation (1) in Strohmayer (2004) gives $\dot{M}_{\text{acc}} \sim 10^{-12} M_{\odot} \text{ yr}^{-1}$. We therefore took the mass-transfer rates from the evolutionary tracks in figure 3 of Kotko et al. (2012), applied $\dot{M}_{\text{acc}} = 0$ and $10^{-12} M_{\odot} \text{ yr}^{-1}$ in equation (2.1), and plotted the resulting supercycle evolution curves. The dotted and dash-dotted lines represent these evolutionary tracks of P_{orb} versus $\dot{M}_{\text{tr}}$ for the cases of the degenerate, semi-degenerate and hot secondaries from bottom to top.

To validate this conversion, we analyzed publicly available data and determined the supercycles of 58 AM CVn-type systems (See table A.1 and the Appendix); the resulting SC values are overplotted in figure 2.4.

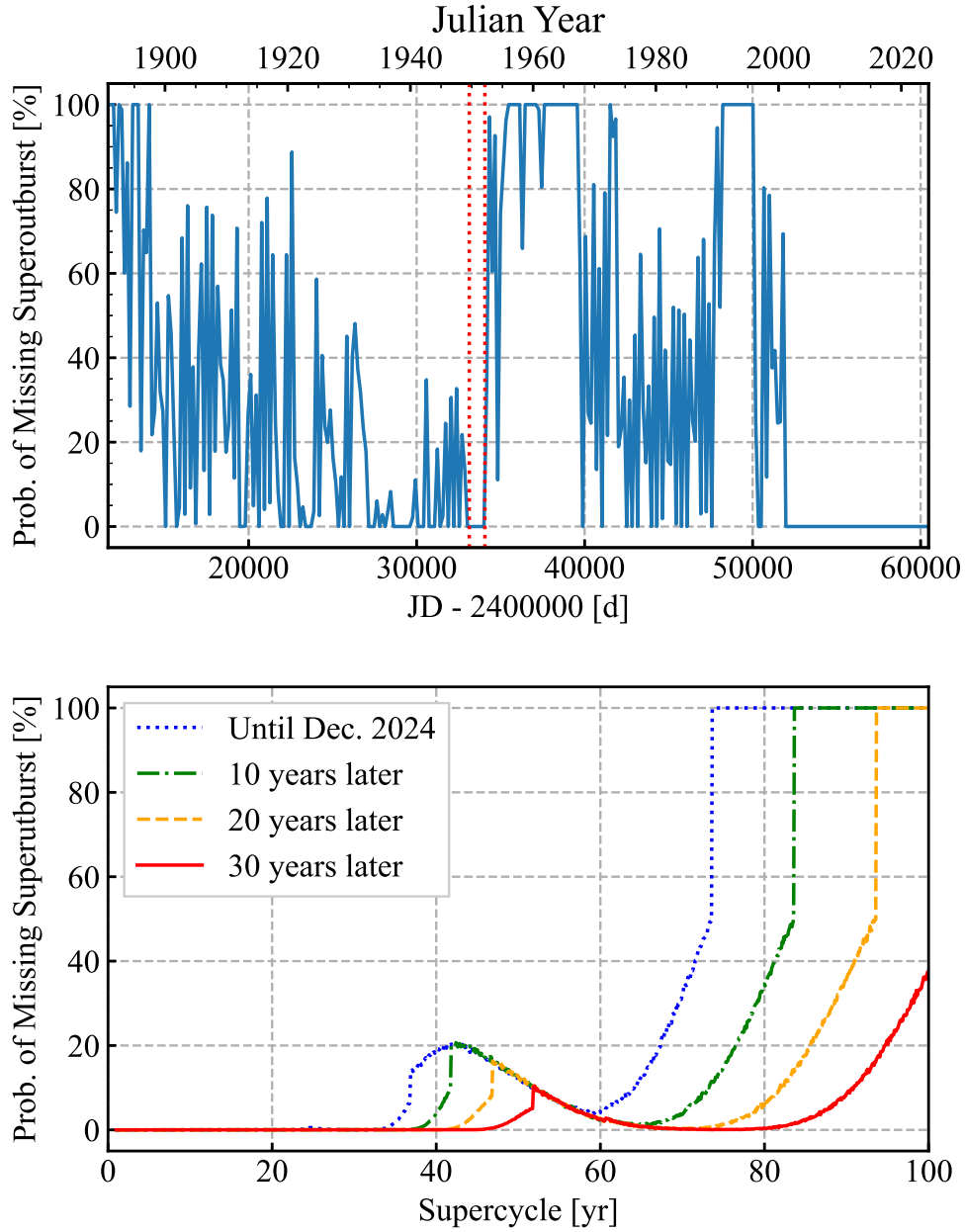


Figure 2.3: (*upper panel*): Probability of missing a superoutburst per yr. The lower probability represents more upper limits. (*lower panel*): The probability of missing a superoutburst considering the supercycle and its $1\text{-}\sigma$ uncertainty of 11 % (Vogt et al. 2021). The dotted, dash-dotted, dashed, and solid lines represent the probability of missing a superoutburst considering the data up to the present, with an additional 10, 20, and 30 yrs in the case of no superoutburst occurred, respectively.

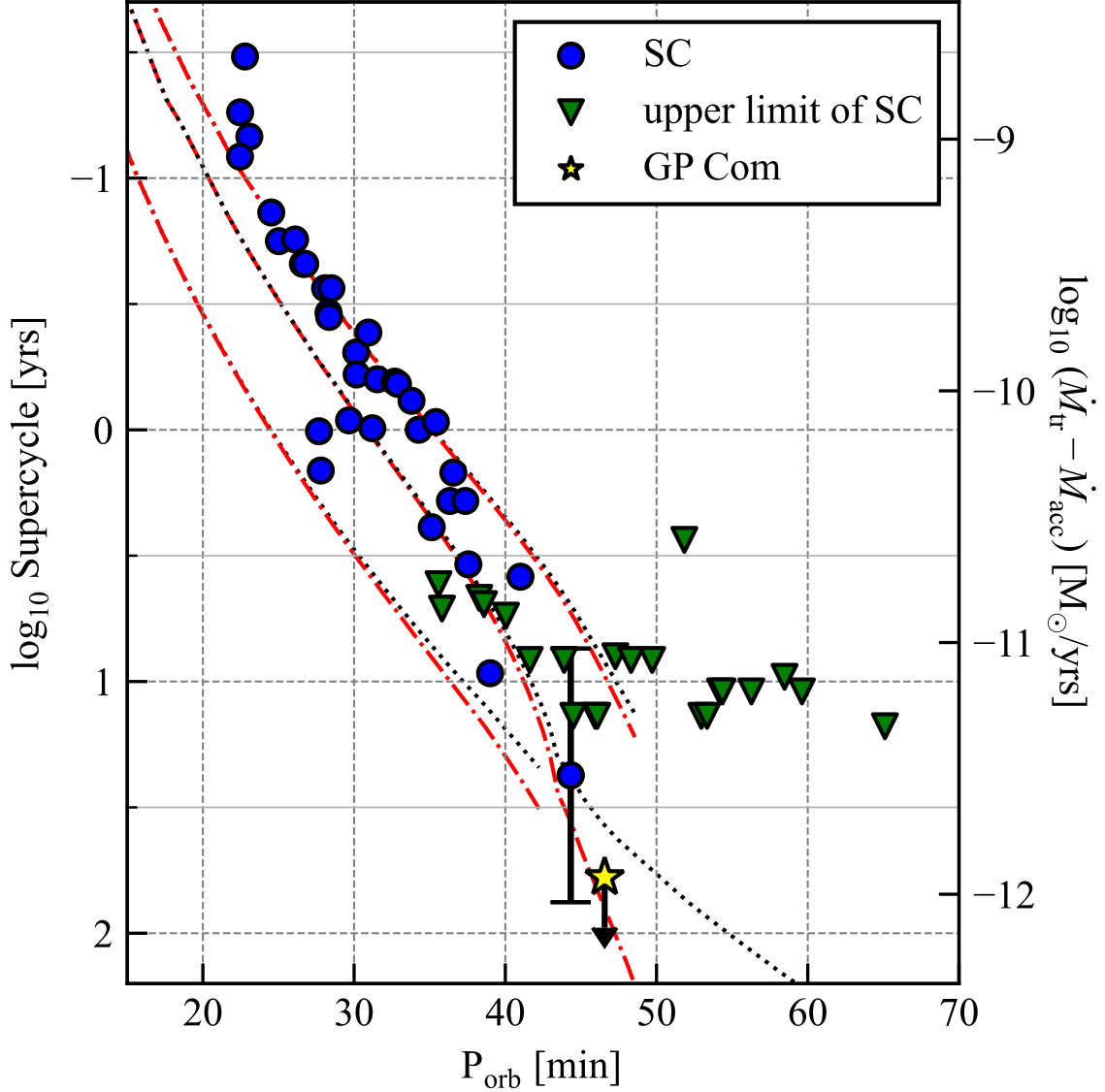


Figure 2.4: Supercycle vs. orbital period (P_{orb}) for AM CVn-type systems. The right y-axis shows mass transfer rates - mass accretion rates derived from equation (2.1). Blue circles indicate supercycles of outbursting AM CVns. Green inverted triangles represent upper limits of supercycles of AM CVns (table ??). Yellow star shows the upper limit of the SC for GP Com (section 2.5.3) of 70 yrs. The black dotted line represents SC calculated by applying equation 2.1 with a mass accretion rate of $\dot{M}_{\text{acc}} = 0 M_{\odot} \text{ yr}^{-1}$, based on the mass-transfer rate from the evolutionary track in figure 3 of Kotko et al. (2012). The red dashed-dotted line shows the SC calculated using $\dot{M}_{\text{acc}} = 1 \times 10^{-12} M_{\odot} \text{ yr}^{-1}$, also based on the same evolutionary track.

Then, the objects with orbital periods of shorter than 40 min align with the evolutionary track. We do not know SC of many AM CVn stars with orbital periods longer

Table 2.3: Parameter for accumulated disk mass for superoutburst of KL Dra and YZ LMi.

	KL Dra	YZ LMi	Ref.
P_{orb} (min)	25	28.3	(1)(2)
M_1 ($M_{\odot}$)	0.76	0.86(4)	(1)(2)
M_2 ($M_{\odot}$)	0.057	0.035(3)	(1)(2)
$R_1/100R_{\odot}$	1.1	1.0	(3)
$\log(L_X)$ (erg s^{-1})	30.56	31.04	(4)*
	—	30.89	(4) [†]
	31.04	—	(4) [‡]
$\dot{M}_{\text{acc}}$ ($M_{\odot} \text{ yr}^{-1}$)	$1.8(9) \times 10^{-12}$	$3.2(5) \times 10^{-12}$	(5)
$\dot{M}_{\text{tr}}$ ($M_{\odot} \text{ yr}^{-1}$)	5×10^{-10}	1.8×10^{-10}	(1)(6)
M_{SO} ($M_{\odot}$)	8.8×10^{-11}	6.1×10^{-11}	

*: XMM

[†]: Chandra

[‡]: Swift

References – (1): Wood et al. (2002); (2): Copperwheat et al. (2011); (3): Figure 1 in Hamada & Salpeter (1961); (4): Begari & Maccarone (2023); (5): Equation 1 in Strohmayer (2004); (6): Szypryt et al. (2014)

than 40 min due to their long SC , and only the lower limit of SC has been determined. Therefore, we only give an upper limit of $\dot{M}_{\text{tr}}$. This result implies that our assumption is acceptable for most stars.

It should be noted that $\dot{M}_{\text{acc}}$ in equation (2.1) for GP Com in quiescence is not negligible. $\dot{M}_{\text{acc}}$ of GP Com is about 25% of the estimated upper limit of $\dot{M}_{\text{tr}}$ (see table 2.1). We substituted the $\dot{M}_{\text{acc}}$ of Strohmayer (2004) and $SC > 70$ yrs into equation (2.1). Then, we obtained $\dot{M}_{\text{tr}} < 1.7 \times 10^{-12} M_{\odot} \text{ yr}^{-1}$. This value is smaller than the upper limit of the mass transfer rate in the previous observational study (table 2.1). If GP Com follows the theoretical evolutionary track, $\dot{M}_{\text{tr}}$ is $1.9 \times 10^{-12} M_{\odot} \text{ yrs}^{-1}$.⁵ By using this value and equation (2.1), we estimated SC to be about 71(16) yrs. This value is roughly consistent with our observational lower limit of $SC > 70$ yrs. GP Com might show the next superoutburst in the near future. If the supercycle is even longer, it is possible that $\dot{M}_{\text{tr}}$ is even smaller than our upper limit or that M_{SO} is larger than the other objects. For the hydrogen-rich CV, WZ Sge, whose supercycle is unexpectedly long, it has been proposed that the viscosity parameter α in the disk is extremely low; hence, M_{SO} is much larger than usual objects (Osaki 1995b).

If the assumption that GP Com has a quasi-periodic supercycle is incorrect, we cannot estimate $\dot{M}_{\text{tr}}$ from the long-term historical data. In other words, EMT might have

⁵Rivera Sandoval & Maccarone (2019), like us, estimated the mass transfer rate for the evolutionary track by reading from figure 3 of Kotko et al. (2012), and adopted $\dot{M}_{\text{tr}} \sim 2.5 \times 10^{-12} M_{\odot} \text{ yr}^{-1}$ for V451 Boo (J1411; $P_{\text{orb}} = 46$ min). Our corresponding estimate at $P_{\text{orb}} = 46$ min is $\dot{M}_{\text{tr}} \sim 2.1 \times 10^{-12} M_{\odot} \text{ yr}^{-1}$, indicating good agreement within the expected precision.

triggered the superoutburst in 1950–1951. However, there are some unclear points about the cause of EMT in GP Com. The degenerated companion of GP Com is thought to have a very low mass and activity. We need to understand the mechanism of EMT in such systems.

Further long-term monitoring is required to determine whether GP Com exhibits quasi-periodic superoutbursts and whether the DIM or EMT can explain its superoutburst. Such observation will provide a valuable hint as to whether GP Com has a cool stable disk where $\dot{M}_{\text{tr}}$ matches $\dot{M}_{\text{acc}}$ except during the outburst state.

2.6 Summary

GP Com experienced an outburst in 1950–1951, which was probably a WZ Sge-type superoutburst. We estimated the probability of missing superoutbursts and found the lower limit of the supercycle SC to be 70 yrs. Also, assuming that the disk mass stored during each supercycle is the same for all outbursting AM CVn systems, we derived the relationship between SC and the mass transfer rate $\dot{M}_{\text{tr}}$. Then, we estimated the upper limit of $\dot{M}_{\text{tr}}$ of GP Com to be $1.8 \times 10^{-12} \text{ M}_{\odot} \text{ yr}^{-1}$ based on the lower limit of SC . Using $\dot{M}_{\text{tr}}$ predicted by the theoretical evolution, we obtained $SC \sim 71(16)$ yrs, roughly consistent with our lower limit of 70 yrs. If SC is even longer, M_{SO} of GP Com might be more massive.

In many of the AM CVns with long orbital periods, a superoutburst has been only recently discovered. The supercycles of these stars are then unknown. In addition, most of the objects are faint in quiescence, and hence there are almost no systems for which binary parameters have been estimated. Therefore, the information that GP Com had an outburst in the past is very useful information for verifying DIM.

Chapter 3

Observational Study of Double Superoutbursts in Long Orbital-Period AM CVn stars

This thesis chapter was originally accepted in PASJ as Kojiguchi, N., Isogai, K., Tampo, Y., et al.

We present an observational study of superoutbursts in six AM CVn systems with orbital periods longer than 35 min. We focused on this range because such systems are expected to have very low mass ratios, making them particularly likely to exhibit double superoutbursts and fading-tail profiles. Using time-resolved photometry from the VSNET and AAVSO campaigns, complemented by survey data from ZTF, ASAS-SN, ATLAS, Gaia, and TESS, we analyzed nine superoutbursts observed between 2014 and 2021. Among them, four events exhibited clear double superoutburst profiles, analogous to those seen in hydrogen-rich WZ Sge-type dwarf novae. We characterized the fading tail following the second superoutburst and found that it can be divided into three distinct phases (tails A, B, and C) with different power-law fading indices. The effective superoutburst durations were typically 7–13 days, while the dip duration is different significantly among systems. Notably, the effective durations of the second superoutbursts in the double superoutburst were consistently around 5 days. These results highlight the importance of thermal–tidal instabilities in explaining the outbursts of long orbital-period AM CVn stars. They also suggested that the three-phase fading-tail structure may be a universal feature of the systems and further imply that in systems with short supercycles the effective viscosity during quiescence could be higher than expected from a true quiescent state.

3.1 Introduction

AM Canum Venaticorum (AM CVn) stars are a subclass of cataclysmic variables (CVs), consisting of a white dwarf (WD) primary and a helium star or He WD secondary (for a review, see e.g., Solheim 2010). Mass is transferred from the donor to the primary,

forming an accretion disk¹ that gives rise to a variety of phenomena.

The orbital period (P_{orb}) ranges from about 5 to 70 minutes, and systems evolve towards longer orbital periods and smaller mass ratios q ($= M_2/M_1$). The angular momentum loss in these systems is primarily driven by the gravitational wave radiation, which strongly influences the mass transfer rate ($\dot{M}_{\text{tr}}$). When the mass transfer rate is sufficiently high, the disk remains in a hot, stable state. As the transfer rate decreases, the disk becomes thermally unstable and undergoes dwarf nova (DN)-type outbursts. As the mass transfer rate decreases further, the disk is thought to settle into a cool, stable state (Tsugawa & Osaki 1997, Solheim 2010, Kotko et al. 2012). The P_{orb} range in which DN outbursts occur has been considered to be roughly 20–50 min (e.g., Tsugawa & Osaki 1997, Levitan et al. 2015a, Green et al. 2025). More recently, DN-type outbursts have been observed even in longer- P_{orb} systems (e.g., ASASSN-21au, $P_{\text{orb}} \sim 58$ min: Rivera Sandoval et al. 2022). In addition, some long P_{orb} systems exhibit faint, long-lasting brightening events which are distinct from ordinary DN outbursts (NSV 1440, $P_{\text{orb}} = 36.3$ min: Kato & Stubbings 2023; SDSS J080710.33+485259.6, $P_{\text{orb}} \sim 53$ min: Kupfer et al. 2019; Rivera Sandoval et al. 2020; SDSS J113732.32+405458.3, $P_{\text{orb}} \sim 59.6$ min: Rivera Sandoval et al. 2021, Wong et al. 2021).

Outbursts in AM CVn stars are theoretically understood in terms of the thermal-tidal instability model, similar to hydrogen-rich DNe. AM CVn systems typically have very low mass ratios ($q < 0.25$; See e.g., Green et al. 2025), enabling the accretion disk to reach the 3:1 resonance radius and produce superhumps and superoutbursts (SOs) (Whitehurst 1988, Osaki 1989, Hirose & Osaki 1990, Lubow 1991a, Lubow 1991b). The behavior of SOs in AM CVn systems is more complex than that in H-rich CVs, often exhibiting features such as dips and rebrightenings² (e.g., Kato et al. 2014, Isogai et al. 2016, Isogai et al. 2019, Kato & Kojiguchi 2021, Rivera Sandoval & Maccarone 2019, Rivera Sandoval et al. 2022, Pichardo Marcano et al. 2021, Duffy et al. 2021). Therefore, there are efforts to explain the outburst profile using thermal instability and enhanced mass transfer (EMT) (Kotko et al. 2012).

As a noteworthy case, some systems have been found to exhibit SOs similar to those of WZ Sge-type DNe among hydrogen-rich CVs (Kato 2015), such as NSV 1440 (Isogai et al. 2019). A WZ Sge-type SO is now understood as an outburst that shows a double-wave modulation with a period nearly equal to P_{orb} in its early stage, called the early superhump, followed by the appearance of ordinary superhumps. The early superhump is considered to be excited at the 2:1 resonance radius (Lin & Papaloizou 1979). Since the amplitude of early superhumps depends on the orbital inclination, they are not always observed (e.g., Osaki & Meyer 2002, Kato 2015). In such systems, a long time lag is seen before the appearance of ordinary superhumps, and this lag is regarded as one of the signatures that early superhumps occurred (Kato 2015).

Among WZ Sge-type DNe, some systems exhibit a dip during the middle phase of their SOs. Such SOs are called double SOs and tend to be observed in systems with smaller mass ratios (Kato 2015, Kimura et al. 2016a). In these systems, early superhumps are observed in the first half of the SO, while ordinary superhumps appear in the latter half. The dip between the two SOs can be explained by the thermal-tidal instability model

¹Systems with orbital periods shorter than ~ 10 min lack accretion disks, and the mass stream from the donor directly impacts the accretor (e.g., Marsh & Steeghs 2002; Roelofs et al. 2010).

²Some papers refer to rebrightenings as “echo outbursts” (e.g., Rivera Sandoval et al. 2022).

(Kimura et al. 2016a). In this model, the growth time of superhumps is proportional to q^{-2} (Lubow 1991a,b); thus, after the early superhumps decay, it takes some time for the ordinary superhumps to develop fully, during which the disk temporarily fades. To date, no AM CVn systems are known to have exhibited an ordinary WZ Sge-type SO. Therefore, WZ Sge-type SOs in AM CVns may all be double SOs.

Systems that exhibit WZ Sge-type SOs are observationally known to appear at $q < 0.08$ in hydrogen-rich CVs (Kato 2015). In AM CVn systems, most objects with orbital periods longer than 30 minutes are expected to satisfy $q \lesssim 0.08$ (e.g., Isogai et al. 2019). Among AM CVns and their candidates that have exhibited WZ Sge-type SOs, the system with the shortest known orbital period is NSV 1440 ($P_{\text{orb}} = 36.3$ min; Aungwerojwit et al. 2025, Isogai et al. 2019). Therefore, in this study, we define AM CVns with $P_{\text{orb}} > 35$ min as long- P_{orb} AM CVns and those with $P_{\text{orb}} < 35$ min as short- P_{orb} AM CVns.

After the rapid fading in WZ Sge-type SOs, the system enters the so-called fading-tail phase, which is also seen in AM CVns. During this stage, the system remains brighter than in quiescence and gradually declines. In hydrogen-rich CVs, this phase shows an infrared excess and decays exponentially or as a power law, lasting from several hundred days to a few years (Kato 2015; Neustroev et al. 2017; Kato & Kojiguchi 2021). Rebrightenings are also known to occur, and in AM CVns, multiple short rebrightenings have been observed (e.g., Isogai et al. 2019; Kato & Kojiguchi 2021; Duffy et al. 2021; Pichardo Marcano et al. 2021; Rivera Sandoval et al. 2022).

Statistical studies of SOs in AM CVn systems have been conducted extensively. Investigations using outburst morphology have also been performed, allowing the discovery and characterization of AM CVn candidates from survey data without relying on detailed spectroscopic observations. Kato & Kojiguchi (2021) proposed a method to distinguish AM CVns from hydrogen-rich systems based on the distinctive behavior of WZ Sge-type SOs, combining a faster decay rate (> 1.5 mag d $^{-1}$) with a shorter outburst duration (typically ~ 5 d). In addition, numerous studies have attempted to constrain the mechanisms of SOs by analyzing the outburst durations of AM CVn stars (e.g., Cannizzo & Nelemans 2015, Cannizzo & Ramsay 2019, Levitan et al. 2015b). However, due to the short duration and rapid rise and decay, determining the full outburst profile remains challenging with sparse survey observations, highlighting the importance of continuous monitoring (e.g., Duffy et al. 2021, Pichardo Marcano et al. 2021). In particular, WZ Sge-type SOs are relatively rare, and many aspects of features such as their fading tails remain poorly understood.

In H-rich CVs, the fading tail has generally been attributed to the cooling process of the WD. However, Kato & Stubbings (2023) pointed out that this interpretation does not hold for AM CVns: (1) the amount of accreted mass is significantly smaller, $\sim 10^{-10} M_{\odot}$ for SO of AM CVns compared to $\sim 10^{-9} M_{\odot}$ for SO of WZ Sge stars (Meyer-Hofmeister et al. 1998; Kojiguchi et al. 2025), and (2) the fading tail in AM CVns ends abruptly, in contrast to the smooth decline as expected from WD cooling. They concluded that the fading tail in AM CVns is more likely caused either by a change in the mass-transfer rate or viscosity.

There is another unsolved problem which may be related either to a change in the mass-transfer rate or in viscosity, that is the active state observed in NSV 1440 (Kato & Stubbings 2023). That active state showed "superposed normal outbursts" having a

short duration of ~ 1 day and a small amplitude up to that of the normal outburst (see Fig. 2 in Kato & Stubbings (2023)). A change of the supercycle (SC) after the active state would provide a test between EMT and viscosity-driven scenarios.

Although individual cases of double SOs and fading tails in long P_{orb} AM CVn systems have been reported, a systematic observational study has not yet been carried out. In particular, it remains unclear whether profile of the fading tail is a universal property of long P_{orb} AM CVn stars, and how the durations of double SOs are related to the mass ratio and secular evolution of these binaries.

In this study, to focus on the issues regarding the general properties of the SO and the fading tail, we investigated six AM CVn systems with orbital periods of more than 35 min. The first five systems are ASASSN-18rg (a18rg in Table 3.2; $P_{\text{SH}} = 45.953(6)$ min), ASASSN-19rg (a19rg in Table 3.2; $P_{\text{SH}} = 42.598(9)$ min), ASASSN-21au (a21au in Table 3.2; $P_{\text{SH}} = 57.92(7)$ min), SDSS J090221.35+381941.9 (hereafter J0902; $P_{\text{orb}} = 48.31(8)$ min), and NSV 1440 (hereafter, the 2015 and 2017 SOs of NSV 1440 are referred to NSV1440 (2015) and NSV 1440 (2017), respectively; $P_{\text{orb}} = 36.335(7)$ min), which were continuously monitored during their SOs through the VSNET campaign. The sixth system is ASASSN-20eq (a20eq in Table 3.2; $P_{\text{orb}} \sim 36 - 45$ min), which was reported in Kato & Kojiguchi (2021) as showing a double SO and was observed with TESS.

We organize this paper as follows. In Section 3.2, we describe the dataset of the light curves, and in Section 3.3, we present the analysis methods. Section 3.4 focuses on the profiles of the SOs and the fading tails, while Section 3.5 provides information and period analyses for individual objects. We discuss the SO and fading tail profiles in Section 3.7, and summarize our work in Section 3.8.

3.2 Dataset

The data were obtained through campaigns led by the Variable Star Network (VSNET) Collaboration (Kato et al. 2004b), and also include observations reported to the American Association of Variable Star Observers (AAVSO; Kafka 2018). The profiles of the SOs of NSV 1440 were determined using visual observations in addition to CCD data. We used time-domain survey data from the Zwicky Transient Facility (ZTF; Masci et al. 2019), the Asteroid Terrestrial-impact Last Alert System (ATLAS) Forced Photometry (Tonry et al. 2018a)³, the All-Sky Automated Survey for Supernovae (ASAS-SN) Sky Patrol (Shappee et al. 2014; Kochanek et al. 2017; Hart et al. 2023)⁴, Gaia Alerts⁵, and the Transiting Exoplanet Survey Satellite (TESS; Ricker et al. 2015).

The list of SOs and observers is summarized in table 3.1. The detailed observation logs for each object are provided in Tables C.1–C.10.

³The ATLAS Forced Photometry is available at <https://fallingstar-data.com/forcedphot/>

⁴The list of ASAS-SN Transients is available at <https://www.astronomy.ohio-state.edu/asassn/transients.html>

⁵<https://gsaweb.ast.cam.ac.uk/alerts>

Table 3.1: List of SOs.

Subsection	Object	Year	Observers or surveys*
3.5.1	J0902	2014	deM, LCO, SWI [‡] , DPV, JJI [‡] , IMi [‡] , KU, OAR [‡] , CRI, CMM [‡] , OKU, Han, Ioh, Mas, RPc, Kis, R JW, CMJ [‡] , UJH [‡] , DKS, Mdy, MIC, Shu, MZK, Nov, Ham, MTu, DDE, MUY, MKi, CRTS, PTF
3.5.2	NSV 1440	2015	MLF, MGW, HaC, SPE [‡] , COO, ASASSN, Gaia, SRX ^{†‡} , HSP ^{†‡}
		2017	MLF, HaC, ASASSN, SRX ^{†‡} , HSP ^{†‡}
		2019	HaC, MLF, SPE [‡] , ASASSN, COO, SkyMapper, SRX ^{†‡} , HSP ^{†‡}
		2021	MLF, ASASSN, ATLAS, SkyMapper, SRX ^{†‡} , HSP ^{†‡}
3.5.3	ASASSN-18rg	2018	SGE, DPV, OKU, Van, HaC, Ioh, KU, Lic, DFS, BSM, CRI, MUY, ZTF, ATLAS, ASASSN
3.5.4	ASASSN-19rg	2019	MLF, HaC, ATLAS, ASASSN
3.5.5	ASASSN-20eq	2020	Ioh, TESS, ZTF, ATLAS, ASASSN
3.5.6	ASASSN-21au	2021	Ioh, KU, Kub, Trt, Van, Vih, CRI, CGR [‡] , RFD, ZTF, ATLAS, ASASSN

*Key to observers: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J. Jones), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muyllaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), R JW (John Rock), RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

[†]Visual observation.

[‡]Inclusive of observations from the AAVSO database.

3.3 Analysis

Before making the analysis, we corrected zero-point differences between different observers by adding a constant to each observer (see Tables C.11 – C.17).

3.3.1 Period Analysis

Prior to the period analysis, the global trend of the light curves was subtracted using locally weighted polynomial regression (LOWESS; Cleveland 1979). The phase dispersion minimization (PDM; Stellingwerf 1978) method was applied for a period analysis of superhumps in this paper. The 1σ error for the PDM analysis is determined by following Fernie (1989) and Kato et al. (2010). The evolution of the superhump period (P_{SH}) was analyzed using an $O - C$ diagram. The timing of the superhump maximum in the $O - C$ diagram was determined in the same way as presented in Kato et al. (2009).

3.3.2 Outburst Profile Analysis

The outburst duration was calculated as the total time during which the system remained brighter than the level 1 mag fainter than the brightness at the end of the 2nd SO (see the left panel of figure 3.1). The end time and magnitude of the second SO were determined by visual inspection of the light curve. The associated magnitude and duration were read directly from the observations, and the uncertainties were estimated based on the nearest available observation times. The statistical values of the durations of each part of the SOs (see Section 3.4.1) were estimated from their mean and standard deviation. The SC was calculated by adopting the first detection of each SO as its starting time, measuring each SO interval, and then taking the mean and standard deviation of these intervals as the SC.

We estimated the fading rate during the fading tail by fitting a power-law function ($m = \alpha \log t + A$) and deriving the power-law index α (see the right panel of figure 3.1).

The fading rate was estimated using photometric data reported to VSNET and AAVSO, including unfiltered (no filter, including "clear") and V -band observations. We also used survey data from ASAS-SN (V, g), ZTF (g, r), ATLAS (cyan), and Gaia (BP). In cases where contamination was suspected in the ASAS-SN data, only measurements obtained when the target was relatively bright were included in the analysis.

It is known that in DN-type outbursts, even when the total radiated energy is the same, the absolute magnitude can differ by up to two magnitudes depending on the inclination angle (Paczynski & Schwarzenberg-Czerny 1980). Moreover, many systems either lack reliable distance estimates or have large uncertainties in their distances⁶. Therefore, to allow for a more comprehensive discussion across different systems, we define the zero magnitude of the relative magnitude scale as the brightness at the end of the 2nd SO.

⁶The method proposed by Kato (2022a) cannot be directly applied to AM CVn systems, since the absolute magnitudes of AM CVns are affected by differences in the disk temperature and disk radius during outburst, which differ from those in WZ Sge-type objects among H-rich CVs. In addition, there are cases where it is not a double SO.

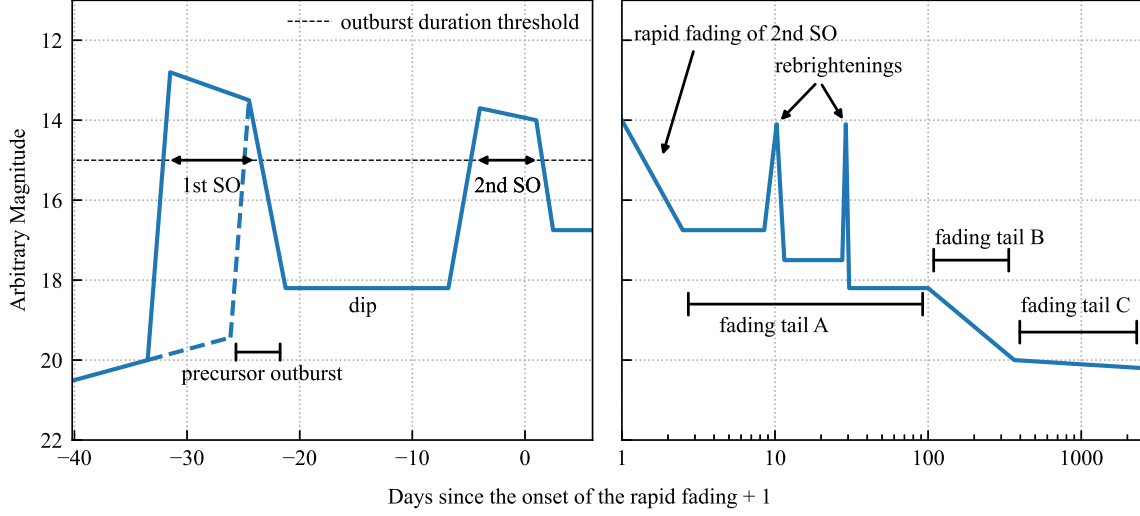


Figure 3.1: Schematic illustration of the light curves of SOs based on six long P_{orb} AM CVn systems. The left panel shows the main part of a SO, while the right panel illustrates the fading tail phase on a logarithmic time scale ($\log_{10}$). Key components of each phase are labeled to clarify the typical features observed in AM CVn-type systems. The dashed line represents a short precursor outburst which are seen in some systems instead of the 1st SO. The dotted line indicates the level that is 1 mag fainter than the end of the second SO. We define this level as the reference for measuring the duration of each part in SOs. The detailed measurement procedure is described in Section 3.3.2.

3.4 General Properties

As illustrated in the figure 3.1, we define the terminology for each phase: 1st SO (or precursor outburst), dip, 2nd SO, rapid fading, fading tail, and rebrightenings. The right panel of figure 3.1 shows the light curves plotted with the elapsed time from the end of the 2nd SO on a logarithmic scale. A short precursor outburst is seen in some systems instead of the 1st SO. In such cases, we refer to the subsequent SO accompanied by ordinary superhumps as the “2nd SO” in this paper. Although this SO does not literally follow a 1st SO, we adopt this terminology to maintain consistency with previous studies and to emphasize that this outburst is physically equivalent to the 2nd SO in double SO systems.

3.4.1 General Tendency in Outburst Profile

We analyzed nine SOs in six AM CVn systems with orbital periods longer than 35 min. Among the nine SOs, four clearly exhibited double SO profiles.

For J0902, the early stage of the outburst was not observed due to a data gap, so it is unclear whether the initial brightening was a 1st SO or a precursor. In the cases of

NSV 1440 (2015, 2017, 2019) and ASASSN-21au, a short precursor outburst was observed instead of a 1st SO. The subsequent SOs in both cases showed ordinary superhumps, similar to the 2nd SOs observed in other systems. For convenience, we refer to the SOs with ordinary superhumps of J0902, NSV 1440 in 2017, 2019, 2021, and ASASSN-21au as 2nd SOs in this paper.

Systems with long orbital periods show temporary dips and fading tails, while systems with short orbital periods often exhibit very long and complex rebrightening phase. Since the systems are fainter during these dips and tails than during the main outburst plateau and the duration of dip varies widely depending on the system, including them in the total outburst duration does not accurately reflect the mass consumed in the SO. To uncover the underlying physics, the durations of the main outburst, the temporary dip and the fading tail should be analyzed separately.

The combined duration of the 1st SO duration or precursor outburst duration, $t_{\text{dur}}^{\text{SO1}}$, and the 2nd SO, $t_{\text{dur}}^{\text{SO2}}$, is called effective SO duration $t_{\text{dur}}^{\text{eff}}$. The combined duration of the 1st SO duration $t_{\text{dur}}^{\text{SO1}}$ or the precursor outburst duration, dip duration $t_{\text{dur}}^{\text{dip}}$ and the 2nd SO duration $t_{\text{dur}}^{\text{SO2}}$ is called all SO duration $t_{\text{dur}}^{\text{all}}$. The word “dip” is hereafter used only for the phase between the precursor outburst or the 1st SO and the 2nd SO. For the definition of each phase, see figure 3.1.

Outbursting AM CVn systems have been the subject of several statistical studies on outburst durations (e.g., Levitan et al. 2015a; Cannizzo & Nelemans 2015; Rivera Sandoval & Maccarone 2019; Cannizzo & Ramsay 2019; Pichardo Marcano et al. 2021; Duffy et al. 2021; Rivera Sandoval et al. 2022). The definition of outburst duration varies across studies. In Levitan et al. (2015a), it is defined as the period during which the system is brighter than the quiescent magnitude by either 3σ or 0.5 magnitude—i.e., from the onset of the outburst to near the end of the fading tail. The outburst duration they present is close to the sum of $t_{\text{dur}}^{\text{all}}$ and the durations of tails A–B (see Section 3.4.2).

In contrast, Rivera Sandoval & Maccarone (2019); Cannizzo & Ramsay (2019); Pichardo Marcano et al. (2021); Rivera Sandoval et al. (2022) define the outburst duration as the interval from the beginning of the 1st SO or the precursor outburst to the end of the 2nd SO, excluding the fading tail. The SO duration in Rivera Sandoval & Maccarone (2019); Cannizzo & Ramsay (2019); Rivera Sandoval et al. (2022) is equivalent to $t_{\text{dur}}^{\text{all}}$. The SO duration defined by Pichardo Marcano et al. (2021) includes the precursor outburst. However, in short-period AM CVn systems, the dip between the precursor outburst and the SO is almost absent. Therefore, their total SO duration corresponds to what we define as $t_{\text{dur}}^{\text{all}}$ in this paper. In addition, since the precursor itself is very short (≤ 1 d), it is practically equivalent to $t_{\text{dur}}^{\text{SO2}}$. Moreover, the SO duration defined by Duffy et al. (2021) includes the period from the beginning of the precursor outburst to the end of the rebrightenings.

3.4.2 General Tendency in Fading Tail Profile

As illustrated in the left panel of figure 3.1, we define the terminology for each phase: 1st SO, dip, 2nd SO, rapid fading, fading tail, and rebrightenings. The right panel of figure 3.1 shows the light curves plotted with the elapsed time from the end of the 2nd SO on a logarithmic scale. It is known that the fading tail of the SO of long P_{orb} AM CVns changes its fading rate significantly during the course of the fading (Kato & Stubbings

2023), so that the fading tail can be divided into three durations that follow a power law, as shown in the right panel of figure 3.1. We define these duration as fading tails A, B, and C (hereafter tails A, B, and C). For details on why we do not uniformly discuss H-rich objects, see the Appendix.

The tail A shows little fading in brightness and exhibits a stepwise fading of approximately 1 magnitude associated with each rebrightening. The tail B features a monotonic fading without any rebrightening. The tail C is slightly brighter than the quiescent magnitude and fades at a slower rate. However, in some systems the brightness reaches the quiescent magnitude immediately after tail B, and in such cases tail C is not present.

3.5 Individual Objects

3.5.1 SDSS J090221.35+381941.9

SDSS J090221.35+381941.9 was identified as an AM CVn-type object based on its Sloan Digital Sky Survey (SDSS) color selection and characteristic helium emission lines, absence of hydrogen features, and blue continuum (Rau et al. 2010).

Rau et al. (2010) obtained time-resolved spectra of this object and determined an orbital period of 48.31(8) min from radial velocity variations in the emission lines.

On 2014 March 6, D. Denisenko discovered an outburst of this object using images from Mobile Astronomical System of Telescope Robots (MASTER)-Kislovodsk (see Lipunov et al. 2010; Gorbovskoy et al. 2013 for the MASTER network; vsnet-alert 16982). A rapid fading was subsequently observed (vsnet-alerts 16986, 16988), followed by a rebrightening on March 12 (vsnet-alert 17016). Between March 15 and 16, growing superhumps were detected, indicating the onset of a SO (vsnet-alert 17023).

The 2014 SO of J0902 is shown in Figure 3.2. At the time, double SOs in AM CVn systems had not yet been recognized, and the first outburst was interpreted as a precursor outburst (Kato et al. 2014). However, it is now unclear whether the 2014 SO was a genuine double SO or a SO with a precursor, since the last pre-outburst observation was taken 12 days earlier during quiescence by CRTS, and double SO phenomena in AM CVn systems were found in Isogai et al. (2019). In addition, an approximately 1-mag mini dip was reported in the early phase (around day -6 in figure 3.2) of the 2nd SO, a feature not seen in other AM CVn systems (Kato et al. 2014). A detailed period analysis of the 2014 SO was reported by Kato et al. (2014).

In 2023, the object exhibited a brightening of approximately 2 magnitudes that lasted for about one year (see Figure 3.3). This behavior appears to be analogous to the active state observed in NSV 1440 in 2022.

3.5.2 NSV 1440

NSV 1440 was originally listed as a candidate variable star in the New Catalogue of Suspected Variable Stars (NSV, Kukarkin et al. 1982). It was later identified as an AM CVn candidate based on detailed photometric observations during its SOs in 2015 and 2017, which revealed superhumps and a low mass ratio. Spectroscopic observations by Aungwerojwit et al. (2025) confirmed its classification, showing helium emission lines,

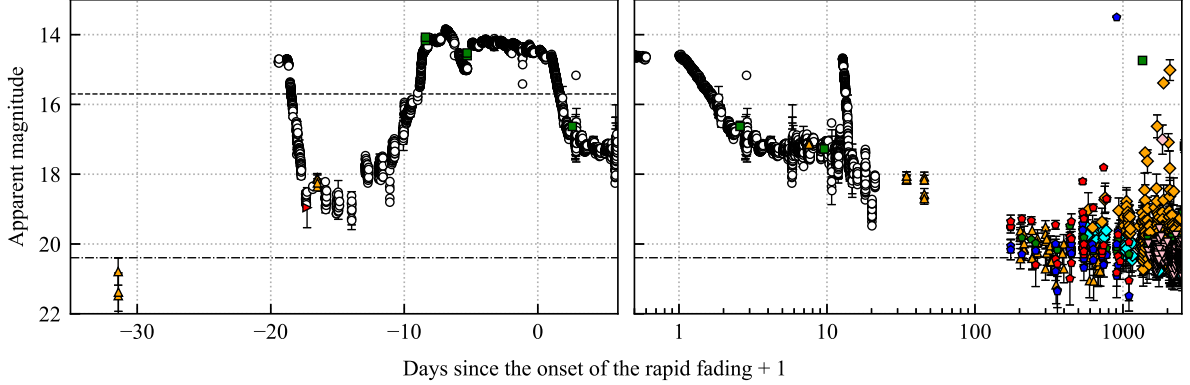


Figure 3.2: Light curve of the 2014 SO of SDSS J090221.35+381941.9. The x-axis is referenced to 1 day after the onset of rapid fading. The left panel shows the SO proper with linear scale, while the right panel displays the fading tail with log scale. White circles indicate VSNET-reported data, green squares represent ASAS-SN g -band, orange and cyan diamonds are ATLAS orange and cyan bands, upward triangles are from CSS, green, red, and pink downward triangles correspond to ZTF g , r , i , green, red, and blue pentagons denote Gaia G , RP , and BP , and green and red rightward triangles represent PTF g and R_c . The dashed line indicates 1 magnitude fainter than the onset of rapid fading, and the dash-dotted line marks the g -band magnitude from the PS1 catalog.

absence of hydrogen, and a blue continuum. Notably, NSV 1440 was the first AM CVn system to exhibit early superhumps.

The counterpart candidate is identified as SMSS J035517.90-822610.9 in SkyMapper ($u = 16.8(6)$, $v = 18.23(6)$, $g = 18.45(1)$, $r = 16.27(6)$, $i = 18.71(6)$, $z = 18.8(1)$) and GALEX J035517.7-822612 in GALEX ($FUV = 18.29(8)$, $NUV = 18.28(6)$) (Bianchi et al. 2017, Chambers et al. 2016, Martin et al. 2005).

The system underwent SOs in 2015, 2017, 2019, and 2021, with possible SOs in 2003 and 2005, and entered an active state in 2022 (Isogai et al. 2019, Kato & Stubbings 2023). Light curves for the 2015, 2017, 2019 and 2021 SOs are shown in Figure 3.4. While Isogai et al. (2019) initially interpreted the 2015 SO as a double SO and the 2017 SO as a partially missed double SO, subsequent visual observations revealed that the 2017 SO was instead a precursor outburst followed by a main SO. Therefore, the 2015 event is now regarded as a double SO, while the 2017, 2019 events are classified as SO with precursor outburst. Due to data gaps, it is unclear whether the 2021 event was a 1st SO or a precursor outburst. Nevertheless, the 2nd SO in 2021 had a longer duration compared to those in other years, which is worth noting.

The SC of NSV 1440 is estimated to be approximately 2 years based on ASAS-3 and ASAS-SN data (Isogai et al. 2019). However, the last confirmed SO before 2015 occurred in 2005, and due to a 4.4-year gap in modern time-domain survey coverage, the precise interval preceding the 2015 SO remains uncertain. Gaia epoch photometry around the 2015 and 2017 SOs shows that the 2017 SO began before the system had fully returned to its quiescent magnitude. Furthermore, tail C remained brighter than the quiescent level but did not display a fading trend. Given the ~ 2 -year intervals preceding the 2017, 2019

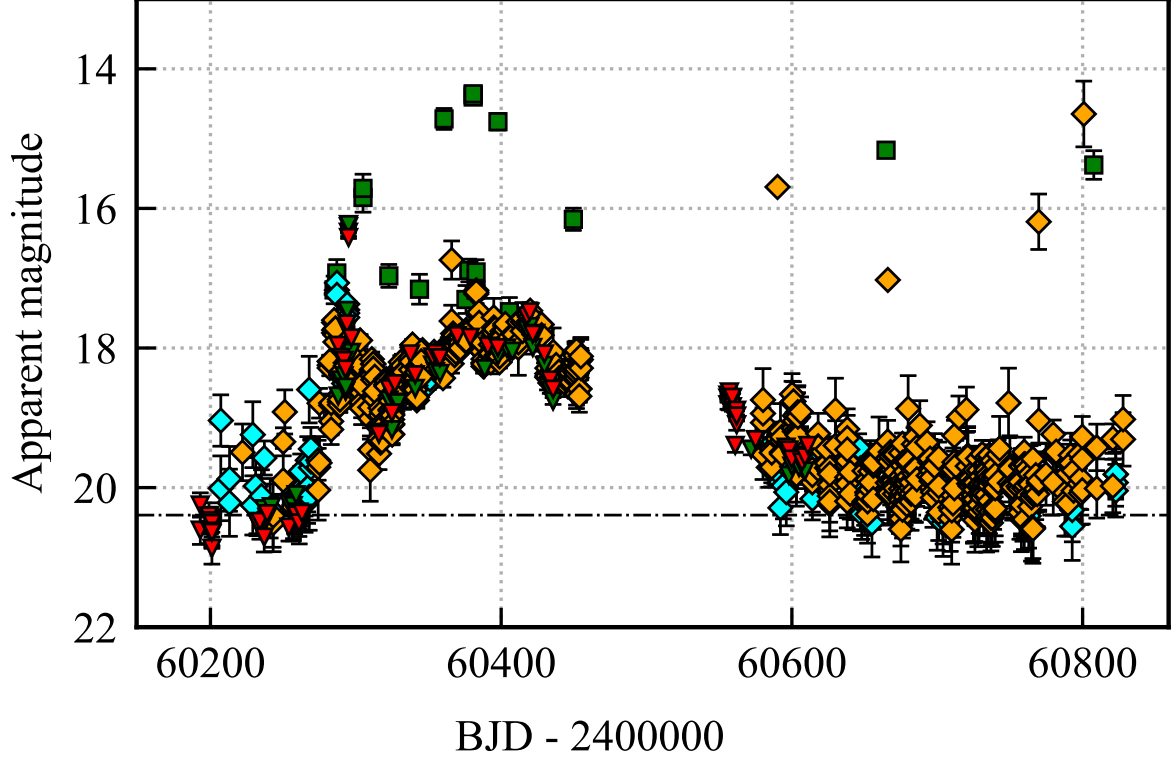


Figure 3.3: Light curve of the 2023 active state of SDSS J090221.35+381941.9. Green squares represent ASAS-SN g -band, orange and cyan diamonds are ATLAS orange and cyan bands, green and red downward triangles are ZTF g - and r -band. The dash-dotted line marks the g -band magnitude from the PS1 catalog.

SOs, their common SO profiles with precursor outburst, and the fact that their effective SO durations were about 2/3 that of the 2015 SO, it is possible that more disk mass had accumulated prior to the 2015 SO due to a longer preceding interval. A similar behavior is observed in H-rich CVs, where AL Com exhibits both WZ Sge-type and SU UMa-type SOs, with shorter outburst intervals preceding the latter (Kimura et al. 2016b).

Isogai et al. (2019) reported an early superhump period (P_{ESH}) of 36.335(7) min for the 2015 SO, while Aungwerojwit et al. (2025) determined an orbital period of 36.56(3) min using TESS data. This results in an P_{ESH} approximately 0.6% shorter than the orbital period. In H-rich CVs, early superhumps are typically only $\lesssim 0.05\%$ shorter than the orbital period (Ishioka et al. 2002), suggesting that early superhumps in AM CVns may deviate more significantly. It should be noted that the P_{orb} reported by Aungwerojwit et al. (2025) is longer than $P_{\text{SH(stageB)}}$ and is close to $P_{\text{SH(Late)}}$. For systems with small mass ratios ($q < 0.036$), $P_{\text{SH(stageB)}}$ can be shorter than the orbital period (Kato 2022b). Using the orbital period from Aungwerojwit et al. (2025) and $P_{\text{SH(stageA)}}$ from Isogai et al. (2019), the stage A method yields a mass ratio of $q = 0.029(3)$. Continuous spectroscopic observations are desirable to determine the orbital period with higher certainty.

Period analyses for the 2015 and 2017 SOs were reported in detail in Isogai et al.

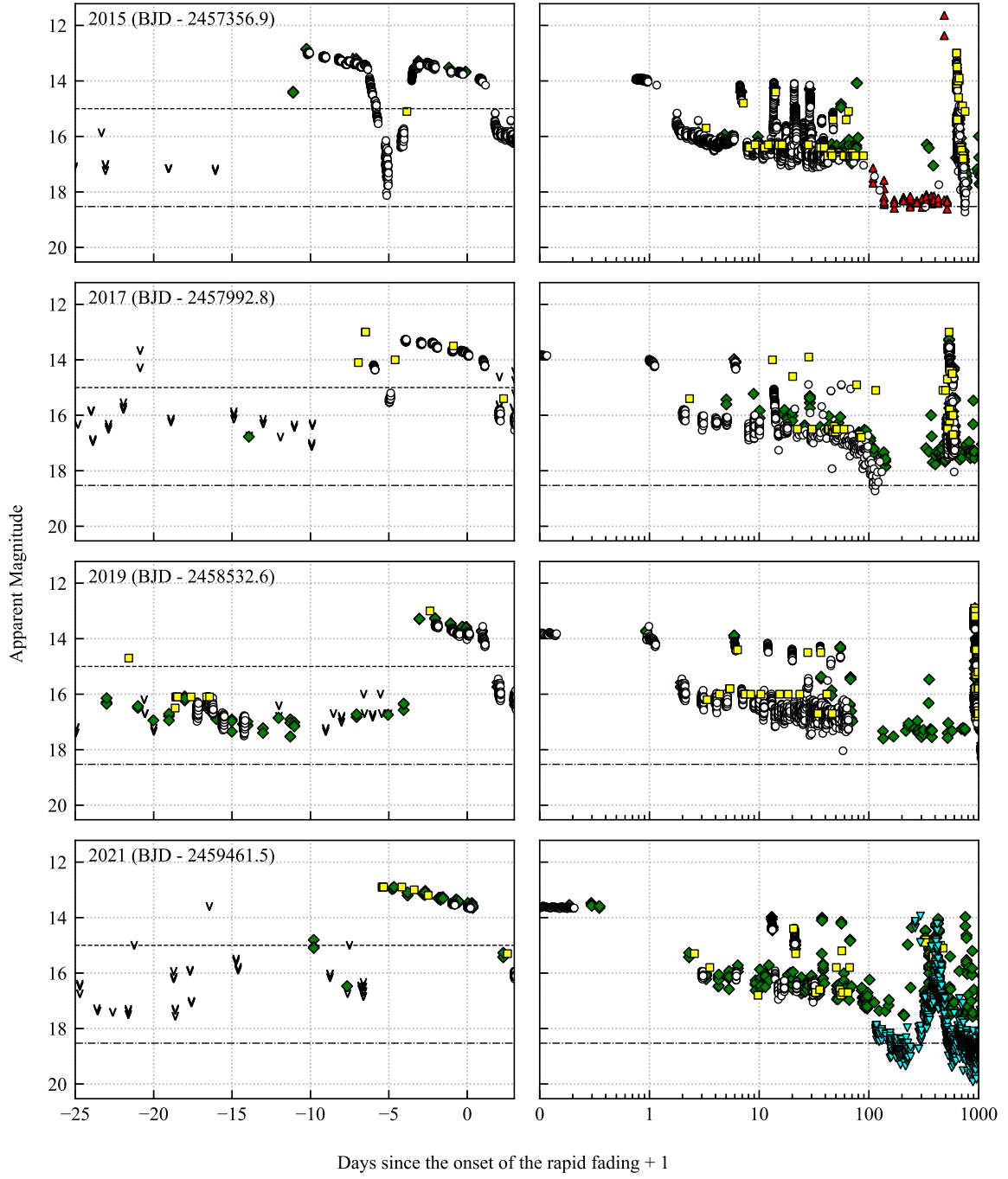


Figure 3.4: Light curves of the 2015, 2017, 2019, and 2021 SOs of NSV 1440. The x-axis is referenced to 1 day after the onset of rapid fading. The left panels show the SOs proper with a linear scale, while the right panels display the fading tails with a logarithmic scale. White circles indicate VSNET-reported data, yellow squares represent visual observations, green diamonds represent ASAS-SN *g*-band, cyan downward triangles represent ATLAS cyan band, and red upward triangles represent Gaia. The dashed line indicates 1 magnitude fainter than the onset of rapid fading, and the dash-dotted line marks the *g*-band magnitude from the SkyMapper DR4 catalog.

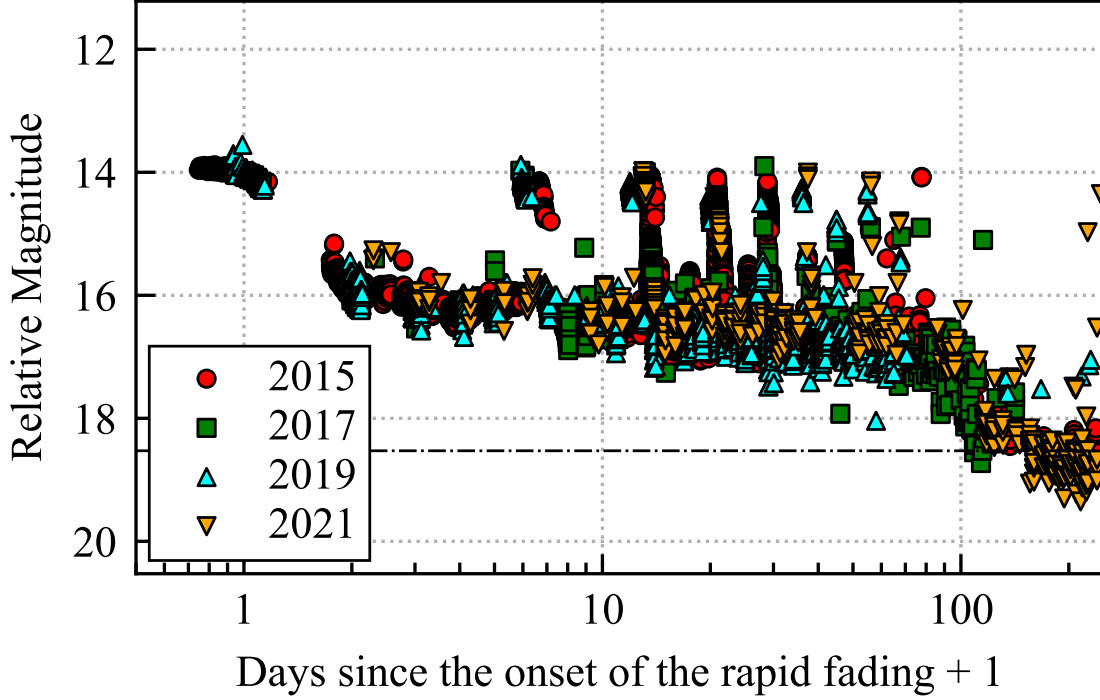


Figure 3.5: Overlaid light curves of the fading tails following the SOs of NSV 1440 in 2015, 2017, 2019, and 2021. The x-axis is referenced to 1 day after the onset of rapid fading. The dash-dotted line marks the g -band magnitude from the PS1 catalog.

(2019).

3.5.3 ASASSN-18rg

Figure 3.6 shows the light curve of the 2018 SO of ASASSN-18rg. ASASSN-18rg was discovered at $g = 12.3$ on 2018 August 8.31 by the ASAS-SN team. Its counterpart candidate is SDSS J211742.16–022228.4, and the outburst was noted as having a large amplitude (ASAS-SN Transients⁴; vsnet-alert 22392⁷).

The counterpart candidate is identified as PS1 105153194256450916 in Pan-STARRS ($g = 20.48(4)$, $r = 20.59(3)$, $i = 20.83(3)$, $z = 20.83(9)$, $y = 19.87(23)$) and GALEX J211742.1–022228 in GALEX ($FUV = 22.5(5)$, $NUV = 21.0(2)$) (Bianchi et al. 2017, Chambers et al. 2016, Martin et al. 2005).

The object did not show ordinary superhumps during the first 7 days after the outburst, and subsequently underwent a rapid fading at a rate of 2.3 mag d^{-1} . After this, the object entered a dip phase lasting approximately 3 weeks, remaining about 1 mag

⁷The vsnet-alert messages can be seen at (<http://ooruri.kusastro.kyoto-u.ac.jp/pipermail/vsnet-alert/>)

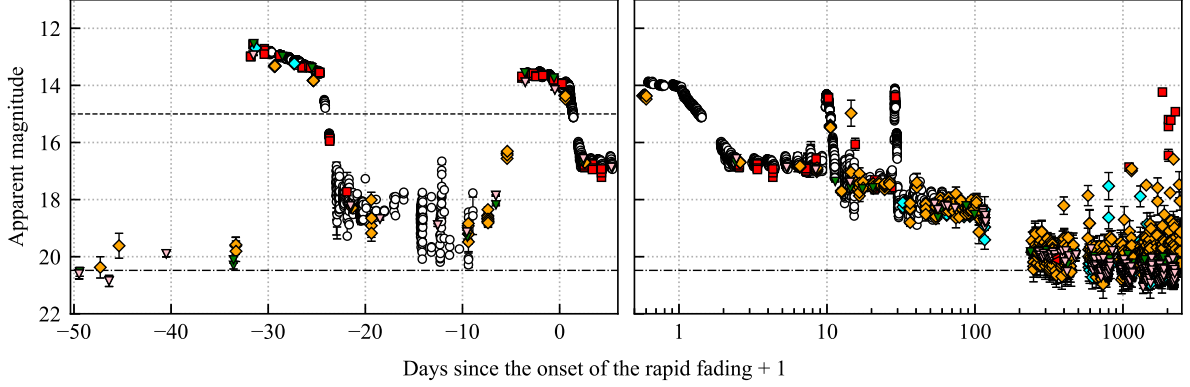


Figure 3.6: Light curve of 2018 SO of ASASSN-18rg. The x-axis is referenced to 1 day after the onset of rapid fading. The left panels shows the SO proper with linear scale, while the right panels displays the fading tail with log scale. White circles indicate VSNET-reported data, red squares represent ASAS-SN g -band, orange and cyan diamonds represent ATLAS orange and cyan bands, and green, red, and pink downward triangles represent ZTF g , r , i -bands. The dashed line indicates 1 magnitude fainter than the onset of rapid fading, and the dash-dotted line marks the g -band magnitude from the PS1 catalog.

brighter than the quiescent magnitude, and then underwent a rebrightening (vsnet-alert 22423⁷).

During the rebrightening, a very short P_{SH} of 0.0340(8) d was detected (vsnet-alert 22496⁷). Based on these features, the SDSS colors in the quiescence, and Gaia parallax, the object was identified as an AM CVn-type system (vsnet-alerts 22499, 22501⁷).

The Gaia EDR3 source 2685503760105453568 is associated with this object, with a distance of 322^{+337}_{-97} pc (Bailer-Jones et al. 2021, Gaia Collaboration et al. 2021). The reddening is estimated as $E(g-r)_{\text{PS1}} = 0.03^{+0.04}_{-0.02}$ (Green et al. 2019)⁸.

The absolute magnitude in quiescence is estimated to be $M_{g_{\text{PS1}}} = 12.9^{+0.7}_{-2.3}$ with $(g-r)_{\text{PS1}} = -0.13^{+0.06}_{-0.05}$, considering Galactic extinction. The peak absolute magnitude of the outburst is $M_g = 4.9^{+0.7}_{-2.3}$, based on the ASAS-SN detection magnitude. These values are typical for AM CVn systems with large-amplitude outbursts (Kato & Kojiguchi 2021).

During the fading tail, the object exhibited two short rebrightenings, with a stepwise profile showing ~ 1 mag decreases before and after each event. The overall outburst morphology was consistent with an outside-in outburst.

Figure 3.7 presents the PDM analysis and phase-averaged profile during the 2nd SO (from BJD 2458366.75 to 2458371.402), revealing a clear ordinary superhump with a period of $P_{\text{SH}} = 0.031912(4)$ d. Figure 3.8 shows the PDM result and phase profile during the rapid fading phase (BJD 2458371.402–2458372.538), indicating a period of $P_{\text{SH}} = 0.03199(2)$ d. The profile during the rapid fading phase differs from that during the 2nd SO and resembles an orbital hump. Variations were observed during the 1st SO, but no clear period could be detected. We did not obtain a clear $O-C$ diagram of

⁸<http://argonaut.skymaps.info/>

superhump.

3.5.4 ASASSN-19rg

Figure 3.9 shows the complete light curve of the 2019 SO of ASASSN-19rg. The object was discovered at $g = 13.13$ on 2019 July 8.16 by the ASAS-SN team. Its PS1 counterpart candidate is PS1 90152014920761753 ($g = 20.37(2)$, $r = 20.45(3)$, $i = 20.65(3)$, $z = 20.81(3)$), and it was identified as a large-amplitude transient (ASAS-SN Transients⁹, vsnet-alert 23366⁷).

Following the outburst, the object showed no ordinary superhumps and entered a rapid fading after about 8 days, suggesting a possible double SO (vsnet-alert 23399⁷). Subsequently, a rebrightening occurred, and ordinary superhumps with $P_{\text{SH}} = 0.03048(3)$ d were observed, confirming the object as an AM CVn system (vsnet-alerts 23425, 23432⁷).

The Gaia counterpart is Gaia EDR3 3608015074033774336, with a distance of 1160^{+518}_{-374} pc (Bailer-Jones et al. 2021, Gaia Collaboration et al. 2021). The reddening is estimated to be $E(g - r)_{\text{PS1}} = 0.05^{+0.02}_{-0.02}$ (Green et al. 2019)⁸. From this, the absolute magnitude in quiescence is estimated to be $M_{g_{\text{PS1}}} = 10.22^{+0.70}_{-0.97}$, with a color of $(g - r)_{\text{PS1}} = -0.08(3)$. The outburst peak absolute magnitude derived from ASAS-SN is $M_g = 2.86^{+0.70}_{-0.97}$. These values are brighter than typical AM CVns with large-amplitude outbursts (Kato & Kojiguchi 2021). During the fading tail, the object exhibited three short rebrightenings. Spectroscopy also confirmed its nature as an AM CVn system, likely evolved via the WD channel (van Roestel et al. 2021).

van Roestel et al. (2021) estimated an upper limit of 7 years for the SC based on the 2019 SO and the CRTS archival data. We were unable to find those CRTS data. In addition, the object appears to have brightened in the Digitized Sky Survey (DSS; STSci 2020) red image taken on 1988 April 19. According to the Guide Star Catalog (GSC) II (Lasker et al. 2007), its brightness was measured as $R_F = 17.5(4)$, which may correspond to the fading tail phase of a past outburst.

The period analysis of the superhumps in 2nd SO is shown in figure 3.10. $P_{\text{SH}} = 0.02959(1)$ d. The $O - C$ analysis did not yield a clear identification of superhump stages.

3.5.5 ASASSN-20eq

Figure 3.11 shows the light curve of the 2020 SO of ASASSN-20eq. The upper panel presents observations from ZTF, ASAS-SN, and ATLAS, while the bottom panel shows the TESS light curve.

This object was discovered at $g = 15.8$ on 2020 March 12 by the ASAS-SN team. ZTF observations revealed multiple rebrightenings and a fading tail. The quiescent color of $(u - g)_{\text{SDSS}} = -0.22$ suggested the possibility that the object is an AM CVn-type system (vsnet-alert 25852⁷).

This classification was supported by more detailed outburst profiles based on ZTF and ATLAS data (vsnet-alert 25859⁷), as well as additional ASAS-SN data (vsnet-alert 25861⁷).

⁹<https://www.astronomy.ohio-state.edu/asasn/transients.html>

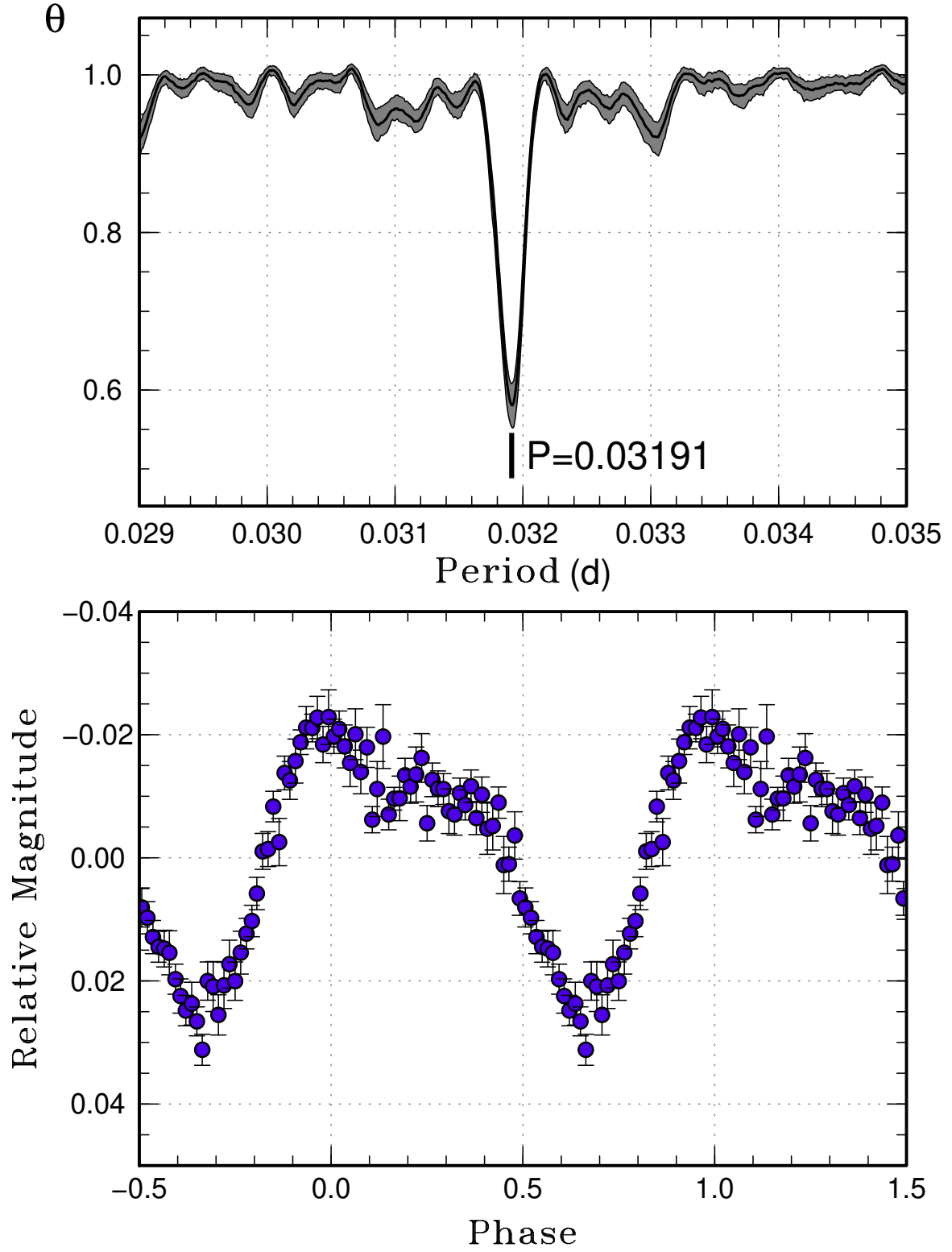


Figure 3.7: Superhumps in the 2nd SO of ASASSN-18rg. (Upper): PDM analysis. (Lower): Phase-averaged profile.

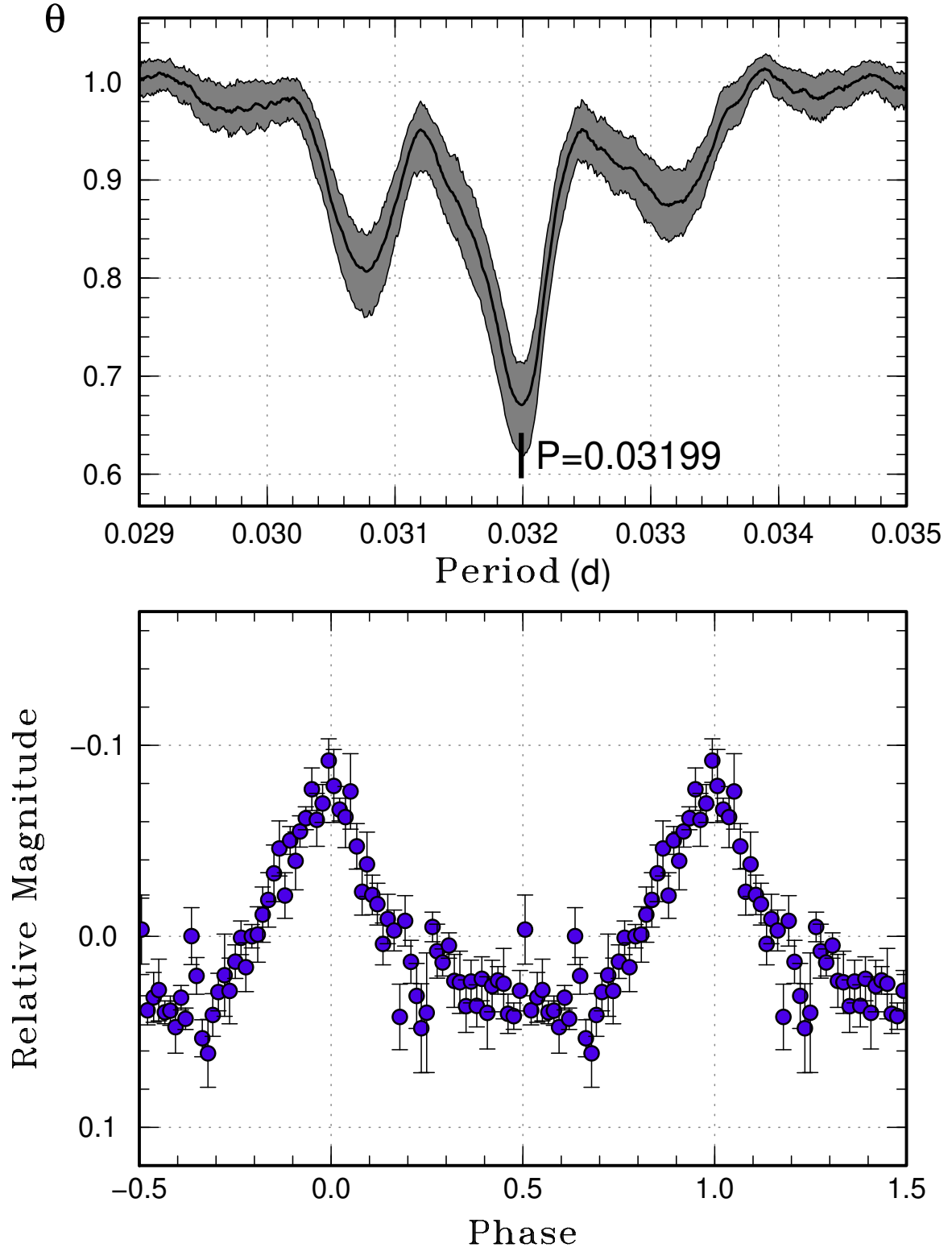


Figure 3.8: Superhumps in the rapid fading of the 2nd SO of ASASSN-18rg. (Upper): PDM analysis. (Lower): Phase-averaged profile.

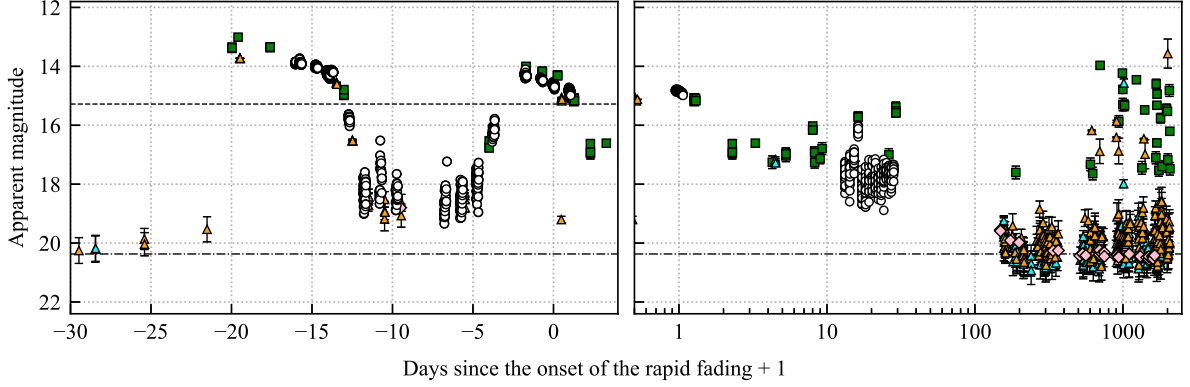


Figure 3.9: Light curve of 2019 SO of ASASSN-19rg. The x-axis is referenced to 1 day after the onset of rapid fading. The left panels shows the SO proper with linear scale, while the right panels displays the fading tail with log scale. White circles indicate VSNET-reported data, green squares represent ASASSN g -band, pink diamonds represent Gaia G -band, orange and cyan upward triangles represent ATLAS orange and cyan bands. The dashed line indicates 1 magnitude fainter than the onset of rapid fading, and the dash-dotted line marks the g -band magnitude from the PS1 catalog.

Possible past SOs were detected in 2008 in CRTS data (vsnet-alert 25861⁷) and in 2014 in ASASSN, CRTS and PS1 data, suggesting a SC of 5.8(2) yrs.

Although the 2020 SO was captured in TESS Sector 25, the cadence was 30 min, which was insufficient for period analysis. Based on the outburst profile, the orbital period is estimated to be about 0.025 d (36 min) (Kato & Kojiguchi 2021). Using equation (1) of van Roestel et al. (2021) with $SC = 5.8(2)$ yrs yields an orbital period estimate of 0.031 d (45 min).

During the fading tail, the object exhibited 7 short rebrightenings.

3.5.6 ASASSN-21au

ASASSN-21au was discovered by the ASASSN team on 2021 February 5.42 with $g = 13.4$ and was also detected in the ZTF alert as ZTF20acyxwzf. Its counterpart is PS1 202202159703645164 with magnitudes $g = 20.96(6)$, $r = 21.04(9)$, $i = 21.35(4)$, and $z = 20.72(17)$. The outburst amplitude is 7.6 magnitudes, and no previous outbursts have been observed according to ASASSN data, suggesting that the object may be a WZ Sge-type DN. In addition, ZTF data showed a gradual brightening of approximately 1 magnitude in the g band, a reddening to $g - r = 0.3$ since June 2020 to the outburst. This behavior was suggested to be a similar phenomenon to the extreme WZ Sge-type object V3101 Cyg reported in Tampo et al. (2020). (vsnet-alert 25331⁷) The light curve of the 2021 SO of ASASSN-21au is shown in Figure 3.12.

Shortly after its discovery, this object showed a rapid fading without showing a plateau. A period analysis of the rapid fading phase revealed a signal with a period of 0.04 days, raising the possibility of the object being an AM CVn or EI Psc-type system (Kato & Kojiguchi 2021; vsnet-alerts 25342, 25369⁷).

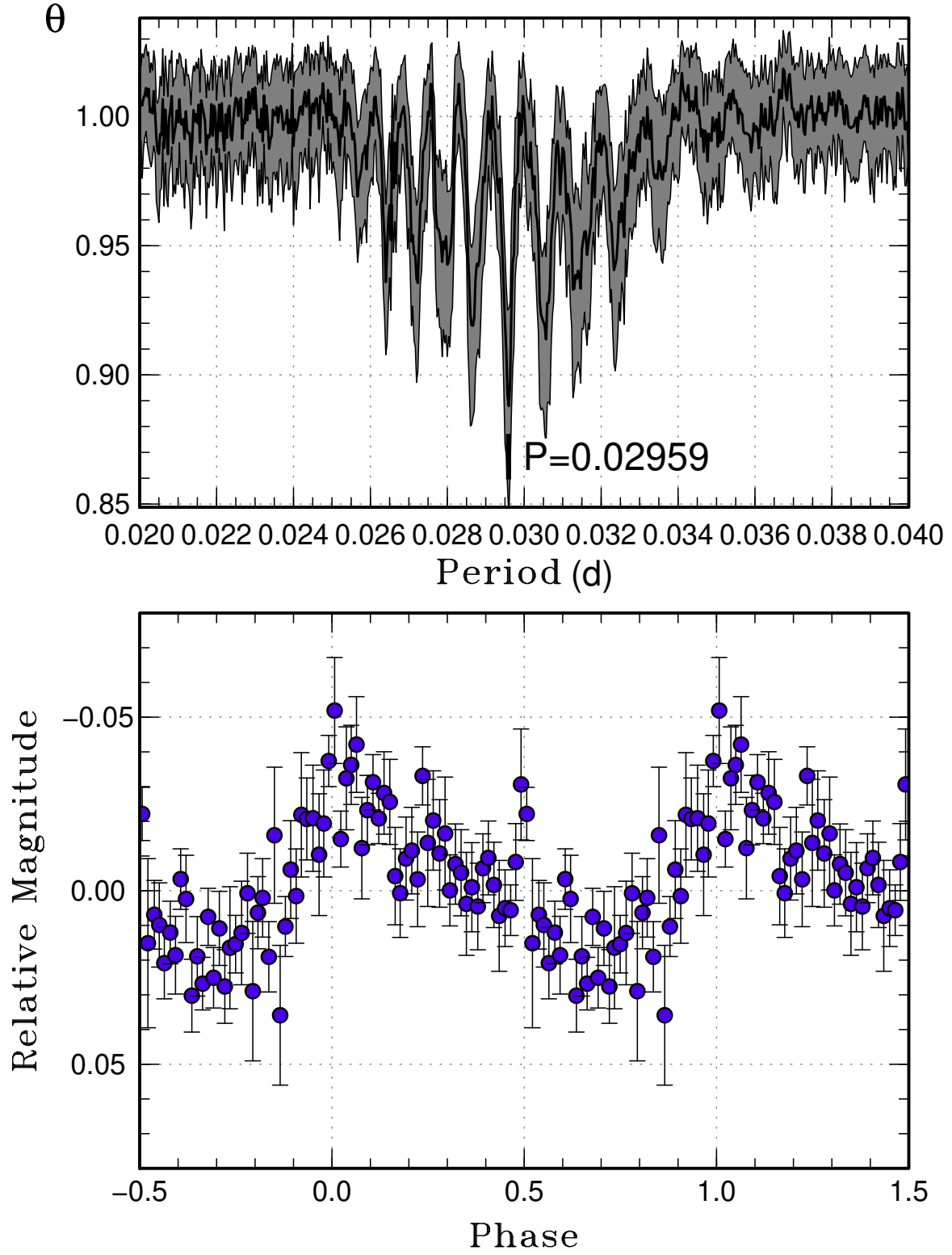


Figure 3.10: Superhumps of 2nd SO in ASASSN-19rg. (Upper): PDM analysis. (Lower): Phase-averaged profile.

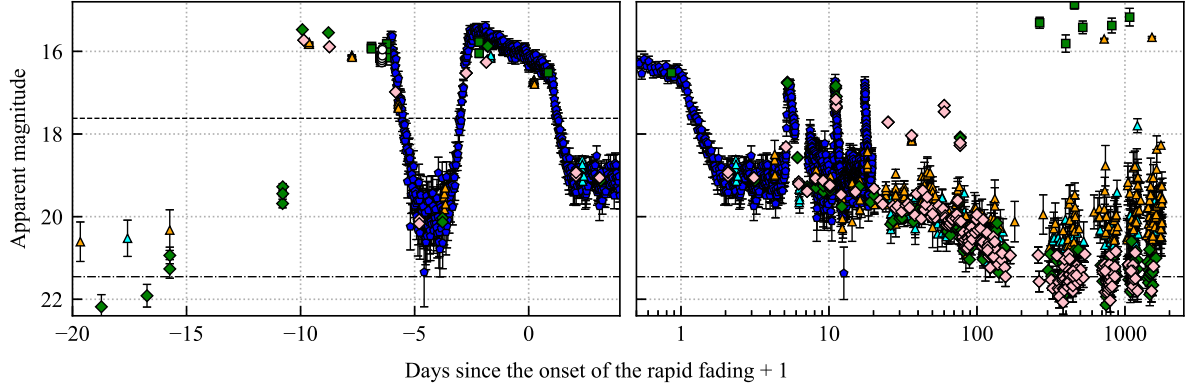


Figure 3.11: Light curve of 2020 SO of ASASSN-20eq. The x-axis is referenced to 1 day after the onset of rapid fading. The left panels shows the SO proper with linear scale, while the right panels displays the fading tail with log scale. Green squares represent ASAS-SN g -band, green, red, and pink diamonds represent ZTF g , r , and i -band, orange and cyan upward triangles are ATLAS orange and cyan bands. The blue pentagons represent the TESS photometric data, whose amplitude has been scaled by a factor of three to match that of the ground-based observations. The dashed line indicates 1 magnitude fainter than the onset of rapid fading, and the dash-dotted line marks the g -band magnitude from the PS1 catalog.

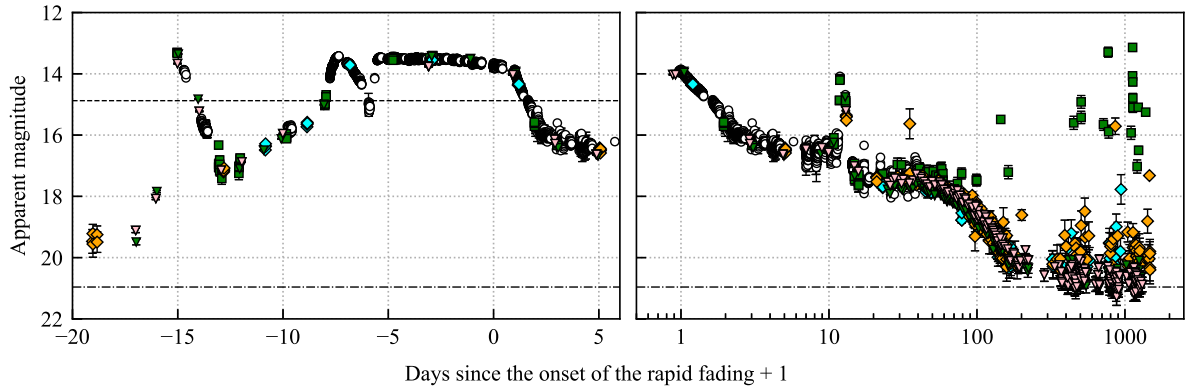


Figure 3.12: Light curve of 2021 SO of ASASSN-21au. The x-axis is referenced to 1 day after the onset of rapid fading. The left panels shows the SO proper with linear scale, while the right panels displays the fading tail with log scale. White circles indicate VSNET and AAVSO-reported data, green squares represent ASAS-SN g -band, orange and cyan diamonds are ATLAS orange and cyan bands, and green, red, and pink downward triangles represent ZTF g , r , and i -bands. The dashed line indicates 1 magnitude fainter than the onset of rapid fading, and the dash-dotted line marks the g -band magnitude from the PS1 catalog.

Subsequent spectroscopic observations by Isogai et al. (2021) confirmed that only He I lines were present and no Balmer lines were detected, identifying the object as an AM CVn system with the longest known orbital period among those that exhibit DN-type outbursts. During the dip phase, a slow rebrightening occurred, during which ordinary superhumps emerged, marking the development of a full SO. A mini dip, which is first observed in J0902 (Kato et al. 2014), was seen in the early stage of the 2nd SO (around day -6 in Figure 3.12). During the fading tail, a single short rebrightening was observed.

X-ray and UV observations covering from the 2nd SO to fading tail phases were reported in Rivera Sandoval et al. (2022).

Figure 3.13 shows the $O - C$ diagram of the superhumps.

The result of the period analysis during the precursor outburst is shown in Figure 3.14. The period was determined to be $0.0404(1)$ d using the PDM method. The phase average profile exhibits a double-peaked structure, suggesting the possibility of early superhumps.

From the results of Figure 3.13, the superhumps before stage B superhumps appears to be stage A superhumps, but in J0902, which has a similar outburst profile, the period from the rapid rising of the 2nd SO to the mini dip is thought to be a transition phase of stage A–B, and it showed stage A only during the slow rising. Similarly to Kato et al. (2014), we performed a sliding-window PDM with a step size of 0.5 days to investigate the evolution of the superhump stages. As a result, it is likely that the interval from the rapid rising of 2nd SO to the mini dip was not a clear stage A, but rather stages A–B transition. The period analysis of the superhumps during the period when the dip gradually rises is shown in figure 3.15. $P_{\text{SH}} = 0.0408(3)$ d. The superhump profile also suggests that this may be a stage A superhumps. The period analysis of the superhumps in stages A–B transition is shown in figure 3.16. The mean P_{SH} of stage A–B transient phase was $0.04054(1)$ d.

The period analysis results for stage B superhumps are shown in Figure 3.17. We estimated $P_{\text{SH(stageB)}} = 0.040526(3)$ d. From O–C diagram, we estimated the period derivative $P_{\text{dot}} (= \dot{P}_{\text{SH}}/P_{\text{SH}}) = 0.1(8) \times 10^{-5}$.

A period analysis of the fading stage superhumps observed during the rapid fading of the 2nd SO is shown in figure 3.18. $P_{\text{SH(Fading)}} = 0.04029(4)$ d. The fading stage was proposed in Isogai et al. (2019), and is known to have a phase profile similar to an orbital hump and a period close to the P_{ESH} . The period analysis in this study also agreed with the early superhump within the margin of error.

The period analysis results of the late-stage (post SO-stage) superhump are shown in Figure 3.19. $P_{\text{SH(Late)}} = 0.040469(6)$ d. The period analysis before and after the short rebrightening is shown in Figure 3.20 and Figure 3.21. $P_{\text{SH}} = 0.040470(3)$ d and $0.040414(4)$ were obtained.

From the relation between orbital period and secondary mass derived by Armstrong et al. (2012), the expected mass ratio of ASASSN-21au is $0.007\text{--}0.03$ (assuming a primary mass of $0.65\text{--}1, M_{\odot}$).

A method to estimate the mass ratio q was proposed by Kato & Osaki (2013), which uses the period of stage A superhumps together with the orbital period P_{orb} . In many cases, the P_{ESH} is used as a substitute for P_{orb} , since it typically yields a value that is nearly identical to the orbital period. In the present study, however, both $P_{\text{SH(stageA)}}$ and P_{ESH} are subject to large uncertainties. Therefore, we instead use P_{SH} during the fading stage, based on the assumption that it is nearly equal to P_{orb} . Applying the stage A

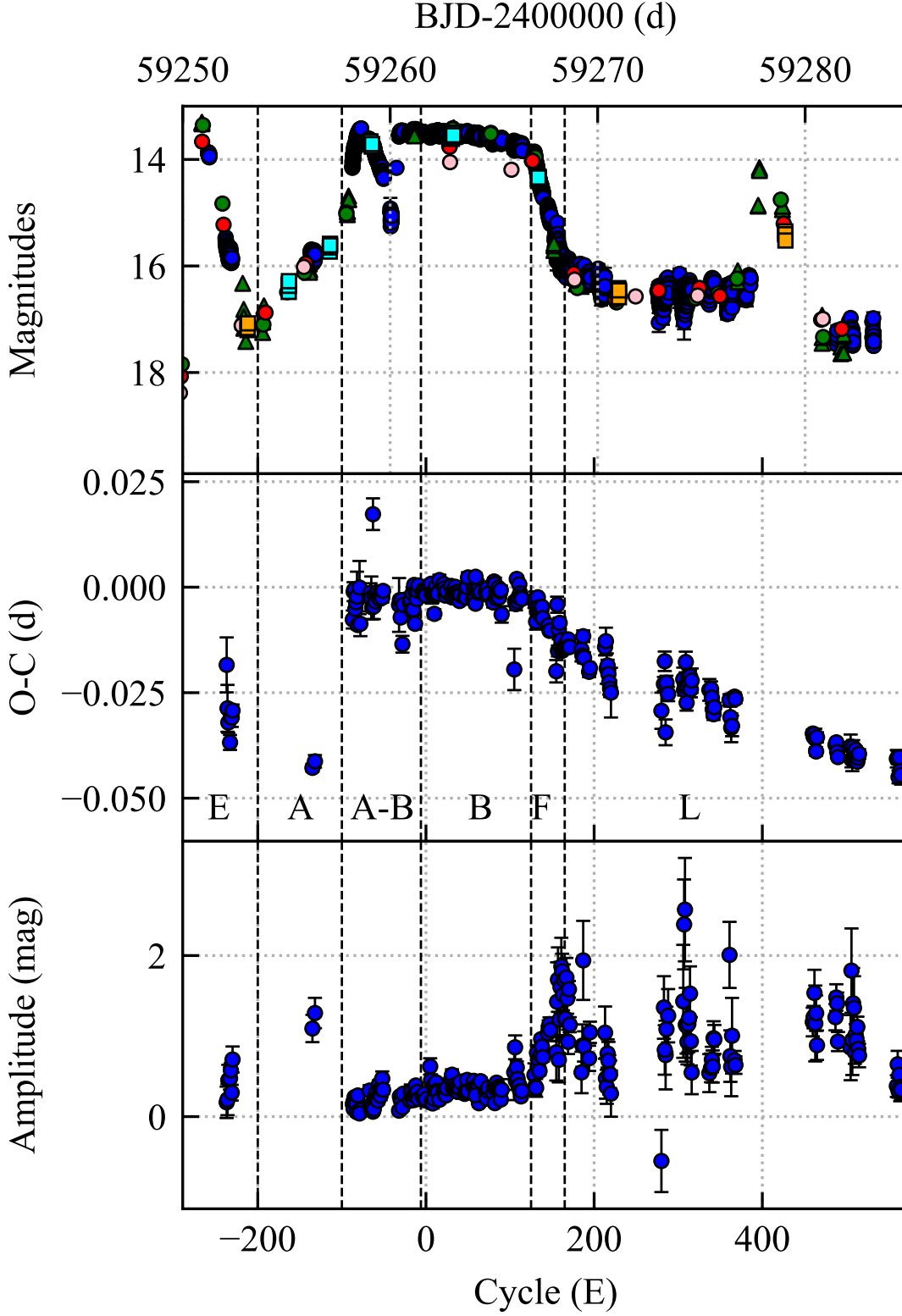


Figure 3.13: The light curve (top), $O - C$ diagram (middle), and amplitude of superhumps (bottom) of SO of ASASSN-21au. E, A, A-B, B, F, and L are early superhumps, possible stage A superhumps, stage A-B transition, stage B superhumps, fading stage superhumps, late stage superhumps.

superhump method with this assumption yields a mass ratio of $q \sim 0.03(2)$.

Kato (2015) derived the empirical relation $q = 0.0043(9)P_{\text{dot}} \times 10^5 + 0.060(5)$ for H-rich WZ Sge-type DNe. Applying this empirical relation to the $\dot{P}$ we obtained yields a mass ratio of $q = 0.060(6)$.

However, Isogai et al. (2016) and Isogai et al. (2019) compared mass ratios estimated from the stage A superhump ϵ^* , ($= 1 - P_{\text{orb}}/P_{\text{SH(stageA)}}$) with those estimated using the empirical relation based on the period derivative of stage B superhumps in H-rich CVs. They found that mass ratios derived from stage B consistently differed from those derived from stage A.

3.6 Statistical result of outburst profile

The list of outburst duration, power law-index α of the fading rate, and relative magnitudes for 6 objects is summarized in table 3.2.

The average duration of the 1st SO was 6.4 ± 1.6 d, with a range of 4.7–7.9 d. The dip phase exhibited substantial variation, with an average duration of 7.2 ± 6.7 d and a range of 1.3–20.3 d. The average duration of the 2nd SO was 6.5 ± 2.4 d, with a range of 4.4–10.3 d. However, for systems that experienced a preceding 1st SO, the duration was more tightly clustered, with an average of 5.0 ± 0.4 d and a range of 4.4–5.4 d. Excluding J0902, where it is unclear whether the initial outburst was a 1st SO or a precursor outburst, the average effective SO duration was 10.5 ± 2.3 d, with a range of 6.9–13.3 d.

The average ratio of effective to total SO duration, $t_{\text{dur}}^{\text{eff}}/t_{\text{dur}}^{\text{all}}$, was 0.68 ± 0.18 , with a range of 0.38–0.84.

The average power-law index during the rapid fading phase was -2.7 ± 0.4 , ranging from -3.39 ± 0.01 to -2.225 ± 0.006 . For tail A, the average index was -0.36 ± 0.11 , ranging from -0.529 ± 0.004 to -0.227 ± 0.001 . For tail B, the average was -2.8 ± 1.7 , with a range of -5.3 ± 0.6 to -1.5 ± 0.2 . For tail C, the average was -0.095 ± 0.185 , ranging from -0.40 ± 0.05 to $+0.08 \pm 0.04$.

Tail B is affected by large dispersions due to seasonal gaps caused by solar conjunction. Tail C includes both systems that have already reached quiescence and those still fading. Both ASASSN-18rg and ASASSN-21au exhibit a distinct tail C.

The comparison magnitudes exhibit relatively small dispersion for $\Delta m_{\text{SO1}}^{\text{peak}} = -1.3(2)$, $\Delta m_{\text{SO1}}^{\text{end}} = -0.6(2)$, $\Delta m_{\text{SO2}}^{\text{peak}} = -0.7(2)$, $\Delta m_{\text{tailA}}^{\text{start}} = 2.3(3)$, and $\Delta m_{\text{tailC}}^{\text{start}} = 6.0(2)$, whereas larger dispersion is found for $\Delta m_{\text{dip}} = 3.6(1.1)$ and $\Delta m_{\text{qui}} = 5.4(1.0)$.

NSV 1440 and ASASSN-20eq appear relatively bright during quiescence in terms of their relative magnitudes. This is likely because their short orbital periods result in intrinsically higher absolute magnitudes in quiescence. In the case of NSV 1440, its brightness may be further enhanced due to a high inclination, as suggested by the detection of early superhumps during the 2015 SO.

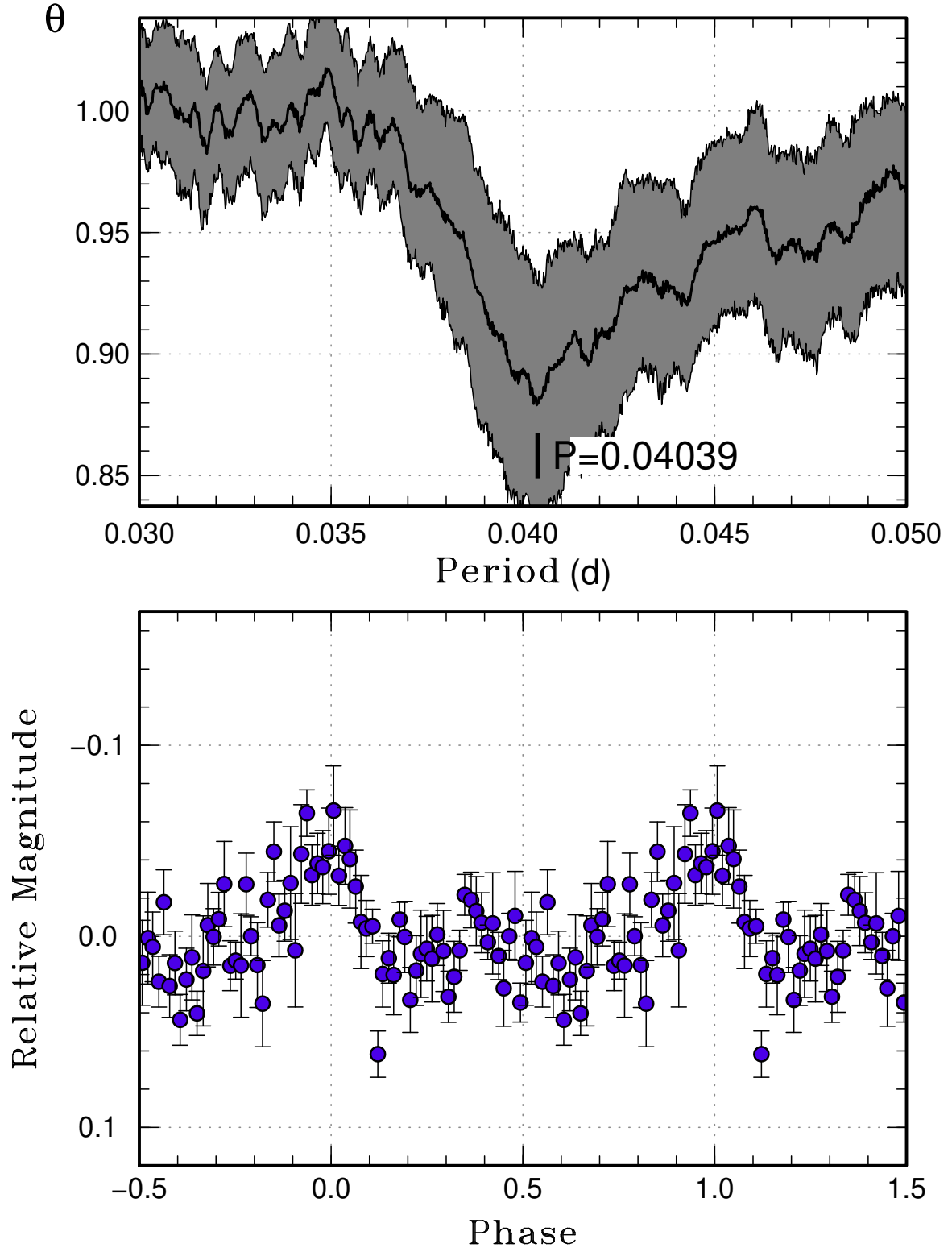


Figure 3.14: Possible early superhumps in ASASSN-21au. (Upper): PDM analysis. (Lower): Phase-averaged profile.

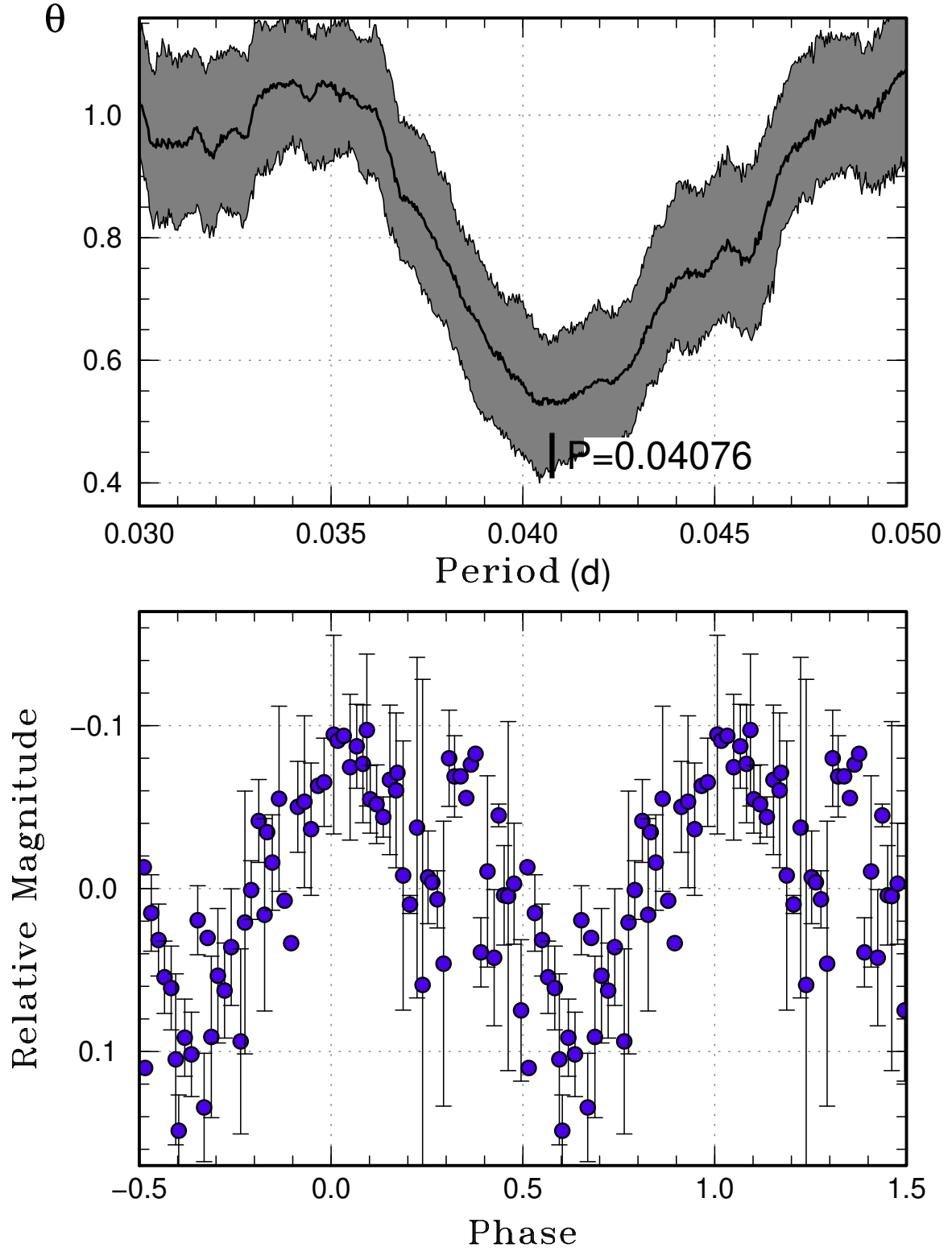


Figure 3.15: Superhumps in possible stage A of ASASSN-21au. (Upper): PDM analysis. (Lower): Phase-averaged profile.

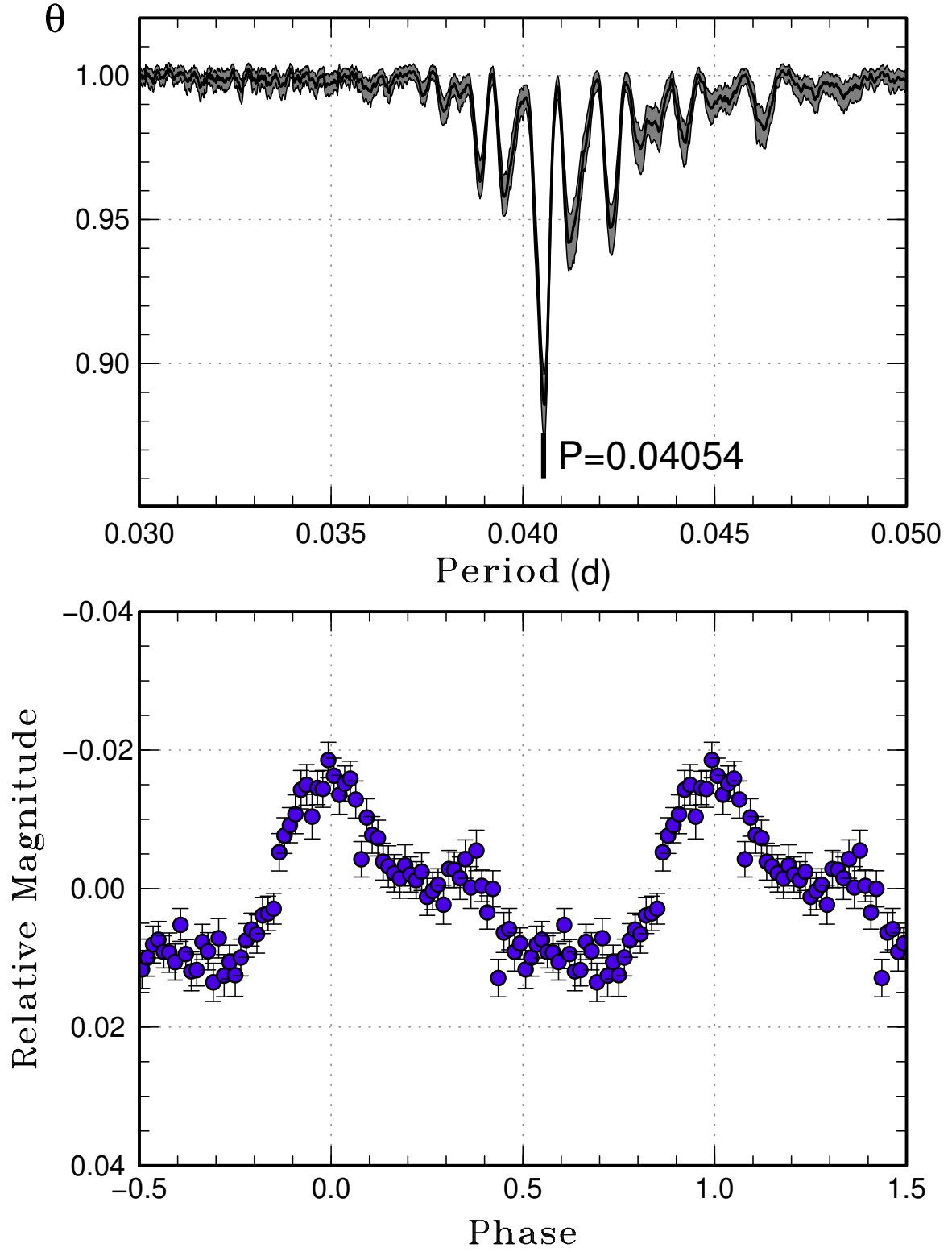


Figure 3.16: Superhumps in stage A – B transition phase superoutburst of ASASSN-21au in 2021. (Upper): PDM analysis. (Lower): Phase-averaged profile.

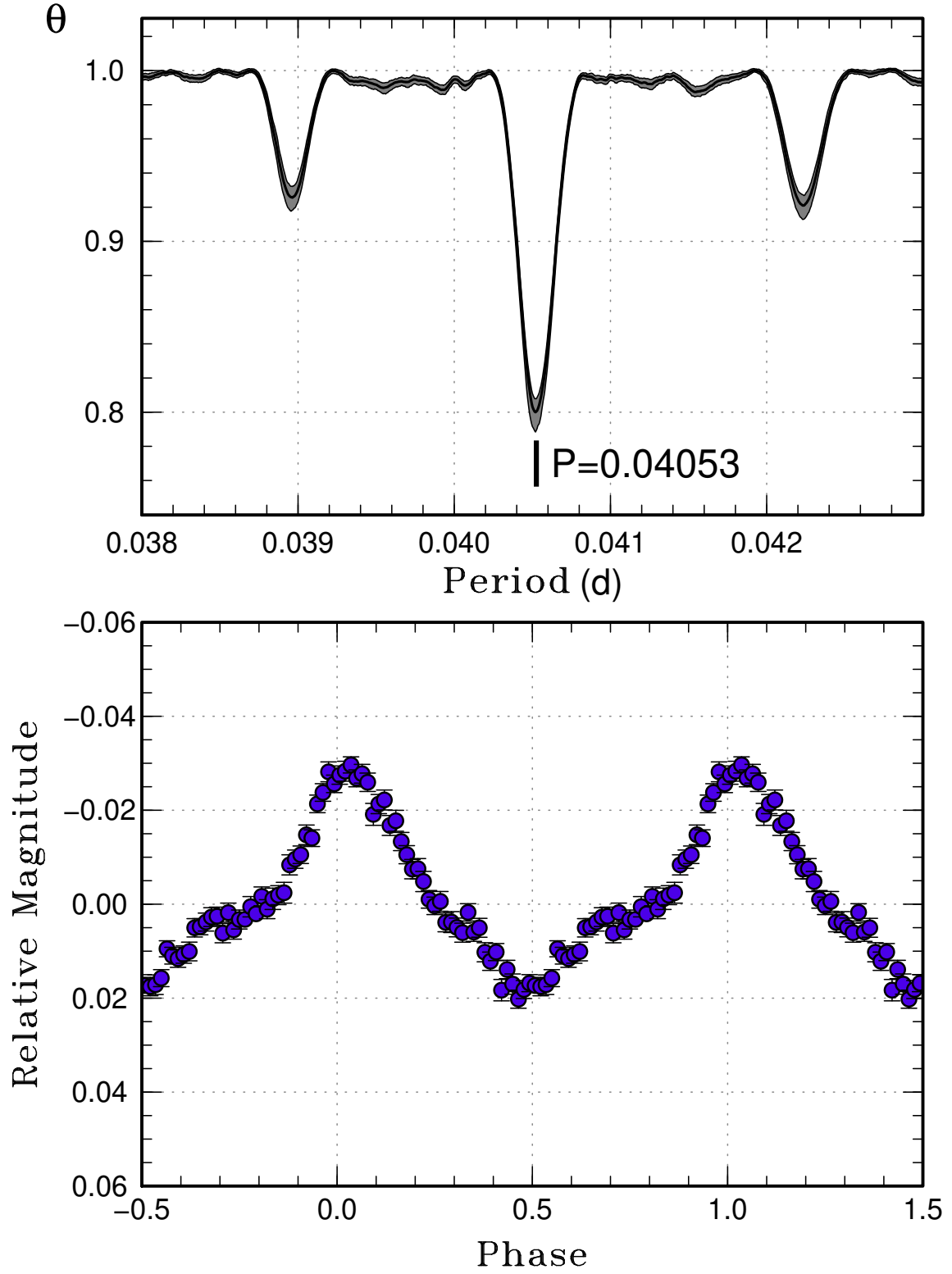


Figure 3.17: Superhumps in stage B of ASASSN-21au. (Upper): PDM analysis. (Lower): Phase-averaged profile.

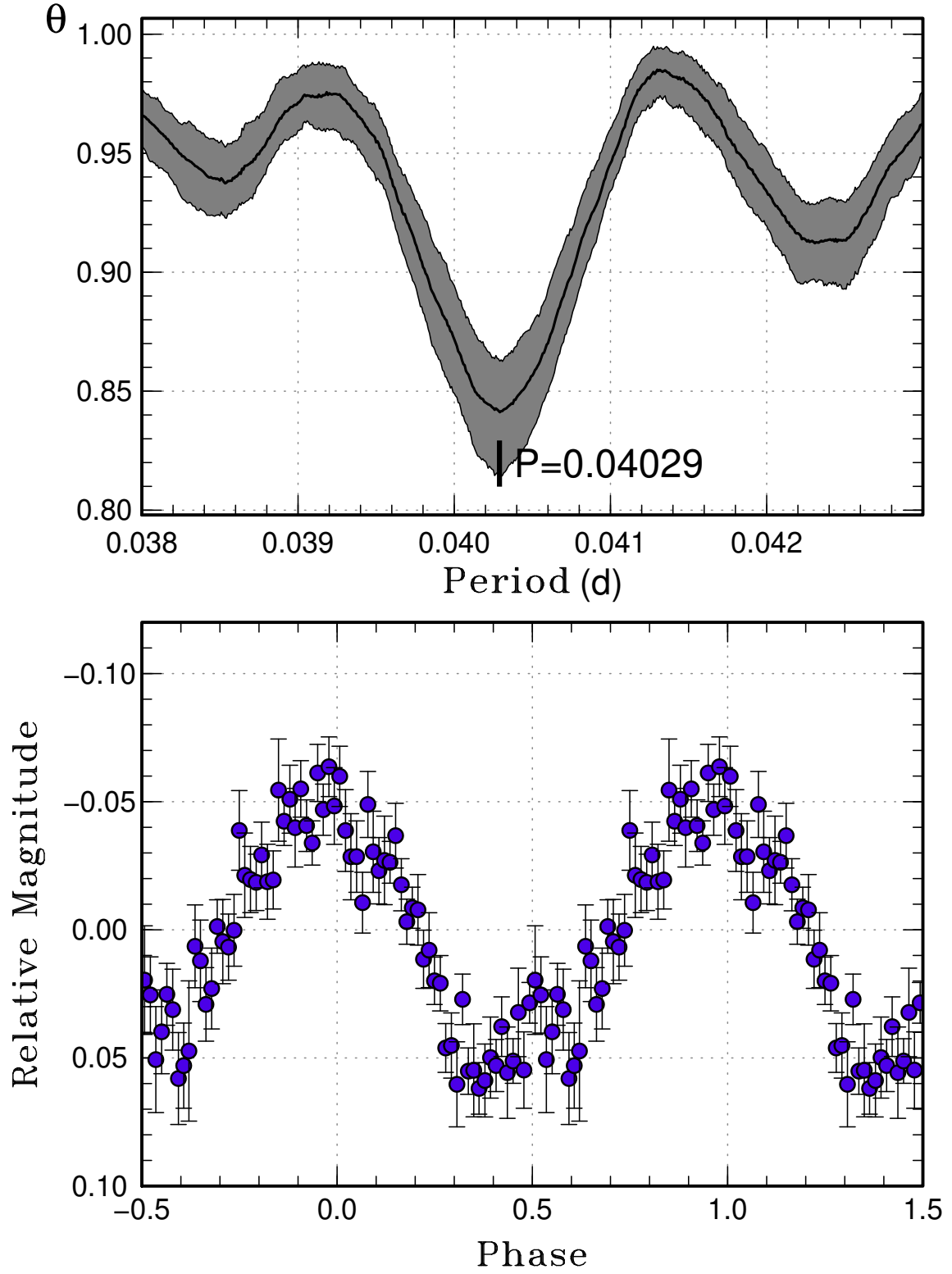


Figure 3.18: Superhumps in fading stage of ASASSN-21au. (Upper): PDM analysis. (Lower): Phase-averaged profile.

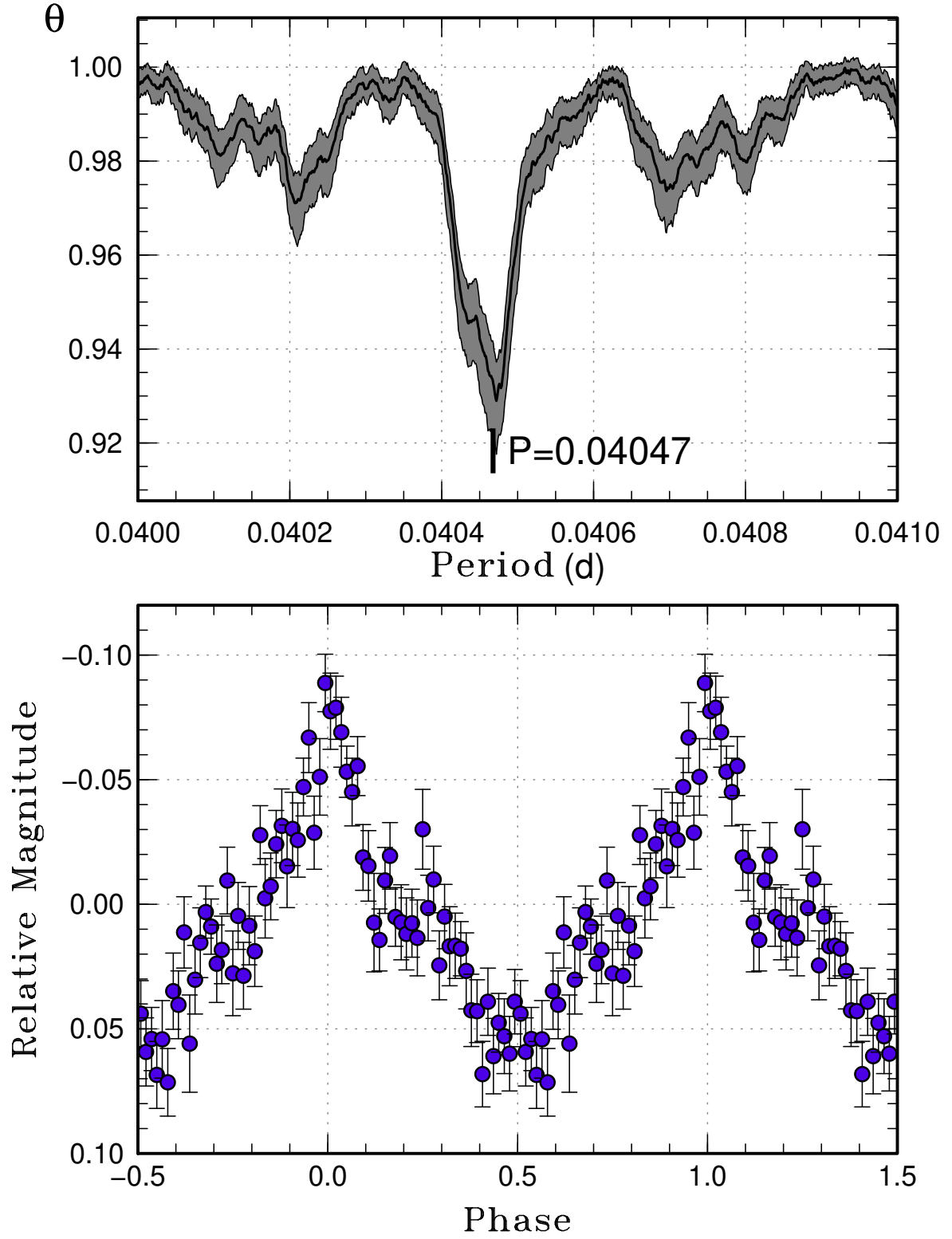


Figure 3.19: Superhumps in late stage of ASASSN-21au. (Upper): PDM analysis. (Lower): Phase-averaged profile.

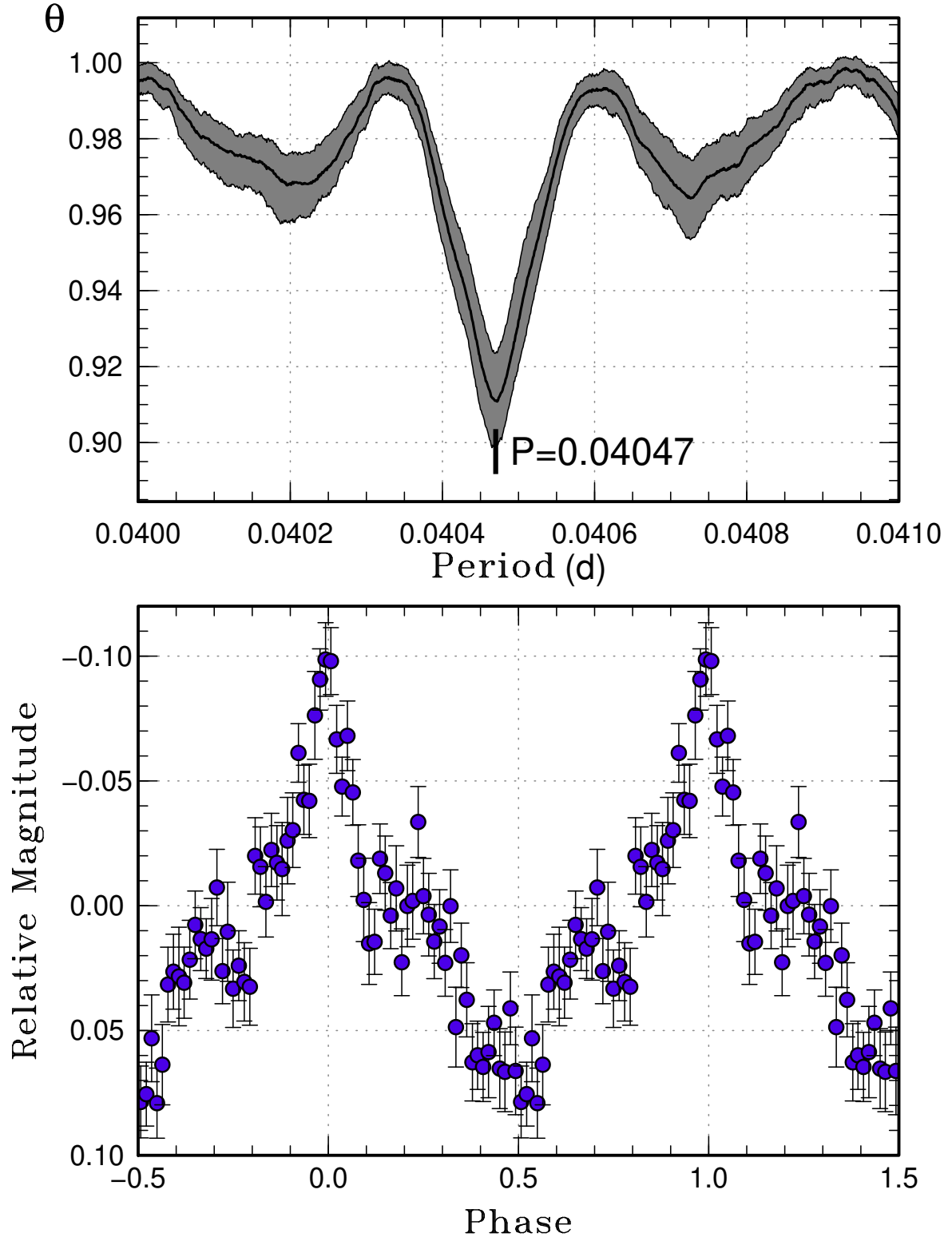


Figure 3.20: Superhumps before short rebrightening in late stage of ASASSN-21au. (Upper): PDM analysis. (Lower): Phase-averaged profile.

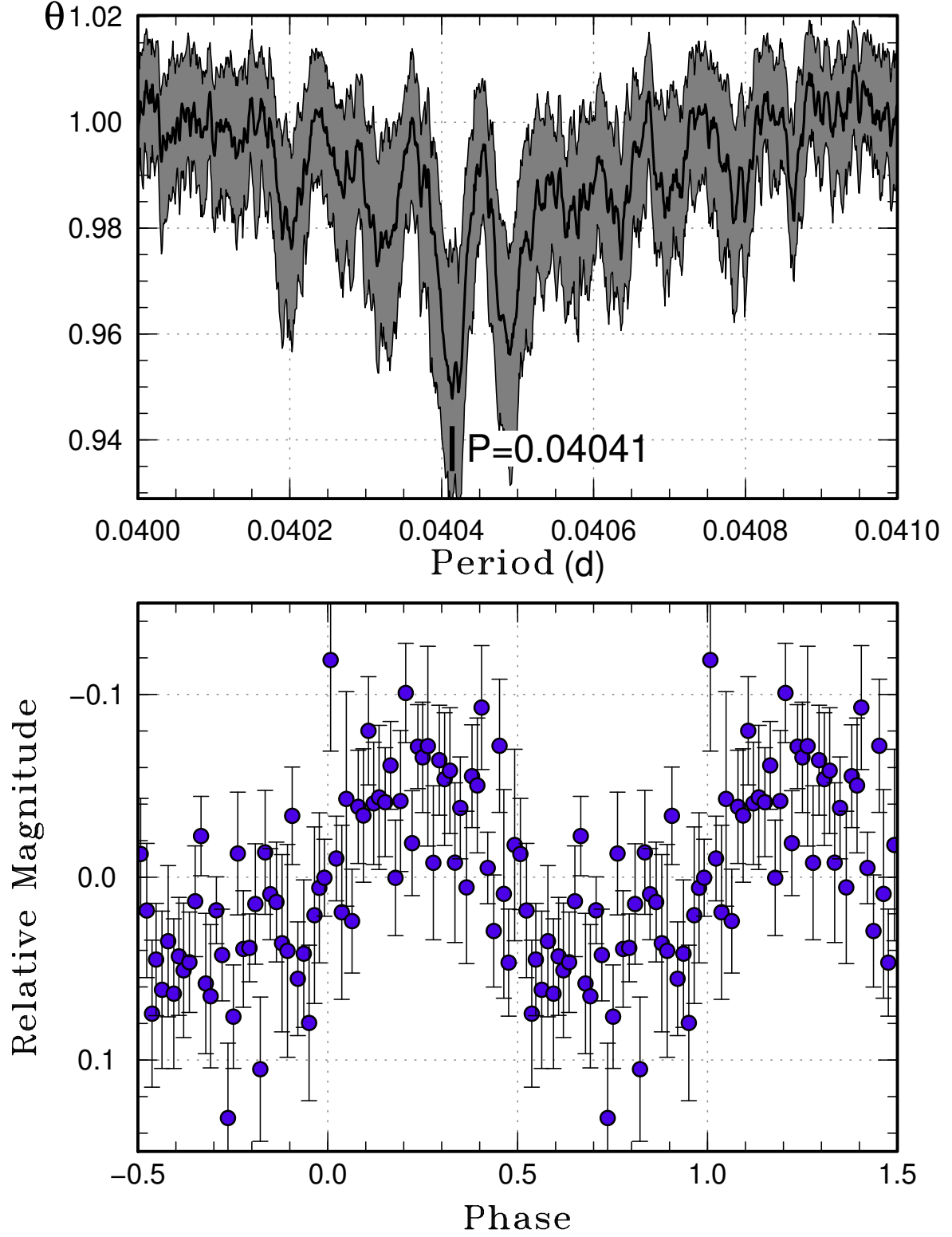


Figure 3.21: Superhumps after short rebrightening in late stage of ASASSN-21au. (Upper): PDM analysis. (Lower): Phase-averaged profile.

CHAPTER 3. OBSERVATIONAL STUDY OF DOUBLE SUPEROUTBURSTS IN LONG ORBITAL-PERIOD AM CVN STARS

Table 3.2: Duration, power law index α of the fading rate and relative magnitude of SOs.

object year P_{orb} (min)	J0902 2014 48.31(8)	NSV 1440 2015 36.335(7)	NSV 1440 2017 36.335(7)	NSV 1440 2019 36.335(7)	NSV 1440 2021 36.335(7)	a18rg 2018 45.953(6)*	a19rg 2019 42.598(9)*	a20eq 2020 36 – 45	a21au 2021 57.92(7)*
$t_{\text{dur}}^{\text{SO1}}$ (d)	0.9 – 12.8 [†]	5.2	1.3 [‡]	< 2.1 [†]	< 4.8 [†]	7.6	7.9	4.7(5)	1.3 [‡]
$t_{\text{dur}}^{\text{dip}}$ (d)	9.8	2.1	1.3	18.2(4)	3.7(5)	20.3	8.9	2.5	5.7
$t_{\text{dur}}^{\text{SO2}}$ (d)	10.3 [§]	5.2	5.6	5.3(5)	6.0 – 9.1	5.0	5.4	4.4	9.4 [§]
$t_{\text{dur}}^{\text{eff}}$ (d)	10.3	10.4	6.9	7.4(5)	6.0 – 9.1	12.6	13.3	9.1	10.7
$t_{\text{dur}}^{\text{all}}$ (d)	20.1	12.5	8.2	24.5(1)	12.1	32.9	22.2	11.6	16.4
$t_{\text{dur}}^{\text{eff}}/t_{\text{dur}}^{\text{all}}$	0.51	0.83	0.84	0.30	0.50 – 0.75	0.38	0.60	0.78	0.65
α_{RF}	-2.68(1)	-2.8(1)	-2.88(2)	-2.55(3)	–	-3.39(1)	-2.42(8)	–	-2.225(6)
α_{A}	-0.44(1)	-0.227(1)	-0.313(4)	-0.207(5)	-0.193(9)	-0.347(8)	-0.25(6)	-0.41(2)	-0.529(4)
α_{B}	–	-2.0(5)	-5.3(6)	–	–	–	–	-1.5(2)	-2.35(7)
α_{C}	-0.06(10)	-0.01(7)	–	–	–	-0.40(5)	0.08(4)	0.05(5)	-0.23(6)
$\Delta m_{\text{SO1}}^{\text{peak}}$ (mag)	–	-1.0	–	–	–	-1.5	-1.4	-1.1	–
$\Delta m_{\text{SO1}}^{\text{end}}$ (mag)	–	-0.5	-1.0	–	–	-0.4	-0.6	-0.6	-0.4
Δm_{dip} (mag)	4.1	3.0	1.5	4.3	>2.9	5.2	3.8	3.6	3.1
$\Delta m_{\text{SO2}}^{\text{peak}}$ (mag)	–	-0.6	-0.7	-0.7	-1.1	-0.4	-0.5	-0.8	-0.4
$\Delta m_{\text{start}}^{\text{SO2}}$ (mag)	2.6	1.8	2.0	2.1	2.2	2.7	2.4	2.4	2.1
$\Delta m_{\text{tailA}}^{\text{start}}$ (mag)	6.2	–	–	–	–	6.1	5.8	–	6.0
$\Delta m_{\text{C}}^{\text{start}}$ (mag)	6.2	4.6	4.6	4.6	4.6	6.5	5.8	4.9	7.1

*: P_{SH} is given instead of P_{orb} .

[†]: Includes uncertainties due to observational gaps.

[‡]: Precursor outburst.

[§]: Includes a mini dip (approximately 1 day).

^{||}: Does not include the duration of the 1st SO or precursor outburst.

Note – $t_{\text{dur}}^{\text{SO1}}$ is the duration of the 1st SO or the precursor outburst. $t_{\text{dur}}^{\text{dip}}$ is the duration of the dip. $t_{\text{dur}}^{\text{SO2}}$ is the duration of the 2nd SO. $t_{\text{dur}}^{\text{eff}} = t_{\text{dur}}^{\text{SO1}} + t_{\text{dur}}^{\text{SO2}}$. $t_{\text{dur}}^{\text{all}} = t_{\text{dur}}^{\text{SO1}} + t_{\text{dur}}^{\text{dip}} + t_{\text{dur}}^{\text{SO2}}$. α_{RF} is the power-law index of the fading rate in the rapid fading of the 2nd SO. α_{A} is the power-law index of the fading rate in the tail A. α_{B} is the power-law index of the fading rate in the tail B. α_{C} is the power-law index of the fading rate in the tail C or the quiescence. $\Delta m_{\text{SO1}}^{\text{peak}}$ is magnitude difference between the peak of the 1st SO and the end of the 2nd SO. $\Delta m_{\text{SO1}}^{\text{end}}$ is magnitude difference between the end of the 1st SO (or the peak of precursor outburst) and the end of the 2nd SO. Δm_{dip} is magnitude difference between the faintest magnitude of the dip and the end of the 2nd SO. $\Delta m_{\text{SO2}}^{\text{peak}}$ is magnitude difference between the peak of the 2nd SO and the end of the 2nd SO. $\Delta m_{\text{tailA}}^{\text{start}}$ is magnitude difference between the onset of the fading tail and the end of the 2nd SO. Δm_{qui} is magnitude difference between the quiescence and the end of the 2nd SO.

3.7 Discussion

3.7.1 early slow rise phase of pre-outburst

Prior to the SO of ASASSN-21au, a reddening-brightening phase lasting for approximately eight months was observed. This phenomenon was also noted to resemble the long-term red-brightening phase observed so far only in the H-rich extreme WZ Sge-type DN V3101 Cyg, which persisted for several years, as reported in vsnet-alert 25331.

In addition, Rivera Sandoval et al. (2022) suggested that this phenomenon could be caused by EMT, based on its similarity to the faint, redden and long-duration brightening events lasting for about 1 year observed in SDSS J080710.33+485259.6 (Rivera Sandoval et al. 2020) and SDSS J113732.32+405458.3 (Rivera Sandoval et al. 2021, Wong et al. 2021).

Similar active states were also observed in NSV 1440 and J0902, where the systems became redder and brightened by 2 to 3 magnitudes for several months. In NSV 1440 with about 2 years of SC, the interval between the active state in 2022 and the next SO exceeded 2 years. This long delay suggests that the active state may have been triggered by an increase in viscosity within the accretion disk (Kato & Stubbings 2023). A similar mechanism may also explain the gradual brightening observed before the outburst of ASASSN-21au.

3.7.2 Durations of the dip between 1st and 2nd SOs, and growing superhump

The duration of the temporary dip varies significantly among objects (see Table 3.2), with ASASSN-18rg exhibiting an unusually long dip of approximately 20 days. Nakata et al. (2014) suggests that the dip duration in double SOs reflects the growth timescale of the 3:1 resonance. Based on this idea, although ASASSN-18rg has an orbital period similar to those of other systems, it may have an extremely low mass ratio q , implying the presence of a massive WD or a hot secondary or He-star donor. Another possibility is that the hot/cool state of the accretion disk affects the growth rate of the eccentric mode. In H-rich CVs, some systems are known to show a long delay of about five to ten days between the precursor and the onset of the SU UMa-type SO, which is significantly longer than expected from their mass ratios (e.g., Imada et al. 2017, Kato et al. 2016a). This delay has been attributed to the disk reverting to a cool state, which may slow eccentric-mode growth. In double SO AM CVn systems, the brightness during the dip remains slightly above the quiescent magnitude, suggesting that a substantial portion of the disk is in a cool state. Notably, when magnitudes are normalized at the end of the 2nd SO, ASASSN-18rg's dip is about one magnitude fainter than that of other systems. This suggests that the disk of ASASSN-18rg in the dip was largely cooler than that of other systems in dip, which may have slowed the growth of the eccentricity mode.

3.7.3 Consistent 2nd SO duration

Table 3.2 shows that the durations of the 1st SO and of the temporary dip vary greatly among systems, whereas the durations of the 2nd SO are much more uniform. In 4

SOs that exhibit double SOs, the 2nd SO typically lasts about 5 days. Exceptions are NSV 1440 (2017), ASASSN-21au and J0902, whose 2nd SOs last around ten days. The 2nd SO of NSV 1440 in 2017 is slightly longer than that of NSV 1440 (2015). Both SO of NSV 1440 (2017) and ASASSN-21au exhibited no distinct 1st SO but rather a short precursor. Although J0902’s long SC and orbital period suggest the double SO, observational gaps leave it unclear whether its initial brightening was a full 1st SO or only a precursor outburst.

According to the thermal tidal instability model, the 1st SO is driven by the 2:1 resonance while the 2nd is driven by the 3:1 resonance (Isogai et al. 2019). When a 1st SO occurs, it standardizes the amount of disk mass remaining for the 2nd SO, which leads to uniform 2nd SO durations. Also, the 2nd SO becomes uniform when the 1st SO is present, and becomes longer when the precursor outburst occurs, suggesting that the effect of EMT is extremely weak.

3.7.4 Mini dip

Systems without a 1st SO may therefore retain more disk mass prior to their 2nd SO, explaining the longer 2nd SOs in ASASSN-21au and J0902. Both of these systems also display brief, approximately 1-mag “mini dips” during the early phase of their 2nd SOs, a phenomenon not seen in other AM CVn systems and that may be characteristic of long orbital period systems that begin with a precursor. A similar mini dip-like feature was also observed in the early phase of the 2nd SO of the H-rich CV SSS J122221.7—311525. However, since this system also exhibited a 1st SO, the cause of the mini dip may not be the same.

3.7.5 Origins of fading tail A, B, and C

As noted by Kato & Stubbings (2023), the fading tails following SOs in long- P_{orb} AM CVn systems exhibit time-dependent changes in their fading rates. In Section 3.4.2, we defined these phases as tails A, B, and C. This temporal variation in the fading behavior suggests that the entire fading tail cannot be explained solely by the WD cooling process that has been proposed for the long-lasting fading tails observed in H-rich WZ Sge-type DNe (Godon et al. 2004, 2006, Long et al. 2004, Piro et al. 2005, Szkody et al. 1998). Therefore, we examine the physical mechanisms and dominant sources of radiation responsible for each of the tails A, B, and C.

The tail A is showed by a relatively slow fading in brightness and is frequently accompanied by rebrightenings. The stepwise fading dominate the overall fading during the tail A. The tail A begins after the system has faded by approximately 2.3(4) mag from the 2nd SO and ends roughly 70 to 100 days later. In contrast, the tail B shows a more rapid decline in brightness, no rebrightenings, and typically ends around 200 days after the SO. And, the tails A and B transition smoothly.

This progression implies two important points. First, the dominant emission component in tails A and B is likely common among systems. Second, the transition from the tail A to the tail B may be triggered by specific physical conditions, such as changes in temperature.

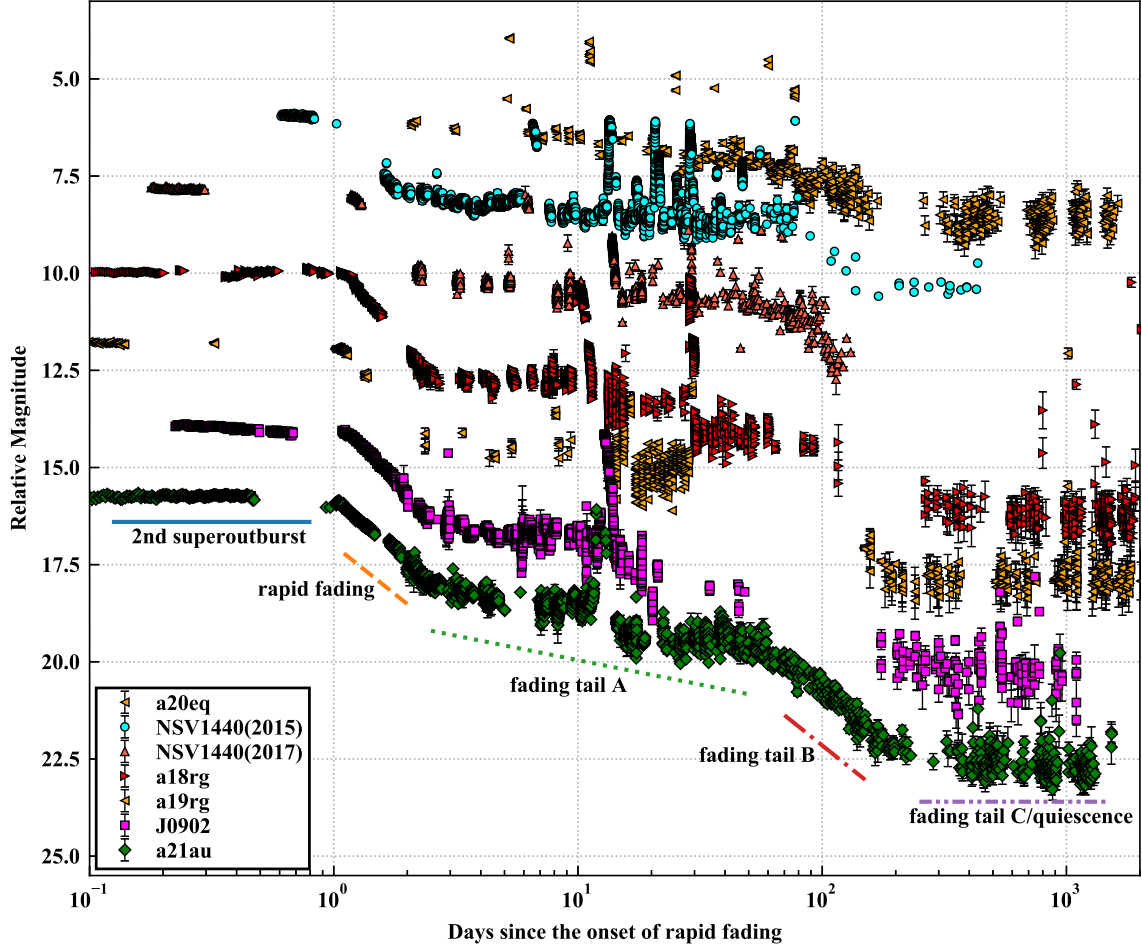


Figure 3.22: Light curves of the fading tails from 7 AM CVn SOs. The horizontal axis represents time, with 1 day corresponding to the onset of the rapid fading phase, and is plotted on a logarithmic scale ($\log_{10}$). The light curves are constructed using CCD observations reported to VSNET and AAVSO, taken with clear filter, V filter, or unfiltered systems, as well as archival data from ZTF archive data g and r bands, ATLAS forced photometry cyan band, Gaia Epoch photometry BR band, and ASAS-SN Sky Patrol V and g bands. The onset of rapid fading for ASASSN-20eq is estimated based on the TESS light curve.

Rebrightenings are generally associated with enhanced mass accretion from the disk onto the WD, which usually causes the WD to become hotter and brighter. However, the fact that rebrightenings are accompanied by stepwise fading suggests that the tail A is primarily dominated by the disk rather than the WD.

Two main mechanisms have been proposed to explain the tail A. One possibility is EMT, which increases disk heating (see, e.g., Hameury & Lasota 2021). Another is a state in which the disk viscosity remains elevated compared to the quiescent state, as discussed in Osaki et al. (2001) and Meyer & Meyer-Hofmeister (2015).

In short P_{orb} AM CVns, features such as frequent short rebrightenings, plateau-type rebrightenings, or transitions into standstills suggest that EMT may be the dominant mechanism governing their variability (Kotko et al. 2012, Pichardo Marciano et al. 2021).

However, in long- P_{orb} systems, such features are rare or absent. Moreover, under the EMT scenario, the duration of the fading tail should depend on the strength of irradiation, which is itself determined by parameters such as the outburst duration and the orbital separation. Considering the above, and particularly the presence of stepwise fading, EMT is unlikely to be the dominant mechanism. A more reasonable scenario may be an increase in viscosity in the disk leads to continued consumption of disk mass. Although Rivera Sandoval et al. (2022) interpreted the fading tail of ASASSN-21au as a consequence of EMT due to the presence of rebrightenings.

In ASASSN-21au, the P_{SH} became shorter following rebrightenings during tail A. According to Hirose & Osaki (1990), the superhump excess $\epsilon^* = 1 - P_{\text{orb}}/P_{\text{SH}}$ depends on both the mass ratio and the disk radius normalized to the binary separation. A smaller disk radius results in a smaller value of ϵ^* . This relation has been used by Kato et al. (2013) to estimate the disk radius after SO. Applying the superhump periods measured before and after the rebrightening (see Section 3.5.6) suggests that the disk radius decreased after the rebrightening. This finding supports the hypothesis that the stepwise fading in tail A is due to mass loss from the disk during rebrightening events.

The fading rate of tail B, being faster than that of tail A, likely reflects the gradual decrease in the accretion disk.

For example, extreme low-alpha disks have been proposed to explain long SCs in WZ Sge-type systems (Osaki 1995b). However, why such disks form remains unclear, and there is no direct observational evidence. Our findings may represent the first observational detection of a state transition from a normal cool disk to an extreme low-alpha disk. If so, it would imply that systems with $SC \lesssim 200$ d undergo new outbursts before the disk returns to a true quiescent state.

Rivera Sandoval et al. (2022) investigated the origin of the radiation in the fading tail of ASASSN-21au by examining the UV and optical colors during this phase. Based on the observed blueward color evolution during the tail A–B transition, they argued that tail A is the disk-dominated, whereas the tail A–B transition is the WD-dominated. However, in our scenario, the blueward shift during the A–B transition can also be explained by the gradual fading of the outer, cooler regions of the disk, resulting in an overall bluer disk spectrum.

Regarding the origin and mechanism of the tail C, this phase is characterized by a very slow fading rate, nearly reaching the quiescent magnitude. Some systems do not show a distinct the tail C and appear to enter quiescence directly. It is known that the absolute magnitudes during quiescence are slightly brighter than those expected

from WD models alone (Green et al. 2025, Ramsay et al. 2018), and eclipse modeling suggests that the accreting WD dominates the quiescent brightness (van Roestel et al. 2022). These findings support the idea that the tail C is dominated by the WD or by a combination of the WD and a residual disk.

Two candidate mechanisms for the tail C are (1) the cooling of a heated WD, and (2) a gradual fading of the accretion disk via a mechanism different from those operating in the tails A and B.

The tail C is clearly seen in systems such as ASASSN-18rg and ASASSN-21au. For ASASSN-18rg, the expected absolute magnitude in quiescence based on its orbital period is $M_G = 11.4(3)$, whereas the observed value is $M_{g_{PS1}} = 12.8^{+0.7}_{-2.3}$, suggesting that the system may be fainter than expected. In the case of ASASSN-21au, its long orbital period naturally implies a faint quiescent magnitude. The tail C in these systems persists for over 1000 days after the end of the 2nd SO. Given these characteristics, the tail C is unlikely to originate from residual disk emission. In systems without the prominent tail C, the disk in quiescence may be as bright as the WD, whereas in systems with the well-defined tail C, the WD is likely brighter than the disk. Thus, the tail C can be reasonably interpreted as the cooling WD process.

This interpretation is also consistent with the “active state” scenario proposed in Kato & Stubbings (2023).

A similar break in the power-law decay index was reported around 15–20 days after the end of the SO in the H-rich WZ Sge-type object SSS J122221.7-311523, which experienced a double SO (Neustroev et al. 2017). However, the change in the power-law index was not as pronounced as that seen in the tail A–B transition in AM CVns. This suggests that the mechanism behind the fading tails in long- P_{orb} AM CVns is fundamentally different from that operating in H-rich systems like SSS J122221.7-311523.

3.7.6 Supercycle vs outburst duration

According to Pichardo Marcano et al. (2021), short- P_{orb} AM CVn systems typically exhibit SOs lasting about 5 days.¹⁰ Levitan et al. (2015a) and Kojiguchi et al. (2025) reported that their SC are generally shorter than one year.

In contrast, long- P_{orb} AM CVn systems have longer SO durations, around 10 days, and much longer SC , often exceeding 2 years. In many systems, SC is even longer than 5 years. Furthermore, the fading tails, up to the end of tail B, can continue for about 200 days.

These observations raise the possibility that in systems with SCs shorter than one year, the next SO may occur before the accretion disk has fully returned to a quiescent state. This implies that an outburst might be triggered before the disk viscosity has sufficiently decreased. As a result, the disk may not accumulate as much mass, which could in turn explain the shorter SO durations observed in these systems.

¹⁰Some of short P_{orb} AM CVn systems are known to exhibit large variations in SC and SO durations (e.g., ASASSN-14cc, CR Boo, V803 Cen: Kato et al. 2001; Kato et al. 2004a; Kato et al. 2015; Isogai et al. 2016; Duffy et al. 2021). These systems transition between a dwarf nova state and a permanent superhumper (novalike) state. Therefore, statistical values of objects in a high state are not considered for comparison in this study.

3.8 Summary

We investigated the SO profiles and fading tails of 6 long- P_{orb} AM CVn systems.

- A bright and red state lasting approximately eight months was observed in ASASSN-21au prior to its outburst. This state may be analogous to the phenomenon seen in V3101 Cyg. Similar active states were also observed in NSV 1440 and J0902, where the systems became redder and brightened by 2 to 3 magnitudes for several months. In NSV 1440, the interval between the active state in 2022 and the next SO exceeded two years. This long delay suggests that the active state may have been triggered by an increase in viscosity within the accretion disk. A similar mechanism may also explain the gradual brightening observed before the outburst of ASASSN-21au.
- The dip duration shows a large variation. This may be attributed to the extent to which the disk cools after the precursor outburst or the first SO, before ordinary superhumps fully develop.
- The duration of the 1st SO shows significant variability, while the duration of the 2nd SO in systems that exhibit a preceding 1st SO is consistently around 5 days. In contrast, the 2nd SO durations of J0902 and ASASSN-21au are approximately 10 days. According to the TTI model, this uniformity in 2nd SO duration can be explained by the normalization of the remaining disk mass by the preceding 1st SO. If the preceding outburst is a precursor rather than a 1st SO, such normalization may not occur, leading to longer and more variable 2nd SO durations. Therefore, it is possible that the outburst preceding the 2nd SO in J0902 was a precursor outburst rather than a 1st SO.
- Although the effective SO duration shows some variation, it is approximately 10 days on average. Furthermore, the effective duration accounts for about 60% of the all SO duration on average, with the lowest observed ratio being around 40%.
- Both J0902 and ASASSN-21au exhibited a mini dip during their 2nd SO. This behavior may be a common feature of long 2nd SO duration.
- We found that the fading tail following the SO can be divided into three distinct phases, each characterized by different fading rates. The durations of these fading phases are roughly consistent among systems. Tail A lasts for approximately 70 – 100 days after the end of the 2nd SO, showing little decline in brightness. It exhibits stepwise fading associated with rebrightenings, during which the P_{SH} becomes shorter. This suggests a decrease in the disk radius during these events. Tail B continues until around 200 days after the 2nd SO, while tail C can last for over 1000 days in some systems. The brightness during tails A and B appears to be dominated by the accretion disk, whereas in tail C, the WD likely becomes the dominant contributor. Tail A is thought to be sustained by an accretion disk with a viscosity higher than in quiescence. Tail B may represent a phase in which the disk viscosity gradually decreases. Tail C is interpreted as the cooling phase of the WD that had been heated during the SO.

- In short- P_{orb} AM CVn systems, $t_{\text{dur}}^{\text{eff}}$ typically last about 5 days (Pichardo Marcano et al. 2021), and the SC is usually shorter than one year (Kojiguchi et al. 2025, Levitan et al. 2015a). In contrast, long- P_{orb} systems exhibit $t_{\text{dur}}^{\text{eff}}$ lasting around 10 days, and their SCs often exceed 2 to 5 years. Moreover, the fading stages known as tail A to tail B, which suggest elevated disk viscosity, can last for approximately 200 days. These observations imply that in systems with short SCs, the next outburst may occur before the accretion disk has fully returned to a quiescent (low-viscosity) state. As a result, the high viscosity may prevent sufficient mass accumulation in the disk, potentially explaining the shorter duration of SOs in these systems.

Chapter 4

General Conclusion

In this thesis, I have elucidated the outburst mechanisms and long-term activity of long-orbital-period AM CVn systems. These systems lie in a transitional regime between frequently outbursting systems and those with cool, thermally stable accretion disks. The aim of this work was to examine, through systematic observations, how the thermal–tidal instability (TTI) model and enhanced mass transfer (EMT) operate in helium accretion disks characterized by extremely low mass ratios and low mass-transfer rates. To this end, I combined monitoring campaigns and high-cadence photometric survey data with more than a century of historical photographic plate archives, enabling us to determine the supercycle timescales and to characterize recent superoutbursts in long-period systems in detail.

In Chapter 2, I analyzed the DASCH photographic plate archive and other survey data and identified a historical superoutburst of GP Com that occurred in 1950–1951—the first such event ever recorded for this system. The amplitude and duration of the event confirm that it was indeed a genuine superoutburst. Although GP Com lies theoretically near the boundary between the dwarf nova state and the cool stable state, our findings demonstrate that an outburst comparable to those of dwarf nova–state systems can occur. A Monte Carlo estimate of the probability of “missed superoutbursts” showed that, if the supercycle is shorter than 70 yr, the likelihood of having missed an event is low; thus, the supercycle of GP Com is likely longer than 70 yr. This provides an upper limit of $\dot{M}_{\text{tr}} \lesssim 1.8 \times 10^{-12} M_{\odot}, \text{yr}^{-1}$, reaffirming that GP Com sits close to the thermal stability boundary. As an additional result, I newly identified a historical outburst of SDSS J152509.57+360054.5 (J1525). J1525 is now the longest-period AM CVn system with multiple recorded superoutbursts, and its estimated supercycle is consistent with the empirical $P_{\text{orb}}\text{--SC}$ correlation. This supports the idea that systems close to the cool stable state still show continuity with dwarf-nova–state AM CVn stars.

In Chapter 3, I analyzed nine superoutbursts from six long-period AM CVn systems observed between 2014 and 2021, four of which exhibited double-superoutburst profiles. NSV 1440 displayed both a double superoutburst and a precursor+SO pattern, demonstrating that these phenomena form a continuous sequence. Although the duration of second superoutbursts in general was 6.6(2.2) d, the second events in double superoutbursts had a much narrower distribution, 5.0(0.4) d. These results indicate that the classical TTI mechanism is effective in helium-dominated disks and that the contribution from EMT is minor. The duration of double superoutbursts averaged 11.4(1.9) d, about

twice that of superoutbursts in short- P_{orb} AM CVn systems.

Furthermore, all fading tails could be decomposed into three phases (tails A, B, and C), each described by a power-law decline, allowing us to establish an empirical morphology of long-period AM CVn outbursts. This provides a quantitative criterion for distinguishing partially observed outbursts from genuine superoutbursts and from other brightening events. Changes in disk radius before and after rebrightening suggest that EMT plays only a minor role. I also found that in systems with short supercycles, such as short- P_{orb} AM CVn stars, a new superoutburst may begin before the fading tail has fully decayed. These results yield new observational constraints on viscosity parameters, the presence or absence of EMT triggering, and the physical origin of fading tails.

Taken together, these findings provide a coherent picture of accretion-disk physics in long-period AM CVn stars. The existence of double superoutbursts and multi-phase fading tails shows that the same physical instability responsible for WZ Sge-type outbursts in hydrogen-rich cataclysmic variables also operates in helium accretion disks. The historical GP Com outburst demonstrates that thermal instability can occur even near the thermal stability limit of the mass-transfer rate, implying that long-period AM CVn systems undergo outbursts through mechanisms similar to those of other members of the class.

A concern remained that in the missing-superoutburst simulations for GP Com in Chapter 2, the use of V451 Boo’s light curve as the superoutburst template might bias the derived supercycle. However, because Chapter 3 provided a more accurate empirical outburst profile for long-period systems, this concern has been removed, allowing a far more robust estimate of the missing-superoutburst probability.

I also found that WZ Sge-type superoutbursts in AM CVn stars have long durations and extremely long supercycles, just as in hydrogen-rich cataclysmic variables, yet they form a continuous sequence with ordinary SU UMa-type superoutbursts.

By integrating short-timescale, high-cadence photometric observations with century-scale archival data, this thesis establishes long-period AM CVn stars as indispensable laboratories for testing accretion-disk instability theory. Future high-cadence all-sky surveys and intensive spectro-photometric campaigns will be key to constraining mass ratios, discovering new outbursts, and determining whether helium disks remain cool and stable or undergo sporadic instabilities. Long-period AM CVn systems thus serve as crucial observational testbeds for understanding the physics of cool accretion disks and the late evolutionary stages of ultracompact binaries.

Chapter 5

Future Work

In this study, I investigated the temporal evolution of outbursts and fading tails in long-period AM CVn systems through detailed analyses of their light curves. To directly test the physical processes that govern these brightness variations, multi-wavelength observations—particularly spectroscopy and photometry in high-energy bands such as X-rays and the ultraviolet—will be indispensable. In particular, forthcoming UV survey missions such as ULTRASAT and Umitsubame are expected to capture the previously unobserved rise phase of outbursts, which will place strong constraints on the heating processes operating in the accretion disk.

As shown in this work, the supercycle of long-period AM CVn systems may extend over several decades or longer. Historical legacy data, including photographic plate archives, will therefore become increasingly important. Furthermore, with the operation of the Rubin Observatory (LSST), observations will reach unprecedented depth and cadence, and the known population of long-period AM CVn systems is expected to increase by orders of magnitude. Our quantitative characterization of fading-tail morphology provides a means of distinguishing them from phenomena such as faint long brightenings and active states, which were previously difficult to separate in sparse light curves. This advancement will improve the accuracy of supercycle statistics, and statistical analyses of the enlarged sample and superoutburst detection frequencies will place new constraints on the distribution and evolutionary trends of supercycles.

A systematic investigation of fading tails in short-period AM CVn systems may further refine the disk instability model (DIM) for helium accretion disks and deepen our understanding of their viscous evolution. In addition, the presence or absence of spontaneous enhanced mass transfer (EMT) in AM CVn systems may influence theoretical models of stellar magnetic dynamos, motivating both observational and theoretical studies.

Within the long-period AM CVn systems examined in this study, NSV 1440, with its short supercycle, and J0902, expected to possess an extremely long supercycle, both exhibit active states. This suggests that active states may be a common phenomenon among long-period AM CVn systems. Although superhump-like variations have been reported during the faint long brightening events of J0807 and J1137, their nature remains unconfirmed. To elucidate the physical origin of these phenomena, high-time-resolution observations capable of capturing short-term variability, together with long-term multi-color photometry and spectroscopy, will be essential. In particular, continuous monitoring with the Seimei Telescope / TriCCS will provide a powerful means of addressing these

questions.

Appendix A

Supercycles of 58 AM CVn-type objects

We show the AM CVns' data used in figure 2.4. We calculated the supercycles using data from the modern time-domain survey and report them in table A.1. The data are listed in the order of the orbital or superhump period. The second column of table A.1 means whether an outburst has been observed in the past. We found that SDSS J152509.57+360054.5 (SDSSJ1525 hereafter) had a superoutburst that remained bright for about 7 days in 1940, which was recorded in DASCH. We estimated the upper limit of the supercycle for SDSSJ1525 using two outbursts, the 2015 superoutburst in the modern survey and the 1940 superoutburst in DASCH, and the lower limit using only the modern survey. Since the quiescence magnitude of SDSSJ1525 is faint compared to the upper limit of DASCH data, the probability of missing superoutburst for SDSSJ1525 was not estimated. We report the longest period without an outburst as the lower limit of the supercycle for AM CVns that have had only one outburst and for AM CVns that have never had an outburst (longest period with dense data).

Table A.1: Supercycles of outbursting AM CVns.

Name	Outburst	Supercycle (d)	Orbital Period (d) ^{†,‡}
MGAB-V240	yes	12	0.015824
SDSS J183131.63+420220.2	yes	25	0.01602343
PTF1 J191905.19+481506.2	yes	30	0.0155944
ASASSN-14cc	yes	20	0.0156 (sh)
CR Boo	yes	50	0.017029
KL Dra	yes	65	0.01738
CSS 110507:163239+351108	yes	64	0.018125
V803 Cen	yes	80	0.01848
PTF1 J071912.13+485834.0	yes	80	0.01859
ASASSN-15kf	yes	370	0.01922 (sh)
ASASSN-20pv	yes	530	0.019303 (sh)
PTF1 J221910.09+313523.1	yes	100	0.0195:
YZ LMi	yes	125	0.01966
CP Eri	yes	130	0.01969
GUVV-2 J104325.0+563258.0	yes	100	0.01979167:
CSS 150211:091017-200813	yes	335	0.0206:
ASASSN-15dg	yes	180	0.02093
PTF1 J094329.59+102957.6	yes	220	0.02095
ZTF18abihypg	yes	150	0.0214887: (sh)
ASASSN-19ct	yes	360	0.02167
CSS 091016:010550+190317	yes	230	0.0219
CSS 110507:163239+351108	yes	235	0.0227:
CSS 091029:074420+325448	yes	240	0.02284722:
V406 Hya	yes	280	0.02347

APPENDIX A. SUPERCYCLES OF 58 AM CVN-TYPE OBJECTS

Table A.1 Supercycles of outbursting AM CVns. (continued)

Name	Outburst	Supercycle (d)	Orbital Period (d) ^{†,‡}
CSS 090219:043518+002941	yes	365	0.0238
SDSS J173047.59+554518.5	yes	890	0.0244
ASASSN-18dg	yes	340	0.024588123
ASASSN-21hc	yes	>1875	0.02487 (sh)
ASASSN-16hb	yes	>1500	0.02471 (sh)
NSV 1440	yes	700	0.0252329
V558 Vir	yes	540	0.02539
SDSS J124058.03-015919.2	yes	700	0.025941
V0744 And (SDSS J0129+3842)	yes	1250	0.02608
ASASSN-15oe	yes	>1700	0.02658 (sh:)
SDSS J172102.48+273301.2	yes	3386	0.02708125 (sh)
ASASSN-21br	yes	>1800	0.0268
OX Eri (ASASSN-14ei)	yes	>2000	0.027808
V493 Gem (ASASSN-14mv)	yes	1400	0.028472222 (sh)
ASASSN-22gm	yes	>3000	0.02890
ASASSN-19rg	yes	>3000	0.03048 (sh)
SDSS J152509.57+360054.5	yes	2700–27500	0.03078
SDSS J080449.49+161624.8	no	>5000	0.0309
ASASSN-18rg	yes	>5000	0.031905 (sh)
SDSS J141118.31+481257.6	yes	>5000	0.032
GP Com	yes	>27000	0.032339
CSS 121123:045020-093113	yes	>2900	0.03283
SDSS J090221.35+381941.9	yes	>3000	0.03355
ASASSN-14cn (Gaia14aae)	yes	>3000	0.034521
ASASSN-17fp	yes	>1000	0.036
SDSS J120841.96+355025.2	no	>5000	0.03678
SDSS J080710.33+485259.6	yes*	>3380	0.037
ZTF J022008.6+214155.8	yes	>5000	0.037041443
SDSS J164228.06+193410.0	no	>4000	0.03764
NADA-V123	no	>4000	0.03774946
SDSS J155252.48+320150.9	no	>4000	0.039078
ASASSN-21au	yes	>3500	0.0406 (sh)
SDSS J113732.32+405458.3	yes*	>4000	0.0414
V396 Hya	no	>5500	0.04521

* The faint and long-duration activities reported by Rivera Sandoval et al. (2021, 2020).

[†] “sh” means the superhump period, which is a few percent longer than the orbital period.

[‡] Orbital periods are taken from the International Variable Star Index (VSX) database³.

Appendix B

Additional Considerations for Studies of AM CVn-type object

B.1 Reliability of Time Information in Digitized Photographic Plates

Photographic plates converted to FITS images (e.g., DASCH, DSS) may contain incorrect time information in their headers because the dates were originally entered manually. To evaluate the reliability of these time data, we propose using high proper motion stars as probes. By comparing the measured positions of such stars with their predicted positions at the header time, discrepancies can be revealed. Furthermore, treating the observation time as a free parameter and sampling it via MCMC allows us to statistically assess the consistency of the header time. This approach provides a practical way to identify and quantify potential errors in historical plate metadata.

B.2 Comparison of the fading tails between long- P_{orb} AM CVn objects and H-rich WZ Sge-type objects with multiple rebrightenings

The fading tail profile of H-rich CVs that show multiple rebrightenings, such as EG Cnc, bears some resemblance to the fading tail profiles of AM CVn systems. The logarithmic light curve of the fading tail of EG Cnc is presented in Figure B.1. When the fading tail is analyzed under the assumption that it consists of tail A, B, and C, as in the case of AM CVn systems, tail A shows a rising trend in brightness and does not exhibit the stepwise fading typically associated with rebrightening. Furthermore, rebrightenings are observed even during tail B. In contrast, AM CVn systems show the presence of tail A even when the number of rebrightenings is small, as seen in type-C rebrightening events. Due to these differences in behavior, further discussion is not pursued here.

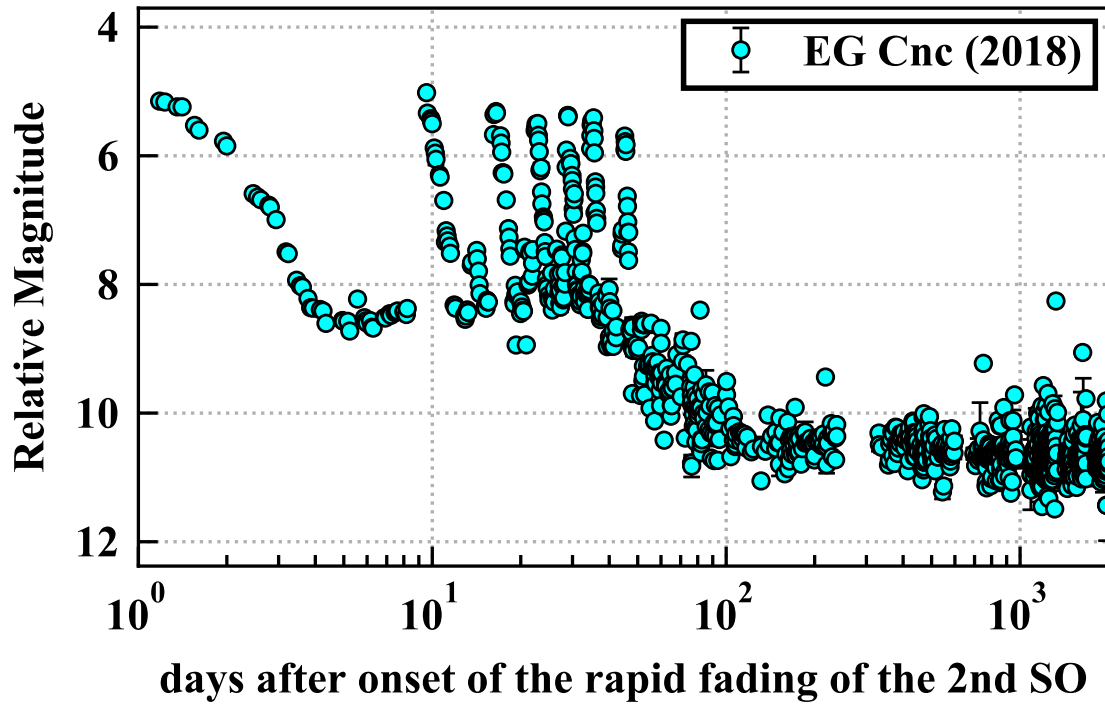


Figure B.1: Light curve of fading tail of 2018 SO of EG Cnc.

Appendix C

Log of Observations and Magnitude Corrections

C.1 Observation Logs

The observation logs of the superoutbursts and active states for each object are presented in E-table C.1 – C.10.

C.2 Correction of Observer-Dependent Magnitude Offsets

The observer-dependent magnitude offsets of time-series photometry reported to VSNET and AAVSO, excluding survey data, were estimated for each SO and are summarized in E-tables C.11 – C.17. For the 2021 superoutburst of NSV 1440 and the 2020 superoutburst of ASASSN-20eq, no correction tables are provided because the time-series data (excluding survey observations) were available from only a single observatory.

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1: Log of observations of the 2014 superoutburst in SDSS J090221.35+381941.

Start*	End*	Mag	Error	N	Obs	Filter#
56700.9319	56700.9333	>16.270	0.084	2	ASN	V
56710.7533	56710.7722	21.260	0.210	3	CSS	C
56723.3760	56723.5205	14.779	0.004	212	deM	C
56723.6271	56723.8428	15.725	0.011	478	LCO	CV
56723.6886	56723.8148	1.170	0.006	328	MIC	V
56724.0834	56724.1224	2.274	0.007	49	OKU	C
56724.0936	56724.2022	16.437	0.018	201	Kis	C
56724.2390	56724.3448	2.139	0.010	143	DPV	C
56724.3027	56724.4652	17.391	0.020	208	RPc	V
56724.3234	56724.4741	17.634	0.013	182	deM	C
56724.7922	56724.8467	4.036	0.018	44	MIC	V
56724.8982	56724.8982	18.458	–	1	PTF	R
56725.3251	56725.3266	18.406	0.060	2	deM	C
56725.4280	56725.4280	>17.600	–	1	RPc	CV
56725.6622	56725.6790	18.218	0.066	4	CSS	C
56726.2558	56726.3368	3.526	0.022	67	DPV	C
56726.3574	56726.3589	18.584	0.115	2	deM	C
56727.0913	56727.1076	4.591	0.058	10	OKU	C
56727.2270	56727.2549	3.669	0.052	20	DPV	C
56727.3272	56727.3287	18.862	0.084	2	deM	C
56728.2299	56728.2473	3.829	0.095	13	DPV	C
56729.2469	56729.5102	2.684	0.012	158	DPV	C
56730.2495	56730.5889	2.673	0.009	183	DPV	C
56730.3430	56730.4003	17.804	0.028	36	deM	C
56730.4691	56730.5637	2.810	0.023	45	CRI	C
56730.4970	56730.4970	>16.100	–	1	RPc	CV
56731.0882	56731.1045	4.056	0.143	7	OKU	C
56731.2329	56731.4205	2.223	0.015	103	DPV	C
56731.4091	56731.4732	2.393	0.028	26	CRI	C
56732.0567	56732.1526	2.805	0.014	183	KU1	C
56732.1868	56732.2030	1.785	0.039	10	OKU	C
56732.3005	56732.4355	1.407	0.011	64	CRI	C
56732.3270	56732.6043	16.291	0.007	263	deM	C
56732.5355	56732.7859	16.150	0.010	102	MZK	CV
56732.5487	56732.6058	16.025	0.018	41	DKS	CV
56732.5599	56732.6721	15.943	0.005	271	IMi	C
56732.5599	56732.6721	15.943	0.005	271	IMi	CV
56733.1826	56733.1880	1.477	0.049	4	OKU	C
56733.3288	56733.5961	15.018	0.020	319	deM	C
56733.3323	56733.5292	14.879	0.018	238	RJW	CV
56733.3505	56733.4826	15.086	0.031	51	HaC	CV
56733.5578	56733.7417	14.416	0.002	387	LCO	CV
56733.6458	56733.9486	14.145	0.003	346	CMM	V
56733.7253	56733.8675	13.975	0.003	188	SWI	V
56733.7695	56733.7708	14.122	0.063	2	ASN	V
56734.0826	56734.0988	-0.201	0.004	10	OKU	C
56734.3213	56734.5940	14.154	0.001	410	deM	C
56734.3592	56734.6314	14.164	0.002	186	Han	CV
56734.3592	56734.6314	14.164	0.002	186	OAR	CV
56734.5015	56734.7402	14.303	0.002	127	MZK	CV
56734.6132	56734.9065	13.888	0.002	434	CMM	V
56734.6151	56734.8032	14.111	0.001	403	LCO	CV
56734.6477	56734.8126	13.835	0.002	187	UJH	CV
56735.2664	56735.4062	2.161	0.002	696	Mas	C
56735.3136	56735.5316	13.663	0.001	468	IMi	C
56735.3136	56735.5316	13.663	0.001	468	IMi	CV
56735.3262	56735.6026	13.967	0.002	356	deM	C
56735.4114	56735.4776	-0.971	0.003	84	CRI	C
56735.4404	56735.5407	13.691	0.006	85	RPc	V
56735.5219	56735.7113	13.943	0.004	89	DKS	CV
56735.5765	56735.6363	13.925	0.003	118	LCO	CV
56735.6126	56735.7164	14.175	0.003	69	MZK	CV
56735.6228	56735.9438	13.861	0.004	461	CMM	V
56736.2598	56736.3873	2.837	0.002	478	Mas	C
56736.3237	56736.4519	14.716	0.003	175	deM	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1 Log of observations of the 2014 superoutburst in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
56736.4434	56736.6297	14.570	0.003	236	RPc	V
56736.5250	56736.7936	14.829	0.003	257	DKS	CV
56736.6364	56736.8518	14.692	0.002	315	CMM	V
56736.6428	56736.9069	14.665	0.001	499	SWI	V
56736.8847	56736.8860	14.565	0.052	2	ASN	V
56737.2422	56737.4392	-0.938	0.001	241	DPV	C
56737.3298	56737.6075	14.336	0.001	392	deM	C
56737.4073	56737.6409	14.041	0.001	543	IMi	C
56737.4073	56737.6409	14.041	0.001	543	IMi	CV
56737.4437	56737.5717	2.309	0.003	177	Nov	C
56737.5823	56737.7649	14.229	0.001	693	LCO	CV
56737.6495	56737.7378	14.012	0.002	108	UJH	CV
56737.6503	56737.7536	14.247	0.004	246	JJI	CV
56737.6619	56737.7638	14.278	0.004	59	DKS	CV
56737.9774	56738.1289	-0.100	0.002	101	OKU	C
56738.2448	56738.5541	-1.021	0.002	416	DPV	C
56738.3242	56738.5938	14.243	0.001	358	deM	C
56738.3576	56738.4148	-0.678	0.002	78	CRI	C
56738.6962	56738.9515	14.192	0.002	691	JJI	CV
56738.9431	56739.0732	-0.110	0.002	118	OKU	C
56739.0034	56739.1593	14.235	0.002	379	Mdy	C
56739.3264	56739.5851	14.236	0.001	340	deM	C
56739.3344	56739.3968	-0.678	0.003	85	CRI	C
56739.3882	56739.3882	13.900	–	1	MUY	Vis
56739.3934	56739.5324	13.944	0.001	332	IMi	C
56739.3934	56739.5324	13.944	0.001	332	IMi	CV
56739.6460	56739.9477	14.235	0.001	817	JJI	CV
56739.6630	56739.9234	14.046	0.004	83	CMM	V
56739.9126	56740.2298	13.871	0.002	1048	Ioh	C
56739.9453	56740.1748	13.882	0.002	430	Kis	C
56739.9849	56740.1481	0.481	0.002	402	KU1	C
56740.1551	56740.2399	0.133	0.005	85	OKU	C
56740.3153	56740.6041	14.025	0.002	358	RJW	CV
56740.3281	56740.5794	14.303	0.001	322	deM	C
56740.3464	56740.4191	-0.604	0.002	96	CRI	C
56740.4008	56740.6172	14.046	0.001	529	IMi	C
56740.4008	56740.6172	14.046	0.001	529	IMi	CV
56740.4117	56740.6040	14.054	0.001	258	RPc	V
56740.5762	56740.7351	14.261	0.001	840	LCO	CV
56740.6323	56740.9239	14.126	0.005	89	CMM	V
56740.6378	56740.7920	14.052	0.002	182	UJH	CV
56740.6497	56740.9480	14.322	0.002	783	JJI	CV
56740.6836	56740.9075	14.062	0.001	424	SWI	V
56740.7345	56740.9022	14.134	0.002	200	CMJ	V
56740.9949	56741.0480	0.510	0.017	103	KU1	C
56741.2603	56741.4681	-0.489	0.002	617	CRI	C
56741.3188	56741.5981	14.409	0.004	75	Han	CV
56741.3188	56741.5993	14.409	0.002	299	OAR	CV
56741.3847	56741.3847	14.200	–	1	MUY	Vis
56741.5422	56741.6653	14.271	0.001	647	LCO	CV
56741.6722	56741.9028	14.153	0.001	440	SWI	V
56742.3244	56742.4436	14.474	0.001	148	deM	C
56742.3536	56742.5905	14.513	0.003	156	Han	CV
56742.3536	56742.5905	14.513	0.003	156	OAR	CV
56742.4650	56742.5962	14.517	0.004	57	HaC	CV
56742.4650	56742.5962	14.517	0.004	57	Ham	CV
56742.6482	56742.7814	0.236	0.003	159	DKS	C
56742.6482	56742.7814	14.513	0.003	159	DKS	CV
56743.1819	56743.2597	14.539	0.005	50	MTu	CV
56743.2681	56743.5321	-0.212	0.009	327	DPV	C
56743.3673	56743.5884	15.135	0.007	293	deM	C
56743.3949	56743.6076	15.203	0.012	128	OAR	CV
56743.4058	56743.5408	0.615	0.006	114	Shu	V
56743.6291	56743.9118	15.339	0.008	351	SWI	V
56743.9580	56744.1025	1.733	0.007	190	OKU	C
56744.0031	56744.1146	2.237	0.011	247	KU1	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1 Log of observations of the 2014 superoutburst in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
56744.3034	56744.5320	1.564	0.007	291	DPV	C
56744.3194	56744.3854	1.606	0.013	32	CRI	C
56744.3490	56744.5851	16.698	0.008	156	OAR	CV
56744.3490	56744.5851	16.699	0.008	155	Han	CV
56744.3660	56744.4633	2.245	0.011	41	Shu	V
56744.3857	56744.4579	16.567	0.008	92	IMi	C
56744.3857	56744.4579	16.567	0.008	92	IMi	CV
56744.7641	56744.7641	16.629	–	1	ASN	V
56744.7654	56744.7654	>17.049	–	1	ASN	V
56744.9468	56744.9935	2.686	0.016	43	OKU	C
56744.9772	56745.0955	3.025	0.022	197	KU1	C
56745.3174	56745.5326	16.978	0.006	132	OAR	CV
56745.3184	56745.5326	16.978	0.006	131	Han	CV
56745.4083	56745.5000	2.579	0.010	41	Shu	V
56745.6219	56745.8771	16.926	0.004	231	SWI	V
56746.2575	56746.5302	2.053	0.007	182	DPV	C
56746.2612	56746.4965	2.765	0.006	149	Shu	V
56746.3253	56746.4747	17.205	0.006	143	deM	C
56746.3269	56746.4100	2.131	0.014	40	CRI	C
56746.3570	56746.4372	17.185	0.012	69	Han	CV
56746.3570	56746.4372	17.185	0.012	69	OAR	CV
56746.6211	56746.8860	17.011	0.004	240	SWI	V
56747.2108	56747.4063	2.369	0.008	99	CRI	C
56747.2544	56747.4736	2.033	0.006	141	DPV	C
56747.2641	56747.2866	2.809	0.010	20	Shu	V
56747.3404	56747.4033	17.053	0.017	51	RPc	V
56747.3707	56747.4094	16.978	0.008	49	IMi	C
56747.3707	56747.4094	16.978	0.008	49	IMi	CV
56747.6035	56747.7487	17.075	0.009	100	CMJ	V
56747.9461	56748.0817	3.563	0.020	116	OKU	C
56748.0024	56748.1325	3.215	0.014	281	KU1	C
56748.2151	56748.4587	2.229	0.013	99	CRI	C
56748.5631	56748.7087	17.033	0.011	99	CMJ	V
56748.6201	56748.8739	16.927	0.005	230	SWI	V
56748.9560	56749.0881	3.085	0.011	120	OKU	C
56749.0064	56749.1305	3.294	0.014	251	KU1	C
56749.3222	56749.3606	2.074	0.015	19	CRI	C
56749.3358	56749.5737	17.059	0.007	195	Han	CV
56749.3358	56749.5737	17.059	0.007	195	OAR	CV
56749.6114	56749.8729	17.100	0.004	237	SWI	V
56749.7319	56749.7519	17.108	0.022	4	CSS	C
56749.9564	56750.0924	2.803	0.007	57	OKU	C
56750.2165	56750.3209	2.193	0.011	50	CRI	C
56751.2778	56751.3251	2.454	0.020	42	CRI	C
56751.3253	56751.3796	17.237	0.008	45	Han	CV
56751.3253	56751.3796	17.237	0.008	45	OAR	CV
56751.3401	56751.5177	17.216	0.004	162	deM	C
56751.7658	56751.7658	17.275	–	1	ASN	V
56751.7672	56751.7672	>17.080	–	1	ASN	V
56751.9854	56752.0844	2.927	0.012	83	OKU	C
56752.2871	56752.3053	17.229	0.018	16	Han	CV
56752.2871	56752.3053	17.229	0.018	16	OAR	CV
56752.3436	56752.3746	17.167	0.022	36	RPc	V
56752.5187	56752.5187	17.180	–	1	MUY	CV
56752.8012	56752.8025	>16.945	0.004	2	ASN	V
56752.9240	56752.9832	17.207	0.060	65	Ioh	C
56753.4407	56753.5102	17.301	0.005	69	deM	C
56753.6002	56753.7229	17.211	0.012	100	CMJ	V
56753.9384	56754.1633	17.078	0.014	269	Ioh	C
56753.9572	56754.0840	3.011	0.011	115	OKU	C
56754.3442	56754.4859	16.947	0.008	136	deM	C
56754.4072	56754.4072	16.920	–	1	DDE	CV
56754.9423	56755.0984	0.478	0.003	375	OKU	C
56755.2364	56755.4727	0.440	0.011	74	CRI	C
56755.2749	56755.4198	0.068	0.006	187	DPV	C
56755.3331	56755.5107	15.413	0.006	205	deM	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1 Log of observations of the 2014 superoutburst in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
56755.3828	56755.5416	15.499	0.008	143	Han	CV
56755.3828	56755.5416	15.499	0.008	143	OAR	CV
56755.6807	56755.8472	15.817	0.008	220	SWI	V
56755.9732	56756.1043	2.936	0.018	254	KU1	C
56756.1156	56756.1478	3.168	0.038	30	OKU	C
56756.2248	56756.3637	2.761	0.017	63	CRI	C
56756.3029	56756.5610	17.751	0.010	222	Han	CV
56756.3029	56756.5610	17.751	0.010	222	OAR	CV
56756.3351	56756.4970	17.822	0.009	125	deM	C
56756.3981	56756.4034	17.488	0.043	6	RPc	V
56756.9721	56757.0142	3.836	0.048	54	KU1	C
56757.2384	56757.3087	2.839	0.023	31	CRI	C
56757.3081	56757.3300	17.908	0.028	7	Han	CV
56757.3081	56757.3300	17.908	0.028	7	OAR	CV
56758.2262	56758.2879	3.141	0.020	29	CRI	C
56758.7701	56758.7714	>16.469	0.073	2	ASN	V
56759.7825	56759.8210	17.813	0.048	4	PS1	iP
56759.7924	56759.7937	>16.282	0.132	2	ASN	V
56760.2698	56760.4225	2.901	0.033	98	DPV	C
56762.2777	56762.3353	4.153	0.037	28	CRI	C
56763.2658	56763.3382	3.273	0.017	34	CRI	C
56764.5519	56764.5519	>17.100	–	1	DKS	V
56770.5647	56770.5647	>16.100	–	1	DKS	V
56771.7818	56771.7832	>17.014	0.017	2	ASN	V
56772.5666	56772.5666	>15.700	–	1	DKS	V
56773.5485	56773.5485	>17.200	–	1	DKS	V
56774.5962	56774.5962	>16.700	–	1	DKS	V
56776.6866	56776.7047	18.104	0.035	4	CSS	C
56782.5732	56782.5732	>17.200	–	1	DKS	V
56783.5541	56783.5541	>17.100	–	1	DKS	V
56784.6011	56784.6011	>17.200	–	1	DKS	V
56785.5881	56785.5881	>17.000	–	1	DKS	V
56787.6548	56787.6729	18.410	0.161	4	CSS	C
56787.7419	56787.7419	18.001	–	1	PS1	yP
56787.7618	56787.7631	>16.545	0.077	2	ASN	V
56788.7591	56788.7604	>16.475	0.046	2	ASN	V
56790.7471	56790.7471	18.200	–	1	PS1	zP
56795.7569	56795.7582	>17.102	0.022	2	ASN	V
56796.7517	56796.7530	>17.017	0.056	2	ASN	V
56799.7467	56799.7481	>16.641	0.125	2	ASN	V
56802.7396	56802.7409	>16.146	0.177	2	ASN	V
56803.7372	56803.7372	>14.302	–	1	ASN	V
56916.5631	56916.6371	19.515	0.009	2	GIE	G
56916.5634	56916.6374	20.112	0.076	2	GIE	BP
56916.5635	56916.6375	19.431	0.101	2	GIE	RP
56917.1383	56917.1399	>16.102	0.226	2	ASN	V
56924.1273	56924.1287	>16.945	0.013	2	ASN	V
56935.1153	56935.1153	>16.990	–	1	ASN	V
56936.1151	56936.1151	>16.881	–	1	ASN	V
56938.1270	56938.1284	>16.387	0.045	2	ASN	V
56939.1078	56939.1092	>15.237	0.083	2	ASN	V
56940.1073	56940.1087	>16.189	0.016	2	ASN	V
56943.0771	56943.0786	>16.351	0.042	2	ASN	V
56944.9782	56945.0005	19.946	0.212	4	CSS	C
56949.5234	56949.5234	19.818	–	1	GIE	G
56949.5238	56949.5238	19.281	–	1	GIE	RP
56949.5238	56949.5238	20.297	–	1	GIE	BP
56956.9042	56956.9365	20.016	0.101	4	CSS	C
56961.0279	56961.0292	>16.933	0.069	2	ASN	V
56968.0008	56968.0022	>15.914	0.033	2	ASN	V
56969.0026	56969.0041	>15.710	0.205	2	ASN	V
56970.0020	56970.0034	>15.828	0.182	2	ASN	V
56970.9989	56971.0004	>16.050	0.038	2	ASN	V
56971.0839	56971.1359	19.927	0.043	8	PS1	iP
56971.9961	56971.9975	>16.304	0.051	2	ASN	V
56979.9992	56980.0007	>17.085	0.139	2	ASN	V

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1 Log of observations of the 2014 superoutburst in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
56981.0000	56981.0017	>17.027	0.000	2	ASN	V
56982.4303	56982.4303	19.867	–	1	GIE	G
56982.4306	56982.4306	23.910	–	1	GIE	BP
56982.4307	56982.4307	19.331	–	1	GIE	RP
56984.0194	56984.1478	>17.037	0.015	4	ASN	V
56985.0331	56985.1396	>17.158	0.073	3	ASN	V
56985.8966	56985.9103	20.199	0.241	3	CSS	C
56987.0331	56987.0346	>17.195	0.146	2	ASN	V
56990.9499	56990.9515	>17.091	0.111	2	ASN	V
56992.9590	56992.9604	>16.559	0.001	2	ASN	V
56994.0273	56994.0287	>16.834	0.123	2	ASN	V
56998.0141	56998.0155	>16.162	0.015	2	ASN	V
56999.4342	56999.4342	19.978	–	1	GIE	G
56999.4346	56999.4346	20.194	–	1	GIE	BP
56999.4346	56999.4346	20.599	–	1	GIE	RP
57003.0165	57003.0180	>16.429	0.099	2	ASN	V
57004.7167	57004.7167	>18.100	–	1	MUY	CV
57006.8139	57006.8269	20.032	0.143	3	CSS	C
57006.9978	57006.9993	>16.914	0.065	2	ASN	V
57009.0046	57009.0061	>17.127	0.046	2	ASN	V
57012.6826	57012.6826	>18.100	–	1	MUY	CV
57012.9928	57012.9943	>17.068	0.096	2	ASN	V
57015.7583	57015.7583	>18.100	–	1	MUY	CV
57016.9846	57016.9861	>17.145	0.079	2	ASN	V
57017.7292	57017.7292	>18.100	–	1	MUY	CV
57019.7299	57019.7299	>18.100	–	1	MUY	CV
57020.8489	57020.8503	>16.542	0.046	2	ASN	V
57021.7083	57021.7083	>18.100	–	1	MUY	CV
57024.8934	57024.8949	>15.658	0.489	2	ASN	V
57025.7271	57025.7271	>17.400	–	1	MUY	CV
57030.9434	57030.9448	>16.357	0.110	2	ASN	V
57032.9542	57032.9556	>16.656	0.044	2	ASN	V
57034.0522	57034.0880	20.088	0.055	4	PS1	iP
57034.9529	57034.9543	>16.943	0.022	2	ASN	V
57035.9641	57035.9655	>17.031	0.064	2	ASN	V
57037.0497	57037.0511	>17.106	0.016	2	ASN	V
57038.6090	57038.6090	>18.100	–	1	MUY	CV
57038.9531	57038.9545	>17.120	0.024	2	ASN	V
57040.9405	57040.9419	>17.255	0.134	2	ASN	V
57041.8958	57041.9183	20.078	0.297	4	CSS	C
57042.9409	57042.9422	>17.142	0.028	2	ASN	V
57044.9452	57044.9466	>17.040	0.083	2	ASN	V
57047.6396	57047.6396	>18.100	–	1	MUY	CV
57047.7770	57047.7847	20.080	0.246	2	CSS	C
57047.8071	57047.8085	>16.926	0.077	2	ASN	V
57049.9520	57049.9534	>17.085	0.058	2	ASN	V
57051.9331	57051.9347	>16.857	0.040	2	ASN	V
57052.6319	57052.6319	>18.100	–	1	MUY	CV
57054.8895	57054.8910	>16.296	0.086	2	ASN	V
57058.6146	57058.6146	>16.800	–	1	MUY	CV
57060.7649	57060.7649	20.170	–	1	CSS	C
57061.0118	57061.0134	>16.470	0.043	2	ASN	V
57065.0344	57065.0358	>16.775	0.111	2	ASN	V
57066.0349	57066.0363	>16.294	0.314	2	ASN	V
57066.7248	57066.7398	20.306	0.277	2	CSS	C
57068.6493	57068.6493	>18.100	–	1	MUY	CV
57069.9800	57069.9817	>17.142	0.010	2	ASN	V
57071.8881	57071.8895	>17.088	0.022	2	ASN	V
57072.7063	57072.7103	20.510	0.014	2	CSS	C
57073.9029	57073.9044	>16.917	0.075	2	ASN	V
57077.7789	57077.7804	>16.915	0.081	2	ASN	V
57080.8219	57080.8232	>16.642	0.012	2	ASN	V
57085.5792	57085.5792	>17.400	–	1	MUY	CV
57091.8613	57091.8628	>16.703	0.022	2	ASN	V
57092.5271	57092.7772	20.055	0.058	2	GIE	G
57092.5274	57092.7775	20.466	0.424	2	GIE	BP

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1 Log of observations of the 2014 superoutburst in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
57092.5275	57092.7776	20.058	0.496	2	GIE	RP
57095.6595	57095.6685	20.764	0.535	2	CSS	C
57096.8721	57096.8737	>16.938	0.040	2	ASN	V
57097.5340	57097.5340	>18.100	–	1	MUY	CV
57098.9275	57098.9291	>17.051	0.048	2	ASN	V
57101.8569	57101.8585	>17.110	0.144	2	ASN	V
57102.6051	57102.8552	20.163	0.009	2	GIE	G
57102.6054	57102.8555	21.342	0.020	2	GIE	BP
57102.6055	57102.8556	21.180	0.498	2	GIE	RP
57104.8111	57104.8128	>15.818	0.167	2	ASN	V
57105.8837	57105.8853	>17.046	0.112	2	ASN	V
57109.7727	57109.7744	>16.480	0.044	2	ASN	V
57112.8231	57112.8247	>16.377	0.105	2	ASN	V
57113.8659	57113.8674	>16.133	0.023	2	ASN	V
57116.8826	57116.8841	>15.511	0.311	2	ASN	V
57118.8670	57118.8687	>15.221	0.136	2	ASN	V
57119.8707	57119.8725	>16.465	0.035	2	ASN	V
57120.7778	57120.7794	>15.527	0.103	2	ASN	V
57121.8290	57121.8290	>16.966	–	1	ASN	V
57122.5076	57122.5076	>18.100	–	1	MUY	CV
57124.8366	57124.8382	>16.993	0.025	2	ASN	V
57126.8272	57126.8288	>14.541	0.166	2	ASN	V
57128.8013	57128.8029	>17.038	0.004	2	ASN	V
57131.7964	57131.7981	>16.929	0.022	2	ASN	V
57132.7036	57132.7036	20.270	–	1	CSS	C
57133.4326	57133.4326	>18.100	–	1	MUY	CV
57134.7594	57134.7594	12.649	–	1	ASN	V
57134.7611	57134.7611	>17.111	–	1	ASN	V
57140.4278	57140.4278	>18.100	–	1	MUY	CV
57140.6973	57140.7049	20.417	0.393	2	CSS	C
57144.7949	57144.7966	>16.246	0.015	2	ASN	V
57149.7403	57149.7419	>15.711	0.187	2	ASN	V
57150.7601	57150.7616	>16.934	0.057	2	ASN	V
57153.4896	57153.4896	>17.800	–	1	MUY	CV
57158.7370	57158.7386	>16.025	0.219	2	ASN	V
57159.7472	57159.7488	>16.770	0.080	2	ASN	V
57171.4222	57171.4222	>17.400	–	1	MUY	CV
57180.0474	57180.4737	19.986	0.152	4	GIE	G
57180.0478	57180.4740	21.152	0.592	4	GIE	BP
57180.0478	57180.4741	22.117	0.678	3	GIE	RP
57190.4785	57190.8026	20.203	0.029	4	GIE	G
57190.4788	57190.8030	19.913	0.334	4	GIE	BP
57190.4789	57190.8031	20.567	0.406	4	GIE	RP
57276.5840	57277.0103	20.031	0.083	4	GIE	G
57276.5843	57277.0106	19.723	0.175	4	GIE	BP
57276.5844	57277.0107	19.653	0.340	4	GIE	RP
57285.1374	57285.1392	>15.999	0.064	3	ASN	V
57286.7663	57287.0905	20.031	0.075	4	GIE	G
57286.7666	57287.0908	20.324	0.236	4	GIE	BP
57286.7667	57287.0909	20.020	0.197	4	GIE	RP
57288.1297	57288.1488	>16.216	0.304	5	ASN	V
57299.1141	57299.1167	>16.393	0.112	3	ASN	V
57306.1098	57306.1123	>16.903	0.009	3	ASN	V
57310.0847	57310.0860	>17.001	0.155	2	ASN	V
57315.0720	57315.0738	>16.587	0.079	3	ASN	V
57317.1068	57317.1268	19.642	0.147	2	ATF	cy
57318.0623	57318.0641	>16.577	0.060	3	ASN	V
57321.0529	57321.0555	>16.216	0.036	3	ASN	V
57323.0484	57323.0509	>15.730	0.034	3	ASN	V
57324.0631	57324.0656	>16.016	0.052	3	ASN	V
57325.0989	57325.0989	19.022	–	1	ATF	o
57333.1395	57333.1420	>17.034	0.041	3	ASN	V
57336.9551	57336.9616	20.773	0.372	2	CSS	C
57342.9964	57342.9983	>16.794	0.065	3	ASN	V
57349.9748	57349.9773	>16.193	0.050	3	ASN	V
57359.1300	57359.1326	>16.591	0.032	3	ASN	V

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1 Log of observations of the 2014 superoutburst in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
57361.0509	57361.0534	>16.956	0.015	3	ASN	V
57362.4709	57362.5450	20.171	0.006	2	GIE	G
57362.4712	57362.5452	19.319	0.881	2	GIE	BP
57362.5453	57362.5453	11.695	–	1	GIE	RP
57363.0473	57363.0498	>16.898	0.030	3	ASN	V
57365.9305	57365.9330	>16.904	0.068	3	ASN	V
57366.0490	57366.0490	19.530	–	1	ATF	o
57366.9609	57366.9635	>16.967	0.054	3	ASN	V
57369.9314	57369.9339	>17.067	0.056	3	ASN	V
57372.4763	57372.5503	20.204	0.000	2	GIE	G
57372.4766	57372.5506	20.320	0.194	2	GIE	BP
57372.4767	57372.4767	18.962	–	1	GIE	RP
57375.8904	57375.8949	20.808	0.340	2	CSS	C
57377.9044	57377.9070	>16.175	0.002	2	ASN	V
57380.9911	57380.9924	>15.951	0.001	2	ASN	V
57385.9671	57385.9696	>16.457	0.076	3	ASN	V
57386.9373	57386.9398	>16.518	0.085	3	ASN	V
57387.0176	57387.0176	20.130	–	1	CSS	C
57387.8883	57387.8908	>16.717	0.069	3	ASN	V
57391.0374	57391.0399	>16.984	0.035	3	ASN	V
57393.0205	57393.0205	>17.028	–	1	ASN	V
57395.9957	57396.0252	19.930	0.168	3	ATF	cy
57396.0281	57396.0306	>17.020	0.043	3	ASN	V
57397.8416	57397.8441	>16.912	0.029	3	ASN	V
57399.8653	57399.8678	>16.965	0.036	3	ASN	V
57399.9280	57399.9406	20.335	0.142	3	CSS	C
57402.0004	57402.0029	>17.067	0.080	3	ASN	V
57403.0121	57403.0121	20.104	–	1	ATF	cy
57403.9793	57404.0086	19.774	0.165	2	ATF	cy
57404.0238	57404.0263	>17.111	0.013	2	ASN	V
57404.6653	57404.6653	>18.100	–	1	MUY	CV
57405.8256	57405.8281	>16.687	0.050	3	ASN	V
57407.0630	57407.0642	>16.959	0.040	2	ASN	V
57407.8312	57407.8337	>16.257	0.043	3	ASN	V
57409.8051	57409.8076	>15.819	0.046	3	ASN	V
57413.9874	57413.9874	>16.378	–	1	ASN	V
57415.9756	57415.9781	>16.569	0.018	2	ASN	V
57417.9577	57417.9601	>16.788	0.012	3	ASN	V
57418.8617	57418.8642	>17.088	0.028	3	ASN	V
57420.9057	57420.9082	>17.147	0.036	3	ASN	V
57420.9747	57420.9956	19.953	0.393	2	ATF	cy
57421.7489	57421.7590	20.590	0.228	3	CSS	C
57422.9441	57422.9467	>17.094	0.006	3	ASN	V
57425.0245	57425.0270	>17.094	0.038	3	ASN	V
57427.8533	57427.8558	>17.264	0.119	3	ASN	V
57428.7571	57428.7919	20.425	0.107	4	CSS	C
57429.8735	57429.8760	>17.102	0.004	3	ASN	V
57430.8542	57430.8568	>17.113	0.070	3	ASN	V
57431.8420	57431.8445	>16.914	0.103	3	ASN	V
57432.8305	57432.8335	>16.970	0.011	3	ASN	V
57433.7864	57433.7889	>16.843	0.075	3	ASN	V
57434.7717	57434.7742	>16.682	0.019	3	ASN	V
57437.7268	57437.7281	>15.908	0.076	2	ASN	V
57440.8730	57440.8755	>15.894	0.016	3	ASN	V
57442.8657	57442.8682	>16.191	0.013	3	ASN	V
57444.8098	57444.8098	20.780	–	1	CSS	C
57445.9742	57445.9767	>16.628	0.034	3	ASN	V
57446.9400	57446.9425	>16.884	0.036	3	ASN	V
57447.8819	57447.8844	>17.124	0.087	3	ASN	V
57450.9179	57450.9179	20.184	–	1	ATF	cy
57450.9486	57450.9511	>17.072	0.080	3	ASN	V
57451.9371	57451.9371	20.145	–	1	ATF	cy
57452.8032	57452.8057	>17.044	0.050	3	ASN	V
57454.9420	57454.9445	>17.121	0.041	3	ASN	V
57458.7992	57458.8017	>17.109	0.060	3	ASN	V
57461.7863	57461.7889	>16.621	0.173	3	ASN	V

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.1 Log of observations of the 2014 superoutburst in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
57462.8059	57462.8085	>16.926	0.027	3	ASN	V
57463.8646	57463.8646	19.367	–	1	ATF	o
57465.8182	57465.8922	20.179	0.054	2	GIE	G
57465.8185	57465.8925	20.372	0.023	2	GIE	BP
57465.8186	57465.8926	20.251	0.064	2	GIE	RP
57469.8468	57469.8493	>16.154	0.069	3	ASN	V
57472.7906	57472.7931	>16.406	0.016	3	ASN	V
57476.8164	57476.8189	>17.051	0.063	3	ASN	V
57479.7062	57479.7062	20.290	–	1	CSS	C
57479.8455	57479.8455	19.610	–	1	ATF	cy
57479.8871	57479.8896	>17.021	0.011	3	ASN	V
57483.0696	57483.1436	20.147	0.017	2	GIE	G
57483.0699	57483.1439	19.906	0.881	2	GIE	BP
57483.0700	57483.1440	19.449	0.761	2	GIE	RP
57483.8211	57483.8211	19.863	–	1	ATF	cy
57483.8217	57483.8242	>17.030	0.032	3	ASN	V
57489.7392	57489.7417	>16.951	0.026	3	ASN	V
57489.8285	57489.8653	19.768	0.058	2	ATF	cy
57495.7331	57495.7357	>16.314	0.112	3	ASN	V
57495.7956	57495.7956	18.735	–	1	ATF	o
57499.7914	57499.7939	>16.285	0.056	3	ASN	V
57500.8380	57500.8380	18.674	–	1	ATF	o
57503.8081	57503.8106	>16.649	0.024	3	ASN	V
57505.7552	57505.7578	>16.958	0.056	3	ASN	V
57508.7986	57508.8011	>16.953	0.002	3	ASN	V
57509.7796	57509.7821	>16.914	0.036	3	ASN	V
57510.7684	57510.7709	>16.990	0.060	3	ASN	V
57512.7804	57512.7829	>16.956	0.023	3	ASN	V
57513.8141	57513.8141	19.614	–	1	ATF	cy
57517.0449	57517.0449	20.122	–	1	GIE	G
57517.0452	57517.0452	18.708	–	1	GIE	RP
57517.0452	57517.0452	20.316	–	1	GIE	BP
57524.7426	57524.7439	>14.372	0.383	2	ASN	V
57526.7434	57526.7459	>16.222	0.081	3	ASN	V
57649.3800	57649.6302	20.145	0.038	3	GIE	G
57649.3803	57649.6305	20.155	0.565	3	GIE	BP
57649.3804	57649.6306	20.968	0.566	3	GIE	RP
57651.1350	57651.1375	>15.978	0.077	3	ASN	V
57661.1286	57661.1311	>16.869	0.018	3	ASN	V
57669.3114	57669.3854	20.121	0.294	2	GIE	G
57669.3117	57669.3858	20.240	0.482	2	GIE	BP
57669.3118	57669.3858	20.089	0.352	2	GIE	RP
57670.1028	57670.1053	>16.899	0.020	3	ASN	V
57676.0846	57676.0858	>16.118	0.134	2	ASN	V
57677.0875	57677.0888	>14.855	0.361	2	ASN	V
57679.0792	57679.0817	>16.083	0.075	3	ASN	V
57679.1318	57679.1318	19.044	–	1	ATF	o
57687.1106	57687.1131	>16.617	0.032	3	ASN	V
57689.0595	57689.0620	>16.817	0.034	3	ASN	V
57691.1224	57691.1224	20.002	–	1	ATF	cy
57694.1148	57694.1173	>16.882	0.127	3	ASN	V
57695.1160	57695.1288	19.855	0.072	2	ATF	cy

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

57699.0185	57699.0210	>16.987	0.058	3	ASN	V
* BJD - 2400000.0						
† Mean magnitude.						
‡ 1σ of mean magnitude.						
§ Number of observations.						
Observer's code: BSM (Stephen M.Brincat), CGR [‡] (Graeme Coates), CMJ [‡] (Michael Cook), CMM [‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS [‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hamb-sch, remote obs. in Chile), Ham (F.-J. Hamb-sch), Han (Hankasalmi Obs., by A. Oksanen), HSP [†] (Stephen Hovell from AAVSO database), IMi [‡] (I. Miller), Ioh (H. Itoh), JJI [‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY [‡] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc [‡] (R. Pickard), SGE (Geoffrey Stone), SPE [‡] (P. Starr), SRX ^{†‡} (Rod Stub-bings), SWI [‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH [‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)						
# "C" means no filter (clear).						

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.2: Log of observations of the 2023 active state in SDSS J090221.35+381941.

Start*	End*	Mag	Error	N	Obs	Filter#
60193.0101	60193.0126	20.445	0.225	2	ZTF	zr
60198.9994	60199.0019	20.506	0.126	2	ZTF	zr
60200.0110	60200.0110	20.473	–	1	ZTF	zr
60201.0019	60201.0118	20.668	0.065	5	ZTF	zr
60207.1171	60207.1292	19.638	0.493	2	ATF	cy
60213.1077	60213.1383	20.061	0.215	2	ATF	cy
60222.0625	60222.0625	19.495	–	1	ATF	o
60229.1128	60229.1430	19.872	0.507	2	ATF	cy
60231.0867	60231.0867	19.978	–	1	ATF	cy
60231.9527	60231.9527	20.488	–	1	ZTF	zg
60231.9708	60231.9708	20.493	–	1	ZTF	zr
60233.9915	60233.9915	20.483	–	1	ZTF	zr
60234.0097	60234.0097	20.560	–	1	ZTF	zg
60235.1077	60235.1077	20.122	–	1	ATF	cy
60236.9235	60236.9235	20.301	–	1	ZTF	zg
60236.9867	60236.9867	20.709	–	1	ZTF	zr
60237.0865	60237.0865	19.576	–	1	ATF	cy
60238.9254	60238.9254	20.428	–	1	ZTF	zg
60238.9967	60238.9967	20.373	–	1	ZTF	zr
60241.1067	60241.1067	20.296	–	1	ATF	cy
60241.9523	60241.9523	20.273	–	1	ZTF	zg
60243.1160	60243.1240	20.456	0.072	2	ATF	o
60250.0651	60250.0878	19.657	0.322	2	ATF	o
60251.1502	60251.1502	18.916	–	1	ATF	o
60253.9773	60253.9773	20.227	–	1	ZTF	zg
60253.9882	60253.9882	20.565	–	1	ZTF	zr
60256.9789	60256.9789	20.257	–	1	ZTF	zg
60257.0965	60257.1086	20.283	0.001	2	ATF	o
60258.0100	60258.0132	20.254	0.017	2	ATF	cy
60258.9079	60258.9079	20.102	–	1	ZTF	zg
60258.9659	60258.9659	20.393	–	1	ZTF	zr
60260.0648	60260.0833	20.122	0.039	3	ATF	cy
60260.8473	60260.8473	20.349	–	1	ZTF	zg
60260.8881	60260.8881	20.504	–	1	ZTF	zr
60261.0874	60261.0980	20.287	0.073	2	ATF	cy
60262.0617	60262.0753	19.964	0.106	3	ATF	cy
60262.9354	60262.9354	20.458	–	1	ZTF	zg
60262.9986	60262.9986	20.366	–	1	ZTF	zr
60265.1144	60265.1198	20.155	0.117	2	ATF	cy
60266.9215	60266.9600	19.919	0.154	3	ATF	cy
60267.9340	60267.9537	19.635	0.649	2	ATF	cy
60269.0984	60269.1058	19.601	0.090	3	ATF	cy
60274.0985	60274.1284	19.801	0.153	3	ATF	o
60275.0457	60275.0490	19.307	0.451	2	ATF	o
60282.0555	60282.1053	18.230	0.026	4	ATF	o
60283.0534	60283.0754	18.970	0.101	4	ATF	o
60285.0623	60285.1044	17.694	0.049	4	ATF	o
60286.0027	60286.0249	17.796	0.052	4	ATF	o
60287.0140	60287.0316	17.175	0.042	4	ATF	cy
60287.8204	60287.8204	17.960	–	1	ZTF	zr
60287.8928	60287.8928	18.689	–	1	ZTF	zg
60289.0632	60289.0742	18.752	0.033	4	ATF	o
60289.8521	60289.8521	18.136	–	1	ZTF	zr
60289.8812	60289.8812	18.458	–	1	ZTF	zg
60290.0558	60290.0851	18.373	0.015	4	ATF	o
60291.1015	60291.1301	18.648	0.065	2	ATF	cy
60291.8412	60291.8412	18.177	–	1	ZTF	zr
60291.9321	60291.9321	18.398	–	1	ZTF	zg
60291.9710	60292.0091	18.425	0.054	4	ATF	cy
60292.8870	60292.8870	18.301	–	1	ZTF	zr
60292.9684	60293.0450	18.596	0.022	3	ZTF	zg
60293.0460	60293.0837	18.345	0.068	4	ATF	o
60293.9214	60293.9214	17.655	–	1	ZTF	zr
60293.9692	60294.0637	17.569	0.105	3	ZTF	zg
60294.0486	60294.0782	17.474	0.045	4	ATF	cy

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.2 Log of observations of the 2024 active state in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
60294.9071	60294.9879	16.279	0.040	3	ZTF	zg
60295.0336	60295.0336	16.416	—	1	ZTF	zr
60295.9492	60295.9877	18.138	0.071	4	ATF	cy
60296.9382	60296.9382	17.857	—	1	ZTF	zr
60296.9678	60296.9678	18.062	—	1	ZTF	zg
60302.9362	60302.9524	18.224	0.141	4	ATF	o
60303.9511	60303.9809	18.712	0.081	4	ATF	o
60309.9267	60309.9378	19.331	0.214	4	ATF	o
60311.0007	60311.0249	18.305	0.054	4	ATF	o
60311.9884	60311.9993	18.306	0.062	4	ATF	o
60313.0468	60313.1246	18.615	0.073	4	ATF	o
60315.8064	60315.8981	19.221	0.018	2	ZTF	zr
60315.9822	60315.9930	19.279	0.106	4	ATF	o
60316.9677	60316.9989	19.058	0.128	4	ATF	o
60317.9830	60318.0240	19.122	0.097	4	ATF	o
60320.9652	60320.9947	18.500	0.026	4	ATF	o
60322.8234	60322.8234	18.746	—	1	ZTF	zg
60322.9241	60322.9241	18.581	—	1	ZTF	zr
60323.9530	60323.9636	18.810	0.056	4	ATF	o
60324.8235	60324.8235	18.929	—	1	ZTF	zr
60324.8636	60324.8636	19.171	—	1	ZTF	zg
60324.9711	60325.0129	19.070	0.047	8	ATF	o
60326.8918	60326.9330	18.599	0.035	4	ATF	o
60326.8941	60326.8941	18.511	—	1	ZTF	zr
60326.9544	60326.9544	18.775	—	1	ZTF	zg
60328.0185	60328.0791	18.477	0.050	4	ATF	o
60328.9412	60328.9971	18.440	0.090	4	ATF	o
60328.9436	60328.9436	18.784	—	1	ZTF	zg
60329.9317	60329.9613	18.367	0.010	4	ATF	o
60330.9054	60330.9430	18.318	0.043	4	ATF	o
60331.9242	60331.9535	18.368	0.084	4	ATF	o
60332.8727	60332.8829	18.539	0.085	4	ATF	o
60337.6282	60337.6282	18.085	—	1	ZTF	zr
60337.9775	60337.9996	18.204	0.044	4	ATF	o
60338.9903	60339.0128	18.151	0.179	4	ATF	o
60340.1445	60340.1445	18.553	—	1	ATF	o
60340.8452	60340.8452	18.381	—	1	ZTF	zr
60340.8827	60340.8827	18.579	—	1	ZTF	zg
60340.9920	60341.0395	18.512	0.041	4	ATF	o
60341.9958	60342.0551	18.540	0.131	4	ATF	o
60343.9831	60344.0232	18.275	0.015	4	ATF	o
60344.9894	60345.0367	18.240	0.084	4	ATF	o
60345.9169	60345.9314	18.224	0.079	4	ATF	cy
60346.9364	60346.9815	18.388	0.051	4	ATF	cy
60347.9347	60347.9779	18.405	0.062	4	ATF	cy
60349.9538	60349.9992	18.409	0.048	4	ATF	cy
60350.9203	60350.9321	18.374	0.047	4	ATF	cy
60352.7854	60352.7854	18.243	—	1	ZTF	zg
60352.8249	60352.8249	18.128	—	1	ZTF	zr
60353.8720	60353.8828	18.209	0.057	4	ATF	cy
60354.7698	60354.7698	18.077	—	1	ZTF	zr
60354.7833	60354.7833	18.337	—	1	ZTF	zg
60354.9277	60354.9663	18.196	0.061	4	ATF	cy
60357.7922	60357.7922	18.140	—	1	ZTF	zr
60357.9152	60357.9152	18.364	—	1	ZTF	zg
60358.0521	60358.0521	17.800	—	1	Hrm	C
60358.9131	60358.9738	18.179	0.056	4	ATF	o
60359.9279	60359.9751	18.212	0.106	4	ATF	o
60365.9351	60365.9554	17.792	0.263	4	ATF	o
60366.9409	60366.9626	17.893	0.050	4	ATF	o
60367.9324	60367.9522	17.922	0.076	4	ATF	o
60368.8995	60368.9196	17.979	0.033	4	ATF	o
60369.8208	60369.8208	17.822	—	1	ZTF	zr
60370.8879	60370.9089	17.880	0.026	4	ATF	o
60371.8946	60371.9225	17.957	0.043	4	ATF	o
60372.0396	60372.0396	18.100	—	1	Hrm	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.2 Log of observations of the 2024 active state in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
60375.8627	60375.8999	17.827	0.022	8	ATF	o
60378.7357	60378.7357	17.846	—	1	ZTF	zr
60382.8652	60382.8738	17.201	0.019	3	ATF	o
60383.0889	60383.0889	17.400	—	1	Hrm	C
60384.8327	60384.8564	17.550	0.037	4	ATF	o
60386.7968	60386.8367	18.021	0.034	4	ATF	o
60387.8500	60387.8689	18.216	0.025	4	ATF	o
60388.6670	60388.6670	18.295	—	1	ZTF	zg
60390.8161	60390.8161	17.972	—	1	ZTF	zr
60392.8771	60392.8993	18.088	0.058	4	ATF	o
60394.9041	60394.9239	17.723	0.063	4	ATF	o
60395.9441	60395.9473	17.819	0.115	2	ATF	o
60396.9161	60396.9359	18.078	0.067	4	ATF	o
60397.7589	60397.7589	17.995	—	1	ZTF	zr
60397.8075	60397.8075	18.111	—	1	ZTF	zg
60397.8410	60397.8757	18.005	0.065	4	ATF	o
60398.8299	60398.8762	18.042	0.045	8	ATF	o
60399.8364	60399.8567	17.929	0.032	4	ATF	o
60400.8550	60400.9043	17.838	0.014	8	ATF	o
60401.8624	60401.8954	17.785	0.026	8	ATF	cy
60402.8332	60402.8673	17.693	0.029	3	ATF	o
60403.8219	60403.8219	17.999	—	1	ZTF	zg
60405.7861	60405.8315	17.924	0.047	3	ATF	o
60407.7009	60407.7009	18.045	—	1	ZTF	zg
60408.7879	60408.8323	17.892	0.059	3	ATF	o
60411.7900	60411.8356	17.860	0.123	3	ATF	o
60414.7894	60414.8295	17.655	0.066	3	ATF	o
60417.7584	60417.7584	17.543	—	1	ZTF	zr
60417.8207	60417.8207	17.735	—	1	ZTF	zg
60418.8103	60418.8316	17.579	0.040	4	ATF	o
60419.0139	60419.0139	>16.800	—	1	Hrm	C
60419.7026	60419.7026	17.692	—	1	ZTF	zg
60419.7487	60419.7487	17.483	—	1	ZTF	zr
60419.9071	60419.9436	17.587	0.090	3	ATF	o
60421.7206	60421.7206	17.801	—	1	ZTF	zr
60421.7659	60421.7659	17.992	—	1	ZTF	zg
60421.8099	60421.8302	17.683	0.032	4	ATF	o
60422.8152	60422.8339	17.670	0.056	4	ATF	o
60423.8207	60423.8207	17.790	—	1	ZTF	zg
60427.7902	60427.8207	17.721	0.042	4	ATF	o
60428.1442	60428.1442	>17.100	—	1	Myy	C
60429.7149	60429.7149	18.085	—	1	ZTF	zr
60429.7419	60429.7419	18.248	—	1	ZTF	zg
60431.7710	60431.8066	18.371	0.033	4	ATF	o
60431.7859	60431.7859	18.558	—	1	ZTF	zg
60433.6650	60433.6650	18.458	—	1	ZTF	zr
60433.7189	60433.7189	18.607	—	1	ZTF	zg
60433.8149	60433.8354	18.440	0.035	4	ATF	o
60435.7029	60435.7029	18.760	—	1	ZTF	zg
60435.7163	60435.7163	18.589	—	1	ZTF	zr
60435.7618	60435.7618	18.056	—	1	ATF	o
60437.8006	60437.8191	18.378	0.048	4	ATF	o
60439.7555	60439.7820	18.412	0.041	4	ATF	o
60445.7454	60445.7662	18.464	0.065	3	ATF	o
60447.8148	60447.8384	18.361	0.051	4	ATF	o
60449.7701	60449.7837	18.235	0.052	2	ATF	o
60450.8342	60450.8438	18.188	0.067	6	ATF	o
60451.8044	60451.8289	18.397	0.074	8	ATF	o
60453.7575	60453.7933	18.529	0.110	4	ATF	o
60454.8014	60454.8211	18.194	0.061	3	ATF	o
60475.0212	60475.0212	>16.100	—	1	Myy	C
60556.0023	60556.0104	18.737	0.050	3	ZTF	zr
60557.0012	60557.0075	18.761	0.073	3	ZTF	zr
60558.0029	60558.0094	18.744	0.026	3	ZTF	zr
60559.0036	60559.0105	18.755	0.053	3	ZTF	zr
60561.0091	60561.0091	19.395	—	1	ZTF	zr

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.2 Log of observations of the 2024 active state in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
60562.0040	60562.0099	18.992	0.072	3	ZTF	zr
60571.9733	60571.9733	19.449	—	1	ZTF	zg
60574.9705	60574.9705	19.312	—	1	ZTF	zr
60580.1181	60580.1411	19.114	0.188	4	ATF	o
60584.1174	60584.1336	19.571	0.193	2	ATF	cy
60586.1122	60586.1384	19.558	0.094	3	ATF	o
60588.1047	60588.1222	19.561	0.131	2	ATF	cy
60590.1173	60590.1210	18.635	0.850	2	ATF	o
60592.1134	60592.1391	20.009	0.118	4	ATF	cy
60592.1393	60592.1393	19.197	—	1	ATF	o
60593.0863	60593.1124	19.411	0.066	4	ATF	o
60594.0967	60594.1053	19.786	0.164	3	ATF	cy
60595.9671	60595.9671	19.463	—	1	ZTF	zg
60596.0087	60596.0087	19.421	—	1	ZTF	zr
60596.1150	60596.1360	19.773	0.198	3	ATF	cy
60597.9146	60597.9146	19.823	—	1	ZTF	zg
60598.0168	60598.0168	19.462	—	1	ZTF	zr
60599.9473	60599.9473	19.592	—	1	ZTF	zr
60599.9753	60599.9753	19.691	—	1	ZTF	zg
60600.0829	60600.0926	18.722	0.079	2	ATF	o
60601.0924	60601.1031	18.976	0.238	2	ATF	o
60602.0433	60602.0705	19.228	0.103	5	ATF	o
60603.0759	60603.1077	19.763	0.069	2	ATF	o
60604.0100	60604.1486	19.178	0.085	7	ATF	o
60604.8877	60604.8877	19.712	—	1	ZTF	zg
60606.0517	60606.0872	19.406	0.218	3	ATF	o
60606.9090	60606.9090	19.532	—	1	ZTF	zg
60606.9759	60606.9759	19.633	—	1	ZTF	zr
60608.9702	60608.9702	19.762	—	1	ZTF	zg
60609.0069	60609.0069	19.560	—	1	ZTF	zr
60610.9751	60610.9751	19.396	—	1	ZTF	zr
60614.0694	60614.0784	19.831	0.065	3	ATF	o
60614.1037	60614.1354	19.879	0.124	4	ATF	cy
60618.0613	60618.1050	19.464	0.119	4	ATF	o
60624.1083	60624.1412	19.622	0.062	4	ATF	o
60626.0655	60626.0990	19.995	0.085	7	ATF	o
60629.9895	60630.0836	19.176	0.300	2	ATF	o
60638.0179	60638.0860	19.701	0.124	8	ATF	o
60640.0544	60640.0604	19.947	0.196	2	ATF	o
60641.9350	60641.9520	19.963	0.294	2	ATF	cy
60642.9063	60642.9283	19.877	0.109	4	ATF	cy
60646.0115	60646.0184	19.788	0.355	2	ATF	cy
60647.0384	60647.0496	20.042	0.116	4	ATF	cy
60648.0150	60648.0325	20.128	0.112	4	ATF	cy
60649.9899	60650.0128	20.094	0.161	3	ATF	o
60652.0211	60652.0627	20.121	0.062	7	ATF	o
60653.9977	60654.0100	19.791	0.148	3	ATF	cy
60653.9992	60654.0228	19.856	0.089	4	ATF	o
60655.0452	60655.0688	20.160	0.462	2	ATF	cy
60656.0100	60656.0463	19.860	0.198	3	ATF	o
60659.9412	60659.9412	19.476	—	1	ATF	o
60665.9508	60666.0171	19.572	0.272	5	ATF	o
60666.9420	60666.9968	19.937	0.152	3	ATF	o
60667.9135	60667.9194	19.666	0.156	3	ATF	o
60669.9943	60670.0051	19.822	0.147	3	ATF	o
60670.9269	60670.9441	19.874	0.130	4	ATF	o
60673.9220	60673.9860	20.025	0.151	3	ATF	o
60674.9952	60675.0162	20.157	0.134	7	ATF	o
60676.0741	60676.1044	19.947	0.113	8	ATF	o
60677.9361	60678.0065	19.978	0.092	6	ATF	o
60679.0370	60679.1187	20.083	0.099	4	ATF	o
60679.9741	60680.0384	19.682	0.218	4	ATF	o
60681.7969	60682.0023	20.047	0.050	6	ATF	o
60683.9678	60683.9786	19.763	0.141	4	ATF	o
60684.9484	60684.9663	19.763	0.253	3	ATF	o
60685.9497	60685.9658	19.678	0.276	2	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.2 Log of observations of the 2024 active state in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
60687.9988	60687.9988	19.109	—	1	ATF	o
60693.0211	60693.0211	19.352	—	1	ATF	o
60694.0350	60694.0350	19.829	—	1	ATF	o
60695.0378	60695.0415	19.610	0.035	2	ATF	o
60695.9264	60696.0899	19.852	0.056	5	ATF	o
60697.0184	60697.0225	20.106	0.054	2	ATF	o
60698.0991	60698.1058	19.676	0.022	2	ATF	o
60699.9340	60699.9404	20.056	0.250	3	ATF	cy
60700.2715	60700.2715	>17.400	—	1	Hrm	C
60701.0077	60701.0218	20.033	0.164	4	ATF	o
60703.9755	60703.9930	20.362	0.138	3	ATF	cy
60708.9139	60708.9409	20.367	0.104	2	ATF	o
60709.9029	60709.9331	20.066	0.087	2	ATF	cy
60709.9588	60709.9927	20.474	0.176	2	ATF	o
60710.8028	60710.8136	20.048	0.155	3	ATF	o
60711.7836	60711.8071	19.681	0.232	3	ATF	o
60712.8267	60712.8267	19.687	—	1	ATF	o
60714.8919	60714.8919	18.991	—	1	ATF	o
60720.0753	60720.0753	18.884	—	1	ATF	o
60720.9683	60720.9893	19.600	0.058	3	ATF	o
60721.9285	60721.9285	19.944	—	1	ATF	o
60722.9138	60722.9371	19.919	0.032	4	ATF	o
60724.8925	60724.9356	20.141	0.089	5	ATF	o
60725.8995	60725.9472	20.103	0.078	9	ATF	o
60727.1306	60727.1306	>17.700	—	1	Hrm	C
60727.9048	60727.9484	20.055	0.426	2	ATF	o
60728.7667	60728.7838	20.147	0.186	3	ATF	o
60729.1576	60729.1576	>18.000	—	1	Hrm	C
60729.9013	60729.9268	19.998	0.034	8	ATF	o
60730.9431	60730.9587	19.962	0.132	4	ATF	o
60731.8955	60731.9152	20.125	0.084	4	ATF	o
60732.8938	60732.9239	19.848	0.070	4	ATF	o
60733.1389	60733.1389	>17.400	—	1	Hrm	C
60733.9128	60734.0334	19.921	0.132	7	ATF	o
60734.8965	60734.9158	20.145	0.158	4	ATF	o
60735.8737	60735.9032	19.935	0.088	8	ATF	o
60736.9204	60736.9357	20.430	0.054	3	ATF	o
60737.8601	60737.8923	20.037	0.266	3	ATF	o
60738.8663	60738.8871	20.041	0.152	3	ATF	o
60739.8580	60739.9145	19.997	0.093	8	ATF	o
60741.8819	60741.8990	19.740	0.241	2	ATF	o
60742.8870	60742.8870	19.440	—	1	ATF	o
60743.1097	60743.1097	>17.400	—	1	Hrm	C
60749.0460	60749.0460	18.787	—	1	ATF	o
60749.8768	60749.9642	19.838	0.133	2	ATF	o
60751.8547	60751.8792	19.994	0.027	3	ATF	o
60754.1347	60754.1347	>16.600	—	1	Hrm	C
60755.8743	60755.8743	19.982	—	1	ATF	o
60756.8347	60756.8553	20.065	0.126	4	ATF	o
60757.2505	60757.2505	>16.300	—	1	Myy	C
60757.8727	60757.9005	20.171	0.150	4	ATF	cy
60757.8775	60757.8868	19.912	0.220	3	ATF	o
60758.8910	60758.8910	20.346	—	1	ATF	cy
60759.1081	60759.1081	>17.000	—	1	Myy	C
60759.8350	60759.8573	19.975	0.230	4	ATF	o
60759.8517	60759.8709	20.185	0.101	3	ATF	cy
60760.0389	60760.0389	>17.400	—	1	Hrm	C
60760.8292	60760.8457	19.833	0.193	2	ATF	o
60761.8498	60761.8637	19.938	0.236	2	ATF	o
60762.8911	60762.9154	20.078	0.151	4	ATF	cy
60763.8156	60763.8321	20.031	0.161	3	ATF	o
60764.8185	60764.8280	20.379	0.262	2	ATF	o
60765.8093	60765.8223	20.289	0.215	4	ATF	o
60767.8088	60767.8236	19.982	0.090	3	ATF	o
60768.8193	60768.8193	20.094	—	1	ATF	o
60769.8135	60769.8539	19.426	0.374	4	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.2 Log of observations of the 2024 active state in SDSS J0902
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
60774.8397	60774.8397	19.811	—	1	ATF	o
60779.7862	60779.8074	19.597	0.224	3	ATF	o
60781.8299	60781.8378	19.491	0.008	2	ATF	o
60787.7915	60787.7970	20.141	0.083	2	ATF	o
60789.8542	60789.8998	19.925	0.202	3	ATF	o
60791.0333	60791.0333	>17.800	—	1	Hrm	C
60791.8002	60791.8038	19.597	0.079	2	ATF	o
60792.8322	60792.8525	20.321	0.171	3	ATF	cy
60793.8273	60793.8476	19.912	0.184	2	ATF	o
60795.0542	60795.0542	>17.400	—	1	Hrm	C
60795.0997	60795.0997	>16.900	—	1	Myy	C
60797.7619	60797.7868	19.755	0.260	2	ATF	o
60798.7790	60798.8045	19.981	0.139	2	ATF	o
60799.7678	60799.7783	19.685	0.243	3	ATF	o
60800.8367	60800.8367	14.647	—	1	ATF	o
60809.7545	60809.7634	19.761	0.340	2	ATF	o
60820.7840	60820.7891	19.694	0.380	2	ATF	o
60822.7963	60822.8252	19.903	0.064	4	ATF	cy
60827.8194	60827.8364	19.176	0.184	2	ATF	o

* BJD - 2400000.0

† Mean magnitude.

‡ 1σ of mean magnitude.

§ Number of observations.

|| Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muyliaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

"C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.3: Log of observations of the 2015 superoutburst in NSV 1440.

Start*	End*	Mag	Error	N	Obs	Filter#
57332.7622	57332.7635	>17.112	0.030	2	ASN	V
57334.5063	57334.7586	>16.905	0.230	4	ASN	V
57338.7819	57338.7844	>17.162	0.003	3	ASN	V
57341.7683	57341.7695	>17.207	0.047	2	ASN	V
57346.7523	57346.7550	14.409	0.013	3	ASN	V
57347.6019	57347.6045	12.853	0.005	3	ASN	V
57347.6408	57347.8050	12.998	0.002	65	HaC	CV
57348.6380	57348.8414	13.137	0.002	85	HaC	CV
57349.6352	57349.8434	13.248	0.003	87	HaC	CV
57350.0830	57350.1812	13.398	0.001	100	SPE	CV
57350.2684	57350.3754	12.950	0.001	309	MLF	CR
57350.5618	57350.5618	13.223	–	1	GIE	G
57350.5620	57350.5620	13.141	–	1	GIE	BP
57350.5621	57350.5621	13.336	–	1	GIE	RP
57350.6323	57350.8337	13.376	0.002	84	HaC	CV
57350.7771	57350.7797	13.237	0.026	3	ASN	V
57351.0234	57351.1280	13.487	0.001	100	SPE	CV
57351.2864	57351.5211	13.124	0.002	676	MLF	CR
57351.6295	57351.8359	14.267	0.019	86	HaC	CV
57351.9772	57352.0666	14.804	0.010	100	COO	CV
57351.9993	57352.1824	15.262	0.012	154	SPE	CV
57352.6268	57352.8353	17.085	0.048	86	HaC	CV
57353.6241	57353.8342	16.084	0.022	70	HaC	CV
57354.0111	57354.0111	15.100	–	1	SRX	Vis
57354.3158	57354.5939	13.286	0.005	802	MLF	CR
57354.6214	57354.8344	13.465	0.004	115	HaC	CV
57354.7459	57354.7484	13.327	0.028	3	ASN	V
57355.2748	57355.4665	13.054	0.002	552	MLF	CR
57355.6185	57355.8349	13.481	0.004	118	HaC	CV
57356.6954	57356.6954	13.521	–	1	ASN	V
57356.7867	57356.8350	13.665	0.005	29	HaC	CV
57357.2956	57357.5928	13.366	0.001	855	MLF	CR
57357.7595	57357.7620	13.674	0.008	3	ASN	V
57358.6109	57358.8342	13.959	0.003	120	HaC	CV
57359.0287	57359.0287	14.153	–	1	SPE	CV
57359.6081	57359.8335	15.720	0.012	123	HaC	CV
57359.9805	57360.0694	15.920	0.008	98	COO	CV
57360.2701	57360.4295	15.611	0.005	401	MLF	CR
57360.6054	57360.8343	16.084	0.008	125	HaC	CV
57360.6625	57360.6651	15.925	0.078	3	ASN	V
57360.9310	57361.2281	16.225	0.003	315	MGW	CV
57360.9529	57361.0347	16.082	0.006	93	COO	CV
57361.1465	57361.1465	15.700	–	1	SRX	Vis
57361.2786	57361.4797	15.819	0.003	576	MLF	CR
57361.6025	57361.8341	16.340	0.006	174	HaC	CV
57361.9247	57362.2291	16.321	0.003	322	MGW	CV
57362.2731	57362.4228	15.803	0.005	361	MLF	CR
57362.5999	57362.8338	16.209	0.004	156	HaC	CV
57362.6834	57362.6860	16.003	0.041	3	ASN	V
57362.9141	57363.2292	16.200	0.003	346	MGW	CV
57363.3608	57363.5564	15.716	0.003	561	MLF	CR
57363.5971	57363.7980	16.063	0.005	133	HaC	CV
57364.5198	57364.5969	13.872	0.003	222	MLF	CR
57364.5943	57364.7949	14.546	0.011	122	HaC	CV
57364.7066	57364.7091	14.394	0.018	3	ASN	V
57365.0347	57365.0347	14.800	–	1	SRX	Vis
57365.5915	57365.7914	16.448	0.009	124	HaC	CV
57365.9993	57365.9993	16.400	–	1	SRX	Vis
57366.5888	57366.7898	16.529	0.007	125	HaC	CV
57367.0313	57367.0313	16.300	–	1	SRX	Vis
57367.0428	57367.2292	16.484	0.003	214	MGW	CV
57367.2828	57367.5902	15.964	0.002	878	MLF	CR
57367.5860	57367.7870	16.455	0.006	125	HaC	CV
57367.5943	57367.5969	16.135	0.072	3	ASN	V
57368.5832	57368.7829	16.607	0.007	120	HaC	CV

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.3 Log of observations of the 2015 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
57369.0299	57369.2292	16.564	0.004	244	MGW	CV
57369.0333	57369.0333	16.400	–	1	SRX	Vis
57369.5804	57369.5983	16.599	0.026	9	HaC	CV
57369.9882	57369.9882	16.300	–	1	SRX	Vis
57370.0501	57370.2078	16.440	0.003	164	MGW	CV
57370.5776	57370.7787	16.414	0.009	123	HaC	CV
57371.0505	57371.1414	16.324	0.004	115	MGW	CV
57371.2794	57371.5769	14.511	0.025	827	MLF	CR
57371.5749	57371.7757	14.368	0.009	123	HaC	CV
57371.7259	57371.7285	14.250	0.008	3	ASN	V
57371.8820	57371.8820	14.620	–	1	GIE	G
57371.8823	57371.8823	14.555	–	1	GIE	BP
57371.8824	57371.8824	14.735	–	1	GIE	RP
57371.9736	57371.9736	14.400	–	1	SRX	Vis
57372.2767	57372.3423	15.309	0.009	58	MLF	CR
57372.5721	57372.7724	16.509	0.010	123	HaC	CV
57373.0042	57373.0042	16.300	–	1	SRX	Vis
57373.5693	57373.7696	16.695	0.010	119	HaC	CV
57374.0153	57374.0153	16.300	–	1	SRX	Vis
57374.0502	57374.2294	16.670	0.004	213	MGW	CV
57374.3220	57374.5710	16.202	0.005	353	MLF	CR
57374.7154	57374.7180	16.329	0.070	3	ASN	V
57374.7401	57374.7670	16.590	0.020	19	HaC	CV
57375.0515	57375.2292	16.547	0.005	106	MGW	CV
57375.2881	57375.5929	15.519	0.009	431	MLF	CR
57375.5643	57375.7639	16.356	0.010	121	HaC	CV
57376.0547	57376.2285	16.473	0.005	175	MGW	CV
57376.5615	57376.7616	16.593	0.016	119	HaC	CV
57376.6057	57376.6070	16.274	0.029	2	ASN	V
57376.6083	57376.6083	>16.707	–	1	ASN	V
57377.0499	57377.1725	16.606	0.005	119	MGW	CV
57377.5594	57377.7581	16.548	0.017	74	HaC	CV
57378.5561	57378.7557	15.364	0.067	86	HaC	CV
57379.2778	57379.5943	14.938	0.007	907	MLF	CR
57379.5893	57379.7533	15.943	0.016	75	HaC	CV
57379.7031	57379.7057	15.779	0.054	3	ASN	V
57380.0268	57380.1276	16.825	0.082	2	SPE	CV
57380.0431	57380.0431	>15.100	–	1	SRX	Vis
57380.2839	57380.5329	16.301	0.006	352	MLF	CR
57381.0042	57381.0042	>15.100	–	1	SRX	Vis
57381.5570	57381.5595	>15.902	0.038	3	ASN	V
57381.9794	57381.9794	16.701	–	1	SPE	CV
57382.1961	57382.2175	16.591	0.036	25	COO	CV
57383.2845	57383.5908	15.573	0.012	433	MLF	CR
57384.0375	57384.0375	>15.100	–	1	SRX	Vis
57384.3644	57384.5950	16.089	0.005	326	MLF	CR
57384.6888	57384.6913	>16.389	0.109	2	ASN	V
57384.6900	57384.6900	15.943	–	1	ASN	V
57384.9911	57385.2285	16.884	0.008	280	MGW	CV
57385.0328	57385.0328	16.755	–	1	SPE	CV
57385.5366	57385.7370	16.601	0.016	76	HaC	CV
57385.9882	57385.9882	16.300	–	1	SRX	Vis
57386.1032	57386.1032	16.674	–	1	SPE	CV
57386.1634	57386.2288	16.637	0.007	81	MGW	CV
57386.5339	57386.7320	15.389	0.080	63	HaC	CV
57386.6815	57386.6840	14.296	0.011	3	ASN	V
57386.9916	57387.2029	14.697	0.010	225	MGW	CV
57387.1711	57387.1711	14.945	–	1	SPE	CV
57387.5312	57387.7314	15.923	0.018	62	HaC	CV
57387.6816	57387.6842	15.887	0.038	3	ASN	V
57387.9764	57387.9764	>15.600	–	1	SRX	Vis
57388.0026	57388.1517	16.733	0.005	161	MGW	CV
57388.5285	57388.7292	16.769	0.019	55	HaC	CV
57389.5276	57389.7288	16.769	0.017	55	HaC	CV
57389.6701	57389.6727	16.460	0.009	3	ASN	V
57390.3070	57390.3070	16.200	–	1	MLF	CR

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.3 Log of observations of the 2015 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
57391.5222	57391.7228	16.754	0.014	55	HaC	CV
57392.5138	57392.7176	16.805	0.011	79	HaC	CV
57392.9861	57392.9861	16.400	–	1	SRX	Vis
57393.0486	57393.0486	>14.400	–	1	HSP	Vis
57393.5154	57393.7162	16.800	0.010	77	HaC	CV
57394.1264	57394.1264	16.400	–	1	SRX	Vis
57394.5212	57394.7148	16.640	0.013	53	HaC	CV
57394.6526	57394.6552	16.530	0.207	3	ASN	V
57394.9656	57395.1978	15.436	0.003	282	MGW	CV
57396.3200	57396.4343	15.893	0.008	187	MLF	CR
57396.5148	57396.7090	16.770	0.018	56	HaC	CV
57396.6484	57396.6510	16.445	0.058	3	ASN	V
57396.9766	57397.2292	16.856	0.004	193	MGW	CV
57397.0618	57397.0618	16.400	–	1	SRX	Vis
57398.6397	57398.6423	16.502	0.042	3	ASN	V
57399.0646	57399.0646	>15.400	–	1	SRX	Vis
57400.0035	57400.0035	16.700	–	1	SRX	Vis
57400.0285	57400.2293	16.896	0.003	225	MGW	CV
57400.6363	57400.6389	16.618	0.026	3	ASN	V
57403.0174	57403.0174	16.600	–	1	SRX	Vis
57403.6330	57403.6356	16.515	0.162	3	ASN	V
57403.9458	57404.1202	16.562	0.004	219	MGW	CV
57404.0368	57404.0368	16.700	–	1	SRX	Vis
57404.9487	57405.1982	15.420	0.010	287	MGW	CV
57405.0194	57405.0194	15.400	–	1	SRX	Vis
57406.0146	57406.0146	>15.400	–	1	SRX	Vis
57406.6205	57406.6231	16.442	0.039	3	ASN	V
57408.6119	57408.6119	16.325	–	1	ASN	V
57408.6132	57408.6145	>16.282	0.008	2	ASN	V
57409.3376	57409.5138	16.601	0.037	2	GIE	G
57409.3379	57409.5141	16.759	0.033	2	GIE	BP
57409.3380	57409.5142	16.330	0.038	2	GIE	RP
57410.6071	57410.6097	>16.014	0.040	3	ASN	V
57410.9297	57411.1003	16.731	0.005	210	MGW	CV
57413.6020	57413.6045	14.906	0.043	3	ASN	V
57416.5949	57416.5975	16.345	0.030	3	ASN	V
57416.9799	57416.9799	16.700	–	1	SRX	Vis
57417.2930	57417.2930	16.400	–	1	MLF	CR
57419.5794	57419.5820	16.411	0.028	3	ASN	V
57419.9681	57419.9681	15.400	–	1	SRX	Vis
57421.0250	57421.0250	>14.400	–	1	HSP	Vis
57421.5788	57421.5814	16.514	0.038	3	ASN	V
57423.0194	57423.0194	15.100	–	1	SRX	Vis
57423.5811	57423.5830	16.283	0.091	3	ASN	V
57424.0257	57424.0257	16.700	–	1	SRX	Vis
57424.9868	57424.9868	16.600	–	1	SRX	Vis
57425.5650	57425.5650	>17.215	–	1	ASN	V
57425.5663	57425.5676	16.753	0.160	2	ASN	V
57425.9965	57425.9965	16.700	–	1	SRX	Vis
57427.5597	57427.5610	16.909	0.097	2	ASN	V
57427.5623	57427.5623	>17.001	–	1	ASN	V
57427.9729	57427.9729	16.600	–	1	SRX	Vis
57428.9924	57428.9924	16.700	–	1	SRX	Vis
57429.2780	57429.2780	16.300	–	1	MLF	CR
57429.5533	57429.5559	16.435	0.096	3	ASN	V
57430.0187	57430.0187	>14.400	–	1	HSP	Vis
57430.3020	57430.3020	16.600	–	1	MLF	CR
57430.9799	57430.9799	16.700	–	1	SRX	Vis
57432.9660	57432.9660	16.700	–	1	SRX	Vis
57433.5398	57433.5398	16.797	–	1	ASN	V
57433.5411	57433.5424	>16.939	0.037	2	ASN	V
57433.9528	57433.9528	>15.400	–	1	SRX	Vis
57434.5391	57434.5416	16.387	0.039	3	ASN	V
57435.5345	57435.5371	14.079	0.003	3	ASN	V
57436.9667	57436.9667	>15.400	–	1	SRX	Vis
57437.5292	57437.5305	>16.391	0.083	2	ASN	V

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.3 Log of observations of the 2015 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
57437.5318	57437.5318	16.047	—	1	ASN	V
57439.5236	57439.5262	>16.181	0.051	3	ASN	V
57441.5182	57441.5208	>15.979	0.031	3	ASN	V
57443.9757	57443.9757	>15.100	—	1	SRX	Vis
57444.5140	57444.5166	>16.669	0.056	3	ASN	V
57445.9826	57445.9826	>15.600	—	1	SRX	Vis
57446.9486	57446.9486	16.700	—	1	SRX	Vis
57447.2820	57447.2820	16.700	—	1	MLF	CR
57448.0396	57448.0396	>15.600	—	1	SRX	Vis
57451.0257	57451.0257	>16.800	—	1	SRX	Vis
57451.9160	57451.9160	>14.700	—	1	HSP	Vis
57461.9146	57461.9146	>14.400	—	1	HSP	Vis
57461.9229	57461.9229	>15.400	—	1	SRX	Vis
57463.0194	57463.0194	>15.400	—	1	SRX	Vis
57463.9958	57463.9958	>15.400	—	1	SRX	Vis
57466.8012	57466.8012	17.516	—	1	GIE	G
57466.8015	57466.8015	17.687	—	1	GIE	BP
57466.8016	57466.8016	17.140	—	1	GIE	RP
57470.2670	57470.2670	17.100	—	1	MLF	CR
57477.9597	57477.9597	>16.800	—	1	SRX	Vis
57480.9319	57480.9319	>16.800	—	1	SRX	Vis
57481.9854	57481.9854	>16.700	—	1	SRX	Vis
57482.8826	57482.8826	>14.700	—	1	HSP	Vis
57482.9917	57482.9917	>15.400	—	1	SRX	Vis
57483.2530	57483.2530	17.600	—	1	MLF	CR
57484.9375	57484.9375	>14.400	—	1	HSP	Vis
57487.0424	57487.0424	>15.400	—	1	SRX	Vis
57489.9361	57489.9361	>14.400	—	1	HSP	Vis
57494.9683	57495.0423	18.195	0.024	2	GIE	G
57494.9686	57495.0426	18.107	0.456	2	GIE	BP
57494.9687	57495.0427	18.144	0.279	2	GIE	RP
57495.9167	57495.9167	>15.000	—	1	SRX	Vis
57501.9292	57501.9292	>14.800	—	1	SRX	Vis
57504.8840	57504.8840	>16.000	—	1	SRX	Vis
57506.9160	57506.9160	>14.400	—	1	HSP	Vis
57507.8361	57507.8361	>14.400	—	1	HSP	Vis
57508.9424	57508.9424	>15.400	—	1	SRX	Vis
57509.9097	57509.9097	>16.700	—	1	SRX	Vis
57510.8479	57510.8479	>14.400	—	1	HSP	Vis
57513.9069	57513.9069	>15.100	—	1	SRX	Vis
57517.8167	57517.8167	>14.400	—	1	HSP	Vis
57523.8035	57523.8035	>13.500	—	1	HSP	Vis
57528.0280	57528.0280	18.290	—	1	GIE	G
57528.0284	57528.0284	18.592	—	1	GIE	BP
57528.0285	57528.0285	18.401	—	1	GIE	RP
57535.9181	57535.9181	>16.700	—	1	SRX	Vis
57538.8826	57538.8826	>14.400	—	1	HSP	Vis
57538.8889	57538.8889	>16.700	—	1	SRX	Vis
57541.7958	57541.7958	>14.700	—	1	HSP	Vis
57541.8917	57541.8917	>15.200	—	1	SRX	Vis
57542.8042	57542.8042	>14.400	—	1	HSP	Vis
57543.8799	57543.8799	>14.700	—	1	HSP	Vis
57544.8111	57544.8111	>14.400	—	1	HSP	Vis
57545.9076	57545.9095	>16.008	0.054	3	ASN	V
57550.9109	57550.9135	>16.402	0.029	3	ASN	V
57552.8333	57552.8333	>13.900	—	1	HSP	Vis
57553.8326	57553.8326	>13.500	—	1	HSP	Vis
57557.9047	57557.9073	>16.256	0.039	3	ASN	V
57558.8853	57558.8879	>15.356	0.099	3	ASN	V
57560.8817	57560.8843	>15.602	0.056	3	ASN	V
57564.4400	57564.5141	18.266	0.013	2	GIE	G
57564.4404	57564.5144	18.227	0.049	2	GIE	RP
57564.4404	57564.5144	18.291	0.047	2	GIE	BP
57566.8725	57566.8751	>16.132	0.080	3	ASN	V
57569.8795	57569.8821	>15.925	0.132	3	ASN	V
57573.8097	57573.8097	>14.400	—	1	HSP	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.3 Log of observations of the 2015 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
57575.9480	57575.9493	>16.103	0.155	2	ASN	V
57576.8369	57576.9391	>16.825	0.143	5	ASN	V
57577.8400	57577.8426	>14.724	0.125	3	ASN	V
57581.9185	57581.9211	>17.061	0.070	3	ASN	V
57584.8252	57584.8265	>16.404	0.080	2	ASN	V
57585.8126	57585.8152	>15.977	0.055	3	ASN	V
57590.8003	57590.9123	>15.355	0.165	4	ASN	V
57591.7964	57591.9083	>16.022	0.128	6	ASN	V
57595.6839	57595.7579	18.275	0.008	2	GIE	G
57595.6842	57595.7582	18.368	0.165	2	GIE	BP
57595.6843	57595.7583	18.370	0.235	2	GIE	RP
57595.8993	57595.9019	>16.224	0.046	3	ASN	V
57596.9235	57596.9261	>16.757	0.057	3	ASN	V
57599.9285	57599.9311	>17.101	0.129	3	ASN	V
57600.7723	57600.7723	>13.411	–	1	ASN	V
57601.7843	57601.7869	>16.348	0.026	3	ASN	V
57602.8978	57602.9004	>17.203	0.025	3	ASN	V
57603.8188	57603.8214	>16.198	0.037	3	ASN	V
57605.7600	57605.8678	>16.826	0.158	5	ASN	V

* BJD - 2400000.0

[†] Mean magnitude.

[‡] 1σ of mean magnitude.

[§] Number of observations.

^{||} Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J. Jones), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muyliaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW (J.Rock), RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

[#] "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.4: Log of observations of the 2017 superoutburst in NSV 1440.

Start*	End*	Mag	Error	N	Obs	Filter#
57967.8752	57967.8777	>17.183	0.026	3	ASN	V
57968.9224	57968.9224	>16.328	–	1	ASN	V
57969.7616	57969.8747	>16.513	0.214	6	ASN	V
57970.8686	57970.8711	>16.420	0.061	3	ASN	V
57971.8198	57971.8224	>15.687	0.082	3	ASN	V
57972.8878	57972.8891	>14.027	0.355	2	ASN	V
57974.8546	57974.8571	>16.174	0.039	3	ASN	V
57978.8637	57978.8662	>15.999	0.088	3	ASN	V
57979.8455	57979.8467	>16.765	0.024	2	ASN	V
57979.8480	57979.8480	16.773	–	1	ASN	V
57980.7316	57980.7342	>16.251	0.061	3	ASN	V
57981.8392	57981.8392	>16.786	–	1	ASN	V
57982.7253	57982.7265	>16.396	0.061	2	ASN	V
57983.8314	57983.8784	>16.837	0.166	5	ASN	V
57986.8354	57986.8354	14.100	–	1	HSP	Vis
57987.2729	57987.2986	13.000	0.000	2	SRX	Vis
57987.7946	57987.8998	14.274	0.009	44	HaC	CV
57988.7918	57988.8995	15.416	0.011	45	HaC	CV
57989.1812	57989.1812	14.000	–	1	HSP	Vis
57989.7885	57989.8979	13.302	0.003	82	HaC	CV
57990.7857	57990.8978	13.393	0.003	84	HaC	CV
57991.5052	57991.6732	13.074	0.001	484	MLF	CR
57991.7823	57991.8979	13.538	0.003	103	HaC	CV
57992.7800	57992.8965	13.675	0.003	95	HaC	CV
57992.8972	57992.8972	13.500	–	1	SRX	Vis
57993.3870	57993.6694	13.368	0.001	807	MLF	CR
57993.7772	57993.8962	13.828	0.002	97	HaC	CV
57994.7744	57994.9023	14.108	0.007	105	HaC	CV
57995.7716	57995.9018	15.973	0.010	105	HaC	CV
57995.8056	57995.8081	>15.410	0.289	3	ASN	V
57996.0986	57996.0986	15.400	–	1	SRX	Vis
57996.6885	57996.8008	>15.301	0.235	5	ASN	V
57996.7689	57996.9003	16.184	0.010	98	HaC	CV
57997.7663	57997.9000	16.249	0.008	86	HaC	CV
57998.7636	57998.8988	16.222	0.007	87	HaC	CV
57998.7951	57998.7964	15.523	0.116	2	ASN	V
57998.7977	57998.7977	>15.782	–	1	ASN	V
57999.6796	57999.6808	>14.024	0.203	2	ASN	V
57999.6823	57999.8485	14.054	0.031	4	ASN	V
57999.7608	57999.8988	14.229	0.005	89	HaC	CV
58000.6785	58000.6811	>15.584	0.030	3	ASN	V
58001.7553	58001.8975	16.566	0.013	92	HaC	CV
58001.7810	58001.7836	>16.021	0.029	3	ASN	V
58002.6727	58002.8450	>14.757	0.129	5	ASN	V
58002.6752	58002.6752	15.227	–	1	ASN	V
58002.7246	58002.8958	16.400	0.022	76	HaC	CV
58002.9069	58002.9093	>15.734	0.193	3	ASN	g
58003.6691	58003.6716	>15.527	0.022	3	ASN	V
58003.7218	58003.8959	16.457	0.012	77	HaC	CV
58003.8820	58003.8832	15.976	0.171	2	ASN	g
58003.8845	58003.8845	>16.156	–	1	ASN	g
58005.7110	58005.7759	>15.941	0.114	6	ASN	V
58006.0903	58006.0903	>14.400	–	1	SRX	Vis
58006.9965	58006.9965	14.000	–	1	SRX	Vis
58007.3862	58007.6586	15.038	0.007	758	MLF	CR
58007.7684	58007.8820	16.065	0.012	64	HaC	CV
58008.7656	58008.8219	16.670	0.033	28	HaC	CV
58009.8589	58009.8735	>16.352	0.154	4	ASN	V
58009.8601	58009.8710	16.348	0.396	2	ASN	V
58010.7600	58010.8910	16.515	0.009	77	HaC	CV
58010.7679	58010.7705	>16.230	0.058	2	ASN	V
58010.7692	58010.7692	15.807	–	1	ASN	V
58011.7573	58011.8910	16.488	0.008	78	HaC	CV
58011.8304	58011.8330	16.077	0.037	3	ASN	V
58012.7096	58012.7121	>16.154	0.073	3	ASN	V

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.4 Log of observations of the 2017 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58013.8313	58013.8339	16.044	0.106	3	ASN	V
58013.9847	58013.9847	14.600	–	1	SRX	Vis
58014.9011	58014.9018	15.777	0.176	2	HaC	CV
58015.9004	58015.9011	16.713	0.121	2	HaC	CV
58016.0806	58016.0806	16.500	–	1	SRX	Vis
58016.8998	58016.9006	16.710	0.049	2	HaC	CV
58017.6594	58017.6594	>16.056	–	1	ASN	V
58017.8990	58017.8997	16.585	0.047	2	HaC	CV
58018.0028	58018.0028	>15.400	–	1	SRX	Vis
58018.7391	58018.7391	16.607	–	1	ASN	V
58018.8983	58018.8991	16.733	0.199	2	HaC	CV
58019.6415	58019.6415	>16.222	–	1	ASN	V
58019.7369	58019.7394	16.428	0.043	3	ASN	V
58019.8976	58019.8976	16.551	–	1	HaC	CV
58020.7216	58020.7241	>16.048	0.037	3	ASN	V
58020.8970	58020.8970	16.670	–	1	HaC	CV
58021.8944	58021.8952	14.891	0.006	2	HaC	CV
58022.0750	58022.0750	13.900	–	1	SRX	Vis
58022.7264	58022.7820	15.465	0.076	6	ASN	V
58022.8903	58022.8910	15.913	0.046	2	HaC	CV
58023.3925	58023.5975	16.407	0.005	510	MLF	CR
58023.8896	58023.8903	16.777	0.171	2	HaC	CV
58024.1167	58024.1167	16.500	–	1	SRX	Vis
58024.8889	58024.8897	16.868	0.182	2	HaC	CV
58025.8882	58025.8889	16.759	0.015	2	HaC	CV
58026.8875	58026.8882	16.665	0.011	2	HaC	CV
58027.8868	58027.8875	16.726	0.051	2	HaC	CV
58028.7083	58028.7724	>16.082	0.083	6	ASN	V
58028.8861	58028.8869	16.815	0.023	2	HaC	CV
58028.9326	58028.9326	>14.400	–	1	SRX	Vis
58029.7675	58029.7675	16.416	–	1	ASN	g
58029.7675	58029.7699	>16.372	0.118	3	ASN	g
58029.8854	58029.8862	16.697	0.091	2	HaC	CV
58030.7390	58030.7414	>14.512	0.089	3	ASN	g
58030.7399	58030.7424	>13.753	0.071	3	ASN	V
58030.8847	58030.8855	15.685	0.068	2	HaC	CV
58031.8840	58031.8848	15.976	0.090	2	HaC	CV
58032.7456	58032.7500	>15.528	0.124	4	ASN	V
58032.7574	58032.7599	>16.139	0.031	3	ASN	g
58032.8833	58032.8841	16.489	0.012	2	HaC	CV
58033.6942	58033.6966	>16.134	0.097	3	ASN	g
58033.7179	58033.7205	>16.037	0.052	3	ASN	V
58033.8826	58033.8834	16.604	0.210	2	HaC	CV
58034.6361	58034.6373	>15.731	0.055	2	ASN	V
58034.8820	58034.8827	16.841	0.125	2	HaC	CV
58035.8812	58035.8820	16.546	0.009	2	HaC	CV
58035.9618	58035.9618	16.500	–	1	SRX	Vis
58036.8298	58036.8298	>16.368	–	1	ASN	V
58036.8311	58036.8311	16.030	–	1	ASN	V
58036.8805	58036.8813	16.529	0.086	2	HaC	CV
58036.9646	58036.9646	16.500	–	1	SRX	Vis
58037.7083	58037.8136	>16.290	0.148	5	ASN	V
58037.8123	58037.8123	16.342	–	1	ASN	V
58037.8799	58037.8806	16.531	0.080	2	HaC	CV
58038.8791	58038.8799	15.122	0.008	2	HaC	CV
58039.8793	58039.8793	17.926	–	1	HaC	CV
58039.9139	58039.9139	16.500	–	1	SRX	Vis
58040.7028	58040.7317	>16.537	0.280	2	ASN	V
58040.7291	58040.7304	16.732	0.068	2	ASN	V
58040.8777	58040.8785	16.718	0.190	2	HaC	CV
58041.0229	58041.0229	16.600	–	1	SRX	Vis
58041.8771	58041.8778	16.812	0.014	2	HaC	CV
58042.0063	58042.0063	16.400	–	1	SRX	Vis
58042.8763	58042.8771	16.955	0.163	2	HaC	CV
58042.9931	58042.9931	16.600	–	1	SRX	Vis
58043.8757	58043.8764	16.825	0.103	2	HaC	CV

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.4 Log of observations of the 2017 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58043.9757	58043.9757	16.500	—	1	SRX	Vis
58044.8750	58044.8757	16.812	0.166	2	HaC	CV
58044.9833	58044.9833	16.500	—	1	SRX	Vis
58045.5818	58045.5818	>16.126	—	1	ASN	V
58045.6639	58045.6664	16.463	0.035	3	ASN	V
58045.8743	58045.8751	16.824	0.142	2	HaC	CV
58046.5838	58046.5864	>16.257	0.125	2	ASN	V
58046.5851	58046.7156	16.565	0.126	4	ASN	V
58046.8736	58046.8743	16.719	0.020	2	HaC	CV
58047.6081	58047.7797	>16.427	0.220	3	ASN	V
58047.7784	58047.7810	16.752	0.113	2	ASN	V
58047.8728	58047.8736	16.655	0.044	2	HaC	CV
58048.6197	58048.6197	16.061	—	1	ASN	V
58048.6209	58048.6223	>15.885	0.158	2	ASN	V
58048.8722	58048.8730	16.689	0.090	2	HaC	CV
58049.8715	58049.8722	14.906	0.018	2	HaC	CV
58050.6288	58050.6301	>15.473	0.099	2	ASN	V
58050.8715	58050.8722	16.942	0.140	2	HaC	CV
58051.8708	58051.8715	16.970	0.104	2	HaC	CV
58052.5976	58052.6001	>16.113	0.024	3	ASN	V
58052.8702	58052.8709	16.777	0.082	2	HaC	CV
58052.9986	58052.9986	16.500	—	1	SRX	Vis
58053.6531	58053.6556	>16.234	0.044	3	ASN	V
58053.8694	58053.8701	17.052	0.250	2	HaC	CV
58053.9569	58053.9569	>15.000	—	1	SRX	Vis
58054.7110	58054.7135	>14.851	0.317	3	ASN	V
58054.8688	58054.8695	16.920	0.139	2	HaC	CV
58055.8680	58055.8687	16.940	0.040	2	HaC	CV
58056.8681	58056.8688	17.016	0.088	2	HaC	CV
58057.0625	58057.0625	>14.400	—	1	BNK	Vis
58057.8674	58057.8681	16.809	0.164	2	HaC	CV
58058.6546	58058.6571	>16.545	0.035	3	ASN	g
58058.8667	58058.8674	16.901	0.113	2	HaC	CV
58059.8659	58059.8667	16.988	0.088	2	HaC	CV
58060.8660	58060.8667	17.099	0.495	2	HaC	CV
58060.9931	58060.9931	>14.400	—	1	SRX	Vis
58061.8653	58061.8660	15.047	0.037	2	HaC	CV
58062.8646	58062.8653	16.910	0.030	2	HaC	CV
58063.8639	58063.8646	16.958	0.251	2	HaC	CV
58064.6613	58064.6621	16.957	0.113	2	HaC	CV
58065.6586	58065.6593	16.945	0.020	2	HaC	CV
58065.9521	58065.9521	>16.600	—	1	SRX	Vis
58066.6558	58066.6566	17.101	0.173	2	HaC	CV
58067.3592	58067.4434	16.844	0.011	193	MLF	CR
58067.6530	58067.6537	17.335	0.180	2	HaC	CV
58068.6502	58068.6509	17.080	0.033	2	HaC	CV
58068.9792	58068.9792	>16.600	—	1	SRX	Vis
58069.6475	58069.6482	17.247	0.049	2	HaC	CV
58070.0028	58070.0028	>16.700	—	1	SRX	Vis
58070.6447	58070.6454	17.172	0.326	2	HaC	CV
58070.9910	58070.9910	>16.700	—	1	SRX	Vis
58071.0630	58071.0630	14.900	—	1	BNK	Vis
58071.6419	58071.6426	17.245	0.222	2	HaC	CV
58071.9847	58071.9847	>16.000	—	1	SRX	Vis
58072.6391	58072.6398	17.017	0.034	2	HaC	CV
58073.6363	58073.6371	17.209	0.118	2	HaC	CV
58074.6336	58074.6343	17.052	0.060	2	HaC	CV
58074.6893	58074.6918	>16.319	0.035	3	ASN	V
58074.7424	58074.7450	16.651	0.031	3	ASN	V
58075.6307	58075.6314	17.212	0.247	2	HaC	CV
58076.0278	58076.0278	16.700	—	1	SRX	Vis
58076.5941	58076.6187	>16.471	0.151	5	ASN	V
58076.6199	58076.6199	16.801	—	1	ASN	V
58076.6279	58076.6287	17.276	0.096	2	HaC	CV
58076.9785	58076.9785	16.800	—	1	SRX	Vis
58077.6252	58077.6259	17.181	0.044	2	HaC	CV

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.4 Log of observations of the 2017 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58077.9979	58077.9979	>16.700	—	1	SRX	Vis
58078.6224	58078.6231	17.173	0.156	2	HaC	CV
58078.9840	58078.9840	16.800	—	1	SRX	Vis
58079.0299	58079.0299	>16.200	—	1	HSP	Vis
58079.5627	58079.6107	>16.671	0.138	5	ASN	V
58079.6197	58079.6204	17.237	0.164	2	HaC	CV
58079.9854	58079.9854	>16.700	—	1	SRX	Vis
58080.6169	58080.6176	17.326	0.055	2	HaC	CV
58080.6200	58080.6225	>16.187	0.049	3	ASN	V
58081.5636	58081.5661	>16.916	0.034	3	ASN	V
58081.6142	58081.6149	17.835	0.132	2	HaC	CV
58082.6120	58082.6128	17.216	0.039	2	HaC	CV
58082.6748	58082.7466	>16.673	0.143	6	ASN	V
58083.0500	58083.0500	>15.100	—	1	BNK	Vis
58083.6093	58083.6100	17.221	0.070	2	HaC	CV
58084.6065	58084.6072	17.676	0.175	2	HaC	CV
58084.6961	58084.6986	16.617	0.119	2	ASN	V
58084.6974	58084.6974	>16.685	—	1	ASN	V
58085.1743	58085.1743	>16.700	—	1	SRX	Vis
58085.2958	58085.2958	17.041	—	1	ASN	g
58085.2970	58085.2983	>16.976	0.023	2	ASN	g
58085.6037	58085.6044	17.229	0.058	2	HaC	CV
58085.6628	58085.6653	>16.021	0.051	3	ASN	V
58085.9632	58085.9632	>14.400	—	1	SRX	Vis
58086.6008	58086.6016	17.435	0.461	2	HaC	CV
58086.7497	58086.7521	>16.947	0.052	3	ASN	g
58087.5981	58087.5988	17.258	0.250	2	HaC	CV
58087.7628	58087.7653	>16.395	0.034	3	ASN	V
58087.7684	58087.7696	>16.815	0.047	2	ASN	g
58087.7708	58087.7708	16.560	—	1	ASN	g
58088.5953	58088.5960	17.167	0.210	2	HaC	CV
58088.6699	58088.6723	>16.436	0.033	3	ASN	g
58089.5926	58089.5933	17.446	0.021	2	HaC	CV
58089.6576	58089.6601	>14.558	0.139	3	ASN	V
58089.7010	58089.7034	>16.232	0.072	3	ASN	g
58090.5899	58090.5906	17.193	0.002	2	HaC	CV
58090.6316	58090.6342	>15.425	0.027	3	ASN	V
58090.7268	58090.7292	>16.091	0.045	3	ASN	g
58091.5870	58091.5877	16.945	0.241	2	HaC	CV
58091.7459	58091.7483	>16.042	0.043	3	ASN	g
58092.5476	58092.7265	>15.975	0.089	6	ASN	V
58092.7502	58092.7526	>16.349	0.035	3	ASN	g
58093.5815	58093.5822	17.725	0.234	2	HaC	CV
58093.9799	58093.9799	>16.700	—	1	SRX	Vis
58094.7441	58094.7465	>16.675	0.065	3	ASN	g
58095.0550	58095.0550	>14.400	—	1	BNK	Vis
58095.5759	58095.5767	17.968	0.194	2	HaC	CV
58095.6192	58095.7382	>16.411	0.056	6	ASN	V
58095.9806	58095.9806	>16.800	—	1	SRX	Vis
58096.5501	58096.5526	>16.973	0.154	2	ASN	V
58096.5513	58096.5513	16.820	—	1	ASN	V
58096.5732	58096.5739	18.137	0.137	2	HaC	CV
58096.7412	58096.7437	>17.044	0.040	2	ASN	g
58096.7425	58096.7425	16.917	—	1	ASN	g
58097.5704	58097.5711	17.611	0.060	2	HaC	CV
58097.7385	58097.7410	17.194	0.140	2	ASN	g
58097.7397	58097.7397	>17.303	—	1	ASN	g
58098.5676	58098.5684	18.074	0.186	2	HaC	CV
58099.5648	58099.5655	17.839	0.136	2	HaC	CV
58099.7330	58099.7342	>17.477	0.018	2	ASN	g
58099.7355	58099.7355	17.510	—	1	ASN	g
58100.0979	58100.0979	>15.000	—	1	SRX	Vis
58100.5620	58100.5628	18.186	0.224	2	HaC	CV
58100.9903	58100.9903	>16.800	—	1	HSP	Vis
58101.5592	58101.5600	18.203	0.189	2	HaC	CV
58101.7224	58101.7249	>17.614	0.027	2	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.4 Log of observations of the 2017 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58101.7236	58101.7236	17.284	—	1	ASN	g
58102.0049	58102.0049	>16.800	—	1	SRX	Vis
58102.5565	58102.5572	18.481	0.097	2	HaC	CV
58102.9868	58102.9868	>16.700	—	1	SRX	Vis
58103.5264	58103.5290	>16.020	0.070	3	ASN	V
58103.5538	58103.5545	18.453	0.254	2	HaC	CV
58103.7203	58103.7203	>17.368	—	1	ASN	g
58103.7215	58103.7227	17.278	0.120	2	ASN	g
58103.9917	58103.9917	>16.700	—	1	SRX	Vis
58104.5516	58104.5524	17.954	0.265	2	HaC	CV
58104.5605	58104.5617	>17.379	0.061	3	ASN	g
58104.5629	58104.5629	17.213	—	1	ASN	g
58104.7198	58104.7198	>16.943	—	1	ASN	V
58105.5607	58105.5631	>17.541	0.045	3	ASN	g
58106.6018	58106.6018	>14.216	—	1	ASN	V
58107.5578	58107.5586	18.803	0.426	2	HaC	CV
58108.0806	58108.0806	>16.700	—	1	SRX	Vis
58108.5558	58108.5565	18.530	0.096	2	HaC	CV
58108.6028	58108.6028	>16.285	—	1	ASN	V
58109.0550	58109.0550	15.100	—	1	BNK	Vis
58109.5537	58109.5537	18.328	—	1	HaC	CV
58109.5982	58109.7063	>16.723	0.308	2	ASN	V
58110.5503	58110.5510	18.204	0.139	2	HaC	CV
58111.5910	58111.7042	>16.800	0.220	3	ASN	V
58112.0410	58112.0410	>16.700	—	1	SRX	Vis
58113.0882	58113.0882	>16.700	—	1	SRX	Vis
58113.5410	58113.5410	18.045	—	1	HaC	CV
58113.5937	58113.5961	>17.239	0.061	3	ASN	g
58115.5347	58115.5347	18.407	—	1	HaC	CV
58117.0625	58117.0625	>15.400	—	1	HSP	Vis
58118.5948	58118.5975	>16.245	0.085	3	ASN	V
58119.5244	58119.5244	17.673	—	1	HaC	CV
58119.5312	58119.5917	>15.636	0.159	6	ASN	V
58120.5352	58120.5378	>15.644	0.043	3	ASN	V
58122.6029	58122.6043	>16.229	0.015	2	ASN	V
58124.5126	58124.5126	18.037	—	1	HaC	CV
58127.0306	58127.0306	>16.200	—	1	HSP	Vis
58128.0451	58128.0451	>16.000	—	1	SRX	Vis
58128.0472	58128.0472	>16.200	—	1	HSP	Vis
58128.3866	58128.3890	17.523	0.105	2	ASN	g
58128.3878	58128.3878	>17.697	—	1	ASN	g
58129.0111	58129.0111	>15.400	—	1	SRX	Vis
58129.3834	58129.3834	17.581	—	1	ASN	g
58129.3846	58129.3846	>17.727	—	1	ASN	g
58130.0222	58130.0222	>16.700	—	1	HSP	Vis
58130.3852	58130.3864	>17.677	0.017	2	ASN	g
58130.3876	58130.3876	17.334	—	1	ASN	g
58131.4099	58131.4123	>17.720	0.029	2	ASN	g
58131.4111	58131.4111	17.590	—	1	ASN	g
58132.3667	58132.3667	17.604	—	1	ASN	g
58132.3679	58132.3691	>17.734	0.013	2	ASN	g
58133.3707	58133.3736	>17.660	0.034	3	ASN	g
58134.0208	58134.0208	>15.400	—	1	SRX	Vis
58134.3698	58134.3722	>17.717	0.074	3	ASN	g
58135.0451	58135.0451	>15.400	—	1	SRX	Vis
58135.3657	58135.3681	17.701	0.098	3	ASN	g
58136.0104	58136.0104	>15.400	—	1	SRX	Vis
58136.3544	58136.3593	>16.550	0.751	2	ASN	g
58137.0208	58137.0208	>15.400	—	1	SRX	Vis
58140.0271	58140.0271	>16.000	—	1	SRX	Vis
58142.0646	58142.0646	>16.200	—	1	HSP	Vis
58142.5982	58142.6007	>17.145	0.046	3	ASN	g
58143.0639	58143.0639	>16.000	—	1	SRX	Vis
58143.5650	58143.5675	>17.027	0.026	3	ASN	g
58146.5876	58146.5902	>16.152	0.034	3	ASN	V
58148.5442	58148.5466	>16.248	0.013	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.4 Log of observations of the 2017 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58149.5805	58149.5829	>16.083	0.024	3	ASN	g
58150.5767	58150.5791	>16.063	0.035	3	ASN	g
58151.5614	58151.5638	>16.518	0.053	3	ASN	g
58152.5642	58152.5697	>17.117	0.072	2	ASN	g
58152.9833	58152.9833	>15.400	–	1	SRX	Vis
58153.9868	58153.9868	>16.700	–	1	SRX	Vis
58156.0014	58156.0014	>15.400	–	1	HSP	Vis
58156.9965	58156.9965	>16.400	–	1	SRX	Vis
58157.5593	58157.5619	>16.872	0.001	3	ASN	V
58159.0014	58159.0014	>16.400	–	1	SRX	Vis
58161.5334	58161.5359	>16.899	0.068	3	ASN	V
58163.9951	58163.9951	>16.400	–	1	SRX	Vis
58164.5315	58164.5341	>16.711	0.029	3	ASN	V
58165.9979	58165.9979	>16.700	–	1	SRX	Vis
58167.5254	58167.5280	>16.688	0.012	3	ASN	V
58170.5193	58170.5219	>16.572	0.002	3	ASN	V
58171.8708	58171.8708	>16.200	–	1	HSP	Vis
58174.5122	58174.5147	>16.105	0.052	3	ASN	V
58174.9458	58174.9458	>15.400	–	1	HSP	Vis
58182.9771	58182.9771	>14.600	–	1	SRX	Vis
58184.9674	58184.9674	>16.000	–	1	SRX	Vis
58185.8833	58185.8833	>16.200	–	1	HSP	Vis
58185.9542	58185.9542	>16.000	–	1	SRX	Vis
58186.9674	58186.9674	>16.000	–	1	SRX	Vis
58187.9417	58187.9417	>16.700	–	1	SRX	Vis
58190.9292	58190.9292	>16.700	–	1	SRX	Vis
58191.9472	58191.9472	>16.700	–	1	SRX	Vis
58193.0153	58193.0153	>16.700	–	1	SRX	Vis
58195.9444	58195.9444	>16.000	–	1	SRX	Vis
58196.9153	58196.9153	>15.400	–	1	HSP	Vis
58199.9563	58199.9563	>15.400	–	1	SRX	Vis
58203.8715	58203.8715	>15.400	–	1	HSP	Vis
58215.9250	58215.9250	>15.000	–	1	SRX	Vis
58217.8521	58217.8521	>16.200	–	1	HSP	Vis
58217.9625	58217.9625	>14.600	–	1	SRX	Vis
58220.9382	58220.9382	>15.000	–	1	SRX	Vis
58227.9875	58227.9875	>15.400	–	1	SRX	Vis
58241.8521	58241.8521	>16.200	–	1	HSP	Vis
58242.8472	58242.8472	>16.700	–	1	HSP	Vis

* BJD - 2400000.0

[†] Mean magnitude.

[‡] 1 σ of mean magnitude.

[§] Number of observations.

^{||} Observer's code: BSM (Stephen M.Brincat), CGR[†] (Graeme Coates), CMJ[†] (Michael Cook), CMM[†] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[†] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[†] (I. Miller), Ioh (H. Itoh), JJI[†] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovodsk), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[†] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[†] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[†] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[†] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

[#] "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.5: Log of observations of the 2019 superoutburst in NSV 1440.

Start*	End*	Mag	Error	N	Obs	Filter#
58508.0181	58508.0181	>14.000	–	1	SRX	Vis
58508.5976	58508.6001	>17.278	0.075	3	ASN	g
58510.5906	58510.5930	16.265	0.069	3	ASN	g
58512.0063	58512.0063	14.700	–	1	SRX	Vis
58512.5880	58512.5906	16.457	0.022	3	ASN	g
58512.9597	58512.9993	>16.481	0.297	2	SRX	Vis
58513.0194	58513.0194	>16.700	–	1	HSP	Vis
58513.5740	58513.5765	>17.283	0.076	2	ASN	g
58513.5753	58513.5753	16.942	–	1	ASN	g
58514.5715	58514.5741	16.818	0.082	3	ASN	g
58514.9646	58515.1111	16.194	0.095	5	SRX	Vis
58515.5732	58515.5756	16.152	0.050	3	ASN	g
58515.9771	58515.9771	16.100	–	1	SRX	Vis
58516.3065	58516.4505	16.271	0.012	194	MLF	CR
58516.5668	58516.5693	16.476	0.018	3	ASN	g
58516.9764	58517.1569	16.100	0.000	2	SRX	Vis
58517.0045	58517.1587	16.352	0.009	211	SPE	CV
58517.2711	58517.3936	16.152	0.013	337	MLF	CR
58517.5756	58517.5781	16.848	0.047	3	ASN	g
58517.9316	58518.0992	16.979	0.012	150	SPE	CV
58518.5735	58518.5760	17.097	0.162	3	ASN	g
58519.2793	58519.2805	>16.916	0.066	2	ASN	g
58519.2817	58519.5695	17.082	0.035	4	ASN	g
58519.2991	58519.4243	16.779	0.017	338	MLF	CR
58520.5665	58520.5677	17.317	0.113	2	ASN	g
58520.5690	58520.5690	>17.344	–	1	ASN	g
58521.5549	58521.5574	>16.626	0.238	2	ASN	g
58521.5562	58521.5562	16.856	–	1	ASN	g
58522.3073	58522.5620	17.150	0.101	6	ASN	g
58524.5388	58524.5413	>17.280	0.040	3	ASN	g
58525.0313	58525.0313	>16.700	–	1	SRX	Vis
58525.5490	58525.5515	>16.896	0.074	3	ASN	g
58526.5368	58526.5368	>16.830	–	1	ASN	g
58526.5380	58526.5392	16.777	0.063	2	ASN	g
58526.9618	58526.9618	>16.000	–	1	SRX	Vis
58527.0125	58527.0125	>16.700	–	1	HSP	Vis
58527.5323	58527.5347	>16.772	0.037	3	ASN	g
58528.0285	58528.1104	>16.410	0.389	2	SRX	Vis
58528.5392	58528.5416	>16.724	0.022	2	ASN	g
58528.5404	58528.5404	16.743	–	1	ASN	g
58529.5386	58529.5410	16.431	0.090	3	ASN	g
58530.5376	58530.5401	13.289	0.004	3	ASN	g
58531.2174	58531.2174	13.000	–	1	SRX	Vis
58531.5333	58531.5358	13.268	0.006	3	ASN	g
58531.5380	58531.7420	13.534	0.004	79	HaC	CV
58532.5288	58532.5312	13.471	0.024	3	ASN	g
58532.5375	58532.7391	13.690	0.004	79	HaC	CV
58532.9137	58533.1052	13.835	0.002	172	SPE	CV
58533.2727	58533.5314	13.596	0.016	6	ASN	g
58533.5370	58533.7362	13.829	0.005	76	HaC	CV
58534.5272	58534.5297	13.731	0.018	3	ASN	g
58534.5362	58534.7348	14.078	0.010	92	HaC	CV
58535.5233	58535.5259	15.688	0.064	3	ASN	g
58535.5647	58535.7319	15.915	0.019	95	HaC	CV
58536.5389	58536.7291	16.199	0.014	99	HaC	CV
58536.9458	58536.9458	16.200	–	1	SRX	Vis
58537.5387	58537.7263	16.236	0.013	99	HaC	CV
58537.9472	58537.9472	16.000	–	1	SRX	Vis
58538.5382	58538.7247	16.206	0.011	99	HaC	CV
58538.9556	58539.0104	15.800	0.000	2	SRX	Vis
58539.5125	58539.5151	13.910	0.028	3	ASN	g
58539.5376	58539.7207	14.290	0.010	98	HaC	CV
58539.9472	58539.9472	14.400	–	1	SRX	Vis
58540.5101	58540.7181	16.131	0.017	72	HaC	CV
58540.9681	58541.0333	16.000	0.000	2	SRX	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.5 Log of observations of the 2019 superoutburst in NSV 1440.
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58541.9618	58541.9618	16.000	—	1	SRX	Vis
58542.5089	58542.7130	16.387	0.009	55	HaC	CV
58543.5079	58543.7102	16.411	0.011	61	HaC	CV
58543.9667	58543.9667	16.000	—	1	SRX	Vis
58544.5032	58544.7054	16.516	0.025	48	HaC	CV
58545.5024	58545.7019	14.331	0.014	51	HaC	CV
58546.5018	58546.6994	16.248	0.017	50	HaC	CV
58547.5010	58547.6965	16.773	0.023	49	HaC	CV
58548.5006	58548.6939	16.622	0.014	49	HaC	CV
58548.9681	58548.9681	16.000	—	1	SRX	Vis
58549.4994	58549.6917	16.550	0.015	48	HaC	CV
58550.4989	58550.6887	16.678	0.020	48	HaC	CV
58550.9083	58550.9457	16.864	0.010	36	COO	CV
58551.4983	58551.6862	16.612	0.015	47	HaC	CV
58551.9507	58551.9507	16.000	—	1	SRX	Vis
58552.4975	58552.6831	16.634	0.015	47	HaC	CV
58553.4971	58553.6804	14.581	0.020	46	HaC	CV
58554.4961	58554.6779	16.599	0.022	45	HaC	CV
58554.9215	58554.9215	>15.400	—	1	SRX	Vis
58555.4957	58555.6749	16.771	0.019	45	HaC	CV
58556.4946	58556.6717	16.589	0.017	44	HaC	CV
58557.0465	58557.0465	16.000	—	1	SRX	Vis
58557.4940	58557.6694	16.600	0.025	43	HaC	CV
58558.4933	58558.6663	16.739	0.025	43	HaC	CV
58558.9361	58558.9361	>14.000	—	1	SRX	Vis
58559.4926	58559.6639	16.616	0.028	42	HaC	CV
58559.9319	58559.9319	>13.500	—	1	SRX	Vis
58560.5755	58560.6607	16.172	0.042	23	HaC	CV
58561.2819	58561.2819	14.500	—	1	SRX	Vis
58561.5784	58561.6596	15.622	0.021	22	HaC	CV
58562.5757	58562.6577	16.794	0.057	36	HaC	CV
58563.5728	58563.6549	16.723	0.050	36	HaC	CV
58564.5701	58564.6521	16.596	0.035	36	HaC	CV
58565.5674	58565.6494	16.624	0.034	36	HaC	CV
58566.5647	58566.6475	16.631	0.035	27	HaC	CV
58567.5617	58567.6446	16.770	0.042	27	HaC	CV
58567.9444	58567.9444	16.700	—	1	SRX	Vis
58568.5589	58568.6419	16.607	0.022	27	HaC	CV
58569.5599	58569.6365	14.332	0.009	25	HaC	CV
58569.9618	58569.9618	14.500	—	1	SRX	Vis
58570.2632	58570.2658	15.410	0.025	3	ASN	g
58570.5573	58570.6346	16.411	0.026	22	HaC	CV
58571.5547	58571.6319	16.867	0.044	22	HaC	CV
58572.5516	58572.6311	16.743	0.021	25	HaC	CV
58573.2731	58573.2756	16.411	0.046	3	ASN	g
58573.5491	58573.6120	16.777	0.054	17	HaC	CV
58574.5561	58574.6225	16.910	0.042	18	HaC	CV
58574.9639	58575.0319	16.000	0.000	2	SRX	Vis
58575.5435	58575.6197	16.651	0.055	19	HaC	CV
58576.5406	58576.6170	16.676	0.017	23	HaC	CV
58577.9167	58577.9167	>15.400	—	1	SRX	Vis
58578.5655	58578.5988	14.850	0.020	11	HaC	CV
58579.2280	58579.2292	15.960	0.123	2	ASN	g
58579.5629	58579.6094	16.827	0.029	15	HaC	CV
58579.9333	58579.9333	16.700	—	1	SRX	Vis
58580.5207	58580.5233	16.768	0.112	3	ASN	g
58580.5829	58580.6093	16.981	0.063	9	HaC	CV
58580.8417	58580.8417	>16.800	—	1	HSP	Vis
58580.9486	58580.9486	>15.600	—	1	SRX	Vis
58581.5801	58581.6065	16.739	0.035	9	HaC	CV
58582.5756	58582.6033	16.887	0.053	8	HaC	CV
58583.4754	58583.4767	>16.476	0.097	2	ASN	g
58583.5726	58583.6002	17.039	0.035	8	HaC	CV
58584.4825	58584.4850	16.759	0.029	3	ASN	g
58584.5697	58584.5975	16.720	0.021	8	HaC	CV
58584.9653	58584.9653	>15.400	—	1	SRX	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.5 Log of observations of the 2019 superoutburst in NSV 1440.
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58585.5170	58585.5183	16.706	0.132	2	ASN	g
58585.5195	58585.5195	>17.093	—	1	ASN	g
58585.5671	58585.5947	16.673	0.043	8	HaC	CV
58586.0236	58586.0236	>15.400	—	1	SRX	Vis
58586.5644	58586.5920	16.684	0.060	8	HaC	CV
58587.1215	58587.1215	>15.400	—	1	SRX	Vis
58587.5614	58587.5891	16.923	0.074	8	HaC	CV
58588.5068	58588.5094	14.320	0.027	3	ASN	g
58588.5588	58588.5864	14.659	0.009	8	HaC	CV
58590.5068	58590.5094	>16.445	0.085	3	ASN	g
58590.5533	58590.5810	16.774	0.111	7	HaC	CV
58591.5503	58591.5779	17.095	0.230	8	HaC	CV
58592.5477	58592.5744	16.668	0.110	8	HaC	CV
58593.5479	58593.5720	16.874	0.077	10	HaC	CV
58593.8806	58593.8806	>14.000	—	1	SRX	Vis
58594.5452	58594.5695	16.869	0.060	10	HaC	CV
58595.2279	58595.2306	16.865	0.167	3	ASN	g
58595.5423	58595.5664	16.894	0.099	10	HaC	CV
58596.5401	58596.5643	16.788	0.053	10	HaC	CV
58597.4810	58597.4835	>16.649	0.075	3	ASN	g
58598.5347	58598.5588	17.076	0.061	10	HaC	CV
58598.8910	58598.8910	>16.000	—	1	SRX	Vis
58600.4715	58600.4741	16.463	0.086	3	ASN	g
58601.4709	58601.4735	15.431	0.028	3	ASN	g
58602.4665	58602.4691	16.823	0.113	3	ASN	g
58602.9007	58602.9007	>16.000	—	1	SRX	Vis
58604.2056	58604.4640	>16.729	0.090	5	ASN	g
58604.2080	58604.2080	16.976	—	1	ASN	g
58604.9889	58604.9889	>15.400	—	1	SRX	Vis
58605.4570	58605.4595	>16.331	0.125	3	ASN	g
58607.2001	58607.2025	>16.338	0.100	3	ASN	g
58609.8785	58609.8785	>16.000	—	1	SRX	Vis
58610.9590	58610.9590	>15.400	—	1	SRX	Vis
58612.1076	58612.1076	>15.400	—	1	SRX	Vis
58623.9083	58623.9083	>14.400	—	1	SRX	Vis
58625.8792	58625.8792	>15.400	—	1	SRX	Vis
58627.9261	58627.9273	>15.914	0.122	2	ASN	g
58637.9715	58637.9715	>15.400	—	1	SRX	Vis
58641.8750	58641.8750	>15.400	—	1	SRX	Vis
58641.9033	58641.9033	>16.718	—	1	ASN	g
58642.9278	58642.9278	>14.400	—	1	SRX	Vis
58643.8994	58643.9019	>16.788	0.039	3	ASN	g
58645.9042	58645.9042	>14.400	—	1	SRX	Vis
58647.3063	58647.3063	>15.000	—	1	SRX	Vis
58647.8878	58647.8878	>16.842	—	1	ASN	g
58650.8751	58650.8764	>15.780	0.042	2	ASN	g
58651.8776	58651.8802	>15.506	0.031	3	ASN	g
58653.8737	58653.8763	>15.938	0.147	3	ASN	g
58654.6962	58654.6962	>15.797	—	1	ASN	g
58655.9174	58655.9174	>15.000	—	1	SRX	Vis
58655.9478	58655.9478	>16.007	—	1	ASN	g
58656.8627	58656.9479	>15.493	0.079	4	ASN	g
58656.8722	58656.8722	>15.400	—	1	SRX	Vis
58657.8628	58657.9469	>16.284	0.041	6	ASN	g
58657.9438	58657.9438	>15.000	—	1	SRX	Vis
58658.6871	58658.6897	>16.768	0.059	3	ASN	g
58658.8972	58658.8972	>15.100	—	1	SRX	Vis
58659.6856	58659.9420	>16.821	0.063	6	ASN	g
58659.9174	58659.9174	>15.000	—	1	SRX	Vis
58660.9313	58660.9313	>15.000	—	1	SRX	Vis
58660.9427	58660.9453	>16.199	0.148	3	ASN	g
58666.9363	58666.9388	>16.687	0.105	3	ASN	g
58667.8425	58667.9182	>17.225	0.220	4	ASN	g
58667.9170	58667.9170	17.332	—	1	ASN	g
58668.1333	58668.1333	>15.000	—	1	SRX	Vis
58668.6699	58668.9213	>17.423	0.102	5	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.5 Log of observations of the 2019 superoutburst in NSV 1440.
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58668.6723	58668.6723	17.596	—	1	ASN	g
58669.8175	58669.8201	>16.846	0.053	3	ASN	g
58670.8462	58670.8487	>14.240	0.374	3	ASN	g
58671.1174	58671.1174	>15.000	—	1	SRX	Vis
58672.8442	58672.8442	>14.862	—	1	ASN	g
58674.8384	58674.8397	>16.785	0.024	2	ASN	g
58677.8067	58677.9305	>16.262	0.301	5	ASN	g
58678.8042	58678.9011	>16.896	0.255	5	ASN	g
58679.6532	58679.8266	>16.367	0.187	6	ASN	g
58680.8205	58680.8230	>15.635	0.043	3	ASN	g
58681.8207	58681.9309	>15.750	0.131	5	ASN	g
58682.6679	58682.9264	>15.874	0.130	5	ASN	g
58683.8138	58683.8163	>15.817	0.037	3	ASN	g
58684.8179	58684.9257	>16.207	0.074	6	ASN	g
58686.9083	58686.9083	>15.000	—	1	SRX	Vis
58688.7554	58688.8606	>16.810	0.122	6	ASN	g
58690.7698	58690.8686	>16.254	0.353	5	ASN	g
58691.8882	58691.8908	>17.349	0.052	3	ASN	g
58692.8120	58692.8145	>15.887	0.152	3	ASN	g
58694.9155	58694.9180	>17.324	0.112	4	ASN	g
58695.8489	58695.8515	>16.849	0.017	3	ASN	g
58696.8546	58696.8546	>16.582	0.231	2	ASN	g
58697.7611	58697.8847	>17.111	0.115	6	ASN	g
58700.8767	58700.8780	>17.657	0.031	2	ASN	g
58700.8792	58700.8792	17.524	—	1	ASN	g
58700.9125	58700.9125	>14.000	—	1	SRX	Vis
58702.7605	58702.7630	>16.825	0.032	2	ASN	g
58703.8701	58703.8727	>17.581	0.069	3	ASN	g
58705.8214	58705.8240	>16.828	0.025	3	ASN	g
58709.8531	58709.8557	>15.417	0.104	3	ASN	g
58710.8466	58710.8466	>15.084	—	1	ASN	g
58711.8469	58711.8494	>15.520	0.039	3	ASN	g
58712.8434	58712.8460	>16.244	0.031	3	ASN	g
58712.9028	58712.9028	>14.000	—	1	SRX	Vis
58713.6020	58713.8423	>16.128	0.074	8	ASN	g
58715.8358	58715.8382	>16.558	0.046	4	ASN	g
58716.8403	58716.9070	>16.616	0.067	7	ASN	g
58718.8146	58718.8171	>17.232	0.099	3	ASN	g
58719.1278	58719.1278	>15.000	—	1	SRX	Vis
58720.8386	58720.8666	>17.109	0.092	5	ASN	g
58721.8026	58721.8864	>17.109	0.133	9	ASN	g
58722.0069	58722.0069	>15.400	—	1	SRX	Vis
58723.0028	58723.0028	>15.000	—	1	SRX	Vis
58723.7814	58723.8332	>16.914	0.294	6	ASN	g
58725.2201	58725.2201	>16.700	—	1	SRX	Vis
58726.1729	58726.1729	>15.400	—	1	SRX	Vis
58726.9036	58726.9048	>17.433	0.043	2	ASN	g
58726.9903	58726.9903	>15.500	—	1	SRX	Vis
58728.7995	58728.8020	>17.547	0.042	3	ASN	g
58730.1139	58730.1139	>14.400	—	1	SRX	Vis
58730.7916	58730.7942	>17.498	0.047	3	ASN	g
58731.8141	58731.8165	>15.994	0.027	3	ASN	g
58732.0373	58732.0429	18.279	0.183	2	SKM	v
58732.0387	58732.0387	18.466	—	1	SKM	g
58732.0443	58732.0443	18.705	—	1	SKM	i
58736.8085	58736.8111	>16.602	0.046	3	ASN	g
58737.2153	58737.2153	>14.400	—	1	SRX	Vis
58738.8061	58738.8085	>16.239	0.061	3	ASN	g
58739.8101	58739.8125	>15.505	0.236	3	ASN	g
58740.8872	58740.8897	>16.031	0.031	3	ASN	g
58741.7430	58741.7443	>16.221	0.050	2	ASN	g
58742.0201	58742.0201	19.014	—	1	SKM	i
58742.5755	58742.7797	>16.129	0.072	8	ASN	g
58743.5647	58743.8221	>16.390	0.046	6	ASN	g
58743.9625	58743.9625	>14.400	—	1	SRX	Vis
58744.6104	58744.7995	>16.455	0.026	6	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.5 Log of observations of the 2019 superoutburst in NSV 1440.
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58744.9875	58744.9875	>15.000	—	1	SRX	Vis
58745.9068	58745.9092	>15.823	0.050	3	ASN	g
58745.9946	58745.9946	18.451	—	1	SKM	g
58745.9960	58745.9960	18.630	—	1	SKM	r
58746.7684	58746.7710	>16.887	0.044	3	ASN	g
58747.8177	58747.8202	>16.816	0.035	3	ASN	g
58748.7899	58748.8287	>17.198	0.076	4	ASN	g
58749.6492	58749.6517	>15.958	0.067	3	ASN	g
58750.7074	58750.7985	>17.459	0.049	3	ASN	g
58750.7959	58750.7959	17.320	—	1	ASN	g
58751.7495	58751.7495	>17.149	—	1	ASN	g
58751.9743	58751.9743	>15.500	—	1	SRX	Vis
58752.7512	58752.7953	>17.084	0.139	5	ASN	g
58753.0507	58753.0507	>14.400	—	1	SRX	Vis
58753.0839	58753.0839	18.449	—	1	SKM	g
58753.6073	58753.7763	>17.419	0.066	6	ASN	g
58755.6523	58755.6879	>16.976	0.084	8	ASN	g
58756.7098	58756.7777	>17.329	0.097	4	ASN	g
58757.1451	58757.1451	>16.700	—	1	SRX	Vis
58757.7607	58757.7632	>16.185	0.107	4	ASN	g
58758.7442	58758.7735	>17.254	0.171	4	ASN	g
58759.0236	58759.0236	>14.600	—	1	SRX	Vis
58761.8301	58761.8326	>17.403	0.075	2	ASN	g
58761.8314	58761.8314	17.137	—	1	ASN	g
58762.7437	58762.7461	>17.009	0.074	4	ASN	g
58763.7653	58763.7679	>17.175	0.013	2	ASN	g
58763.7666	58763.7666	17.049	—	1	ASN	g
58764.5937	58764.7015	>16.416	0.106	6	ASN	g
58765.7190	58765.7215	>16.371	0.063	4	ASN	g
58765.9403	58765.9403	>14.000	—	1	SRX	Vis
58766.1014	58766.1034	18.802	0.029	2	SKM	i
58766.1048	58766.1062	18.952	0.059	2	SKM	z
58766.8669	58766.8693	>17.199	0.067	3	ASN	g
58767.5924	58767.6966	>16.455	0.144	6	ASN	g
58768.4374	58768.4398	>15.907	0.086	3	ASN	g
58769.5176	58769.5200	>16.330	0.052	3	ASN	g
58771.5150	58771.5174	>16.249	0.031	3	ASN	g
58772.5033	58772.5045	>16.454	0.018	2	ASN	g
58773.7521	58773.7545	>16.416	0.029	3	ASN	g
58774.8536	58774.8561	>16.679	0.056	3	ASN	g
58775.7285	58775.7310	>16.560	0.009	3	ASN	g
58776.7615	58776.7615	>16.959	—	1	ASN	g
58777.8242	58777.8267	>16.951	0.007	3	ASN	g
58778.7717	58778.7743	>16.406	0.425	3	ASN	g
58779.0472	58779.0472	>16.700	—	1	SRX	Vis
58780.0132	58780.0132	>16.700	—	1	SRX	Vis
58781.7930	58781.7955	>17.466	0.056	3	ASN	g

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58782.8233	58782.8258	>17.518	0.065	3	ASN	g
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* BJD - 2400000.0
 † Mean magnitude.
 ‡ 1σ of mean magnitude.
 § Number of observations.
 || Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muylleert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)
 # "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.6: Log of observations of the 2021 superoutburst in NSV 1440.

Start*	End*	Mag	Error	N	Obs	Filter#
59436.5877	59436.8636	>17.225	0.117	6	ASN	g
59437.7157	59437.7183	>16.551	0.125	3	ASN	g
59438.8003	59438.8507	>17.327	0.057	2	ASN	g
59439.8156	59439.8156	>17.413	–	1	ASN	g
59440.8077	59440.8103	>17.397	0.067	3	ASN	g
59441.1819	59441.1819	>15.000	–	1	SRX	Vis
59443.7019	59443.8039	>16.953	0.253	6	ASN	g
59444.7438	59444.8338	>16.639	0.224	6	ASN	g
59445.9771	59445.9771	>13.600	–	1	SRX	Vis
59447.6798	59447.8123	>15.706	0.073	6	ASN	g
59452.6604	59452.6630	14.994	0.102	3	ASN	g
59453.6717	59453.6743	>16.086	0.052	3	ASN	g
59454.7891	59454.7917	>16.640	0.139	2	ASN	g
59454.7904	59454.7904	16.474	–	1	ASN	g
59454.9118	59454.9118	>15.000	–	1	SRX	Vis
59455.6570	59455.8054	>16.585	0.059	8	ASN	g
59457.0194	59457.1139	12.900	0.000	4	SRX	Vis
59457.6571	59457.7751	12.945	0.012	6	ASN	g
59458.2813	59458.2813	12.900	–	1	SRX	Vis
59458.6464	59458.6489	13.138	0.042	3	ASN	g
59459.0667	59459.0667	13.000	–	1	SRX	Vis
59459.6397	59459.7741	13.127	0.015	9	ASN	g
59459.9646	59459.9646	13.200	–	1	SRX	Vis
59460.6392	59460.9019	13.302	0.009	10	ASN	g
59461.4569	59461.6634	0.797	0.001	595	MLF	C
59461.4569	59461.6634	13.247	0.001	595	MLF	CR
59461.6359	59461.8978	13.421	0.017	9	ASN	g
59462.4530	59462.6571	0.924	0.001	588	MLF	C
59462.4530	59462.6571	13.374	0.001	588	MLF	CR
59462.4914	59462.8020	13.553	0.015	13	ASN	g
59464.7468	59464.7494	15.376	0.060	3	ASN	g
59465.0222	59465.0222	15.300	–	1	SRX	Vis
59465.4367	59465.5354	15.809	0.008	285	MLF	CR
59465.4367	59465.5354	3.359	0.008	285	MLF	C
59465.7392	59465.7417	16.109	0.049	4	ASN	g
59465.9986	59465.9986	15.800	–	1	SRX	Vis
59466.7019	59466.7378	16.269	0.080	6	ASN	g
59467.7387	59467.7882	16.166	0.070	9	ASN	g
59468.0980	59468.0980	16.468	–	1	SKM	u
59468.0986	59468.0986	16.161	–	1	SKM	v
59468.0990	59468.0990	16.177	–	1	SKM	g
59468.0993	59468.0993	16.184	–	1	SKM	r
59468.0996	59468.0996	16.216	–	1	SKM	i
59468.1000	59468.1000	16.355	–	1	SKM	z
59468.5844	59468.6561	15.815	0.010	207	MLF	CR
59468.5844	59468.6561	3.365	0.010	207	MLF	C
59468.8405	59468.8430	15.838	0.076	3	ASN	g
59470.9236	59470.9236	>14.000	–	1	SRX	Vis
59471.2951	59471.2951	>15.100	–	1	SRX	Vis
59471.7194	59471.7219	16.429	0.088	4	ASN	g
59472.2167	59472.2167	16.800	–	1	SRX	Vis
59472.6004	59472.7355	>16.255	0.265	3	ASN	g
59472.6030	59472.7819	16.344	0.106	6	ASN	g
59472.9715	59472.9715	>14.000	–	1	SRX	Vis
59473.5923	59473.5949	>15.843	0.076	3	ASN	g
59473.7768	59473.8062	16.208	0.077	6	ASN	g
59474.2569	59474.2569	16.319	–	1	SKM	g
59474.2583	59474.2583	16.311	–	1	SKM	r
59474.6773	59474.6997	>15.842	0.046	5	ASN	g
59474.6971	59474.8283	16.025	0.319	2	ASN	g
59475.4103	59475.6484	1.547	0.004	685	MLF	C
59475.4103	59475.6484	13.997	0.004	685	MLF	CR
59475.4658	59475.6675	14.271	0.061	9	ASN	g
59476.4035	59476.4320	15.869	0.023	83	MLF	CR
59476.4035	59476.4320	3.420	0.024	83	MLF	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.6 Log of observations of the 2021 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59476.6429	59476.7090	>15.473	0.068	9	ASN	g
59477.4030	59477.4433	16.403	0.046	117	MLF	CR
59477.4030	59477.4433	3.953	0.046	117	MLF	C
59478.3968	59478.4170	16.382	0.045	58	MLF	CR
59478.3968	59478.4170	3.932	0.049	58	MLF	C
59478.4985	59478.5010	>15.835	0.032	3	ASN	g
59479.3934	59479.4282	16.213	0.027	101	MLF	CR
59479.3934	59479.4282	3.763	0.027	101	MLF	C
59479.7108	59479.7134	>15.969	0.050	3	ASN	g
59480.5716	59480.7122	>15.888	0.060	10	ASN	g
59480.6781	59480.6781	16.074	–	1	ASN	g
59481.0208	59481.0208	>14.000	–	1	SRX	Vis
59481.5737	59481.6888	>16.112	0.101	4	ASN	g
59481.6901	59481.6914	16.155	0.190	2	ASN	g
59482.5721	59482.7476	16.337	0.074	7	ASN	g
59482.5747	59482.7488	>16.357	0.084	3	ASN	g
59483.0021	59483.0021	14.400	–	1	SRX	Vis
59483.3959	59483.6407	1.993	0.007	703	MLF	C
59483.3959	59483.6407	14.443	0.007	703	MLF	CR
59483.6927	59483.7442	14.957	0.042	7	ASN	g
59483.9632	59483.9632	15.300	–	1	SRX	Vis
59484.3944	59484.4491	3.734	0.013	158	MLF	C
59484.3945	59484.4491	16.184	0.013	158	MLF	CR
59485.0271	59485.0271	>16.000	–	1	SRX	Vis
59485.5734	59485.6853	16.461	0.040	6	ASN	g
59485.5747	59485.6395	>16.501	0.046	4	ASN	g
59486.6118	59486.6144	>16.312	0.098	3	ASN	g
59486.6837	59486.7168	16.482	0.092	6	ASN	g
59488.6755	59488.6780	16.659	0.012	3	ASN	g
59488.6767	59488.6767	>16.625	–	1	ASN	g
59489.7898	59489.7922	16.453	0.098	3	ASN	g
59490.7300	59490.7327	16.367	0.061	3	ASN	g
59492.4085	59492.4110	16.157	0.063	3	ASN	g
59492.5140	59492.6292	16.225	0.009	329	MLF	CR
59492.5155	59492.6292	3.775	0.009	328	MLF	C
59493.4688	59493.5241	16.449	0.014	160	MLF	CR
59493.4688	59493.5241	3.999	0.014	160	MLF	C
59493.5589	59493.5589	>16.403	–	1	ASN	g
59493.5602	59493.7646	16.646	0.067	8	ASN	g
59494.5092	59494.5203	16.257	0.032	33	MLF	CR
59494.5092	59494.5203	3.807	0.032	33	MLF	C
59494.6434	59494.7104	16.508	0.080	7	ASN	g
59495.0569	59495.0569	16.700	–	1	SRX	Vis
59496.0500	59496.0500	>16.000	–	1	SRX	Vis
59496.6470	59496.6827	16.583	0.048	6	ASN	g
59497.6404	59497.6821	16.639	0.044	6	ASN	g
59498.0111	59498.0111	16.600	–	1	SRX	Vis
59498.9264	59498.9264	>15.100	–	1	SRX	Vis
59499.5323	59499.6817	>15.020	0.111	11	ASN	g
59499.6579	59499.8756	14.540	0.364	4	ASN	g
59500.6759	59500.7305	15.942	0.099	6	ASN	g
59501.7282	59501.7294	>16.520	0.018	2	ASN	g
59501.7307	59501.7307	16.372	–	1	ASN	g
59502.1882	59502.1882	>14.400	–	1	SRX	Vis
59502.7379	59502.7405	>16.637	0.019	3	ASN	g
59503.7282	59503.7307	>16.244	0.088	3	ASN	g
59504.7477	59504.7585	>16.398	0.044	6	ASN	g
59506.6229	59506.6815	>15.530	0.028	9	ASN	g
59507.3645	59507.3670	>15.843	0.023	3	ASN	g
59508.5908	59508.8690	>15.796	0.122	6	ASN	g
59510.6840	59510.6865	>16.081	0.009	3	ASN	g
59510.9507	59510.9507	>14.400	–	1	SRX	Vis
59511.3644	59511.3669	>16.431	0.014	3	ASN	g
59512.9375	59512.9375	15.800	–	1	SRX	Vis
59513.5701	59513.5727	>16.494	0.036	3	ASN	g
59513.6021	59513.6047	16.687	0.171	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.6 Log of observations of the 2021 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59514.2243	59514.2243	>14.400	—	1	SRX	Vis
59514.5973	59514.6323	16.737	0.075	6	ASN	g
59516.5987	59516.5987	16.394	—	1	ASN	g
59516.5999	59516.8360	>15.989	0.368	5	ASN	g
59517.0111	59517.0111	16.600	—	1	SRX	Vis
59517.5844	59517.6859	16.667	0.050	5	ASN	g
59517.6846	59517.6846	>16.943	—	1	ASN	g
59518.0028	59518.0028	16.800	—	1	SRX	Vis
59518.5888	59518.5914	14.188	0.024	3	ASN	g
59519.0208	59519.0208	15.200	—	1	SRX	Vis
59519.9972	59519.9972	16.700	—	1	SRX	Vis
59520.5880	59520.5880	>16.609	—	1	ASN	g
59520.5880	59520.5905	16.680	0.069	3	ASN	g
59521.5769	59521.5769	>16.486	—	1	ASN	g
59521.5782	59521.5795	16.151	0.167	2	ASN	g
59522.3359	59522.3384	16.672	0.082	3	ASN	g
59522.9306	59522.9306	>15.100	—	1	SRX	Vis
59523.9375	59523.9375	>15.100	—	1	SRX	Vis
59524.3867	59524.5836	16.659	0.068	5	ASN	g
59524.5849	59524.6332	>16.507	0.018	4	ASN	g
59526.9799	59526.9799	16.700	—	1	SRX	Vis
59528.5616	59528.5629	16.805	0.223	2	ASN	g
59528.5642	59528.5642	>17.000	—	1	ASN	g
59528.9736	59528.9736	>15.100	—	1	SRX	Vis
59529.0299	59529.0299	15.800	—	1	SRX	Vis
59529.7807	59529.7832	14.822	0.016	3	ASN	g
59530.6645	59530.6670	>16.553	0.056	3	ASN	g
59531.6685	59531.6825	>16.531	0.057	5	ASN	g
59531.6710	59531.6710	16.477	—	1	ASN	g
59532.6774	59532.7129	>16.468	0.091	6	ASN	g
59534.5762	59534.5787	>16.097	0.041	3	ASN	g
59535.6114	59535.6127	>15.914	0.049	3	ASN	g
59535.9813	59535.9813	>14.000	—	1	SRX	Vis
59536.8468	59536.8494	>16.244	0.048	3	ASN	g
59538.9688	59538.9688	>14.000	—	1	SRX	Vis
59539.4696	59539.4722	>16.144	0.030	3	ASN	g
59540.0083	59540.0083	>14.000	—	1	SRX	Vis
59541.6724	59541.7015	>15.824	0.116	6	ASN	g
59542.5205	59542.5231	>16.520	0.051	3	ASN	g
59544.5896	59544.5909	>16.545	0.051	2	ASN	g
59545.0285	59545.0285	>15.400	—	1	SRX	Vis
59545.5599	59545.5641	>16.673	0.066	7	ASN	g
59546.0111	59546.0111	>16.700	—	1	SRX	Vis
59546.7741	59546.7767	>17.082	0.047	3	ASN	g
59547.0069	59547.0069	>16.000	—	1	SRX	Vis
59547.9889	59547.9889	>15.800	—	1	SRX	Vis
59548.5743	59548.5743	>16.838	—	1	ASN	g
59548.5756	59548.5768	16.582	0.065	2	ASN	g
59548.9667	59548.9667	>15.400	—	1	SRX	Vis
59549.5674	59549.5699	>16.851	0.125	4	ASN	g
59550.6217	59550.6501	16.965	0.053	5	ASN	g
59550.6476	59550.6476	>17.024	—	1	ASN	g
59551.9639	59551.9639	>16.700	—	1	SRX	Vis
59552.5337	59552.5403	>16.705	0.127	5	ASN	g
59552.5363	59552.5363	16.889	—	1	ASN	g
59553.9715	59553.9715	>15.400	—	1	SRX	Vis
59554.7504	59554.7517	17.221	0.033	2	ASN	g
59554.7530	59554.7530	>17.267	—	1	ASN	g
59555.1236	59555.1236	>16.700	—	1	SRX	Vis
59555.7441	59555.7441	>17.289	—	1	ASN	g
59555.7454	59555.7467	16.891	0.072	2	ASN	g
59556.0014	59556.0014	>16.700	—	1	SRX	Vis
59556.7590	59556.7859	>16.971	0.109	2	ASN	g
59556.7603	59556.7884	17.007	0.052	4	ASN	g
59557.6062	59557.6088	17.112	0.046	2	ASN	g
59557.6075	59557.6075	>17.224	—	1	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.6 Log of observations of the 2021 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59558.7182	59558.7208	17.203	0.055	3	ASN	g
59558.9875	59558.9875	>15.400	—	1	SRX	Vis
59559.6351	59559.6915	>16.984	0.063	4	ASN	g
59559.6377	59559.6928	16.768	0.081	2	ASN	g
59560.3814	59560.3839	>16.454	0.185	3	ASN	g
59560.9826	59560.9826	>14.000	—	1	SRX	Vis
59562.5358	59562.5772	>16.129	0.045	10	ASN	g
59563.6997	59563.7023	>16.439	0.034	2	ASN	g
59563.7010	59563.7010	16.239	—	1	ASN	g
59564.0556	59564.0556	>14.000	—	1	SRX	Vis
59564.7048	59564.7073	>16.181	0.028	3	ASN	g
59564.9910	59564.9910	>14.000	—	1	SRX	Vis
59565.7243	59565.7268	>15.946	0.022	3	ASN	g
59566.7206	59566.7583	>15.911	0.041	6	ASN	g
59569.6629	59569.6654	>15.746	0.073	3	ASN	g
59570.9951	59570.9951	>15.600	—	1	SRX	Vis
59571.5598	59571.5623	>16.950	0.033	3	ASN	g
59572.0111	59572.0111	>15.400	—	1	SRX	Vis
59574.4191	59574.4204	>17.064	0.350	2	ASN	g
59574.4216	59574.4216	17.060	—	1	ASN	g
59576.0278	59576.0278	>16.700	—	1	SRX	Vis
59576.6518	59576.6543	>16.976	0.050	3	ASN	g
59577.1340	59577.1340	>16.200	—	1	SRX	Vis
59578.1340	59578.1340	>16.400	—	1	SRX	Vis
59578.3862	59578.4680	18.014	0.025	8	ATF	o
59579.0750	59579.0750	>16.700	—	1	SRX	Vis
59579.3579	59579.3604	>17.341	0.007	3	ASN	g
59579.3583	59579.5325	18.127	0.023	16	ATF	o
59580.0979	59580.0979	>15.600	—	1	SRX	Vis
59580.3460	59580.4094	18.206	0.043	8	ATF	o
59580.5552	59580.5579	>17.279	0.048	3	ASN	g
59581.7539	59581.7565	>17.283	0.058	3	ASN	g
59583.5731	59583.5757	>17.222	0.052	3	ASN	g
59584.6531	59584.6556	>17.033	0.080	3	ASN	g
59586.3408	59586.4078	18.289	0.048	8	ATF	cy
59586.6034	59586.6060	>17.194	0.045	2	ASN	g
59586.6047	59586.6047	17.359	—	1	ASN	g
59587.6187	59587.6213	>17.129	0.050	3	ASN	g
59588.6148	59588.6173	>16.675	0.018	3	ASN	g
59589.0306	59589.0306	>15.000	—	1	SRX	Vis
59591.0576	59591.0576	>14.000	—	1	SRX	Vis
59592.4548	59592.4573	>16.592	0.009	3	ASN	g
59593.3477	59593.3714	18.210	0.099	4	ATF	o
59593.5803	59593.5828	>16.125	0.034	3	ASN	g
59596.5344	59596.5370	>15.755	0.034	3	ASN	g
59598.4982	59598.5007	>15.927	0.073	3	ASN	g
59599.9944	59599.9944	>14.000	—	1	SRX	Vis
59601.0403	59601.0403	>14.000	—	1	SRX	Vis
59601.9958	59601.9958	>15.400	—	1	SRX	Vis
59602.4926	59602.7394	>16.468	0.040	5	ASN	g
59603.5963	59603.6167	>17.147	0.073	5	ASN	g
59603.6180	59603.6180	17.367	—	1	ASN	g
59603.9910	59603.9910	>15.500	—	1	SRX	Vis
59604.7302	59604.7328	>15.371	0.204	3	ASN	g
59605.0014	59605.0014	>15.600	—	1	SRX	Vis
59605.3379	59605.4355	18.247	0.027	5	ATF	cy
59605.7282	59605.7295	>16.875	0.064	2	ASN	g
59607.3055	59607.3082	>17.361	0.045	3	ASN	g
59608.2874	59608.2901	>17.037	0.087	3	ASN	g
59608.3813	59608.3813	18.426	—	1	ATF	cy
59609.6867	59609.6893	>17.240	0.015	3	ASN	g
59609.9826	59609.9826	>15.000	—	1	SRX	Vis
59610.6086	59610.6567	>16.941	0.035	6	ASN	g
59611.0514	59611.0514	>14.000	—	1	SRX	Vis
59611.6969	59611.6994	>17.325	0.046	3	ASN	g
59613.0597	59613.0597	>15.600	—	1	SRX	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.6 Log of observations of the 2021 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59613.5789	59613.5802	>17.251	0.027	2	ASN	g
59613.5815	59613.5815	17.167	—	1	ASN	g
59614.0188	59614.0188	>16.700	—	1	SRX	Vis
59614.3185	59614.5771	>17.316	0.047	5	ASN	g
59614.5745	59614.5745	16.968	—	1	ASN	g
59615.0500	59615.0500	>16.000	—	1	SRX	Vis
59616.0479	59616.0479	>15.400	—	1	SRX	Vis
59617.0486	59617.0486	>16.000	—	1	SRX	Vis
59617.2781	59617.5655	>16.757	0.050	6	ASN	g
59618.0569	59618.0569	>15.000	—	1	SRX	Vis
59618.2760	59618.3438	18.490	0.076	12	ATF	o
59619.0347	59619.0347	>15.400	—	1	SRX	Vis
59619.3395	59619.3713	>16.942	0.035	6	ASN	g
59620.5352	59620.5378	>16.630	0.025	3	ASN	g
59621.5679	59621.5704	>16.369	0.027	3	ASN	g
59622.3087	59622.4001	18.665	0.047	16	ATF	o
59622.5257	59622.5282	>16.057	0.066	3	ASN	g
59623.6243	59623.6269	>16.093	0.016	3	ASN	g
59625.6219	59625.6232	>15.726	0.032	2	ASN	g
59626.6707	59626.6733	>15.635	0.021	3	ASN	g
59628.3986	59628.6038	>16.003	0.051	6	ASN	g
59629.9826	59629.9826	>14.000	—	1	SRX	Vis
59630.4106	59630.4131	>16.249	0.082	3	ASN	g
59631.9958	59631.9958	>15.400	—	1	SRX	Vis
59632.4072	59632.4097	>16.716	0.040	3	ASN	g
59632.5658	59632.6117	18.600	0.073	5	ATF	cy
59633.0354	59633.0354	>14.000	—	1	SRX	Vis
59634.0243	59634.0243	>15.400	—	1	SRX	Vis
59634.2769	59634.4012	>17.315	0.045	7	ASN	g
59635.2974	59635.2974	>17.237	—	1	ASN	g
59636.3458	59636.5707	>16.784	0.195	8	ASN	g
59636.5805	59636.5805	18.794	—	1	ATF	o
59637.0778	59637.0778	>15.100	—	1	SRX	Vis
59637.5113	59637.5443	>16.639	0.248	6	ASN	g
59638.5591	59638.6130	18.718	0.114	5	ATF	o
59639.5583	59639.5825	18.504	0.044	4	ATF	cy
59639.5687	59639.5712	>16.894	0.023	3	ASN	g
59640.5378	59640.6019	18.565	0.032	8	ATF	cy
59641.2907	59641.2932	>16.805	0.402	3	ASN	g
59641.5518	59641.5747	18.684	0.034	4	ATF	o
59642.5393	59642.5953	18.712	0.068	8	ATF	o
59643.5830	59643.5856	>17.621	0.068	3	ASN	g
59644.5504	59644.5529	>17.234	0.046	3	ASN	g
59646.2974	59646.3309	18.842	0.043	4	ATF	o
59647.6139	59647.6152	>17.451	0.124	2	ASN	g
59648.5509	59648.5535	>17.234	0.025	3	ASN	g
59651.3033	59651.5631	>16.417	0.201	6	ASN	g
59652.5032	59652.5234	18.916	0.070	4	ATF	o
59654.2974	59654.2999	>16.185	0.054	3	ASN	g
59656.3423	59656.3448	>15.805	0.055	3	ASN	g
59656.5521	59656.5817	18.852	0.144	6	ATF	o
59660.4934	59660.5081	18.689	0.170	3	ATF	o
59661.9646	59661.9646	>16.000	—	1	SRX	Vis
59662.9361	59662.9361	>15.000	—	1	SRX	Vis
59663.3253	59663.3265	>17.254	0.056	2	ASN	g
59664.5058	59664.5166	18.845	0.073	3	ATF	o
59664.8611	59664.8611	>16.200	—	1	HSP	Vis
59664.9667	59664.9667	>15.400	—	1	SRX	Vis
59665.4911	59665.4936	>17.191	0.095	3	ASN	g
59665.9493	59665.9493	>15.000	—	1	SRX	Vis
59666.5619	59666.5632	>17.632	0.024	2	ASN	g
59666.9569	59666.9569	>15.000	—	1	SRX	Vis
59667.5600	59667.5600	>17.546	—	1	ASN	g
59668.5533	59668.5533	17.486	—	1	ASN	g
59668.5545	59668.5559	>17.602	0.034	2	ASN	g
59668.9854	59668.9854	>15.100	—	1	SRX	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.6 Log of observations of the 2021 superoutburst in NSV 1440
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59669.9472	59669.9472	>15.400	—	1	SRX	Vis
59670.2606	59670.2790	18.602	0.068	4	ATF	cy
59670.2741	59670.2767	>17.292	0.066	3	ASN	g
59671.5474	59671.5499	17.529	0.007	2	ASN	g
59671.5486	59671.5486	>17.776	—	1	ASN	g
59672.5032	59672.5282	18.770	0.126	6	ATF	o
59672.5089	59672.5115	>17.619	0.059	3	ASN	g
59674.5395	59674.5408	>17.607	0.077	2	ASN	g
59676.9382	59676.9382	>15.300	—	1	SRX	Vis
59677.2694	59677.2719	>17.082	0.044	3	ASN	g
59678.2656	59678.2766	19.137	0.292	2	ATF	o
59679.0007	59679.0007	>14.400	—	1	SRX	Vis
59679.2519	59679.2543	>16.754	0.097	3	ASN	g
59680.4821	59680.5044	18.838	0.108	7	ATF	o
59681.5202	59681.5228	>16.676	0.034	3	ASN	g
59683.2691	59683.2716	>15.683	0.107	3	ASN	g
59684.5123	59684.5136	>16.090	0.120	2	ASN	g
59685.5108	59685.5121	>15.778	0.099	2	ASN	g
59686.2173	59686.2410	18.802	0.248	4	ATF	o
59688.2516	59688.5037	>16.604	0.294	5	ASN	g
59688.2528	59688.2528	14.975	—	1	ASN	g
59688.5036	59688.5295	18.787	0.120	4	ATF	o
59691.9299	59691.9299	>15.400	—	1	SRX	Vis
59692.4900	59692.4926	>17.340	0.036	3	ASN	g
59693.9660	59693.9660	>15.400	—	1	SRX	Vis
59694.9417	59694.9417	>15.400	—	1	SRX	Vis
59697.9868	59697.9868	>14.400	—	1	SRX	Vis
59698.4741	59698.4766	>17.421	0.084	3	ASN	g
59700.4695	59700.4708	>17.282	0.074	2	ASN	g
59702.1188	59702.1188	>14.000	—	1	SRX	Vis
59702.2051	59702.2242	18.826	0.082	4	ATF	o
59702.2118	59702.2130	>16.693	0.088	2	ASN	g
59702.2143	59702.2143	16.525	—	1	ASN	g
59702.9215	59702.9215	>14.400	—	1	SRX	Vis
59704.4594	59704.4594	>16.481	—	1	ASN	g
59704.9396	59704.9396	>15.000	—	1	SRX	Vis
59706.4543	59706.4543	>15.852	—	1	ASN	g
59707.9236	59707.9236	>14.400	—	1	SRX	Vis
59708.1973	59708.1973	14.356	—	1	ASN	g
59708.1985	59708.1997	>15.833	0.121	2	ASN	g
59709.1438	59709.1438	>14.400	—	1	SRX	Vis

* BJD - 2400000.0

† Mean magnitude.

‡ 1σ of mean magnitude.

§ Number of observations.

|| Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX[‡] (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

"C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7: Log of observations of the 2018 outburst in ASASSN-18rg.

Start*	End*	Mag	Error	N	Obs	Filter#
58335.7019	58335.7044	>17.724	0.048	3	ASN	g
58336.0181	58336.0194	>17.082	0.010	2	ASN	V
58336.7809	58336.7814	20.213	0.125	2	ZTF	zg
58337.0182	58337.0398	19.675	0.085	3	ATF	o
58337.9442	58337.9442	18.349	–	1	ZTF	zi
58337.9810	58337.9835	>16.919	0.015	3	ASN	V
58338.5472	58338.8210	12.798	0.097	6	ASN	g
58338.8255	58338.8255	12.944	–	1	ZTF	zr
58338.8599	58338.8599	12.538	–	1	ZTF	zg
58339.0230	58339.0553	12.690	0.006	4	ATF	cy
58339.9453	58339.9478	12.799	0.068	3	ASN	V
58340.5232	58340.5646	0.392	0.003	46	DPV	C
58340.5628	58340.6803	13.055	0.002	163	Van	CV
58340.6350	58340.7131	12.992	0.001	30	HaC	CV
58340.9984	58341.0421	13.322	0.005	9	ATF	o
58341.4642	58341.5541	0.468	0.003	129	DPV	C
58341.5443	58341.5467	12.942	0.007	3	ASN	g
58341.5633	58341.6803	13.186	0.002	157	Van	CV
58341.6322	58341.7108	13.116	0.002	32	HaC	CV
58341.6840	58341.6840	13.030	–	1	MUY	V
58341.8110	58341.8110	12.979	–	1	ZTF	zg
58342.0722	58342.0722	12.900	–	1	Syi	Vis
58342.1948	58342.2502	-1.091	0.001	74	OKU	C
58342.4186	58342.5448	13.251	0.001	172	Van	CV
58342.5047	58342.5926	13.410	0.003	90	BSM	CV
58342.6301	58342.7077	13.237	0.002	32	HaC	CV
58342.8615	58342.8615	13.768	–	1	ZTF	zi
58343.0147	58343.0470	13.230	0.006	6	ATF	cy
58343.0247	58343.3015	-0.992	0.001	689	OKU	C
58343.1312	58343.2908	13.490	0.004	179	Ioh	C
58343.3463	58343.5583	0.655	0.002	259	DPV	C
58343.5546	58343.6550	13.405	0.003	39	Van	CV
58343.6274	58343.7056	13.362	0.002	32	HaC	CV
58343.8619	58343.8645	13.366	0.014	3	ASN	V
58344.0742	58344.2425	-0.869	0.001	209	OKU	C
58344.3318	58344.5682	0.844	0.001	292	DPV	C
58344.5416	58344.7260	13.360	0.008	6	ASN	g
58344.5427	58344.6764	13.500	0.001	311	DFS	V
58344.5557	58344.6562	13.574	0.001	87	Van	CV
58344.6246	58344.7022	13.524	0.002	32	HaC	CV
58344.8547	58344.8547	13.387	–	1	ZTF	zg
58344.9871	58345.0192	13.829	0.004	4	ATF	o
58345.0910	58345.0910	13.300	–	1	Syi	Vis
58345.2085	58345.2578	13.636	0.005	50	Io2	C
58345.5303	58345.6267	13.744	0.002	84	Van	CV
58345.6217	58345.6992	13.711	0.003	32	HaC	CV
58345.6429	58345.6453	13.551	0.004	3	ASN	g
58346.1217	58346.2244	14.938	0.011	51	Ioh	C
58346.6190	58346.6989	15.936	0.012	33	HaC	CV
58346.6763	58346.6788	15.904	0.030	3	ASN	g
58347.3458	58347.4476	5.226	0.086	122	DPV	C
58347.5833	58347.5833	17.880	–	1	MUY	CV
58347.6163	58347.6962	17.997	0.062	33	HaC	CV
58347.8589	58347.8589	17.843	–	1	ZTF	zi
58348.0173	58348.2000	3.778	0.014	103	OKU	C
58348.2290	58348.2506	2.615	0.030	3	KU1	C
58348.4531	58348.4531	17.724	–	1	ASN	g
58348.4544	58348.6346	>17.568	0.153	5	ASN	g
58348.4675	58348.4960	5.776	0.172	16	DPV	C
58348.6133	58348.6933	18.183	0.075	31	HaC	CV
58348.8316	58348.8316	18.224	–	1	ZTF	zr
58348.8542	58348.8542	18.317	–	1	ZTF	zg
58348.9626	58348.9938	18.261	0.015	4	ATF	o
58349.0207	58349.1156	3.985	0.023	51	OKU	C
58349.0550	58349.0692	2.886	0.043	3	KU1	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58349.0861	58349.0861	18.040	—	1	Ioh	C
58349.5122	58349.5200	5.470	0.074	6	DPV	C
58349.7780	58349.9380	18.455	0.016	86	SGE	CV
58349.9981	58350.1306	4.230	0.019	72	OKU	C
58350.0482	58350.0482	>18.400	—	1	KU1	CV
58350.3483	58350.3483	17.492	—	1	Van	CV
58350.4452	58350.4483	5.723	0.051	3	DPV	C
58350.8589	58350.8615	>14.572	0.175	3	ASN	V
58350.9653	58350.9968	18.773	0.224	4	ATF	o
58351.2904	58351.2989	1.335	0.035	5	CRI	C
58351.4630	58351.4660	5.774	0.138	3	DPV	C
58351.8166	58351.8166	18.580	—	1	ZTF	zi
58351.8594	58351.8594	18.678	—	1	ZTF	zr
58351.8972	58351.8997	>16.656	0.030	2	ASN	V
58352.0486	58352.0486	>18.500	—	1	KU1	CV
58352.2548	58352.2572	>16.441	0.038	3	ASN	g
58352.3029	58352.3093	1.208	0.015	4	CRI	C
58352.5358	58352.5383	>15.935	0.025	3	ASN	V
58352.9376	58353.1933	>18.270	0.565	2	KU1	CV
58353.2518	58353.2542	>16.372	0.041	3	ASN	g
58353.2910	58353.2995	0.988	0.086	5	CRI	C
58353.4523	58353.4567	5.697	0.241	3	DPV	C
58354.2992	58354.3056	0.640	0.070	4	CRI	C
58355.0611	58355.0611	>16.300	—	1	Ioh	C
58355.9412	58355.9426	>16.551	0.068	2	KU1	CV
58356.0300	58356.2690	4.679	0.051	109	OKU	C
58356.9280	58356.9280	>16.800	—	1	KU1	CV
58357.1509	58357.1599	5.181	0.284	5	OKU	C
58357.8096	58357.8096	18.892	—	1	ZTF	zr
58358.0347	58358.2245	4.737	0.121	43	OKU	C
58358.1710	58358.1710	>17.000	—	1	KU1	CV
58358.4728	58358.4758	6.217	0.450	3	DPV	C
58358.9340	58358.9340	>17.100	—	1	KU1	CV
58359.0147	58359.0516	5.530	0.177	3	OKU	C
58359.2912	58359.5570	>16.655	0.025	6	ASN	g
58360.0246	58360.0246	>17.600	—	1	KU1	CV
58360.0354	58360.0354	5.571	—	1	OKU	C
58360.7633	58360.7657	>16.719	0.074	3	ASN	g
58360.7941	58360.7941	19.139	—	1	ZTF	zr
58360.8582	58360.8582	19.317	—	1	ZTF	zg
58360.9459	58360.9459	>17.200	—	1	KU1	CV
58360.9505	58360.9807	19.146	0.161	4	ATF	o
58360.9628	58360.9789	5.512	0.208	9	OKU	C
58361.4228	58361.4273	6.000	0.353	4	DPV	C
58361.6755	58361.8517	>16.653	0.084	5	ASN	g
58361.8588	58361.8588	18.903	—	1	ZTF	zi
58362.9575	58362.9909	18.660	0.051	8	ATF	o
58363.7882	58363.7882	17.857	—	1	ZTF	zr
58363.7967	58363.7967	18.186	—	1	ZTF	zg
58364.9413	58364.9727	16.425	0.061	4	ATF	o
58365.8183	58365.8183	15.789	—	1	ZTF	zi
58366.4712	58366.4736	13.719	0.021	3	ASN	g
58366.7710	58366.7710	13.558	—	1	ZTF	zg
58366.8182	58366.8182	13.888	—	1	ZTF	zr
58367.0552	58367.1619	-1.581	0.014	16	KU1	C
58367.4715	58367.9245	13.638	0.018	7	ASN	V
58368.2833	58368.5017	1.057	0.003	140	DPV	C
58368.4705	58368.5830	13.892	0.002	233	Van	CV
58368.6233	58368.6257	13.633	0.012	3	ASN	g
58369.2583	58369.4918	1.164	0.004	148	DPV	C
58369.3667	58369.3667	13.800	—	1	MUY	Vis
58369.4178	58369.5220	14.124	0.002	264	Va2	CV
58369.6383	58369.8078	13.807	0.001	300	SGE	CV
58369.7368	58369.7392	13.793	0.019	3	ASN	g
58369.7758	58369.7758	13.743	—	1	ZTF	zg
58369.8391	58369.8391	14.418	—	1	ZTF	zi

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58369.8651	58369.8651	14.156	—	1	ZTF	zr
58370.3008	58370.3957	0.179	0.001	178	Li2	C
58370.4294	58370.4388	14.127	0.002	23	Va3	CV
58370.5542	58370.6936	14.082	0.002	59	Ha2	CV
58370.6026	58370.6050	13.922	0.009	3	ASN	g
58370.6275	58370.7882	13.955	0.001	300	SGE	CV
58370.9278	58370.9611	14.369	0.018	8	ATF	o
58370.9698	58371.1510	14.287	0.004	159	Ioh	C
58371.2634	58371.5100	1.715	0.015	160	DPV	C
58371.2753	58371.3795	0.395	0.003	163	Lic	C
58371.4688	58371.5831	14.814	0.006	258	Van	CV
58371.5514	58371.6905	14.927	0.012	59	HaC	CV
58371.6315	58371.7835	14.974	0.005	299	SGE	CV
58372.2641	58372.5380	3.833	0.015	189	DPV	C
58372.3576	58372.3576	>13.900	—	1	MUY	Vis
58372.4688	58372.5068	16.797	0.008	80	Van	CV
58372.5494	58372.6875	16.688	0.012	58	HaC	CV
58372.6288	58372.7808	16.655	0.007	300	SGE	CV
58372.7533	58372.7533	16.688	—	1	ZTF	zg
58372.7964	58372.7964	16.571	—	1	ZTF	zr
58372.9068	58372.9094	16.831	0.027	3	ASN	V
58372.9194	58372.9508	16.684	0.011	4	ATF	o
58373.3424	58373.3424	>13.900	—	1	MUY	Vis
58373.4736	58373.4743	16.932	0.036	2	Van	CV
58373.5465	58373.6848	16.814	0.010	59	HaC	CV
58373.6362	58373.7989	16.750	0.006	240	SGE	CV
58373.7364	58373.7389	16.870	0.066	3	ASN	g
58373.8388	58373.8388	16.802	—	1	ZTF	zi
58374.2693	58374.4387	4.183	0.006	120	DPV	C
58374.5151	58374.5159	16.885	0.042	2	Van	CV
58374.5438	58374.6815	16.898	0.009	59	HaC	CV
58374.6237	58374.7867	16.878	0.006	240	SGE	CV
58374.6615	58374.6639	17.075	0.098	3	ASN	g
58375.3729	58375.3729	>14.400	—	1	MUY	Vis
58375.5040	58375.5047	16.847	0.016	2	Van	CV
58375.5409	58375.6788	16.796	0.009	118	HaC	CV
58375.6357	58375.7985	16.811	0.006	201	SGE	CV
58375.6893	58375.6893	16.871	—	1	ZTF	zr
58375.7827	58375.7827	16.900	—	1	ZTF	zg
58376.4167	58376.4167	>13.900	—	1	MUY	Vis
58376.6365	58376.7945	16.705	0.012	112	SGE	CV
58376.8988	58376.9289	16.852	0.011	4	ATF	o
58377.5609	58377.5633	16.940	0.035	3	ASN	g
58377.6378	58377.8006	16.833	0.009	240	SGE	CV
58377.8180	58377.8180	16.956	—	1	ZTF	zi
58378.0242	58378.1712	16.982	0.019	240	Ioh	C
58378.1911	58378.1911	>14.800	—	1	Myy	V
58378.2594	58378.3965	4.357	0.005	96	DPV	C
58378.3611	58378.3611	>14.400	—	1	MUY	Vis
58378.4876	58378.4884	17.104	0.013	2	Van	CV
58378.7522	58378.7522	16.963	—	1	ZTF	zr
58378.7969	58378.7969	16.912	—	1	ZTF	zg
58378.8018	58378.8018	16.578	—	1	ASN	V
58378.8031	58378.8044	>16.767	0.050	2	ASN	V
58378.8971	58378.9272	16.959	0.031	4	ATF	o
58379.0253	58379.1363	1.449	0.021	12	KU1	C
58379.0645	58379.1903	2.592	0.006	169	OKU	C
58379.2721	58379.4419	4.197	0.009	99	DPV	C
58379.3681	58379.3681	>13.900	—	1	MUY	Vis
58379.4344	58379.4344	16.727	—	1	Van	CV
58379.5742	58379.6691	16.847	0.022	40	HaC	CV
58380.1301	58380.1730	0.403	0.021	29	OKU	C
58380.2553	58380.4263	1.837	0.002	227	DPV	C
58380.3493	58380.3493	>13.900	—	1	MUY	Vis
58380.5281	58380.6658	14.687	0.010	51	HaC	CV
58380.5685	58380.5710	14.440	0.008	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58380.6181	58380.7844	14.731	0.006	240	SGE	CV
58380.8914	58380.9235	15.447	0.012	8	ATF	o
58380.9173	58380.9832	0.970	0.004	89	OKU	C
58380.9387	58380.9656	-0.074	0.014	27	KU1	C
58381.2584	58381.4757	3.664	0.017	142	DPV	C
58381.2905	58381.5019	16.451	0.030	70	Van	CV
58381.5246	58381.6629	16.961	0.033	53	HaC	CV
58381.7302	58381.7302	17.365	—	1	ZTF	zg
58382.8863	58382.9174	17.709	0.016	4	ATF	o
58383.5189	58383.6576	17.480	0.059	52	HaC	CV
58383.9295	58384.1480	3.179	0.020	80	OKU	C
58384.1051	58384.1370	2.041	0.047	8	KU1	C
58384.5162	58384.6484	17.328	0.058	43	HaC	CV
58384.6893	58384.6893	17.394	—	1	ZTF	zr
58384.7513	58384.7513	17.607	—	1	ZTF	zg
58384.8895	58384.9162	16.465	0.740	2	ATF	o
58385.0634	58385.1790	3.200	0.073	17	OKU	C
58385.1218	58385.1360	2.143	0.102	3	KU1	C
58385.5141	58385.6521	17.751	0.065	51	HaC	CV
58385.8715	58385.8729	>16.179	0.064	2	ASN	V
58385.8742	58385.8742	16.063	—	1	ASN	V
58385.9337	58385.9567	17.490	0.058	3	ATF	o
58386.3326	58386.3326	>13.900	—	1	MUY	Vis
58386.7806	58386.7831	>15.996	0.015	3	ASN	g
58386.9028	58386.9291	17.577	0.085	8	ATF	o
58387.7114	58387.7114	17.624	—	1	ZTF	zg
58387.8984	58387.9314	17.495	0.139	2	ATF	o
58388.2663	58388.2692	>16.537	0.171	2	ASN	g
58388.3486	58388.3486	>13.900	—	1	MUY	Vis
58389.0036	58389.0197	3.269	0.032	10	OKU	C
58389.0858	58389.1093	2.096	0.022	2	KU1	C
58389.2863	58389.2863	>17.516	—	1	ASN	g
58389.3507	58389.3507	>13.900	—	1	MUY	Vis
58389.8922	58389.8922	2.038	—	1	KU1	C
58389.8984	58389.9145	3.314	0.023	10	OKU	C
58390.3632	58390.3632	>13.900	—	1	MUY	Vis
58390.5963	58390.7764	>17.104	0.125	6	ASN	g
58390.7887	58390.7887	17.446	—	1	ZTF	zi
58390.8097	58390.8097	17.587	—	1	ZTF	zg
58390.8877	58390.9176	17.512	0.047	4	ATF	o
58391.3570	58391.3595	17.501	0.103	3	ASN	g
58391.8400	58391.8426	>16.014	0.193	3	ASN	V
58392.8780	58392.9102	17.479	0.019	8	ATF	o
58393.0349	58393.0420	3.166	0.019	5	OKU	C
58393.0870	58393.1330	2.066	0.029	11	KU1	C
58393.6673	58393.6686	>17.640	0.034	2	ASN	g
58393.6699	58393.6699	17.525	—	1	ASN	g
58394.1016	58394.1123	3.182	0.038	7	OKU	C
58394.8629	58394.9044	17.526	0.025	8	ATF	o
58395.6795	58395.6819	>15.786	0.019	3	ASN	g
58396.3646	58396.3646	>13.900	—	1	MUY	Vis
58396.8692	58396.8997	17.418	0.025	4	ATF	o
58397.3325	58397.3502	2.948	0.024	13	DP3	C
58397.6690	58397.6690	>17.661	—	1	ASN	g
58397.6702	58397.6714	17.582	0.010	2	ASN	g
58397.8912	58397.9073	2.870	0.019	10	OKU	C
58398.6870	58398.6895	>16.442	0.326	3	ASN	g
58398.8999	58399.1761	-0.826	0.037	253	KU1	C
58398.9476	58399.0367	0.491	0.026	120	OKU	C
58399.2714	58399.4366	14.814	0.009	135	Van	CV
58399.3093	58399.3117	14.390	0.005	3	ASN	g
58399.4285	58399.4285	>13.900	—	1	MUY	Vis
58399.9216	58400.0894	1.783	0.013	154	OKU	C
58400.0587	58400.1659	1.017	0.014	116	KU1	C
58400.3313	58400.3313	>13.900	—	1	MUY	Vis
58400.4092	58400.4636	3.781	0.042	38	DP3	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58400.7381	58400.7381	18.077	—	1	ZTF	zi
58400.8887	58401.0034	4.048	0.021	65	OKU	C
58401.0516	58401.0516	>18.500	—	1	KU1	CV
58401.3215	58401.3215	>13.900	—	1	MUY	Vis
58402.3263	58402.3287	>17.838	0.144	3	ASN	g
58402.3285	58402.3285	>13.900	—	1	MUY	Vis
58402.8961	58402.8979	18.187	0.105	2	ATF	cy
58403.4068	58403.4377	3.778	0.035	22	DP2	C
58403.6704	58403.6717	>16.362	0.238	2	ASN	g
58403.9974	58404.0028	4.004	0.036	4	OKU	C
58404.0623	58404.0623	>17.900	—	1	KU1	CV
58404.6563	58404.6588	>17.559	0.020	3	ASN	g
58405.3349	58405.3496	3.869	0.030	11	DP3	C
58405.7353	58405.7417	>17.681	0.059	3	ASN	g
58405.8809	58405.8970	4.225	0.069	10	OKU	C
58406.2840	58406.2840	>13.900	—	1	MUY	Vis
58406.6523	58406.6549	>17.454	0.056	3	ASN	g
58406.8236	58406.8555	18.371	0.083	8	ATF	o
58406.9030	58406.9191	4.027	0.097	10	OKU	C
58407.3014	58407.3014	>13.900	—	1	MUY	Vis
58407.3462	58407.3668	4.024	0.038	15	DP3	C
58408.3028	58408.3028	>13.900	—	1	MUY	Vis
58408.3364	58408.3496	3.790	0.039	9	DP3	C
58408.3422	58408.3422	3.808	—	1	DPV	C
58409.0120	58409.0281	3.663	0.098	10	OKU	C
58409.3210	58409.3343	3.954	0.187	9	DP3	C
58409.3269	58409.3269	3.886	—	1	DPV	C
58410.0707	58410.0778	3.854	0.056	5	OKU	C
58410.8432	58410.8514	17.493	0.115	2	ATF	o
58410.8793	58410.8883	4.211	0.198	5	OKU	C
58411.8911	58411.9055	4.243	0.088	6	OKU	C
58412.0882	58412.0882	>16.300	—	1	Ioh	C
58412.3826	58412.3826	>13.900	—	1	MUY	Vis
58412.8040	58412.8065	>16.286	0.060	3	ASN	V
58412.9781	58412.9925	3.757	0.090	9	OKU	C
58413.3028	58413.3028	>13.900	—	1	MUY	Vis
58413.9781	58413.9853	3.838	0.117	4	OKU	C
58414.5314	58414.5339	>16.574	0.028	3	ASN	g
58415.6129	58415.6154	>16.290	0.015	3	ASN	g
58415.8866	58415.8937	4.049	0.064	5	OKU	C
58416.7213	58416.7239	>16.424	0.059	3	ASN	V
58416.8383	58416.8656	18.294	0.102	4	ATF	o
58416.8791	58416.8899	4.236	0.026	5	OKU	C
58417.0430	58417.0430	2.911	—	1	KU1	C
58417.6024	58417.6049	>16.582	0.035	3	ASN	g
58418.8840	58418.8965	4.116	0.079	4	OKU	C
58419.7745	58419.7771	>15.803	0.303	3	ASN	V
58419.9633	58419.9794	4.201	0.065	9	OKU	C
58420.6916	58420.6941	>16.984	0.031	3	ASN	g
58420.9523	58420.9684	3.693	0.044	10	OKU	C
58421.6887	58421.6900	>14.954	0.251	2	ASN	g
58421.9602	58421.9763	4.244	0.089	10	OKU	C
58423.2804	58423.2965	3.941	0.051	12	DP3	C
58423.6262	58423.6262	18.159	—	1	ZTF	zr
58424.3284	58424.3309	>17.739	0.044	3	ASN	g
58424.7866	58424.8315	18.431	0.068	8	ATF	o
58425.3289	58425.3313	>17.615	0.044	3	ASN	g
58426.6063	58426.6063	18.354	—	1	ZTF	zr
58426.6480	58426.6480	18.628	—	1	ZTF	zg
58427.7326	58427.7352	>17.140	0.045	3	ASN	V
58428.6498	58428.6522	>17.674	0.052	3	ASN	g
58428.7850	58428.8158	18.227	0.055	10	ATF	o
58429.6684	58429.6684	18.312	—	1	ZTF	zg
58430.2507	58430.3066	3.778	0.028	39	DP3	C
58430.2710	58430.2710	>17.667	—	1	ASN	g
58430.5768	58430.5794	>17.676	0.036	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58430.7155	58430.7155	18.077	—	1	ZTF	zi
58430.8012	58430.8307	18.040	0.050	4	ATF	cy
58432.5852	58432.5852	18.204	—	1	ZTF	zr
58432.6683	58432.6683	18.202	—	1	ZTF	zg
58432.7395	58432.7420	>17.079	0.065	3	ASN	V
58432.7689	58432.7828	18.260	0.062	4	ATF	o
58433.5665	58433.5690	>17.604	0.041	3	ASN	g
58434.5599	58434.5624	>17.503	0.036	3	ASN	g
58434.7221	58434.7221	18.284	—	1	ZTF	zi
58434.7820	58434.8115	18.497	0.043	4	ATF	cy
58435.5731	58435.5731	18.232	—	1	ZTF	zr
58436.7578	58436.7859	18.126	0.053	8	ATF	o
58440.2736	58440.2760	>16.061	0.111	3	ASN	g
58440.6159	58440.6183	>16.750	0.034	3	ASN	g
58441.5398	58441.5422	>16.493	0.045	3	ASN	g
58442.6302	58442.6326	>16.411	0.015	3	ASN	g
58442.7452	58442.7637	18.315	0.070	4	ATF	o
58443.2794	58443.2806	>15.996	0.148	2	ASN	g
58443.6050	58443.6050	18.304	—	1	ZTF	zr
58444.2763	58444.2788	>16.323	0.012	3	ASN	g
58444.7653	58444.7861	18.179	0.210	4	ATF	o
58445.7236	58445.7261	>16.033	0.016	3	ASN	V
58446.5244	58446.5269	>16.602	0.074	3	ASN	g
58447.5177	58447.5202	>16.607	0.039	3	ASN	g
58448.5962	58448.5974	>17.666	0.033	2	ASN	g
58448.7114	58448.7389	18.431	0.086	4	ATF	o
58450.7061	58450.7653	18.095	0.038	8	ATF	o
58451.6010	58451.6036	>17.675	0.053	3	ASN	g
58452.5698	58452.5723	>17.726	0.006	3	ASN	g
58452.7306	58452.7367	18.349	0.006	2	ATF	o
58453.5870	58453.5883	>17.507	0.158	2	ASN	g
58454.5922	58454.5947	>17.723	0.022	3	ASN	g
58454.7418	58454.7646	18.453	0.044	8	ATF	cy
58456.5773	58456.5798	>17.708	0.097	3	ASN	g
58456.7201	58456.7392	18.394	0.056	4	ATF	o
58457.5614	58457.5614	>17.567	—	1	ASN	g
58457.5922	58457.5922	18.222	—	1	ZTF	zg
58460.7200	58460.7547	18.329	0.033	8	ATF	o
58462.7271	58462.7575	18.454	0.041	8	ATF	cy
58464.7269	58464.7470	18.147	0.098	4	ATF	o
58468.7322	58468.7506	18.276	0.039	4	ATF	o
58469.6247	58469.6247	18.523	—	1	ZTF	zg
58470.7349	58470.7349	18.145	—	1	ATF	o
58472.5397	58472.5423	>16.166	0.107	3	ASN	g
58472.7249	58472.7450	18.116	0.048	4	ATF	o
58476.7253	58476.7467	18.761	0.162	4	ATF	o
58478.7356	58478.7356	18.692	—	1	ATF	o
58480.7327	58480.7387	18.488	0.002	2	ATF	o
58482.5773	58482.5921	18.661	0.123	3	ZTF	zr
58483.5768	58483.5918	18.423	0.036	4	ZTF	zr
58486.5800	58486.5947	18.785	0.079	4	ZTF	zr
58486.7002	58486.7133	18.997	0.300	3	ATF	cy
58487.5775	58487.5920	18.601	0.032	4	ZTF	zr
58488.5827	58488.5827	18.779	—	1	ZTF	zr
58567.9131	58567.9131	>15.931	—	1	ASN	g
58569.1445	58569.1470	>16.368	0.176	3	ASN	g
58569.6534	58569.6558	>15.352	0.212	3	ASN	g
58576.8926	58577.1226	>17.382	0.048	4	ASN	g
58578.1248	58578.1274	>17.541	0.098	3	ASN	g
58579.1244	58579.1270	>17.595	0.014	3	ASN	g
58580.8806	58580.8831	>17.231	0.017	3	ASN	g
58581.8839	58581.8863	>17.349	0.057	3	ASN	g
58582.8804	58582.8830	>17.347	0.019	3	ASN	g
58583.8755	58583.8781	>17.406	0.055	3	ASN	g
58584.8703	58584.8727	>17.336	0.010	3	ASN	g
58586.8604	58586.8630	>17.466	0.004	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58589.8581	58589.8608	>17.493	0.039	3	ASN	g
58592.1021	58592.1021	>16.314	–	1	ASN	g
58593.0956	58593.0982	>16.181	0.019	3	ASN	g
58593.8527	58593.8553	>16.120	0.044	3	ASN	g
58594.8713	58594.8737	>16.352	0.047	3	ASN	g
58597.0698	58597.0723	>16.490	0.039	3	ASN	g
58598.9353	58598.9378	>16.533	0.047	3	ASN	g
58603.8241	58603.8266	>16.197	0.171	3	ASN	g
58604.9270	58604.9294	>16.599	0.034	3	ASN	g
58605.6539	58605.6568	>17.696	0.035	3	ASN	g
58606.8144	58606.8168	>17.393	0.020	3	ASN	g
58607.9707	58607.9707	19.835	–	1	ZTF	zg
58608.8096	58608.8120	>17.217	0.108	3	ASN	g
58609.9112	58609.9112	>16.176	–	1	ASN	g
58611.0518	58611.0543	>17.704	0.072	3	ASN	g
58613.0909	58613.1126	19.728	0.143	3	ATF	o
58614.0423	58614.0448	>17.750	0.054	3	ASN	g
58615.0912	58615.1014	19.785	0.018	3	ATF	o
58616.0254	58616.0279	>17.637	0.023	3	ASN	g
58617.6117	58617.8936	>16.888	0.190	4	ASN	g
58618.5406	58618.5430	>16.806	0.044	3	ASN	g
58619.0775	58619.0933	20.330	0.087	3	ATF	o
58619.7786	58619.7811	>15.468	0.182	3	ASN	g
58620.5933	58620.8343	>16.549	0.026	6	ASN	g
58621.8737	58621.8762	>15.930	0.031	3	ASN	g
58624.7631	58624.7656	>16.206	0.034	3	ASN	g
58625.0478	58625.0555	19.140	0.022	2	ATF	o
58625.7612	58625.7638	>16.318	0.060	3	ASN	g
58627.0583	58627.0680	19.412	0.240	2	ATF	o
58630.9801	58630.9827	>17.691	0.102	3	ASN	g
58631.0464	58631.0464	20.268	–	1	ATF	o
58631.8236	58631.8260	>16.799	0.078	3	ASN	g
58633.0587	58633.0803	19.963	0.184	3	ATF	o
58633.8946	58633.8946	>17.664	–	1	ASN	g
58634.9606	58634.9606	19.830	–	1	ZTF	zg
58635.0432	58635.0521	19.852	0.260	3	ATF	cy
58635.9733	58635.9758	>17.756	0.026	3	ASN	g
58637.0153	58637.0349	19.895	0.068	4	ATF	o
58637.4899	58637.4911	>17.715	0.008	2	ASN	g
58637.9610	58637.9610	19.808	–	1	ZTF	zg
58638.7227	58638.7227	>13.563	–	1	ASN	g
58639.7229	58639.7255	>17.232	0.030	3	ASN	g
58639.9739	58639.9739	19.888	–	1	ZTF	zi
58640.8657	58640.8682	>17.081	0.120	3	ASN	g
58640.9451	58640.9451	19.974	–	1	ZTF	zg
58640.9625	58640.9625	19.842	–	1	ZTF	zr
58642.4842	58642.4842	>17.733	–	1	ASN	g
58643.0432	58643.0631	19.935	0.099	4	ATF	cy
58643.7069	58643.7093	>17.548	0.056	3	ASN	g
58643.9792	58643.9792	19.969	–	1	ZTF	zr
58644.7289	58644.7314	>17.599	0.043	3	ASN	g
58644.9987	58645.0168	19.601	0.059	4	ATF	o
58645.4679	58645.4703	>17.471	0.063	3	ASN	g
58646.7569	58646.7593	>17.044	0.051	3	ASN	g
58646.9201	58646.9201	19.785	–	1	ZTF	zg
58646.9619	58646.9619	19.951	–	1	ZTF	zr
58646.9975	58647.0093	20.052	0.322	2	ATF	o
58647.7370	58647.7394	>16.708	0.075	3	ASN	g
58648.6995	58648.7020	>16.319	0.043	3	ASN	g
58649.0130	58649.0233	19.649	0.242	2	ATF	o
58649.8821	58649.8821	19.876	–	1	ZTF	zg
58649.9816	58649.9841	>16.755	0.057	3	ASN	g
58650.8887	58650.8912	>16.373	0.095	3	ASN	g
58650.9757	58650.9921	19.731	0.051	3	ATF	o
58652.6954	58652.6980	>15.999	0.038	3	ASN	g
58652.9758	58652.9958	19.120	0.014	2	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58653.6986	58653.7010	>16.050	0.019	3	ASN	g
58653.9608	58653.9608	19.893	—	1	ZTF	zi
58657.9195	58657.9195	20.045	—	1	ZTF	zr
58657.9370	58657.9396	>16.971	0.012	3	ASN	g
58658.9207	58658.9207	20.140	—	1	ZTF	zi
58659.7745	58659.7745	>17.278	—	1	ASN	g
58660.9226	58660.9226	19.873	—	1	ZTF	zg
58660.9604	58660.9604	19.892	—	1	ZTF	zr
58661.0547	58661.0547	19.773	—	1	ATF	o
58662.8369	58662.8369	20.354	—	1	ZTF	zi
58662.8677	58662.8703	>17.694	0.010	3	ASN	g
58663.9199	58663.9199	19.965	—	1	ZTF	zr
58663.9797	58663.9797	19.828	—	1	ZTF	zg
58665.0479	58665.0706	19.954	0.117	5	ATF	o
58666.9398	58666.9398	19.947	—	1	ZTF	zi
58666.9603	58666.9603	19.841	—	1	ZTF	zg
58667.0073	58667.0336	19.856	0.089	4	ATF	cy
58667.7582	58667.7606	>17.618	0.016	3	ASN	g
58668.7209	58668.7234	>17.686	0.038	3	ASN	g
58669.0296	58669.0525	20.098	0.103	4	ATF	o
58669.9419	58669.9419	19.827	—	1	ZTF	zg
58670.0064	58670.0090	>17.837	0.056	3	ASN	g
58670.9000	58670.9000	20.001	—	1	ZTF	zi
58670.9034	58670.9059	>15.911	0.146	3	ASN	g
58671.0154	58671.0398	19.806	0.136	3	ATF	o
58672.9238	58672.9238	19.785	—	1	ZTF	zg
58672.9353	58672.9353	>17.833	—	1	ASN	g
58674.0578	58674.0769	19.995	0.141	3	ATF	o
58674.7222	58674.7222	>17.364	—	1	ASN	g
58675.3529	58675.3553	>16.545	0.022	3	ASN	g
58675.7878	58675.7902	>16.436	0.248	3	ASN	g
58675.9609	58675.9609	19.984	—	1	ZTF	zr
58676.7949	58676.7974	>17.204	0.065	3	ASN	g
58676.9736	58676.9736	20.240	—	1	ATF	o
58677.7851	58677.7878	>16.795	0.017	3	ASN	g
58678.6373	58678.6397	>16.408	0.096	3	ASN	g
58678.9138	58678.9708	19.592	0.119	3	ATF	o
58678.9830	58678.9830	20.014	—	1	ZTF	zr
58679.4265	58679.4289	>16.302	0.044	3	ASN	g
58679.8897	58679.8923	>16.475	0.052	2	ASN	g
58680.8604	58680.8629	>15.907	0.039	3	ASN	g
58686.9980	58686.9980	19.953	—	1	ATF	o
58688.8364	58688.8364	19.960	—	1	ZTF	zi
58689.0093	58689.0179	20.071	0.063	3	ATF	o
58689.0540	58689.0565	>17.529	0.056	3	ASN	g
58690.0537	58690.0562	>17.674	0.028	3	ASN	g
58690.6229	58690.6253	>17.315	0.097	3	ASN	g
58690.7996	58690.7996	19.902	—	1	ZTF	zg
58690.8740	58690.8740	20.079	—	1	ZTF	zr
58690.9741	58690.9942	20.263	0.158	4	ATF	o
58691.6166	58691.6934	>17.364	0.158	6	ASN	g
58692.0453	58692.0478	>17.732	0.028	3	ASN	g
58692.7963	58692.7963	19.986	—	1	ZTF	zi
58692.9914	58693.0028	19.667	0.063	2	ATF	o
58693.8156	58693.8156	19.910	—	1	ZTF	zg
58693.8564	58693.8564	19.951	—	1	ZTF	zr
58694.9649	58694.9858	20.132	0.162	4	ATF	cy
58696.8650	58696.8650	19.922	—	1	ZTF	zr
58696.9586	58696.9808	19.725	0.118	4	ATF	o
58697.2972	58697.2996	>17.618	0.042	3	ASN	g
58697.8068	58697.8094	>17.629	0.047	3	ASN	g
58698.8884	58698.8884	20.192	—	1	ZTF	zi
58698.9856	58698.9881	>16.930	0.196	3	ASN	g
58699.4560	58699.4584	>17.804	0.012	3	ASN	g
58699.8712	58699.8712	20.100	—	1	ZTF	zr
58699.9270	58699.9270	19.937	—	1	ZTF	zg

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58699.9931	58699.9956	>17.128	0.199	3	ASN	g
58700.5067	58700.5706	>17.475	0.081	6	ASN	g
58700.9206	58700.9231	>17.789	0.007	3	ASN	g
58700.9497	58700.9676	19.743	0.183	3	ATF	o
58701.7648	58701.7672	>17.644	0.086	3	ASN	g
58702.5813	58702.5837	>17.086	0.016	3	ASN	g
58702.8845	58702.8845	20.048	–	1	ZTF	zr
58702.9110	58702.9300	20.117	0.132	4	ATF	cy
58703.7894	58703.7919	>17.139	0.014	3	ASN	g
58703.8801	58703.8801	20.096	–	1	ZTF	zi
58703.9905	58703.9928	19.973	0.148	6	ATF	o
58704.9305	58704.9520	19.765	0.048	3	ATF	o
58705.4855	58705.4880	>17.109	0.062	3	ASN	g
58705.6703	58705.6703	19.849	–	1	ZTF	zr
58706.3108	58706.3137	>16.604	0.059	3	ASN	g
58706.8189	58706.8215	>15.337	0.123	3	ASN	g
58707.6475	58707.8782	>16.617	0.056	6	ASN	g
58708.5165	58708.6189	>16.256	0.041	5	ASN	g
58708.9234	58708.9234	19.833	–	1	ZTF	zg
58712.5683	58712.5683	>16.265	–	1	ASN	g
58712.7116	58712.7116	19.777	–	1	ZTF	zi
58713.9233	58713.9388	>16.465	0.197	4	ASN	g
58714.9473	58714.9498	>16.749	0.015	3	ASN	g
58715.6316	58715.6342	>17.065	0.021	3	ASN	g
58715.8160	58715.8160	19.931	–	1	ZTF	zr
58715.9351	58715.9376	>17.088	0.016	3	ASN	g
58716.4972	58716.4996	>16.927	0.055	3	ASN	g
58716.8324	58716.8324	20.205	–	1	ZTF	zi
58716.9421	58716.9447	>17.378	0.124	3	ASN	g
58717.4823	58717.4847	>17.024	0.065	3	ASN	g
58717.9705	58717.9730	>17.470	0.079	3	ASN	g
58718.4415	58718.4439	>17.645	0.051	3	ASN	g
58718.8264	58718.8264	20.059	–	1	ZTF	zr
58718.9278	58718.9366	20.099	0.260	3	ATF	o
58718.9748	58718.9773	>17.499	0.043	3	ASN	g
58721.0626	58721.0626	19.924	–	1	ATF	o
58721.7338	58721.7363	>17.745	0.053	3	ASN	g
58722.0543	58722.0556	20.077	0.073	2	SKM	Vis
58722.7537	58722.7561	>17.808	0.069	3	ASN	g
58723.3511	58723.3535	>17.856	0.076	3	ASN	g
58723.8392	58723.8417	>17.905	0.037	3	ASN	g
58724.4097	58724.5200	>17.694	0.072	6	ASN	g
58724.8267	58724.8267	19.954	–	1	ZTF	zi
58724.8742	58724.8742	20.066	–	1	ZTF	zr
58724.9116	58724.9142	>17.818	0.095	3	ASN	g
58724.9369	58724.9560	20.309	0.221	3	ATF	o
58725.5063	58725.5087	>17.503	0.022	3	ASN	g
58725.8874	58725.8900	>14.453	0.234	3	ASN	g
58726.8827	58726.9056	20.026	0.149	4	ATF	cy
58726.9362	58726.9387	>17.823	0.057	3	ASN	g
58727.7632	58727.7632	20.005	–	1	ZTF	zg
58728.7527	58728.7551	>17.420	0.024	3	ASN	g
58729.3537	58729.5569	>17.692	0.097	6	ASN	g
58730.4981	58730.7248	>17.518	0.087	6	ASN	g
58730.9004	58730.9205	20.174	0.156	4	ATF	cy
58732.2797	58732.2821	>17.157	0.013	3	ASN	g
58732.7823	58732.7849	>17.040	0.066	3	ASN	g
58732.8021	58732.8021	19.980	–	1	ZTF	zg
58732.8173	58732.8173	20.191	–	1	ZTF	zi
58733.3215	58733.3239	>17.232	0.108	3	ASN	g
58733.7662	58733.7687	>17.052	0.015	3	ASN	g
58740.6060	58740.6084	>16.007	0.074	3	ASN	g
58741.5559	58741.5583	>16.265	0.021	3	ASN	g
58743.5427	58743.5451	>17.229	0.049	3	ASN	g
58744.4858	58744.4882	>15.773	0.195	3	ASN	g
58744.8588	58744.8588	20.044	–	1	ZTF	zr

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58744.9047	58744.9072	>16.899	0.118	3	ASN	g
58745.8858	58745.8884	>16.933	0.061	3	ASN	g
58746.8811	58746.8837	>16.012	0.124	3	ASN	g
58747.7751	58747.7751	19.932	—	1	ZTF	zg
58748.7287	58748.7312	>16.591	0.062	3	ASN	g
58748.7762	58748.7762	20.032	—	1	ZTF	zi
58750.4244	58750.5659	>17.719	0.053	6	ASN	g
58750.7546	58750.7546	19.881	—	1	ZTF	zr
58750.8706	58750.8732	>17.872	0.047	3	ASN	g
58750.8891	58750.9105	20.141	0.212	4	ATF	cy
58751.5602	58751.5627	>17.591	0.068	3	ASN	g
58751.8817	58751.8843	>17.772	0.040	2	ASN	g
58752.4481	58752.5664	>17.640	0.087	4	ASN	g
58752.8792	58752.8890	20.183	0.119	3	ATF	o
58752.8812	58752.8838	>17.836	0.049	3	ASN	g
58753.4479	58753.4503	>17.444	0.015	3	ASN	g
58753.8885	58753.8910	>17.821	0.082	3	ASN	g
58754.6834	58754.6859	>17.493	0.041	3	ASN	g
58754.7059	58754.7059	20.051	—	1	ZTF	zr
58754.7538	58754.7538	19.877	—	1	ZTF	zg
58755.6798	58755.6810	>17.695	0.117	2	ASN	g
58756.6927	58756.6953	>17.452	0.046	3	ASN	g
58756.8115	58756.8333	20.408	0.185	3	ATF	o
58757.6892	58757.6892	19.969	—	1	ZTF	zg
58757.6896	58757.6921	>17.393	0.085	3	ASN	g
58760.7706	58760.7706	>14.371	—	1	ASN	g
58760.7711	58760.7711	19.801	—	1	ZTF	zr
58761.3414	58761.3439	>17.133	0.015	3	ASN	g
58761.7841	58761.7867	>17.462	0.059	3	ASN	g
58761.8054	58761.8054	19.906	—	1	ZTF	zi
58762.6799	58762.6824	>16.776	0.062	3	ASN	g
58762.7379	58762.7593	19.751	0.208	4	ATF	o
58767.3261	58767.3285	>16.374	0.050	3	ASN	g
58768.3465	58768.3489	>16.111	0.087	3	ASN	g
58768.8334	58768.8360	>15.839	0.131	3	ASN	g
58768.8889	58768.8889	18.213	—	1	ATF	o
58769.8370	58769.8395	>16.522	0.051	3	ASN	g
58770.7893	58770.7919	>16.716	0.050	3	ASN	g
58770.8877	58770.8997	19.538	0.121	3	ATF	o
58771.6915	58771.6939	>15.745	0.055	3	ASN	g
58772.3832	58772.3857	>16.601	0.138	3	ASN	g
58772.7473	58772.8489	19.733	0.055	3	ATF	o
58772.8276	58772.8302	>16.944	0.091	3	ASN	g
58773.5296	58773.7405	>17.142	0.219	6	ASN	g
58774.8209	58774.8287	19.899	0.331	2	ATF	o
58775.3922	58775.3947	>17.261	0.036	3	ASN	g
58775.8184	58775.8210	>17.819	0.075	3	ASN	g
58776.6914	58776.6914	20.184	—	1	ZTF	zr
58777.8133	58777.8159	>17.812	0.009	3	ASN	g
58778.7490	58778.7712	20.113	0.201	4	ATF	cy
58778.8090	58778.8116	>17.807	0.065	3	ASN	g
58779.6268	58779.6268	>13.959	—	1	ASN	g
58780.6294	58780.6319	>17.400	0.145	3	ASN	g
58780.7682	58780.7770	19.908	0.129	3	ATF	o
58781.6039	58781.6039	19.798	—	1	ZTF	zr
58781.6234	58781.6259	>17.432	0.019	3	ASN	g
58782.6254	58782.6278	>17.462	0.024	3	ASN	g
58783.7925	58783.7950	>17.732	0.035	3	ASN	g
58784.7205	58784.7417	20.005	0.115	4	ATF	o
58785.6472	58785.6472	>17.869	—	1	ASN	g
58786.3611	58786.3636	>17.774	0.172	3	ASN	g
58788.6574	58788.6599	>17.779	0.036	3	ASN	g
58788.7749	58788.7948	20.447	0.040	4	ATF	o
58789.7122	58789.7122	20.526	—	1	ZTF	zr
58790.6576	58790.6600	>15.454	0.132	3	ASN	g
58790.7044	58790.7163	20.076	0.107	2	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58794.5839	58794.6058	>16.291	0.038	4	ASN	g
58794.6483	58794.6483	20.268	—	1	ZTF	zg
58795.5648	58795.5673	>16.411	0.053	3	ASN	g
58796.5805	58796.5830	>16.052	0.053	3	ASN	g
58796.7095	58796.7095	19.327	—	1	ATF	o
58797.5700	58797.5725	>16.373	0.069	3	ASN	g
58798.5643	58798.7544	>16.447	0.118	5	ASN	g
58799.3272	58799.3297	>15.903	0.031	3	ASN	g
58800.3214	58800.3238	>15.979	0.067	3	ASN	g
58800.7291	58800.7304	>16.752	0.038	2	ASN	g
58800.7834	58800.7834	19.954	—	1	ATF	o
58801.2706	58801.2730	>16.752	0.063	3	ASN	g
58801.5728	58801.5728	19.974	—	1	ZTF	zr
58801.6755	58801.6755	19.885	—	1	ZTF	zg
58801.7276	58801.7302	>17.049	0.067	3	ASN	g
58802.6560	58802.6584	>16.527	0.023	3	ASN	g
58802.7618	58802.7710	20.199	0.161	2	ATF	o
58803.2905	58803.2929	>17.594	0.039	3	ASN	g
58803.7232	58803.7258	>17.768	0.037	3	ASN	g
58804.5656	58804.6531	>17.303	0.109	6	ASN	g
58805.5426	58805.5450	>17.365	0.057	3	ASN	g
58806.2593	58806.2617	>14.409	0.246	3	ASN	g
58807.5364	58807.5388	>17.409	0.054	3	ASN	g
58808.5709	58808.5734	>17.312	0.081	3	ASN	g
58808.7735	58808.7901	20.127	0.128	3	ATF	o
58809.3209	58809.3234	>17.494	0.061	3	ASN	g
58810.6387	58810.6412	>17.728	0.021	3	ASN	g
58811.2745	58811.2773	>17.258	0.018	3	ASN	g
58811.6991	58811.7016	>17.466	0.094	3	ASN	g
58812.2711	58812.2736	>16.834	0.071	3	ASN	g
58812.7083	58812.7279	20.187	0.150	4	ATF	o
58813.5708	58813.6979	>17.323	0.096	6	ASN	g
58814.5699	58814.5724	>17.259	0.013	3	ASN	g
58814.7460	58814.7460	20.073	—	1	ATF	cy
58815.6877	58815.6903	>16.543	0.177	3	ASN	g
58816.5636	58816.5662	>17.289	0.072	3	ASN	g
58816.7402	58816.7602	20.331	0.284	2	ATF	o
58823.5995	58823.6019	>14.702	0.361	3	ASN	g
58824.5663	58824.5688	>16.856	0.057	3	ASN	g
58825.5478	58825.5503	>16.729	0.129	3	ASN	g
58828.7081	58828.7081	19.635	—	1	ATF	o
58831.5830	58831.5854	>16.653	0.096	3	ASN	g
58832.7058	58832.7058	19.595	—	1	ATF	o
58833.5873	58833.5897	>17.594	0.029	3	ASN	g
58834.7015	58834.7015	19.750	—	1	ATF	cy
58835.5920	58835.5920	>17.520	—	1	ASN	g
58839.5851	58839.5875	>17.519	0.048	3	ASN	g
58846.5860	58846.5908	20.029	0.015	2	ZTF	zr
58852.5922	58852.5922	19.935	—	1	ZTF	zr
58931.6527	58931.6552	>16.156	0.089	3	ASN	g
58942.1205	58942.1231	>17.298	0.051	3	ASN	g
58950.0845	58950.0845	19.351	—	1	ATF	o
58951.0924	58951.0924	17.859	—	1	ATF	o
58957.1025	58957.1097	19.882	0.157	2	ATF	o
58958.0911	58958.0911	>17.137	—	1	ASN	g
58959.0794	58959.0819	>17.543	0.064	3	ASN	g
58959.0919	58959.0951	20.311	0.086	2	ATF	cy
58962.0714	58962.0739	>17.583	0.082	3	ASN	g
58964.9432	58964.9456	>17.542	0.070	3	ASN	g
58965.1000	58965.1117	18.831	0.001	2	ATF	o
58967.0610	58967.0635	>17.642	0.052	3	ASN	g
58967.0890	58967.1192	20.218	0.117	4	ATF	cy
58969.0608	58969.0634	>17.597	0.083	3	ASN	g
58973.0521	58973.0547	>17.423	0.036	3	ASN	g
58973.0524	58973.1006	19.911	0.115	4	ATF	o
58974.9141	58974.9166	>16.359	0.033	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58978.5481	58978.5481	>15.786	—	1	ASN	g
58979.9603	58979.9603	19.726	—	1	ZTF	zr
58980.5585	58980.5611	>16.342	0.081	3	ASN	g
58986.6761	58986.6791	>17.103	0.093	3	ASN	g
58987.9574	58987.9574	20.373	—	1	ZTF	zg
58987.9861	58987.9861	20.379	—	1	ZTF	zr
58989.0306	58989.0331	>17.738	0.084	3	ASN	g
58991.0639	58991.0857	20.303	0.278	3	ATF	cy
58991.5734	58991.5734	>17.530	—	1	ASN	g
58992.5035	58992.5060	>17.408	0.033	3	ASN	g
58993.0514	58993.0744	20.135	0.122	4	ATF	o
58995.0594	58995.0594	20.072	—	1	ATF	cy
58995.9783	58995.9808	>17.471	0.105	3	ASN	g
58996.9490	58996.9490	20.104	—	1	ZTF	zg
58996.9649	58996.9649	20.488	—	1	ZTF	zr
58998.9851	58998.9877	>17.783	0.009	3	ASN	g
58999.0412	58999.0412	20.127	—	1	ATF	cy
58999.9137	58999.9137	20.381	—	1	ZTF	zg
58999.9580	58999.9580	20.304	—	1	ZTF	zr
59001.0637	59001.0688	20.031	0.201	3	ATF	o
59001.5365	59001.5378	>17.559	0.098	2	ASN	g
59002.8530	59002.8554	>16.702	0.027	3	ASN	g
59002.9401	59002.9401	19.995	—	1	ZTF	zg
59002.9635	59002.9635	20.284	—	1	ZTF	zr
59003.0761	59003.0881	20.367	0.208	2	ATF	cy
59004.8444	59004.8469	>16.280	0.061	3	ASN	g
59005.0059	59005.0096	19.715	0.019	2	ATF	o
59008.4783	59008.4796	>15.726	0.009	2	ASN	g
59008.9388	59008.9413	>16.463	0.047	3	ASN	g
59009.0369	59009.0369	19.644	—	1	ATF	o
59012.9404	59012.9430	>16.820	0.030	3	ASN	g
59014.9539	59014.9566	>17.726	0.042	3	ASN	g
59014.9794	59014.9794	20.086	—	1	ZTF	zr
59015.8778	59015.8778	>15.514	—	1	ASN	g
59016.5657	59016.5681	>17.661	0.073	3	ASN	g
59017.0273	59017.0300	>17.712	0.068	3	ASN	g
59017.8180	59017.8180	20.271	—	1	ZTF	zg
59018.4894	59018.4919	>17.601	0.091	3	ASN	g
59020.9708	59020.9708	20.279	—	1	ZTF	zr
59021.0305	59021.0305	20.315	—	1	ATF	o
59021.4312	59021.4328	>15.588	0.276	2	ASN	g
59023.0156	59023.0279	20.325	0.126	3	ATF	cy
59023.8428	59023.8428	20.286	—	1	ZTF	zg
59023.9149	59023.9175	>17.702	0.104	3	ASN	g
59025.0084	59025.0084	19.829	—	1	ATF	o
59025.7861	59025.7861	>17.461	—	1	ASN	g
59026.8785	59026.8785	20.551	—	1	ZTF	zg
59026.9611	59026.9611	20.328	—	1	ZTF	zr
59028.9911	59028.9937	>17.836	0.052	3	ASN	g
59029.0062	59029.0062	20.716	—	1	ATF	o
59030.9416	59030.9443	>17.095	0.108	3	ASN	g
59033.0914	59033.0940	>17.823	0.042	3	ASN	g
59036.4902	59036.4926	>15.983	0.113	3	ASN	g
59041.8613	59041.8639	>17.716	0.100	3	ASN	g
59042.8353	59042.8353	20.224	—	1	ZTF	zg
59042.8908	59042.8908	20.537	—	1	ZTF	zr
59043.9055	59043.9081	>17.732	0.092	3	ASN	g
59045.8557	59045.8557	20.571	—	1	ZTF	zr
59045.9408	59045.9408	20.302	—	1	ZTF	zg
59046.3508	59046.3534	>17.635	0.090	3	ASN	g
59048.8643	59048.8669	>17.885	0.063	3	ASN	g
59048.9658	59048.9686	20.239	0.119	2	ATF	o
59050.9544	59050.9862	20.162	0.172	4	ATF	cy
59051.8574	59051.8600	>17.788	0.037	3	ASN	g
59051.8775	59051.8775	20.484	—	1	ZTF	zr
59053.0353	59053.0395	20.285	0.263	2	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59053.8143	59053.8143	>17.721	—	1	ASN	g
59054.8607	59054.8607	20.453	—	1	ZTF	zr
59054.9408	59054.9408	20.283	—	1	ZTF	zg
59056.3177	59056.3201	>16.903	0.018	3	ASN	g
59057.8658	59057.8658	20.533	—	1	ZTF	zr
59057.8887	59057.8887	20.423	—	1	ZTF	zg
59058.3134	59058.3158	>16.710	0.059	3	ASN	g
59059.9251	59059.9276	>17.411	0.029	3	ASN	g
59060.8441	59060.8446	20.422	0.121	2	ZTF	zg
59060.9015	59060.9040	>17.801	0.081	3	ASN	g
59060.9424	59060.9424	20.377	—	1	ATF	o
59061.8473	59061.8473	20.530	—	1	ZTF	zr
59061.8605	59061.8629	>17.010	0.048	3	ASN	g
59062.8982	59062.9000	19.756	0.151	2	ATF	o
59063.0213	59063.0239	>16.644	0.017	3	ASN	g
59063.8350	59063.8350	20.090	—	1	ZTF	zr
59067.8119	59067.8119	20.458	—	1	ZTF	zr
59068.9365	59068.9389	>16.857	0.074	3	ASN	g
59069.7655	59069.7680	>16.635	0.011	3	ASN	g
59070.8482	59070.8507	>17.809	0.043	3	ASN	g
59072.8361	59072.8361	20.421	—	1	ZTF	zg
59072.8717	59072.8742	>17.762	0.082	3	ASN	g
59072.9814	59072.9842	19.982	0.094	2	ATF	o
59073.8443	59073.8467	>17.424	0.018	3	ASN	g
59074.8746	59074.8771	>17.439	0.094	3	ASN	g
59074.9711	59074.9841	20.306	0.155	4	ATF	o
59075.8028	59075.8052	>17.796	0.008	3	ASN	g
59076.7947	59076.7947	20.372	—	1	ZTF	zg
59076.9448	59076.9539	20.364	0.248	2	ATF	o
59078.8850	59078.8994	20.090	0.077	5	ATF	cy
59078.9178	59078.9202	>17.803	0.059	3	ASN	g
59079.8087	59079.8705	20.470	0.048	5	ZTF	zr
59079.8153	59079.8153	20.273	—	1	ZTF	zg
59080.7425	59080.7450	>17.707	0.016	3	ASN	g
59080.9204	59080.9312	20.524	0.179	2	ATF	o
59082.7704	59082.7704	20.731	—	1	ZTF	zr
59082.7943	59082.7943	20.211	—	1	ZTF	zg
59082.8677	59082.8702	>17.311	0.101	3	ASN	g
59082.8835	59082.9111	20.208	0.138	4	ATF	cy
59084.9207	59084.9880	20.447	0.172	4	ATF	o
59085.8649	59085.8649	>16.968	—	1	ASN	g
59086.7733	59086.7733	20.458	—	1	ZTF	zg
59086.7805	59086.7830	>17.284	0.059	3	ASN	g
59086.8149	59086.8149	20.334	—	1	ZTF	zr
59088.8224	59088.8224	20.418	—	1	ZTF	zg
59088.8940	59088.8940	19.940	—	1	ATF	o
59089.0830	59089.0830	>14.000	—	1	BNK	Vis
59090.8813	59090.8813	20.020	—	1	ATF	o
59094.9511	59094.9536	>16.178	0.104	3	ASN	g
59095.9187	59095.9211	>16.483	0.056	3	ASN	g
59097.8073	59097.8097	>16.834	0.047	3	ASN	g
59098.7259	59098.7269	20.365	0.079	2	ZTF	zg
59098.7980	59098.7989	20.316	0.072	2	ZTF	zr
59099.8214	59099.8239	>17.584	0.065	3	ASN	g
59100.1449	59100.1449	>14.700	—	1	Oht	cG
59100.8767	59100.8827	20.202	0.122	2	ATF	o
59101.9115	59101.9235	20.099	0.037	2	ATF	o
59101.9131	59101.9156	>17.438	0.049	3	ASN	g
59102.8519	59102.8788	20.260	0.217	3	ATF	cy
59103.2341	59103.2366	>17.306	0.054	3	ASN	g
59104.8834	59104.8918	20.615	0.229	3	ATF	o
59105.8707	59105.9016	20.310	0.200	2	ATF	cy
59105.9007	59105.9032	>17.744	0.061	3	ASN	g
59106.7095	59106.7095	20.058	—	1	ZTF	zr
59106.8802	59106.9015	20.427	0.080	4	ATF	cy
59108.7715	59108.7715	20.314	—	1	ZTF	zg

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59108.7924	59108.7949	>17.796	0.012	3	ASN	g
59108.8415	59108.8447	20.525	0.020	2	ATF	o
59110.8435	59110.8471	20.313	0.103	2	ATF	cy
59111.7954	59111.7979	>15.419	0.066	3	ASN	g
59112.4749	59112.4762	>17.373	0.037	2	ASN	g
59112.8338	59112.8532	20.370	0.037	2	ATF	o
59114.7095	59114.7104	20.405	0.143	2	ZTF	zg
59114.7774	59114.7792	20.448	0.033	2	ZTF	zr
59114.8536	59114.8702	19.989	0.270	2	ATF	cy
59115.1250	59115.1250	>15.000	–	1	BNK	Vis
59115.7990	59115.8015	>17.544	0.074	3	ASN	g
59117.7813	59117.7813	19.611	–	1	ATF	o
59125.6899	59125.6899	20.153	–	1	ZTF	zg
59125.7549	59125.7708	20.338	0.031	2	ZTF	zr
59127.8334	59127.8359	>15.131	0.358	3	ASN	g
59128.6864	59128.6864	20.017	–	1	ZTF	zg
59128.9152	59128.9203	19.985	0.011	2	ATF	o
59129.6905	59129.6962	20.298	0.011	2	ZTF	zr
59130.6706	59130.6706	20.734	–	1	ZTF	zg
59130.7073	59130.7073	20.402	–	1	ZTF	zr
59130.7254	59130.7279	>17.747	0.101	3	ASN	g
59130.8249	59130.8500	20.378	0.222	3	ATF	cy
59131.6902	59131.7061	20.383	0.000	2	ZTF	zg
59131.8194	59131.8218	>17.643	0.065	3	ASN	g
59132.7655	59132.7679	>17.284	0.056	3	ASN	g
59134.6459	59134.6459	20.468	–	1	ZTF	zg
59134.6858	59134.6858	20.480	–	1	ZTF	zr
59135.7296	59135.7296	20.358	–	1	ZTF	zg
59135.7694	59135.7694	20.464	–	1	ZTF	zr
59136.3690	59136.3702	>17.626	0.107	2	ASN	g
59136.6311	59136.6325	20.438	0.024	2	ZTF	zg
59136.6697	59136.6745	20.563	0.075	2	ZTF	zr
59136.8401	59136.8461	20.458	0.119	2	ATF	o
59137.6754	59137.6754	20.377	–	1	ZTF	zr
59137.7290	59137.7290	20.574	–	1	ZTF	zg
59138.6187	59138.6200	20.456	0.075	2	ZTF	zr
59138.6963	59138.6972	20.407	0.083	2	ZTF	zg
59138.8189	59138.8447	20.315	0.100	4	ATF	cy
59139.1110	59139.1110	>14.600	–	1	BNK	Vis
59139.7486	59139.7486	>17.619	–	1	ASN	g
59140.6165	59140.6175	20.527	0.104	2	ZTF	zr
59140.6544	59140.6553	20.398	0.097	2	ZTF	zg
59141.6478	59141.6478	20.694	–	1	ZTF	zr
59141.8806	59141.8806	>15.600	–	1	HSP	Vis
59142.5550	59142.5574	>17.512	0.111	2	ASN	g
59142.6137	59142.6146	20.375	0.072	2	ZTF	zg
59142.6459	59142.6459	20.535	–	1	ZTF	zr
59142.7867	59142.8014	20.339	0.319	2	ATF	cy
59143.6334	59143.6334	20.622	–	1	ZTF	zr
59143.6925	59143.6925	20.353	–	1	ZTF	zg
59144.6170	59144.6195	>17.256	0.066	3	ASN	g
59144.7767	59144.7767	20.125	–	1	ATF	o
59145.7048	59145.7072	>17.020	0.043	3	ASN	g
59146.8093	59146.8093	19.877	–	1	ATF	o
59149.8887	59149.8887	>15.100	–	1	Mdy	c
59151.6114	59151.6114	20.311	–	1	ZTF	zr
59152.6987	59152.7011	>16.172	0.015	3	ASN	g
59153.6856	59153.6880	>15.977	0.045	3	ASN	g
59153.9027	59153.9027	>15.100	–	1	Mdy	c
59155.5987	59155.5987	20.349	–	1	ZTF	zr
59155.6478	59155.6478	20.174	–	1	ZTF	zg
59155.6773	59155.6797	>16.422	0.103	3	ASN	g
59156.6057	59156.6067	20.597	0.060	2	ZTF	zg
59156.6752	59156.6764	>13.726	0.159	2	ASN	g
59156.7694	59156.7694	20.038	–	1	ATF	o
59156.8910	59156.8910	>14.400	–	1	Mdy	c

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59157.6694	59157.6719	>16.699	0.027	3	ASN	g
59157.8997	59157.8997	>16.000	—	1	Mdy	c
59158.6256	59158.6256	20.270	—	1	ZTF	zr
59158.6523	59158.6547	20.353	0.104	2	ZTF	zg
59158.6727	59158.6752	>16.716	0.044	3	ASN	g
59158.7424	59158.7511	20.143	0.375	2	ATF	o
59159.6617	59159.6629	>17.492	0.054	2	ASN	g
59160.7870	59160.7870	20.413	—	1	ATF	o
59162.6490	59162.6515	>17.503	0.095	3	ASN	g
59164.5642	59164.5667	>17.497	0.028	3	ASN	g
59164.6465	59164.6465	20.520	—	1	ZTF	zr
59165.6009	59165.6009	20.604	—	1	ZTF	zr
59165.6486	59165.6486	>17.792	—	1	ASN	g
59165.6616	59165.6616	20.640	—	1	ZTF	zg
59167.6286	59167.6286	20.567	—	1	ZTF	zg
59167.6458	59167.6470	>17.611	0.050	2	ASN	g
59168.5581	59168.5607	>17.438	0.022	3	ASN	g
59168.6035	59168.6035	20.190	—	1	ZTF	zg
59168.6172	59168.6172	20.444	—	1	ZTF	zr
59170.6338	59170.6351	>17.623	0.003	2	ASN	g
59170.7393	59170.7508	19.373	0.612	3	ATF	cy
59171.6032	59171.6032	20.337	—	1	ZTF	zr
59171.6275	59171.6275	20.314	—	1	ZTF	zg
59171.6398	59171.6410	>17.612	0.013	2	ASN	g
59172.7347	59172.7564	20.118	0.153	2	ATF	o
59173.5806	59173.5806	20.322	—	1	ZTF	zr
59173.6277	59173.6277	20.494	—	1	ZTF	zg
59178.2808	59178.2833	>16.280	0.220	3	ASN	g
59178.6604	59178.6604	20.452	—	1	ZTF	zr
59179.5189	59179.5214	>16.162	0.058	3	ASN	g
59180.5276	59180.5302	>16.459	0.034	3	ASN	g
59182.5210	59182.5236	>16.087	0.046	3	ASN	g
59182.6293	59182.6293	20.077	—	1	ZTF	zg
59184.6004	59184.6029	>16.202	0.037	3	ASN	g
59184.7407	59184.7407	19.936	—	1	ATF	o
59187.5795	59187.5819	>16.909	0.058	3	ASN	g
59188.5930	59188.5930	20.218	—	1	ZTF	zr
59188.7063	59188.7179	19.398	0.113	2	ATF	o
59190.6116	59190.6116	20.337	—	1	ZTF	zr
59191.5748	59191.5772	>17.506	0.075	3	ASN	g
59193.5751	59193.5775	>17.512	0.003	3	ASN	g
59194.7229	59194.7229	20.292	—	1	ATF	cy
59196.5489	59196.5489	>17.320	—	1	ASN	g
59198.5573	59198.5597	>17.457	0.032	3	ASN	g
59200.5452	59200.5465	>16.971	0.022	2	ASN	g
59205.5403	59205.5428	>16.041	0.100	3	ASN	g
59207.5911	59207.5936	>16.043	0.044	3	ASN	g
59208.7217	59208.7217	19.382	—	1	ATF	o
59216.5905	59216.5905	19.792	—	1	ZTF	zr
59293.6560	59293.6560	>15.449	—	1	ASN	g
59294.9083	59294.9108	>15.792	0.089	3	ASN	g
59298.9010	59298.9036	>16.790	0.032	3	ASN	g
59307.1194	59307.1219	>16.619	0.023	3	ASN	g
59311.3339	59311.3339	>14.300	—	1	Mdy	c
59313.1057	59313.1082	>17.329	0.068	3	ASN	g
59313.3411	59313.3411	>13.200	—	1	Mdy	c
59314.3370	59314.3370	>13.700	—	1	Mdy	c
59314.6287	59314.6314	>17.119	0.014	3	ASN	g
59315.3361	59315.3361	>13.500	—	1	Mdy	c
59317.6460	59317.6484	>17.305	0.063	3	ASN	g
59319.0931	59319.0956	>17.424	0.071	3	ASN	g
59321.5937	59321.5961	>17.194	0.025	3	ASN	g
59325.6319	59325.6344	>16.253	0.269	3	ASN	g
59326.5989	59326.6014	>17.182	0.055	3	ASN	g
59327.1053	59327.1053	20.108	—	1	ATF	o
59328.0892	59328.0917	>17.610	0.037	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.7 Log of observations of the 2018 outburst in ASASSN-18rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59329.5930	59329.5955	>14.826	0.239	3	ASN	g
59330.8667	59330.8692	>16.002	0.034	3	ASN	g
59331.3012	59331.3012	>13.900	–	1	Mdy	c
59332.8190	59332.8215	>15.940	0.050	3	ASN	g
59335.1042	59335.1042	19.633	–	1	ATF	o

* BJD - 2400000.0

[†] Mean magnitude.

[‡] 1σ of mean magnitude.

[§] Number of observations.

^{||} Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

[#] "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8: Log of observations of the 2019 outburst in ASASSN-19rg.

Start*	End*	Mag	Error	N	Obs	Filter#
58657.7688	58657.7714	>17.652	0.033	3	ASN	g
58660.7717	58660.7743	>17.126	0.361	3	ASN	g
58660.7949	58660.7949	20.253	–	1	ATF	o
58661.6292	58661.6305	>14.075	0.111	2	ASN	g
58661.8130	58661.8319	20.191	0.015	2	ATF	cy
58662.6849	58662.6849	>13.923	–	1	ASN	g
58664.8599	58664.8701	19.953	0.118	2	ATF	o
58667.6162	58667.6187	>17.548	0.064	3	ASN	g
58668.5931	58668.5955	>17.309	0.003	3	ASN	g
58668.7518	58668.7518	19.532	–	1	ATF	o
58669.6080	58669.6104	>17.188	0.059	3	ASN	g
58670.3010	58670.3034	13.369	0.016	3	ASN	g
58670.6766	58670.6766	13.010	–	1	ASN	g
58670.7891	58670.8087	13.726	0.005	4	ATF	o
58672.6689	58672.6713	13.353	0.011	3	ASN	g
58674.2313	58674.2693	13.310	0.002	106	MLF	CR
58674.4524	58674.6248	13.704	0.004	78	HaC	CV
58675.4527	58675.6228	13.834	0.003	77	HaC	CV
58676.1889	58676.3815	13.676	0.002	527	MLF	CR
58676.4531	58676.5991	13.989	0.003	66	HaC	CV
58676.7882	58676.8138	14.567	0.016	4	ATF	o
58677.2486	58677.2511	14.921	0.073	3	ASN	g
58677.5389	58677.6185	15.630	0.015	38	HaC	CV
58677.7800	58677.7953	16.523	0.010	4	ATF	o
58678.2490	58678.2514	>16.526	0.050	3	ASN	g
58678.4536	58678.6160	18.118	0.043	64	HaC	CV
58678.7805	58678.8034	18.528	0.079	4	ATF	o
58679.4562	58679.6115	17.788	0.104	23	HaC	CV
58679.5127	58679.5151	>16.365	0.037	3	ASN	g
58679.7791	58679.7981	18.916	0.138	4	ATF	o
58680.4593	58680.6031	18.254	0.059	26	HaC	CV
58680.5956	58680.5968	>16.007	0.068	2	ASN	g
58680.7746	58680.7746	18.800	–	1	Gai	G
58680.8162	58680.8260	18.874	0.265	2	ATF	o
58681.2153	58681.2177	>16.112	0.078	3	ASN	g
58682.5875	58682.5899	>16.138	0.022	3	ASN	g
58683.4705	58683.6537	18.520	0.070	29	HaC	CV
58683.5898	58683.5923	>16.388	0.032	3	ASN	g
58684.4587	58684.6380	18.370	0.044	53	HaC	CV
58684.7669	58684.7866	18.519	0.125	4	ATF	o
58685.4587	58685.6228	17.873	0.050	54	HaC	CV
58686.2718	58686.2751	16.685	0.084	3	ASN	g
58686.4554	58686.6169	16.060	0.019	57	HaC	CV
58688.4562	58688.6145	14.126	0.006	56	HaC	CV
58688.5686	58688.5711	14.014	0.008	3	ASN	g
58689.4564	58689.6117	14.267	0.005	55	HaC	CV
58689.5729	58689.5754	14.182	0.019	3	ASN	g
58690.2193	58690.3395	14.063	0.002	327	MLF	CR
58690.5231	58690.5257	14.306	0.012	3	ASN	g
58690.7557	58690.7938	17.491	0.690	6	ATF	o
58691.2148	58691.3356	14.294	0.004	331	MLF	CR
58691.5362	58691.5679	15.141	0.023	6	ASN	g
58692.5627	58692.5653	16.846	0.114	3	ASN	g
58693.5503	58693.5528	>16.807	0.266	2	ASN	g
58693.5515	58693.5515	16.609	–	1	ASN	g
58694.5424	58694.5424	17.257	–	1	ASN	g
58694.5436	58694.5448	>17.239	0.116	2	ASN	g
58694.7451	58694.7685	17.220	0.027	4	ATF	cy
58695.5460	58695.5484	16.989	0.033	3	ASN	g
58696.5380	58696.5392	>15.154	0.630	2	ASN	g
58698.2828	58698.5335	16.678	0.206	6	ASN	g
58699.2574	58699.5333	16.979	0.216	2	ASN	g
58699.2586	58699.5345	>17.294	0.109	4	ASN	g
58703.4598	58703.5452	17.557	0.050	30	HaC	CV
58704.4599	58704.5444	17.502	0.064	37	HaC	CV

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58704.5172	58704.5197	>16.627	0.032	3	ASN	g
58704.7424	58704.7623	17.512	0.048	4	ATF	o
58705.2316	58705.5145	>16.553	0.063	6	ASN	g
58705.3021	58705.3761	17.220	0.000	2	Gai	G
58705.4726	58705.5397	16.994	0.041	24	HaC	CV
58706.4605	58706.5371	15.984	0.021	27	HaC	CV
58706.5212	58706.5236	15.709	0.021	2	ASN	g
58706.5224	58706.5643	>15.811	0.438	2	ASN	g
58707.4612	58707.5294	18.025	0.071	21	HaC	CV
58707.5013	58707.5039	>16.489	0.021	3	ASN	g
58708.4607	58708.5310	17.999	0.080	24	HaC	CV
58708.4979	58708.5005	>16.471	0.033	3	ASN	g
58709.4613	58709.5284	17.728	0.080	20	HaC	CV
58709.4931	58709.4955	>15.055	0.136	3	ASN	g
58710.2375	58710.4972	>16.190	0.046	6	ASN	g
58710.4649	58710.5114	17.626	0.091	15	HaC	CV
58711.4618	58711.5226	17.697	0.062	20	HaC	CV
58711.4901	58711.4926	>15.746	0.032	3	ASN	g
58712.4730	58712.5219	17.814	0.074	17	HaC	CV
58712.4867	58712.4891	>16.633	0.075	3	ASN	g
58713.4628	58713.5178	17.782	0.053	27	HaC	CV
58713.4842	58713.4867	>17.211	0.023	3	ASN	g
58714.4626	58714.5156	17.655	0.100	22	HaC	CV
58714.4807	58714.4832	>16.444	0.149	3	ASN	g
58715.2248	58715.4797	>17.125	0.117	5	ASN	g
58715.4649	58715.5136	17.441	0.028	24	HaC	CV
58716.4633	58716.5099	17.491	0.055	23	HaC	CV
58716.4770	58716.5222	>17.006	0.023	3	ASN	g
58716.4795	58716.4795	17.001	–	1	ASN	g
58717.4658	58717.5082	17.630	0.052	21	HaC	CV
58717.4739	58717.4765	>16.897	0.047	3	ASN	g
58718.4703	58718.4729	>16.532	0.058	3	ASN	g
58718.4732	58718.5050	17.347	0.040	16	HaC	CV
58719.4669	58719.5143	15.513	0.050	4	ASN	g
58721.5203	58721.5203	>16.936	–	1	ASN	g
58723.5136	58723.5161	>16.920	0.052	3	ASN	g
58829.1557	58829.1583	>16.374	0.036	2	ASN	g
58833.1607	58833.1633	>16.136	0.129	3	ASN	g
58838.7724	58838.9486	19.570	0.028	2	Gai	G
58842.5928	58842.5928	>16.521	–	1	ASN	g
58845.1531	58845.1556	>17.615	0.052	3	ASN	g
58845.6023	58845.6048	>15.825	0.074	3	ASN	g
58847.0679	58847.0916	19.645	0.135	7	ATF	cy
58847.5905	58847.5917	>17.051	0.142	2	ASN	g
58848.1621	58848.1646	>17.372	0.069	3	ASN	g
58849.5898	58849.5898	>17.105	–	1	ASN	g
58850.1042	58850.1211	19.968	0.124	5	ATF	o
58850.5957	58850.5982	>16.832	0.022	3	ASN	g
58851.0969	58851.0969	>17.530	–	1	ASN	g
58851.1094	58851.1189	20.326	0.008	2	ATF	o
58851.5726	58851.5726	>17.140	–	1	ASN	g
58853.5958	58853.5983	>16.164	0.170	3	ASN	g
58855.8258	58855.8283	>16.968	0.013	3	ASN	g
58856.8709	58856.8709	>15.705	–	1	ASN	g
58857.8023	58857.8023	>15.948	–	1	ASN	g
58860.6138	58860.6138	>15.798	–	1	ASN	g
58861.5953	58861.5978	>15.898	0.024	3	ASN	g
58863.8141	58863.8141	19.910	–	1	Gai	G
58867.1231	58867.1231	19.912	–	1	ATF	o
58869.0224	58869.0224	19.759	–	1	ATF	o
58869.0937	58869.0963	>17.565	0.024	3	ASN	g
58870.1065	58870.1090	>17.703	0.018	3	ASN	g
58870.1761	58870.1761	19.415	–	1	ATF	o
58871.0163	58871.0215	20.371	0.353	2	ATF	cy
58871.1064	58871.1090	>17.770	0.026	3	ASN	g
58872.1040	58872.1065	>17.765	0.036	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58873.1001	58873.1013	>17.836	0.012	2	ASN	g
58873.6175	58873.6187	>16.707	0.049	2	ASN	g
58874.0914	58874.0940	>17.722	0.014	3	ASN	g
58874.1309	58874.1309	20.139	—	1	ATF	cy
58875.0956	58875.0982	>17.863	0.046	3	ASN	g
58876.0920	58876.0945	>17.813	0.045	3	ASN	g
58877.0245	58877.0245	20.321	—	1	ATF	o
58877.0921	58877.0946	>17.789	0.102	3	ASN	g
58877.5986	58877.6010	>17.385	0.043	3	ASN	g
58878.0852	58878.0878	>17.804	0.008	3	ASN	g
58878.1135	58878.1135	20.452	—	1	ATF	cy
58878.9844	58878.9844	20.078	—	1	ATF	cy
58879.0779	58879.0805	>17.712	0.002	2	ASN	g
58879.0792	58879.0792	17.604	—	1	ASN	g
58879.5924	58879.5948	>17.410	0.027	3	ASN	g
58880.0306	58880.0331	>16.007	0.104	3	ASN	g
58880.5934	58880.5946	>17.460	0.096	2	ASN	g
58881.0224	58881.0249	>15.778	0.388	3	ASN	g
58881.0466	58881.0466	20.547	—	1	ATF	o
58883.0053	58883.0262	20.451	0.092	4	ATF	cy
58883.0163	58883.0189	>17.603	0.040	3	ASN	g
58883.4899	58883.4912	>17.308	0.070	2	ASN	g
58884.0461	58884.0487	>17.768	0.014	3	ASN	g
58884.4951	58884.4975	>17.311	0.053	3	ASN	g
58885.0093	58885.0119	>16.683	0.066	3	ASN	g
58885.4965	58885.4989	>16.562	0.062	3	ASN	g
58886.7420	58886.7445	>16.037	0.048	3	ASN	g
58887.7662	58887.7688	>16.375	0.074	3	ASN	g
58888.4807	58888.7588	>15.691	0.029	5	ASN	g
58888.7828	58888.8568	19.985	0.007	2	Gai	G
58891.6345	58891.6369	>15.760	0.003	2	ASN	g
58896.1398	58896.1398	19.818	—	1	ATF	o
58898.6945	58898.6958	>17.373	0.052	2	ASN	g
58899.7342	58899.7367	>17.277	0.020	3	ASN	g
58900.7409	58900.7435	>17.588	0.022	3	ASN	g
58901.0276	58901.0617	20.338	0.120	2	ATF	o
58902.9969	58903.0162	20.509	0.073	6	ATF	cy
58903.6846	58903.6871	>17.388	0.017	3	ASN	g
58904.0998	58904.1258	20.414	0.126	4	ATF	o
58904.4854	58904.4878	>17.520	0.048	2	ASN	g
58904.9898	58904.9923	>17.567	0.009	3	ASN	g
58905.0017	58905.0102	20.591	0.082	2	ATF	o
58906.4955	58906.4979	>17.533	0.091	3	ASN	g
58906.9246	58906.9271	>17.557	0.036	3	ASN	g
58907.9198	58907.9210	>17.532	0.057	2	ASN	g
58909.6610	58909.6636	>17.419	0.076	3	ASN	g
58911.6557	58911.6570	>17.138	0.068	2	ASN	g
58912.3950	58912.3974	>16.865	0.039	3	ASN	g
58912.8536	58912.8561	>17.533	0.039	3	ASN	g
58915.9262	58915.9274	>15.788	0.363	2	ASN	g
58922.7098	58922.7122	>15.386	0.418	3	ASN	g
58925.5789	58925.8804	>17.126	0.036	5	ASN	g
58926.9751	58926.9751	>17.203	—	1	ASN	g
58928.8486	58928.9460	>17.458	0.057	2	ASN	g
58929.9996	58930.0078	20.706	0.158	3	ATF	cy
58930.8813	58930.8839	>17.681	0.049	3	ASN	g
58931.9930	58931.9956	>17.725	0.061	3	ASN	g
58941.8450	58941.8476	>16.877	0.027	3	ASN	g
58951.9882	58951.9956	20.032	0.152	2	ATF	o
58951.9924	58951.9950	>16.619	0.162	3	ASN	g
58955.9826	58955.9826	20.122	—	1	ATF	o
58956.9149	58956.9175	>17.677	0.023	3	ASN	g
58957.9194	58957.9194	20.283	—	1	ATF	cy
58958.8167	58958.8191	>17.457	0.064	3	ASN	g
58959.7964	58959.7988	>17.354	0.050	3	ASN	g
58960.9319	58960.9482	20.199	0.297	2	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58961.9162	58961.9162	20.227	—	1	ATF	cy
58961.9592	58961.9592	>17.635	—	1	ASN	g
58962.9008	58962.9033	>17.177	0.052	3	ASN	g
58963.9153	58963.9153	18.848	—	1	ATF	o
58964.9265	58964.9317	19.623	0.096	2	ATF	o
58965.9334	58965.9334	20.037	—	1	ATF	cy
58965.9428	58965.9454	>17.701	0.052	3	ASN	g
58966.9077	58966.9524	20.395	0.221	3	ATF	cy
58967.8387	58967.8411	>17.402	0.003	3	ASN	g
58967.8863	58967.8863	20.294	—	1	ATF	o
58969.8759	58969.8785	>17.434	0.050	3	ASN	g
58970.9127	58970.9127	19.869	—	1	ATF	o
58971.9089	58971.9089	19.928	—	1	ATF	o
58973.8803	58973.8829	>16.438	0.048	3	ASN	g
58978.2342	58978.2366	>16.089	0.042	3	ASN	g
58978.9860	58978.9860	19.307	—	1	ATF	o
58979.2948	58979.2973	>16.489	0.020	3	ASN	g
58979.9809	58980.0003	19.690	0.072	2	ATF	o
58980.2856	58980.2881	>16.983	0.020	3	ASN	g
58981.2370	58981.2394	>16.725	0.169	3	ASN	g
58982.8359	58982.8359	20.208	—	1	ATF	cy
58983.8939	58983.8965	>17.766	0.029	3	ASN	g
58984.9224	58984.9335	20.096	0.265	2	ATF	o
58985.8805	58985.9165	20.457	0.130	4	ATF	cy
58986.8455	58986.8481	>17.775	0.021	3	ASN	g
58986.8931	58986.8931	20.434	—	1	ATF	cy
58987.8730	58987.9067	20.352	0.302	2	ATF	o
58988.9014	58988.9014	19.942	—	1	ATF	o
58989.2485	58989.2509	>17.492	0.051	3	ASN	g
58989.8682	58989.8833	20.595	0.108	2	ATF	cy
58990.8467	58990.8674	20.659	0.240	2	ATF	cy
58991.8508	58991.8872	20.426	0.119	3	ATF	o
58992.8512	58992.8790	20.459	0.147	4	ATF	o
58994.8325	58994.8351	>17.807	0.113	3	ASN	g
58995.8814	58995.9054	20.235	0.263	2	ATF	o
58996.7829	58996.7829	>17.372	—	1	ASN	g
58997.7865	58997.7889	>17.268	0.053	3	ASN	g
58997.8822	58997.8822	20.242	—	1	ATF	o
58998.7730	58998.7754	>16.857	0.077	3	ASN	g
58998.8306	58998.8306	20.317	—	1	ATF	o
58999.7293	58999.7317	>16.794	0.079	3	ASN	g
58999.8387	58999.8489	20.266	0.322	2	ATF	o
59006.7538	59006.7564	>16.416	0.045	3	ASN	g
59006.8363	59006.8363	19.520	—	1	ATF	o
59007.2340	59007.2364	>16.226	0.062	3	ASN	g
59008.8252	59008.8278	>16.906	0.062	3	ASN	g
59011.8589	59011.8677	20.126	0.222	3	ATF	o
59012.8155	59012.8182	>17.461	0.020	3	ASN	g
59015.8167	59015.8200	20.437	0.121	2	ATF	o
59016.4068	59016.4092	>17.397	0.045	3	ASN	g
59016.8131	59016.8131	20.076	—	1	ATF	cy
59017.7984	59017.8010	>17.805	0.085	3	ASN	g
59020.8039	59020.8279	20.024	0.483	2	ATF	o
59021.8013	59021.8214	20.645	0.165	2	ATF	cy
59022.7654	59022.7681	>17.734	0.024	3	ASN	g
59023.7066	59023.7091	>16.687	0.027	3	ASN	g
59026.6587	59026.6611	>17.108	0.043	3	ASN	g
59027.7452	59027.7452	20.260	—	1	Gai	G
59032.7583	59032.7609	>16.484	0.055	3	ASN	g
59034.7543	59034.7569	>16.208	0.047	3	ASN	g
59036.7820	59036.7820	19.829	—	1	ATF	o
59038.3619	59038.3643	>16.238	0.043	3	ASN	g
59038.7747	59038.7935	20.329	0.202	2	ATF	o
59042.8011	59042.8076	20.574	0.138	2	ATF	cy
59043.7939	59043.7939	19.938	—	1	ATF	o
59044.6228	59044.6252	>15.986	0.111	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59048.3263	59048.3367	>17.346	0.038	6	ASN	g
59050.7603	59050.7713	20.240	0.320	2	ATF	cy
59055.7492	59055.7492	19.682	—	1	ATF	o
59056.5404	59056.5404	20.250	—	1	Gai	G
59059.6186	59059.6186	>15.399	—	1	ASN	g
59061.2804	59061.2828	>16.255	0.026	3	ASN	g
59063.2625	59063.2650	>16.183	0.064	3	ASN	g
59069.2621	59069.2645	>16.734	0.064	3	ASN	g
59072.2627	59072.2652	>17.164	0.047	3	ASN	g
59078.2424	59078.2448	>16.982	0.131	3	ASN	g
59080.2368	59080.2368	>17.147	—	1	ASN	g
59081.2324	59081.2348	>17.061	0.060	3	ASN	g
59087.2478	59087.2502	>16.231	0.050	3	ASN	g
59177.3518	59177.3518	>13.600	—	1	Mdy	c
59184.3803	59184.3803	>14.300	—	1	Mdy	c
59185.3540	59185.3540	>14.100	—	1	Mdy	c
59186.3887	59186.3887	>14.100	—	1	Mdy	c
59187.1529	59187.1529	>16.082	—	1	ASN	g
59187.3736	59187.3736	>13.800	—	1	Mdy	c
59188.1467	59188.1492	>16.515	0.034	3	ASN	g
59188.3614	59188.3614	>14.300	—	1	Mdy	c
59190.3549	59190.3549	>14.300	—	1	Mdy	c
59192.8528	59192.8552	>15.734	0.106	3	ASN	g
59193.3429	59193.3429	>15.100	—	1	Mdy	c
59194.3741	59194.3741	>14.600	—	1	Mdy	c
59196.3799	59196.3799	>15.100	—	1	Mdy	c
59196.8508	59196.8532	>16.216	0.103	3	ASN	g
59199.8372	59199.8397	>16.854	0.016	3	ASN	g
59201.4358	59201.4358	20.430	—	1	Gai	G
59202.5892	59202.5917	>16.418	0.105	3	ASN	g
59203.3153	59203.3153	>15.000	—	1	Mdy	c
59205.1395	59205.1395	20.579	—	1	ATF	cy
59206.0063	59206.0087	>17.388	0.064	3	ASN	g
59206.3921	59206.3921	>13.900	—	1	Mdy	c
59206.6022	59206.6022	>14.670	—	1	ASN	g
59207.5966	59207.5990	>16.056	0.107	3	ASN	g
59210.1185	59210.1210	>17.558	0.042	3	ASN	g
59212.3526	59212.3526	>14.500	—	1	Mdy	c
59212.9669	59212.9694	>15.935	0.054	3	ASN	g
59217.0963	59217.0988	>16.447	0.054	3	ASN	g
59217.3948	59217.3948	>14.500	—	1	Mdy	c
59219.9576	59219.9600	>16.551	0.028	3	ASN	g
59223.9347	59223.9347	20.360	—	1	Gai	G
59224.5277	59224.5301	>17.239	0.056	3	ASN	g
59225.1445	59225.1445	20.524	—	1	ATF	cy
59227.1073	59227.1127	20.126	0.099	2	ATF	cy
59228.0907	59228.0907	19.996	—	1	ATF	cy
59229.0502	59229.0527	>17.564	0.013	3	ASN	g
59229.1283	59229.1637	20.497	0.273	3	ATF	cy
59229.3372	59229.3372	>14.500	—	1	Mdy	c
59231.0684	59231.0840	20.399	0.074	2	ATF	cy
59231.3237	59231.3237	>13.700	—	1	Mdy	c
59231.5203	59231.5203	>17.234	—	1	ASN	g
59232.0493	59232.0558	20.408	0.201	2	ATF	cy
59232.7999	59232.8024	>17.090	0.061	3	ASN	g
59233.1046	59233.1179	20.344	0.295	2	ATF	cy
59233.2653	59233.2653	>15.700	—	1	Mdy	c
59233.5985	59233.5985	>17.353	—	1	ASN	g
59234.2395	59234.2395	>14.500	—	1	Mdy	c
59235.3010	59235.3010	>14.700	—	1	Mdy	c
59236.9968	59236.9992	>17.583	0.029	3	ASN	g
59239.3131	59239.3131	>14.600	—	1	Mdy	c
59242.2320	59242.2320	>13.400	—	1	Mdy	c
59243.4781	59243.4806	>15.551	0.042	3	ASN	g
59244.0979	59244.0979	19.152	—	1	ATF	o
59244.2425	59244.2425	>14.000	—	1	Mdy	c

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59245.2878	59245.2878	>14.200	—	1	Mdy	c
59246.7762	59246.8348	>16.304	0.093	6	ASN	g
59250.2140	59250.2140	>14.800	—	1	Mdy	c
59251.1765	59251.1765	20.420	—	1	Gai	G
59251.6190	59251.6214	>16.943	0.045	3	ASN	g
59252.1564	59252.1564	20.259	—	1	ATF	o
59252.2675	59252.2675	>13.500	—	1	Mdy	c
59253.2695	59253.2695	>13.500	—	1	Mdy	c
59254.2226	59254.2226	>15.300	—	1	Mdy	c
59255.2127	59255.2127	>13.000	—	1	Mdy	c
59255.4410	59255.4435	>17.243	0.006	3	ASN	g
59256.0078	59256.0078	20.414	—	1	ATF	cy
59256.5551	59256.5576	>15.397	0.095	3	ASN	g
59257.0474	59257.0511	20.613	0.038	2	ATF	cy
59257.7418	59257.7444	>17.509	0.093	3	ASN	g
59258.8843	59258.8867	>17.033	0.091	3	ASN	g
59259.2416	59259.2416	>15.000	—	1	Mdy	c
59261.0327	59261.0391	20.374	0.301	2	ATF	cy
59262.0602	59262.0602	20.657	—	1	ATF	cy
59262.9592	59262.9617	>17.654	0.031	3	ASN	g
59266.2577	59266.2577	>14.700	—	1	Mdy	c
59267.2091	59267.2091	>14.700	—	1	Mdy	c
59267.4742	59267.4766	>17.330	0.028	3	ASN	g
59268.2512	59268.2512	>15.400	—	1	Mdy	c
59268.5927	59268.5951	>17.277	0.025	3	ASN	g
59269.2506	59269.2506	>14.700	—	1	Mdy	c
59270.2193	59270.2193	>13.800	—	1	Mdy	c
59273.0212	59273.0212	19.241	—	1	ATF	o
59273.6572	59273.6596	>15.497	0.067	3	ASN	g
59274.1508	59274.1508	>13.800	—	1	Mdy	c
59277.1652	59277.1652	>14.000	—	1	Mdy	c
59278.0505	59278.0949	>16.802	0.049	6	ASN	g
59278.6884	59278.6910	>16.845	0.106	3	ASN	g
59280.6642	59280.6668	>17.402	0.004	3	ASN	g
59282.1566	59282.1566	>14.700	—	1	Mdy	c
59283.2138	59283.2138	>14.700	—	1	Mdy	c
59283.8963	59283.8989	>16.926	0.063	3	ASN	g
59284.2081	59284.2081	>15.400	—	1	Mdy	c
59286.9172	59286.9172	>15.324	—	1	ASN	g
59288.1132	59288.1132	>14.300	—	1	Mdy	c
59288.9792	59288.9792	20.606	—	1	ATF	o
59289.8117	59289.8142	>15.678	0.010	2	ASN	g
59290.1880	59290.1880	>15.300	—	1	BNK	Vis
59291.1267	59291.1267	>13.800	—	1	Mdy	c
59291.9823	59292.0076	>17.858	0.035	6	ASN	g
59292.0353	59292.0353	20.626	—	1	ATF	o
59293.0169	59293.0778	20.156	0.224	4	ATF	o
59293.3804	59293.3804	>17.336	—	1	ASN	g
59293.3816	59293.3816	17.328	—	1	ASN	g
59295.5965	59295.5989	>16.779	0.028	3	ASN	g
59296.6274	59296.6298	>16.722	0.038	3	ASN	g
59297.1026	59297.1026	>15.000	—	1	Mdy	c
59297.8410	59297.8422	>16.620	0.054	2	ASN	g
59298.9579	59298.9579	>16.830	—	1	ASN	g
59299.1001	59299.1001	>14.800	—	1	Mdy	c
59300.0858	59300.0858	>13.900	—	1	Mdy	c
59300.7952	59300.7976	>15.703	0.040	3	ASN	g
59305.8277	59305.8302	>17.610	0.057	3	ASN	g
59306.0496	59306.0496	16.176	—	1	ATF	o
59306.9031	59306.9056	>15.415	0.019	3	ASN	g
59307.7069	59307.7094	>16.032	0.270	3	ASN	g
59308.9469	59308.9711	20.285	0.023	2	ATF	cy
59309.5814	59309.5838	>17.154	0.035	3	ASN	g
59310.1840	59310.1840	>15.300	—	1	BNK	Vis
59310.8329	59310.9524	>16.788	0.179	8	ASN	g
59311.0730	59311.0730	>15.500	—	1	Mdy	c

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59311.7148	59312.0295	>17.277	0.061	9	ASN	g
59311.8785	59311.8785	20.205	—	1	ATF	cy
59312.7811	59312.7836	>17.087	0.067	3	ASN	g
59313.0783	59313.0783	>13.900	—	1	Mdy	c
59313.6751	59313.6777	>17.438	0.041	3	ASN	g
59314.0769	59314.0769	>14.700	—	1	Mdy	c
59314.8908	59314.9227	>17.702	0.040	5	ASN	g
59314.9239	59314.9239	17.640	—	1	ASN	g
59315.0769	59315.0769	>14.300	—	1	Mdy	c
59315.7739	59315.7764	>17.249	0.043	3	ASN	g
59315.9313	59315.9313	20.548	—	1	ATF	cy
59316.0862	59316.0862	>14.800	—	1	Mdy	c
59317.7546	59317.7834	>17.239	0.051	6	ASN	g
59318.0992	59318.0992	>14.300	—	1	Mdy	c
59318.7438	59318.7937	>17.375	0.076	6	ASN	g
59319.0941	59319.0941	>13.500	—	1	Mdy	c
59319.7551	59319.8348	>16.648	0.254	6	ASN	g
59319.8979	59319.8979	20.809	—	1	ATF	cy
59321.9016	59321.9016	20.339	—	1	ATF	o
59322.8272	59322.8296	>16.965	0.043	3	ASN	g
59322.8950	59322.9005	20.425	0.143	2	ATF	o
59323.0680	59323.0680	>14.400	—	1	Mdy	c
59324.0631	59324.0631	>15.700	—	1	Mdy	c
59324.8097	59324.8671	>17.241	0.066	6	ASN	g
59325.0726	59325.0726	>13.800	—	1	Mdy	c
59326.0745	59326.0745	>13.300	—	1	Mdy	c
59326.8318	59326.8343	>16.437	0.040	3	ASN	g
59327.7477	59327.7502	>16.368	0.026	3	ASN	g
59328.7188	59328.7631	>16.179	0.084	6	ASN	g
59329.0595	59329.0595	>14.500	—	1	Mdy	c
59330.0480	59330.0480	>14.000	—	1	Mdy	c
59331.0369	59331.0369	>13.300	—	1	Mdy	c
59333.7635	59333.9143	>17.225	0.224	6	ASN	g
59336.0488	59336.0488	>14.400	—	1	Mdy	c
59336.9335	59336.9729	19.594	0.105	4	ATF	o
59337.0338	59337.0338	>15.200	—	1	Mdy	c
59337.7016	59337.7041	>16.887	0.030	3	ASN	g
59338.0691	59338.0691	>14.600	—	1	Mdy	c
59338.6897	59338.7752	>16.939	0.035	9	ASN	g
59339.8576	59339.8600	>17.277	0.037	3	ASN	g
59340.0398	59340.0398	>14.900	—	1	Mdy	c
59340.7973	59340.7998	>17.051	0.100	3	ASN	g
59341.7007	59341.7297	>16.837	0.480	3	ASN	g
59343.8208	59343.8233	>17.363	0.076	3	ASN	g
59344.0540	59344.0540	>14.700	—	1	Mdy	c
59344.8767	59344.8767	20.115	—	1	ATF	o
59345.0511	59345.0511	>15.100	—	1	Mdy	c
59345.1140	59345.1140	>15.300	—	1	BNK	Vis
59345.4755	59345.5104	>17.171	0.137	6	ASN	g
59346.8748	59346.8774	>17.877	0.051	3	ASN	g
59348.5828	59348.6102	>17.341	0.073	6	ASN	g
59348.8766	59348.8766	20.169	—	1	ATF	o
59349.8668	59349.8692	>16.743	0.024	3	ASN	g
59349.8757	59349.8757	19.729	—	1	ATF	cy
59353.7817	59353.7842	>17.167	0.035	3	ASN	g
59354.7778	59354.7839	>16.375	0.074	6	ASN	g
59356.8509	59356.8534	>16.523	0.035	3	ASN	g
59357.0103	59357.0103	>14.300	—	1	Mdy	c
59359.0180	59359.0180	>14.200	—	1	Mdy	c
59360.0137	59360.0137	>15.000	—	1	Mdy	c
59360.5379	59360.5404	>15.676	0.074	3	ASN	g
59361.2247	59361.2272	>15.410	0.088	3	ASN	g
59362.7789	59362.7814	>15.844	0.023	3	ASN	g
59363.9693	59363.9693	>14.300	—	1	Mdy	c
59364.7081	59364.7106	>16.462	0.088	3	ASN	g
59366.8507	59366.8532	>17.621	0.026	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59367.9390	59367.9543	20.448	0.269	2	ATF	cy
59368.7945	59368.7970	>17.860	0.079	3	ASN	g
59369.1010	59369.1010	>15.300	–	1	BNK	Vis
59369.7456	59369.7703	>16.074	0.062	6	ASN	g
59370.7219	59370.7624	>16.900	0.203	6	ASN	g
59371.6146	59371.7049	>17.182	0.069	9	ASN	g
59371.8389	59371.8421	20.077	0.203	2	ATF	cy
59373.6702	59373.6727	>17.436	0.044	3	ASN	g
59374.7538	59374.7563	>17.110	0.044	3	ASN	g
59375.7505	59375.7529	>16.967	0.018	3	ASN	g
59376.7423	59376.7448	>17.098	0.041	3	ASN	g
59377.2473	59377.2497	>17.388	0.059	3	ASN	g
59378.7323	59378.8114	>17.514	0.114	6	ASN	g
59378.8663	59378.8663	20.115	–	1	ATF	o
59379.8299	59379.8396	20.720	0.105	3	ATF	cy
59380.4753	59380.4779	>17.401	0.038	3	ASN	g
59382.4733	59382.4909	>16.438	0.231	6	ASN	g
59383.7266	59383.7290	>16.294	0.056	3	ASN	g
59384.3563	59384.3588	>16.552	0.045	3	ASN	g
59385.9569	59386.0309	20.318	0.101	2	Gai	G
59387.8602	59387.8602	16.885	–	1	ATF	o
59388.5945	59388.5971	>16.141	0.021	3	ASN	g
59390.5901	59390.7106	>15.644	0.194	4	ASN	g
59390.7119	59390.7119	13.967	–	1	ASN	g
59392.5639	59392.6080	>16.493	0.089	6	ASN	g
59392.8382	59392.8382	19.923	–	1	ATF	o
59393.8024	59393.8024	20.402	–	1	ATF	o
59395.7694	59395.7719	>17.786	0.036	3	ASN	g
59396.6276	59396.6301	>17.010	0.030	3	ASN	g
59396.8174	59396.8381	20.367	0.035	4	ATF	o
59397.6239	59397.6264	>17.062	0.039	3	ASN	g
59398.6817	59398.6842	>17.018	0.164	3	ASN	g
59400.7905	59400.8039	20.184	0.347	2	ATF	o
59401.6778	59401.6803	>17.209	0.081	3	ASN	g
59402.5720	59402.5877	>17.208	0.089	6	ASN	g
59403.5923	59403.5949	>17.333	0.031	3	ASN	g
59404.7636	59404.7830	20.646	0.200	2	ATF	o
59405.6543	59405.6567	>17.325	0.005	3	ASN	g
59406.6539	59406.6679	>17.131	0.031	5	ASN	g
59408.5892	59408.5917	>17.134	0.053	3	ASN	g
59409.5817	59409.5842	>17.173	0.029	3	ASN	g
59410.5602	59410.5627	>16.871	0.030	3	ASN	g
59411.5684	59411.5710	>16.964	0.006	3	ASN	g
59411.7617	59411.7751	20.037	0.275	2	ATF	o
59412.7729	59412.7729	20.360	–	1	Gai	G
59415.3056	59415.3082	>15.924	0.066	3	ASN	g
59416.5045	59416.5070	>16.074	0.098	3	ASN	g
59417.5609	59417.5635	>16.238	0.095	3	ASN	g
59422.5369	59422.5394	>16.936	0.033	3	ASN	g
59424.5194	59424.5220	>17.282	0.017	3	ASN	g
59426.2821	59426.2846	>17.417	0.079	3	ASN	g
59426.7576	59426.7576	20.341	–	1	ATF	o
59427.7625	59427.7625	19.783	–	1	ATF	cy
59429.5166	59429.5178	>17.016	0.072	2	ASN	g
59430.5334	59430.5361	>17.242	0.058	3	ASN	g
59431.5259	59431.5285	>17.252	0.027	3	ASN	g
59432.5214	59432.5239	>16.919	0.041	3	ASN	g
59433.5257	59433.5282	>16.958	0.070	3	ASN	g
59434.5197	59434.5222	>16.961	0.098	3	ASN	g
59437.2511	59437.2536	>17.025	0.043	3	ASN	g
59438.5090	59438.5114	>16.826	0.018	3	ASN	g
59439.1903	59439.2643	20.387	0.088	2	Gai	G
59443.2355	59443.5013	>16.003	0.258	5	ASN	g
59443.8565	59443.8565	>16.399	–	1	ASN	g
59447.4773	59447.4799	>16.310	0.068	3	ASN	g
59450.4696	59450.4696	>15.989	–	1	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59453.4706	59453.4706	>15.777	—	1	ASN	g
59550.3568	59550.3568	>15.600	—	1	Mdy	c
59556.0179	59556.0203	>16.504	0.167	3	ASN	g
59559.8537	59559.8561	>15.581	0.152	3	ASN	g
59561.3593	59561.3593	>13.000	—	1	Mdy	c
59562.8489	59562.8515	>16.456	0.078	3	ASN	g
59566.0197	59566.0221	>16.834	0.105	3	ASN	g
59567.8537	59567.8562	>15.543	0.053	3	ASN	g
59570.3430	59570.3430	>14.600	—	1	Mdy	c
59571.0214	59571.0239	>15.293	0.145	3	ASN	g
59571.3310	59571.3310	>14.300	—	1	Mdy	c
59572.3524	59572.3524	>14.100	—	1	Mdy	c
59574.8468	59574.8493	>15.919	0.048	3	ASN	g
59576.2338	59576.2338	20.430	—	1	Gai	G
59580.3628	59580.3628	>15.100	—	1	Mdy	c
59582.3186	59582.3186	>14.300	—	1	Mdy	c
59582.5738	59582.5763	>17.000	0.063	3	ASN	g
59583.3335	59583.3335	>14.100	—	1	Mdy	c
59586.0754	59586.0779	>17.560	0.054	3	ASN	g
59586.3651	59586.3651	>14.100	—	1	Mdy	c
59586.8602	59586.8627	>16.706	0.085	3	ASN	g
59587.1137	59587.1137	20.348	—	1	ATF	cy
59587.8458	59587.8483	>16.905	0.056	3	ASN	g
59588.9316	59588.9341	>16.862	0.355	3	ASN	g
59589.2962	59589.2962	>14.200	—	1	Mdy	c
59592.1068	59592.1094	>17.645	0.058	3	ASN	g
59593.1054	59593.1288	19.354	0.850	2	ATF	o
59593.9658	59593.9682	>17.039	0.030	3	ASN	g
59597.0116	59597.0116	15.865	—	1	ATF	o
59598.2363	59598.2363	>14.700	—	1	Mdy	c
59598.5099	59598.5124	>15.583	0.071	3	ASN	g
59600.5743	59600.5755	>15.309	0.483	2	ASN	g
59601.5572	59601.5597	>16.078	0.045	3	ASN	g
59602.0081	59602.0081	19.111	—	1	ATF	o
59603.4752	59603.5492	20.395	0.021	2	Gai	G
59604.2530	59604.2530	>14.300	—	1	Mdy	c
59606.7296	59606.7322	>16.913	0.104	3	ASN	g
59607.1055	59607.1188	20.255	0.156	2	ATF	o
59607.5055	59607.5080	>17.061	0.069	3	ASN	g
59608.5261	59608.5286	>17.115	0.066	3	ASN	g
59609.5039	59609.5520	>17.207	0.023	6	ASN	g
59609.5938	59609.5938	20.433	—	1	ATF	cy
59610.2649	59610.2649	>15.700	—	1	Mdy	c
59611.1032	59611.1078	20.473	0.168	2	ATF	o
59611.2521	59611.2521	>15.800	—	1	Mdy	c
59611.7185	59611.7210	>16.931	0.060	3	ASN	g
59612.2337	59612.2337	>14.400	—	1	Mdy	c
59614.0790	59614.0815	>17.727	0.023	3	ASN	g
59615.0709	59615.0734	>17.685	0.034	3	ASN	g
59615.0963	59615.1617	20.007	0.172	3	ATF	o
59616.7294	59616.7320	>16.918	0.041	3	ASN	g
59617.1246	59617.1246	20.207	—	1	ATF	cy
59617.4957	59617.4969	>17.046	0.054	2	ASN	g
59617.6042	59617.6042	20.271	—	1	ATF	cy
59619.0777	59619.0777	20.113	—	1	ATF	o
59619.2391	59619.2391	>14.600	—	1	Mdy	c
59619.7008	59619.7034	>17.078	0.079	3	ASN	g
59620.8868	59620.8893	>16.453	0.045	3	ASN	g
59621.2469	59621.2469	>15.400	—	1	Mdy	c
59621.8796	59621.8822	>17.164	0.048	3	ASN	g
59622.4651	59622.4676	>16.529	0.023	3	ASN	g
59623.0469	59623.0469	19.670	—	1	ATF	o
59623.9543	59623.9568	>16.447	0.053	3	ASN	g
59624.9716	59624.9741	>16.736	0.078	3	ASN	g
59625.5599	59625.5650	18.432	0.750	2	ATF	o
59626.0490	59626.2251	20.465	0.021	2	Gai	G

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.8 Log of observations of the 2019 outburst in ASASSN-19rg
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59626.8662	59626.8688	>16.207	0.085	3	ASN	g
59627.6003	59627.6015	>15.886	0.086	2	ASN	g
59627.6028	59627.6028	15.867	–	1	ASN	g
59629.5266	59629.5291	>15.780	0.042	3	ASN	g
59633.8350	59633.8350	19.956	–	1	ATF	o
59633.9279	59633.9304	>17.529	0.039	3	ASN	g
59634.1789	59634.1789	>15.800	–	1	Mdy	c
59634.4523	59634.4548	>16.518	0.028	3	ASN	g
59634.7558	59634.7584	>16.956	0.078	3	ASN	g
59635.1902	59635.1902	>14.000	–	1	Mdy	c
59635.7765	59635.7790	>16.905	0.002	3	ASN	g
59635.8221	59635.8221	20.033	–	1	ATF	o
59636.1922	59636.1922	>15.100	–	1	Mdy	c
59636.7590	59636.7959	>17.003	0.022	6	ASN	g
59637.2111	59637.2111	>14.900	–	1	Mdy	c
59637.9539	59637.9564	>17.594	0.078	3	ASN	g
59638.1987	59638.1987	>15.900	–	1	Mdy	c
59639.5210	59639.5262	>17.244	0.062	5	ASN	g
59641.0509	59641.0811	20.175	0.081	3	ATF	cy
59641.1840	59641.1840	>15.300	–	1	BNK	Vis
59641.9371	59641.9397	>17.597	0.030	3	ASN	g
59643.0181	59643.0781	20.034	0.061	3	ATF	o
59643.8073	59643.8151	20.211	0.015	3	ATF	cy
59643.9519	59643.9545	>17.931	0.039	3	ASN	g
59644.9907	59644.9932	>17.556	0.057	3	ASN	g
59646.4070	59646.4095	>17.099	0.005	3	ASN	g
59647.1521	59647.1521	19.760	–	1	ATF	o
59649.0217	59649.0842	20.188	0.088	3	ATF	cy
59649.0940	59649.0965	>17.728	0.046	3	ASN	g
59649.5531	59649.5544	>15.644	0.663	2	ASN	g
59651.8776	59651.8801	>16.705	0.035	3	ASN	g
59652.8053	59652.8053	>17.554	–	1	ASN	g
59653.4277	59653.4302	>15.376	0.234	3	ASN	g
59653.9139	59653.9627	>16.607	0.053	6	ASN	g
59654.2113	59654.2113	>15.700	–	1	Mdy	c
59655.1917	59655.1917	>14.200	–	1	Mdy	c
59655.3635	59655.3660	>15.629	0.022	3	ASN	g

* BJD - 2400000.0

[†] Mean magnitude.

[‡] 1 σ of mean magnitude.

[§] Number of observations.

^{||} Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[‡] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX[‡] (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

[#] "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9: Log of observations of the 2020 outburst in ASASSN-20eq.

Start*	End*	Mag	Error	N	Obs	Filter#
58962.0370	58962.0370	20.296	—	1	ATF	o
58962.7699	58962.7724	>17.340	0.091	3	ASN	g
58963.9794	58963.9794	21.365	—	1	ZTF	zg
58964.8000	58964.8024	>17.379	0.010	3	ASN	g
58964.8831	58964.8831	21.107	—	1	ZTF	zg
58964.9238	58964.9238	21.602	—	1	ZTF	zr
58965.8816	58965.8841	>17.570	0.003	3	ASN	g
58970.0434	58970.0434	20.607	—	1	ATF	o
58970.9642	58970.9642	22.182	—	1	ZTF	zg
58972.1135	58972.1135	20.524	—	1	ATF	cy
58972.9641	58972.9641	21.914	—	1	ZTF	zg
58973.9629	58973.9639	21.115	0.206	2	ZTF	zg
58973.9650	58973.9650	20.326	—	1	ATF	o
58978.9084	58978.9157	19.482	0.136	3	ZTF	zg
58979.4769	58979.4794	>15.450	0.027	3	ASN	g
58979.7762	58979.7762	15.445	—	1	ZAL	zg
58979.7762	58979.7762	15.474	—	1	ZTF	zg
58979.8385	58979.8385	15.704	—	1	ZAL	zr
58979.8385	58979.8385	15.729	—	1	ZTF	zr
58980.0526	58980.0800	15.813	0.012	4	ATF	o
58980.9192	58980.9192	15.547	—	1	ZTF	zg
58980.9615	58980.9615	15.889	—	1	ZTF	zr
58981.9456	58981.9581	16.114	0.012	4	ATF	o
58982.8073	58982.8097	15.914	0.021	3	ASN	g
58983.1696	58983.2843	16.164	0.011	107	Ioh	C
58983.4689	58983.4714	15.995	0.112	3	ASN	g
58983.8623	58983.8623	16.964	—	1	ZAL	zr
58983.8623	58983.8623	16.982	—	1	ZTF	zr
58983.9747	58983.9880	17.307	0.042	4	ATF	o
58984.8985	58984.8994	20.124	0.064	2	ZTF	zr
58985.4909	58985.4934	>16.860	0.189	3	ASN	g
58985.8536	58985.8536	19.944	—	1	ZTF	zi
58985.9194	58985.9203	20.084	0.067	2	ZTF	zg
58985.9822	58986.0504	19.577	0.098	5	ATF	o
58986.4750	58986.4774	>17.176	0.041	3	ASN	g
58986.9536	58986.9546	16.525	0.001	2	ZTF	zr
58987.5232	58987.5245	15.919	0.176	2	ASN	g
58987.8401	58987.8401	16.262	—	1	ZTF	zr
58987.9042	58987.9052	15.878	0.010	2	ZTF	zg
58988.0213	58988.0418	16.132	0.016	4	ATF	cy
58989.8759	58989.9555	16.737	0.021	5	ATF	o
58990.5584	58990.5584	16.518	—	1	ASN	g
58991.7728	58991.7737	18.975	0.056	2	ZTF	zr
58991.7737	58991.7737	18.896	—	1	ZAL	zr
58991.8184	58991.8194	18.920	0.007	2	ZTF	zg
58991.8725	58991.8749	>17.543	0.092	3	ASN	g
58991.8732	58991.8732	18.877	—	1	ZTF	zi
58992.0444	58992.1186	18.890	0.101	5	ATF	cy
58992.4409	58992.4434	>17.093	0.031	3	ASN	g
58992.7947	58992.8089	19.061	0.004	2	ZTF	zr
58992.8428	58992.8438	19.137	0.011	2	ZTF	zg
58993.4512	58993.4512	>17.374	—	1	ASN	g
58993.9897	58994.0111	18.810	0.139	4	ATF	o
58994.4337	58994.4337	>17.110	—	1	ASN	g
58994.8142	58994.8142	18.312	—	1	ZTF	zr
58994.9349	58994.9373	16.756	0.008	3	ZTF	zg
58995.8208	58995.8217	18.571	0.001	2	ZTF	zg
58995.9357	58995.9366	19.185	0.035	2	ZTF	zr
58995.9902	58996.0361	19.532	0.075	4	ATF	cy
58996.8100	58996.8109	19.382	0.008	2	ZTF	zr
58996.8321	58996.8331	19.301	0.038	2	ZTF	zg
58996.8743	58996.8743	19.301	—	1	ZTF	zi
58997.7983	58997.7993	19.090	0.023	2	ZTF	zr
58997.8814	58997.8814	19.300	—	1	ZTF	zg
58997.9038	58997.9038	18.870	—	1	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
58998.8297	58998.8306	19.126	0.008	2	ZTF	zr
58998.8595	58998.8604	19.329	0.094	2	ZTF	zg
58999.8127	58999.8533	19.183	0.002	2	ZAL	zr
58999.8127	58999.8533	19.244	0.020	3	ZTF	zr
58999.8998	58999.9007	19.338	0.042	2	ZTF	zg
58999.9330	58999.9567	19.144	0.068	4	ATF	o
59000.8116	59000.9169	16.945	0.093	3	ZTF	zg
59000.8116	59000.9169	16.966	0.112	2	ZAL	zg
59000.8327	59000.8963	17.275	0.052	4	ZTF	zr
59000.8332	59000.8963	17.266	0.085	2	ZAL	zr
59001.7767	59001.7767	19.421	—	1	ZAL	zr
59001.7767	59001.7767	19.471	—	1	ZTF	zr
59001.9172	59001.9172	19.758	—	1	ZTF	zg
59002.0041	59002.0287	19.890	0.209	4	ATF	o
59002.4159	59002.4159	>14.800	—	1	ASN	g
59004.0042	59004.0381	19.633	0.328	3	ATF	o
59004.7220	59004.7220	19.379	—	1	ZTF	zg
59004.7220	59004.7220	19.430	—	1	ZAL	zg
59004.7872	59004.7872	19.277	—	1	ZAL	zr
59004.7872	59004.7872	19.401	—	1	ZTF	zr
59005.7245	59005.7245	19.250	—	1	ZAL	zg
59005.7245	59005.7245	19.272	—	1	ZTF	zg
59005.8842	59005.9212	19.558	0.213	3	ATF	o
59007.8954	59007.9083	18.606	0.119	4	ATF	o
59008.5351	59008.7894	>16.054	0.206	6	ASN	g
59008.8082	59008.8082	19.648	—	1	ZTF	zg
59008.8082	59008.8082	19.684	—	1	ZAL	zg
59009.7741	59009.7741	19.476	—	1	ZTF	zg
59009.7741	59009.7741	19.538	—	1	ZAL	zg
59009.8522	59009.8522	19.352	—	1	ZTF	zi
59009.8619	59009.8619	19.273	—	1	ZAL	zr
59009.8619	59009.8619	19.321	—	1	ZTF	zr
59009.9483	59009.9879	19.632	0.060	4	ATF	o
59011.7794	59011.7794	19.652	—	1	ZTF	zg
59011.8194	59011.8194	19.570	—	1	ZAL	zr
59011.8194	59011.8194	19.608	—	1	ZTF	zr
59012.7741	59012.7741	19.702	—	1	ZTF	zr
59012.8118	59012.8118	19.652	—	1	ZTF	zg
59013.9445	59013.9677	19.478	0.104	4	ATF	o
59014.7607	59014.7607	17.689	—	1	ZAL	zr
59014.7607	59014.7607	17.717	—	1	ZTF	zr
59014.8001	59014.8001	18.094	—	1	ZTF	zi
59014.8517	59014.8517	17.711	—	1	ZTF	zg
59015.3817	59015.3842	>17.115	0.056	3	ASN	g
59015.8113	59015.8113	20.186	—	1	ZTF	zg
59015.8867	59015.9039	19.991	0.160	4	ATF	cy
59016.7569	59016.7569	19.718	—	1	ZAL	zr
59016.7569	59016.7569	19.738	—	1	ZTF	zr
59016.8366	59016.8366	20.102	—	1	ZTF	zg
59017.4986	59017.4998	>16.937	0.056	2	ASN	g
59017.7788	59017.7788	19.789	—	1	ZTF	zr
59017.9352	59017.9777	19.574	0.152	7	ATF	o
59018.7605	59018.7605	19.740	—	1	ZTF	zr
59018.8118	59018.8118	19.806	—	1	ZTF	zi
59019.3602	59019.3626	>16.986	0.104	2	ASN	g
59019.7764	59019.7764	20.045	—	1	ZTF	zg
59020.7677	59020.7677	19.880	—	1	ZTF	zr
59020.8673	59020.8673	20.032	—	1	ZTF	zg
59021.9256	59021.9701	19.592	0.107	7	ATF	o
59022.7527	59022.7527	19.727	—	1	ZTF	zr
59022.8098	59022.8098	19.505	—	1	ZTF	zi
59022.8422	59022.8422	19.855	—	1	ZTF	zg
59023.3511	59023.3536	>17.125	0.069	3	ASN	g
59023.7967	59023.7967	19.691	—	1	ZTF	zr
59023.8598	59023.8704	19.773	0.108	4	ATF	cy
59024.4060	59024.4073	>17.229	0.016	2	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59024.7421	59024.7421	19.695	—	1	ZAL	zr
59024.7421	59024.7421	19.782	—	1	ZTF	zr
59024.8733	59024.8733	19.818	—	1	ZTF	zg
59025.8702	59025.8702	18.038	—	1	ZTF	zr
59025.9231	59025.9456	18.153	0.010	4	ATF	o
59026.3306	59026.3338	>17.018	0.031	3	ASN	g
59026.8103	59026.8103	19.966	—	1	ZTF	zi
59026.8745	59026.8745	20.123	—	1	ZTF	zg
59027.7375	59027.7375	19.777	—	1	ZAL	zg
59027.7375	59027.7375	19.807	—	1	ZTF	zg
59027.7740	59027.7740	19.880	—	1	ZAL	zr
59027.7740	59027.7740	19.968	—	1	ZTF	zr
59027.9024	59027.9635	19.959	0.088	8	ATF	cy
59028.7319	59028.7319	19.397	—	1	ZAL	zr
59028.7319	59028.7319	19.449	—	1	ZTF	zr
59028.8369	59028.8369	19.860	—	1	ZTF	zg
59029.7547	59029.7547	19.850	—	1	ZTF	zg
59029.9199	59029.9408	19.772	0.045	4	ATF	o
59030.8735	59030.8735	19.899	—	1	ZAL	zg
59030.8735	59030.8735	19.915	—	1	ZTF	zg
59031.3714	59031.3739	>16.191	0.095	3	ASN	g
59031.6934	59031.6934	19.940	—	1	ZTF	zg
59031.7486	59031.7486	20.051	—	1	ZTF	zr
59031.7928	59031.7928	19.554	—	1	ZTF	zi
59031.9154	59031.9679	19.492	0.107	6	ATF	o
59032.7442	59032.7442	19.368	—	1	ZTF	zr
59032.7442	59032.7442	19.377	—	1	ZAL	zr
59032.8938	59032.8938	19.745	—	1	ZAL	zg
59032.8938	59032.8938	19.813	—	1	ZTF	zg
59033.3469	59033.3493	>15.665	0.037	3	ASN	g
59033.7329	59033.7329	19.927	—	1	ZTF	zg
59033.8329	59033.8329	19.831	—	1	ZTF	zr
59033.9021	59033.9245	19.537	0.120	6	ATF	o
59034.3681	59034.3706	>15.536	0.053	3	ASN	g
59034.7143	59034.7143	19.519	—	1	ZTF	zg
59034.7143	59034.7143	19.603	—	1	ZAL	zg
59034.8380	59034.8380	19.610	—	1	ZAL	zr
59034.8380	59034.8380	19.708	—	1	ZTF	zr
59035.7674	59035.7674	19.418	—	1	ZTF	zi
59035.8310	59035.8310	19.524	—	1	ZTF	zr
59035.8310	59035.8310	19.540	—	1	ZAL	zr
59035.9215	59035.9369	19.080	0.137	3	ATF	o
59036.8874	59036.8899	>15.663	0.019	3	ASN	g
59037.8512	59037.8537	>16.123	0.057	3	ASN	g
59037.8757	59037.9200	19.267	0.056	7	ATF	o
59038.7280	59038.7280	20.008	—	1	ZTF	zr
59038.7525	59038.7525	19.957	—	1	ZTF	zg
59038.8879	59038.8903	>16.188	0.069	3	ASN	g
59039.7862	59039.7887	>15.628	0.304	3	ASN	g
59039.8073	59039.8083	19.874	0.084	2	ZTF	zr
59039.8083	59039.8083	19.799	—	1	ZAL	zr
59039.8149	59039.8149	19.805	—	1	ZTF	zi
59039.8713	59039.9157	19.728	0.195	5	ATF	o
59041.7278	59041.7278	19.996	—	1	ZTF	zg
59041.7535	59041.7535	20.026	—	1	ZTF	zr
59041.8925	59041.9157	19.769	0.135	4	ATF	o
59043.8142	59043.8142	19.985	—	1	ZTF	zi
59043.9025	59043.9255	20.060	0.181	4	ATF	cy
59044.7495	59044.7495	19.733	—	1	ZTF	zr
59044.8275	59044.8275	19.822	—	1	ZTF	zg
59045.8129	59045.8129	19.909	—	1	ZTF	zg
59047.7074	59047.7074	19.866	—	1	ZTF	zi
59047.8205	59047.8205	19.840	—	1	ZTF	zr
59047.8937	59047.9173	19.941	0.222	4	ATF	cy
59048.7447	59048.7447	19.810	—	1	ZTF	zr
59048.7772	59048.7772	19.933	—	1	ZTF	zg

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59049.7709	59049.8455	17.389	0.104	2	ZTF	zr
59050.7456	59050.8615	20.154	0.106	2	ZTF	zg
59050.7912	59050.7921	20.005	0.038	2	ZTF	zr
59050.7921	59050.7921	19.920	—	1	ZAL	zr
59050.8615	59050.8615	19.974	—	1	ZAL	zg
59051.7724	59051.7724	20.124	—	1	ZTF	zi
59051.8119	59051.8119	20.353	—	1	ZTF	zg
59051.8527	59051.8527	20.195	—	1	ZTF	zr
59051.8918	59051.9174	20.248	0.128	4	ATF	cy
59052.7535	59052.7535	20.149	—	1	ZTF	zr
59052.7985	59052.7985	20.359	—	1	ZTF	zg
59053.7978	59053.7987	20.112	0.044	2	ZTF	zr
59053.8316	59053.8519	20.084	0.132	4	ATF	o
59053.8384	59053.8394	20.151	0.037	2	ZTF	zg
59054.7906	59054.7906	20.257	—	1	ZTF	zg
59054.8537	59054.8537	20.201	—	1	ZTF	zr
59055.7438	59055.7438	20.150	—	1	ZTF	zr
59055.7532	59055.7532	20.328	—	1	ZTF	zi
59055.7614	59055.7626	>17.086	0.106	2	ASN	g
59055.7976	59055.7976	20.449	—	1	ZTF	zg
59056.7728	59056.7853	20.215	0.039	2	ZTF	zg
59056.8007	59056.8031	>17.470	0.028	3	ASN	g
59056.8381	59056.8505	20.049	0.020	2	ZTF	zr
59056.8505	59056.8505	19.997	—	1	ZAL	zr
59057.7692	59057.7711	20.036	0.029	2	ZTF	zg
59057.7711	59057.7711	19.961	—	1	ZAL	zg
59057.8211	59057.8211	20.064	—	1	ZTF	zr
59058.7361	59058.7386	>16.987	0.025	3	ASN	g
59059.7524	59059.7524	20.021	—	1	ZTF	zi
59059.7901	59059.7901	20.151	—	1	ZTF	zg
59059.8552	59059.8756	20.089	0.114	2	ATF	o
59060.7952	59060.7952	20.134	—	1	ZTF	zg
59061.6839	59061.6853	20.152	0.084	3	ZTF	zg
59061.6848	59061.6848	19.948	—	1	ZAL	zg
59061.7531	59061.7531	20.041	—	1	ZTF	zr
59061.7748	59061.7773	>16.314	0.087	3	ASN	g
59061.8311	59061.8605	19.642	0.065	3	ATF	o
59062.7305	59062.7305	19.946	—	1	ZTF	zr
59062.7332	59062.7356	>16.211	0.066	3	ASN	g
59062.8373	59062.8373	19.641	—	1	ZTF	zg
59063.7105	59063.7105	19.780	—	1	ZTF	zi
59063.7548	59063.7577	19.999	0.111	2	ZTF	zg
59063.7800	59063.7800	19.511	—	1	ZAL	zr
59063.7800	59063.7819	19.625	0.026	2	ZTF	zr
59063.8197	59063.8267	19.406	0.069	2	ATF	o
59064.7970	59064.7970	20.102	—	1	ZTF	zr
59065.7249	59065.7249	19.659	—	1	ZTF	zg
59065.8707	59065.9027	19.771	0.283	3	ATF	o
59066.7370	59066.7370	18.244	—	1	ZAL	zr
59066.7370	59066.7380	18.246	0.043	2	ZTF	zr
59066.7958	59066.7958	18.071	—	1	ZAL	zg
59066.7958	59066.7967	18.084	0.018	2	ZTF	zg
59067.6880	59067.6880	20.116	—	1	ZTF	zr
59067.6917	59067.6917	20.536	—	1	ZTF	zg
59067.7318	59067.7318	20.290	—	1	ZTF	zi
59068.2422	59068.2447	>17.097	0.043	3	ASN	g
59068.7284	59068.7284	20.330	—	1	ZTF	zg
59069.6725	59069.6725	20.558	—	1	ZTF	zg
59069.7155	59069.7164	20.469	0.043	2	ZTF	zr
59069.8061	59069.8304	20.484	0.105	4	ATF	o
59070.6954	59070.6954	20.387	—	1	ZTF	zr
59070.7432	59070.7432	20.828	—	1	ZTF	zg
59071.6939	59071.6939	20.605	—	1	ZTF	zr
59071.8073	59071.8354	20.004	0.185	4	ATF	cy
59072.6900	59072.6909	20.649	0.126	2	ZTF	zr
59072.7459	59072.7469	20.575	0.064	2	ZTF	zg

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59072.7880	59072.7880	20.295	—	1	ZTF	zi
59073.6998	59073.6998	20.769	—	1	ZTF	zr
59073.8548	59073.8726	20.472	0.291	3	ATF	o
59075.6927	59075.6927	20.827	—	1	ZTF	zg
59075.7317	59075.7461	20.645	0.161	2	ZTF	zr
59075.8310	59075.8365	20.472	0.278	2	ATF	cy
59076.7086	59076.7086	20.531	—	1	ZTF	zr
59076.7279	59076.7279	20.270	—	1	ZTF	zi
59077.7134	59077.7134	20.472	—	1	ZTF	zg
59077.7633	59077.7633	20.599	—	1	ZTF	zr
59077.8316	59077.8523	20.278	0.041	3	ATF	o
59078.7256	59078.7275	20.833	0.282	2	ZTF	zg
59078.7872	59078.7882	20.532	0.204	2	ZTF	zr
59079.6878	59079.6878	20.709	—	1	ZTF	zg
59079.7911	59079.7911	20.289	—	1	ATF	cy
59080.6870	59080.6870	20.433	—	1	ZTF	zr
59080.7564	59080.7564	20.437	—	1	ZTF	zi
59081.7035	59081.7044	20.350	0.114	2	ZTF	zr
59081.7114	59081.7114	20.741	—	1	ZTF	zg
59081.7495	59081.7519	>17.103	0.077	3	ASN	g
59082.6722	59082.6722	20.548	—	1	ZTF	zr
59082.7894	59082.7894	20.459	—	1	ZTF	zg
59083.7875	59083.8082	20.139	0.053	3	ATF	cy
59084.6825	59084.6825	20.534	—	1	ZTF	zg
59084.7151	59084.7151	20.529	—	1	ZTF	zi
59085.6713	59085.6737	>16.678	0.067	3	ASN	g
59085.7965	59085.7965	19.780	—	1	ATF	o
59086.6727	59086.6727	20.389	—	1	ZTF	zr
59086.7378	59086.7402	>17.312	0.046	3	ASN	g
59087.6810	59087.6834	>16.808	0.065	3	ASN	g
59087.7733	59087.7933	20.082	0.140	4	ATF	o
59088.6857	59088.6857	20.066	—	1	ZTF	zr
59088.7720	59088.7744	>16.530	0.007	3	ASN	g
59089.7141	59089.7141	19.954	—	1	ZTF	zr
59089.8268	59089.8268	20.183	—	1	ATF	o
59090.6820	59090.6845	>16.277	0.045	3	ASN	g
59090.6828	59090.6828	20.323	—	1	ZTF	zr
59091.7218	59091.7218	20.183	—	1	ZTF	zg
59092.6681	59092.6681	20.621	—	1	ZTF	zi
59093.7822	59093.7822	19.960	—	1	ATF	o
59095.6546	59095.6546	20.291	—	1	ZTF	zr
59095.7180	59095.7205	>16.001	0.079	3	ASN	g
59096.6672	59096.6672	20.617	—	1	ZTF	zg
59096.6943	59096.6943	20.578	—	1	ZTF	zr
59096.7140	59096.7140	20.709	—	1	ZTF	zi
59096.7145	59096.7169	>16.149	0.004	3	ASN	g
59097.6886	59097.6886	20.730	—	1	ZTF	zg
59097.7128	59097.7153	>16.385	0.032	3	ASN	g
59097.7280	59097.7491	20.447	0.068	2	ZTF	zi
59097.8277	59097.8319	20.122	0.222	2	ATF	o
59098.6558	59098.6577	20.677	0.036	3	ZTF	zr
59098.7011	59098.7011	20.749	—	1	ZTF	zg
59098.7480	59098.7480	20.442	—	1	ZTF	zi
59099.6317	59099.8009	20.509	0.127	4	ZTF	zr
59099.6750	59099.6759	21.012	0.032	2	ZTF	zg
59099.7454	59099.7454	20.703	—	1	ZTF	zi
59101.7514	59101.7677	20.161	0.198	2	ATF	o
59103.8106	59103.8359	20.750	0.219	3	ATF	cy
59105.8002	59105.8122	20.573	0.013	2	ATF	o
59106.6851	59106.6851	20.753	—	1	ZTF	zg
59106.6980	59106.6980	20.389	—	1	ZTF	zr
59107.6246	59107.6316	20.759	0.032	3	ZTF	zr
59107.7176	59107.7176	20.530	—	1	ZTF	zi
59109.6261	59109.7905	20.704	0.442	2	ZTF	zi
59109.6620	59109.6681	20.787	0.111	3	ZTF	zr
59109.7380	59109.7547	20.443	0.016	3	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59110.6406	59110.6406	20.619	—	1	ZTF	zr
59110.6505	59110.6505	20.822	—	1	ZTF	zg
59110.6830	59110.6844	20.669	0.363	2	ZTF	zi
59111.6818	59111.6818	20.847	—	1	ZTF	zi
59112.6389	59112.6495	21.072	0.239	2	ZTF	zg
59112.6701	59112.6711	21.057	0.244	2	ZTF	zr
59112.7256	59112.7484	20.907	0.359	2	ZTF	zi
59113.6225	59113.6225	21.048	—	1	ZTF	zi
59113.6292	59113.6382	20.831	0.146	2	ZTF	zr
59113.6791	59113.6791	20.930	—	1	ZTF	zg
59113.7766	59113.7795	20.164	0.159	2	ATF	o
59114.6453	59114.6600	20.886	0.148	2	ZTF	zi
59114.7366	59114.7366	20.740	—	1	ZTF	zg
59115.6245	59115.6827	20.959	0.054	2	ZTF	zi
59116.6636	59116.6636	20.790	—	1	ZTF	zi
59116.7541	59116.7541	20.371	—	1	ZTF	zg
59117.6103	59117.6265	20.776	0.268	2	ZTF	zr
59117.6488	59117.6781	20.692	0.097	2	ZTF	zi
59118.6457	59118.6609	20.864	0.100	2	ZTF	zi
59118.7323	59118.7323	20.489	—	1	ZTF	zr
59119.6236	59119.6286	20.918	0.222	2	ZTF	zi
59119.6627	59119.6627	20.971	—	1	ZTF	zr
59119.7186	59119.7453	20.196	0.104	3	ATF	o
59120.6603	59120.6603	20.729	—	1	ZTF	zi
59121.6358	59121.6358	20.402	—	1	ZTF	zi
59121.6600	59121.6627	20.685	0.101	2	ZTF	zr
59121.7805	59121.7966	19.853	0.204	3	ATF	o
59124.6438	59124.6438	20.332	—	1	ZTF	zg
59126.7056	59126.7056	20.155	—	1	ZTF	zg
59127.6302	59127.6327	>16.466	0.049	3	ASN	g
59128.6293	59128.6317	>17.011	0.041	3	ASN	g
59128.6429	59128.6429	21.154	—	1	ZTF	zr
59128.6633	59128.6633	20.928	—	1	ZTF	zg
59129.6602	59129.6602	20.549	—	1	ZTF	zi
59130.6544	59130.6544	21.354	—	1	ZTF	zg
59130.7298	59130.7298	20.507	—	1	ZTF	zi
59131.7562	59131.7562	20.514	—	1	ATF	cy
59132.6118	59132.6142	>17.317	0.049	3	ASN	g
59133.7541	59133.7541	20.277	—	1	ATF	o
59135.6111	59135.6111	21.058	—	1	ZTF	zg
59136.6427	59136.6452	>17.160	0.036	3	ASN	g
59136.6651	59136.6651	21.054	—	1	ZTF	zr
59137.6011	59137.6011	20.885	—	1	ZTF	zr
59139.5728	59139.5752	>17.290	0.049	3	ASN	g
59139.6196	59139.6196	21.074	—	1	ZTF	zg
59139.7503	59139.7503	20.366	—	1	ATF	cy
59142.5773	59142.5797	>17.184	0.085	3	ASN	g
59143.6455	59143.6455	21.229	—	1	ZTF	zr
59143.6609	59143.6609	20.752	—	1	ZTF	zg
59144.5763	59144.5787	>16.793	0.080	3	ASN	g
59145.5666	59145.5690	>17.008	0.033	3	ASN	g
59145.6011	59145.6011	21.452	—	1	ZTF	zr
59148.5591	59148.5615	>16.621	0.059	3	ASN	g
59157.5802	59157.5802	20.940	—	1	ZTF	zr
59169.6989	59169.6989	20.120	—	1	ATF	o
59217.0395	59217.0395	>15.053	—	1	ASN	g
59218.0299	59218.0311	>14.663	0.033	2	ASN	g
59219.0343	59219.0368	>15.914	0.082	3	ASN	g
59223.0399	59223.0411	>15.490	0.204	2	ASN	g
59231.0143	59231.0168	>17.470	0.063	3	ASN	g
59231.9955	59231.9980	>17.194	0.079	3	ASN	g
59238.9872	59238.9896	>17.186	0.052	3	ASN	g
59240.9916	59240.9940	>16.418	0.089	3	ASN	g
59245.0387	59245.0387	>15.640	—	1	ASN	g
59245.9701	59245.9713	>14.898	0.097	2	ASN	g
59249.0359	59249.0359	20.932	—	1	ZTF	zr

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59252.9499	59252.9523	>17.268	0.035	3	ASN	g
59253.0448	59253.0448	21.572	—	1	ZTF	zr
59254.9585	59255.0373	>17.150	0.275	4	ASN	g
59255.0361	59255.0361	15.309	—	1	ASN	g
59270.0789	59270.0789	19.949	—	1	ATF	o
59276.8934	59276.8958	>15.972	0.010	3	ASN	g
59279.9057	59279.9082	>15.450	0.065	3	ASN	g
59291.6258	59291.6258	>16.978	—	1	ASN	g
59292.8568	59292.8592	>17.342	0.041	3	ASN	g
59292.9475	59292.9475	21.300	—	1	ZTF	zg
59298.0829	59298.0829	20.750	—	1	ATF	o
59298.8277	59298.8720	>17.030	0.031	6	ASN	g
59299.8818	59299.9185	>16.652	0.623	2	ASN	g
59302.9935	59302.9935	20.904	—	1	ZTF	zg
59306.9107	59306.9107	>15.580	—	1	ASN	g
59306.9945	59306.9945	21.532	—	1	ZTF	zr
59308.5928	59308.8440	>16.248	0.093	9	ASN	g
59309.9452	59309.9452	21.440	—	1	ZTF	zg
59312.8374	59312.8663	>17.001	0.032	6	ASN	g
59313.8696	59313.8949	>17.248	0.097	6	ASN	g
59314.0497	59314.0909	20.571	0.020	2	ATF	cy
59314.9584	59314.9584	21.733	—	1	ZTF	zr
59316.7762	59316.7774	>15.617	0.639	2	ASN	g
59316.8835	59316.8835	21.541	—	1	ZTF	zg
59318.0261	59318.0383	20.487	0.008	2	ATF	cy
59320.0122	59320.0122	20.292	—	1	ATF	o
59322.0383	59322.0456	20.479	0.050	2	ATF	cy
59327.9867	59327.9867	20.160	—	1	ATF	o
59333.7877	59333.8358	>15.722	0.031	6	ASN	g
59336.9413	59336.9413	21.067	—	1	ZTF	zg
59336.9783	59336.9783	20.944	—	1	ZTF	zr
59339.8305	59339.9145	>17.168	0.152	6	ASN	g
59340.7748	59340.7773	>17.033	0.014	3	ASN	g
59340.8916	59340.8916	21.567	—	1	ZTF	zg
59341.7622	59341.7646	>15.698	0.232	3	ASN	g
59342.9192	59342.9192	21.734	—	1	ZTF	zr
59343.9703	59343.9703	20.501	—	1	ATF	cy
59345.9038	59345.9038	21.796	—	1	ZTF	zg
59345.9436	59345.9436	21.552	—	1	ZTF	zr
59346.9104	59346.9104	21.589	—	1	ZTF	zr
59348.9006	59348.9006	21.767	—	1	ZTF	zr
59349.8511	59349.8511	21.932	—	1	ZTF	zr
59351.9464	59351.9464	20.610	—	1	ATF	cy
59353.8898	59353.8923	>17.439	0.011	3	ASN	g
59368.7628	59368.8459	>17.122	0.138	5	ASN	g
59369.7942	59369.8222	>17.240	0.157	6	ASN	g
59369.8741	59369.8741	21.587	—	1	ZTF	zg
59369.9232	59369.9232	21.557	—	1	ZTF	zr
59369.9630	59369.9795	20.715	0.158	2	ATF	cy
59370.7365	59370.7365	21.130	—	1	ZTF	zg
59370.9229	59370.9253	>17.485	0.099	3	ASN	g
59371.8219	59371.8369	21.805	0.184	3	ZTF	zr
59371.8796	59371.8796	21.576	—	1	ZTF	zg
59371.9336	59371.9336	20.338	—	1	ATF	o
59372.6308	59372.7159	>17.053	0.044	6	ASN	g
59373.8544	59373.8568	>17.488	0.043	3	ASN	g
59373.8676	59373.8676	21.449	—	1	ZTF	zr
59373.9335	59373.9335	21.906	—	1	ZTF	zg
59376.8321	59376.8321	21.745	—	1	ZTF	zr
59377.8355	59377.8355	21.727	—	1	ZTF	zg
59377.8972	59377.8972	21.006	—	1	ATF	cy
59378.7254	59378.8592	21.418	0.039	3	ZTF	zg
59378.7578	59378.8162	21.538	0.332	2	ZTF	zr
59378.9331	59378.9356	>15.275	0.126	3	ASN	g
59379.9148	59379.9172	>17.246	0.047	3	ASN	g
59380.8397	59380.8397	21.033	—	1	ZTF	zr

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59381.9610	59381.9610	20.765	—	1	ATF	cy
59382.8185	59382.8185	21.507	—	1	ZTF	zr
59384.3416	59384.3441	>16.251	0.087	3	ASN	g
59385.3682	59385.4946	>16.008	0.089	5	ASN	g
59386.0586	59386.0586	20.065	—	1	ATF	cy
59386.5959	59386.5984	>15.994	0.043	3	ASN	g
59387.7913	59387.7913	15.811	—	1	ASN	g
59387.7926	59387.7938	>15.802	0.015	2	ASN	g
59388.7730	59388.7754	>15.624	0.066	3	ASN	g
59391.8147	59391.8159	13.698	0.236	2	ASN	g
59391.8171	59391.8171	>14.697	—	1	ASN	g
59394.7303	59394.7327	>15.874	0.050	3	ASN	g
59396.8197	59396.8197	21.610	—	1	ZTF	zr
59397.8392	59397.8392	21.677	—	1	ZTF	zr
59397.9106	59397.9106	20.713	—	1	ATF	o
59398.8390	59398.8414	>17.027	0.064	3	ASN	g
59399.7780	59399.7780	21.565	—	1	ZTF	zg
59399.8316	59399.8316	21.569	—	1	ZTF	zr
59400.5535	59400.5560	>16.305	0.082	3	ASN	g
59401.7496	59401.7666	21.498	0.116	2	ZTF	zg
59401.8273	59401.8282	21.659	0.062	2	ZTF	zr
59401.9345	59401.9345	20.552	—	1	ATF	o
59402.7988	59402.7988	21.168	—	1	ZTF	zg
59404.7147	59404.7972	21.190	0.300	2	ZTF	zr
59405.7990	59405.7990	21.204	—	1	ZTF	zg
59406.2971	59406.2996	>17.000	0.055	3	ASN	g
59406.6917	59406.6917	21.447	—	1	ZTF	zg
59407.2897	59407.2931	>16.917	0.030	3	ASN	g
59407.6950	59407.8184	21.429	0.163	2	ZTF	zr
59408.7142	59408.7166	>16.978	0.049	3	ASN	g
59409.7796	59409.7983	21.487	0.116	2	ZTF	zr
59409.8658	59409.9092	20.479	0.571	2	ATF	o
59410.6274	59410.6299	>17.055	0.034	3	ASN	g
59411.7288	59411.7288	21.396	—	1	ZTF	zr
59412.8648	59412.8648	21.022	—	1	ZTF	zr
59413.8614	59413.8642	20.447	0.357	2	ATF	o
59414.6931	59414.6955	>16.295	0.063	3	ASN	g
59415.8655	59415.8655	19.578	—	1	ATF	o
59416.5843	59416.5868	>15.876	0.035	3	ASN	g
59417.7731	59417.7756	>14.937	0.048	3	ASN	g
59421.2713	59421.2713	>13.523	—	1	ASN	g
59422.4989	59422.5014	>16.907	0.049	3	ASN	g
59423.3864	59423.3864	>16.132	—	1	ASN	g
59424.8171	59424.8196	>16.573	0.044	3	ASN	g
59425.7359	59425.7536	21.433	0.064	2	ZTF	zg
59425.7974	59425.7999	>15.809	0.220	3	ASN	g
59426.3807	59426.3832	>16.980	0.029	3	ASN	g
59427.7549	59427.7549	21.429	—	1	ZTF	zg
59427.8208	59427.8208	21.328	—	1	ZTF	zr
59429.7502	59429.7502	21.671	—	1	ZTF	zr
59429.7991	59429.7991	21.292	—	1	ZTF	zg
59429.8618	59429.8618	20.449	—	1	ATF	cy
59430.3798	59430.3823	>16.752	0.048	3	ASN	g
59430.7901	59430.8013	21.542	0.191	2	ZTF	zg
59431.7162	59431.7186	>17.319	0.181	3	ASN	g
59432.6507	59432.6532	>17.070	0.056	3	ASN	g
59433.8529	59433.8700	20.680	0.025	2	ATF	cy
59434.6927	59434.6936	21.741	0.087	2	ZTF	zr
59434.7543	59434.7543	21.419	—	1	ZTF	zg
59434.7621	59434.7646	>17.428	0.049	3	ASN	g
59435.5189	59435.5214	>17.015	0.037	3	ASN	g
59435.7053	59435.7293	21.433	0.052	2	ZTF	zg
59435.7811	59435.7816	21.382	0.079	2	ZTF	zr
59435.8531	59435.8531	20.254	—	1	ATF	o
59436.7371	59436.7381	21.257	0.015	2	ZTF	zg
59437.2587	59437.2611	>17.047	0.105	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59437.8230	59437.8682	20.685	0.106	3	ATF	cy
59441.7291	59441.7559	21.345	0.246	2	ZTF	zg
59441.8454	59441.8454	20.612	–	1	ATF	o
59442.2161	59442.2186	>16.041	0.077	3	ASN	g
59442.7807	59442.7807	20.828	–	1	ZTF	zg
59445.6764	59445.6788	>15.394	0.456	2	ASN	g
59445.6776	59445.6776	14.863	–	1	ASN	g
59445.7911	59445.7911	20.350	–	1	ATF	o
59447.8171	59447.8171	19.467	–	1	ATF	o
59449.8595	59449.8719	19.836	0.092	2	ATF	o
59451.8393	59451.8393	19.999	–	1	ATF	o
59452.7173	59452.7198	>16.442	0.070	3	ASN	g
59453.6902	59453.6902	21.255	–	1	ZTF	zg
59454.6948	59454.7343	21.504	0.150	2	ZTF	zg
59454.7111	59454.7136	>16.980	0.061	3	ASN	g
59455.5444	59455.5469	>17.029	0.082	3	ASN	g
59455.7122	59455.7122	21.171	–	1	ZTF	zg
59457.2509	59457.2534	>16.968	0.074	3	ASN	g
59457.7081	59457.7081	21.422	–	1	ZTF	zg
59458.6588	59458.6754	21.424	0.106	2	ZTF	zg
59458.7470	59458.7470	21.186	–	1	ZTF	zr
59459.7156	59459.7170	21.366	0.075	2	ZTF	zr
59460.6745	59460.6745	21.538	–	1	ZTF	zg
59460.7167	59460.7167	21.333	–	1	ZTF	zr
59461.6825	59461.6825	21.194	–	1	ZTF	zr
59462.5702	59462.5727	>16.857	0.031	3	ASN	g
59463.6515	59463.6515	21.290	–	1	ZTF	zr
59464.2321	59464.2346	>16.921	0.043	3	ASN	g
59464.5471	59464.5496	>16.752	0.056	3	ASN	g
59464.6533	59464.6533	21.533	–	1	ZTF	zg
59465.5407	59465.5432	>16.720	0.078	3	ASN	g
59465.6527	59465.6527	20.779	–	1	ZTF	zi
59466.6634	59466.6644	21.484	0.151	2	ZTF	zr
59467.2948	59467.2973	>16.508	0.027	3	ASN	g
59467.7542	59467.7542	20.398	–	1	ATF	cy
59468.6650	59468.6650	21.233	–	1	ZTF	zg
59469.2726	59469.2751	>15.431	0.073	3	ASN	g
59473.6727	59473.6727	20.798	–	1	ZTF	zg
59473.6935	59473.6947	>13.995	0.401	2	ASN	g
59475.6392	59475.6416	>16.248	0.080	3	ASN	g
59476.2771	59476.2796	>15.163	0.012	3	ASN	g
59479.6605	59479.6629	>14.745	0.077	2	ASN	g
59479.6617	59479.6617	14.222	–	1	ASN	g
59479.7343	59479.7343	20.291	–	1	ATF	o
59481.6564	59481.6576	>15.072	0.021	2	ASN	g
59481.6589	59481.6589	14.214	–	1	ASN	g
59484.5024	59484.5049	>16.843	0.081	3	ASN	g
59485.6455	59485.6480	>17.173	0.076	3	ASN	g
59488.6506	59488.6506	21.527	–	1	ZTF	zr
59490.6182	59490.6207	>17.310	0.024	2	ASN	g
59491.6252	59491.6277	>16.597	0.073	3	ASN	g
59491.6522	59491.6522	21.283	–	1	ZTF	zr
59493.6145	59493.6170	>17.336	0.045	3	ASN	g
59495.6280	59495.6304	>17.322	0.088	3	ASN	g
59498.6307	59498.6307	21.421	–	1	ZTF	zg
59500.5801	59500.5826	>15.873	0.668	2	ASN	g
59501.5791	59501.5816	>16.844	0.046	3	ASN	g
59503.3993	59503.3993	>18.100	–	1	MUY	CV
59503.5964	59503.5989	>16.500	0.014	3	ASN	g
59505.5928	59505.5952	>16.256	0.036	3	ASN	g
59507.5692	59507.5717	>16.119	0.110	3	ASN	g
59508.5810	59508.5810	15.419	–	1	ASN	g
59508.5823	59508.5835	>15.692	0.138	2	ASN	g
59510.5579	59510.5603	>17.273	0.016	3	ASN	g
59512.5562	59512.5586	>17.132	0.033	3	ASN	g
59512.6208	59512.6208	21.474	–	1	ZTF	zr

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59514.5588	59514.5613	>17.237	0.013	3	ASN	g
59515.7168	59515.7168	20.596	–	1	ATF	cy
59516.3576	59516.3576	>17.700	–	1	MUY	CV
59516.5539	59516.5564	>17.183	0.077	3	ASN	g
59520.5442	59520.5467	>16.384	0.142	3	ASN	g
59525.6408	59525.6408	20.908	–	1	ZTF	zr
59584.0345	59584.0370	>15.206	0.142	3	ASN	g
59585.0312	59585.0337	>16.548	0.078	3	ASN	g
59587.0284	59587.0309	>16.787	0.093	3	ASN	g
59594.0196	59594.0221	>17.217	0.063	3	ASN	g
59608.1605	59608.1605	19.885	–	1	ATF	o
59609.9652	59609.9676	>17.146	0.059	3	ASN	g
59627.9774	59627.9798	>16.115	0.095	3	ASN	g
59638.9036	59638.9049	>15.521	0.197	2	ASN	g
59646.1224	59646.1224	20.023	–	1	ATF	cy
59657.8621	59657.8645	>15.820	0.061	3	ASN	g
59658.8351	59658.8376	>15.847	0.036	3	ASN	g
59661.0664	59661.0664	19.801	–	1	ATF	o
59662.1008	59662.1008	20.004	–	1	ATF	o
59662.8337	59662.8349	>16.447	0.507	2	ASN	g
59664.8677	59664.9607	>17.404	0.034	9	ASN	g
59666.8526	59666.9087	>17.061	0.059	6	ASN	g
59670.0861	59670.0861	20.325	–	1	ATF	cy
59672.8618	59672.8643	>17.523	0.012	3	ASN	g
59674.9121	59674.9146	>17.527	0.061	3	ASN	g
59676.9183	59676.9207	>17.504	0.028	3	ASN	g
59677.9738	59677.9738	21.179	–	1	ZTF	zg
59678.9521	59678.9546	>17.545	0.124	3	ASN	g
59680.8202	59680.8226	>16.753	0.023	3	ASN	g
59681.8214	59681.8239	>17.125	0.011	3	ASN	g
59682.5687	59682.5712	>16.744	0.038	3	ASN	g
59693.9502	59693.9527	>17.272	0.034	3	ASN	g
59695.7380	59695.8727	>17.138	0.123	7	ASN	g
59697.9166	59697.9166	21.293	–	1	ZTF	zr
59697.9175	59697.9199	>16.864	0.054	3	ASN	g
59697.9414	59697.9414	21.564	–	1	ZTF	zg
59699.8595	59699.8607	>16.381	0.784	2	ASN	g
59700.9038	59700.9038	21.344	–	1	ZTF	zr
59701.9509	59701.9534	>17.418	0.035	3	ASN	g
59702.5922	59702.5947	>16.627	0.009	3	ASN	g
59702.9026	59702.9026	21.192	–	1	ZTF	zr
59705.7406	59705.7431	>17.329	0.097	3	ASN	g
59706.8136	59706.8161	>17.167	0.042	3	ASN	g
59708.7638	59708.7664	>16.903	0.067	3	ASN	g
59709.8011	59709.8035	>17.241	0.046	3	ASN	g
59711.7436	59711.7461	>16.444	0.049	3	ASN	g
59713.7357	59713.7576	>15.985	0.032	6	ASN	g
59713.7606	59713.7606	15.699	–	1	ATF	o
59714.9759	59714.9759	19.814	–	1	ATF	o
59719.5961	59719.5961	>18.300	–	1	Fnm	cG
59721.0092	59721.0092	19.375	–	1	ATF	o
59721.8585	59721.8585	21.153	–	1	ZTF	zr
59721.9426	59721.9481	20.581	0.154	2	ATF	cy
59722.9963	59722.9963	20.420	–	1	ATF	o
59723.4449	59723.6838	>16.116	0.276	6	ASN	g
59724.4414	59724.7820	>16.715	0.046	12	ASN	g
59724.9380	59724.9380	21.314	–	1	ZTF	zr
59725.4317	59725.4342	>16.754	0.043	3	ASN	g
59725.8957	59725.8957	21.826	–	1	ZTF	zr
59726.4231	59726.6005	>16.810	0.036	6	ASN	g
59727.4253	59727.8078	>16.907	0.087	9	ASN	g
59727.9059	59727.9059	18.767	–	1	ATF	o
59727.9374	59727.9374	21.395	–	1	ZTF	zg
59729.4270	59729.4295	>16.646	0.010	3	ASN	g
59731.8527	59731.8527	21.183	–	1	ZTF	zg
59732.9295	59732.9295	20.378	–	1	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59734.8120	59734.8120	22.135	—	1	ZTF	zg
59735.7855	59735.7864	21.460	0.087	2	ZTF	zg
59736.9470	59736.9470	21.564	—	1	ZTF	zg
59737.4601	59737.5270	>16.754	0.030	6	ASN	g
59737.7811	59737.7811	21.575	—	1	ZTF	zr
59737.9541	59737.9554	>15.674	0.251	2	ASN	g
59738.3954	59738.9152	>16.808	0.168	10	ASN	g
59738.8986	59738.8986	21.422	—	1	ZTF	zg
59739.4072	59739.6999	>16.388	0.133	6	ASN	g
59739.8820	59739.8829	21.720	0.293	2	ZTF	zg
59739.9268	59739.9268	21.362	—	1	ZTF	zr
59739.9671	59739.9671	19.993	—	1	ATF	o
59740.3955	59740.6686	>15.987	0.025	6	ASN	g
59741.4007	59741.4031	>15.710	0.031	3	ASN	g
59742.6475	59742.6500	>15.963	0.039	3	ASN	g
59747.6550	59747.6575	>16.144	0.040	3	ASN	g
59747.8450	59747.8450	21.205	—	1	ZTF	zr
59749.6147	59749.6171	>16.493	0.290	3	ASN	g
59750.6070	59750.6095	>16.809	0.104	3	ASN	g
59751.8458	59751.8458	21.413	—	1	ZTF	zg
59753.8444	59753.8541	21.602	0.162	2	ZTF	zr
59754.8638	59754.8663	>17.456	0.068	3	ASN	g
59755.4879	59755.4903	>16.868	0.062	3	ASN	g
59755.8517	59755.8517	21.785	—	1	ZTF	zr
59755.8928	59755.8928	21.432	—	1	ZTF	zg
59756.3420	59756.3445	>16.929	0.120	3	ASN	g
59756.8591	59756.8591	21.834	—	1	ZTF	zr
59756.8649	59756.8674	>17.408	0.049	3	ASN	g
59757.3765	59757.3789	>16.879	0.056	3	ASN	g
59757.7739	59757.7764	>17.398	0.054	3	ASN	g
59758.4203	59758.4229	>16.806	0.040	3	ASN	g
59758.7973	59758.7973	21.647	—	1	ZTF	zr
59759.3547	59759.4977	>16.778	0.026	6	ASN	g
59759.7979	59759.7979	21.425	—	1	ZTF	zr
59760.3219	59760.3244	>16.820	0.024	3	ASN	g
59760.7495	59760.7495	21.725	—	1	ZTF	zg
59761.3355	59761.3380	>16.875	0.032	3	ASN	g
59761.7089	59761.7089	21.558	—	1	ZTF	zr
59761.7744	59761.7744	21.425	—	1	ZTF	zg
59762.3676	59762.3717	>16.570	0.084	3	ASN	g
59762.7909	59762.7909	21.619	—	1	ZTF	zr
59762.8191	59762.8191	21.101	—	1	ZTF	zg
59764.8186	59764.8195	21.537	0.117	2	ZTF	zg
59765.3067	59765.3092	>16.575	0.080	3	ASN	g
59765.7102	59765.7127	>17.008	0.076	3	ASN	g
59765.8240	59765.8492	21.629	0.169	2	ZTF	zr
59765.8839	59765.8839	21.683	—	1	ZTF	zg
59766.8280	59766.8280	21.465	—	1	ZTF	zg
59766.8802	59766.8802	20.229	—	1	ATF	o
59767.3070	59767.3095	>16.382	0.049	3	ASN	g
59767.4501	59767.4501	>17.300	—	1	Fnm	cG
59768.3467	59768.3831	>16.155	0.040	6	ASN	g
59768.8423	59768.8423	21.313	—	1	ZTF	zg
59769.3144	59769.4833	>15.691	0.047	6	ASN	g
59770.7415	59770.7440	>16.212	0.072	3	ASN	g
59772.8514	59772.8538	>15.273	0.074	3	ASN	g
59774.8322	59774.8346	>15.307	0.101	3	ASN	g
59776.6929	59776.7128	21.476	0.075	2	ZTF	zr
59776.7098	59776.7123	>16.770	0.056	3	ASN	g
59777.6916	59777.6916	21.648	—	1	ZTF	zr
59777.7847	59777.7872	>16.821	0.110	3	ASN	g
59779.7778	59779.7778	21.153	—	1	ZTF	zr
59780.7310	59780.7310	21.346	—	1	ZTF	zg
59781.7566	59781.7566	21.698	—	1	ZTF	zg
59781.8362	59781.8386	>16.584	0.027	3	ASN	g
59782.6877	59782.6902	>17.089	0.059	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59782.7790	59782.7790	20.985	—	1	ZTF	zg
59782.8897	59782.8897	20.532	—	1	ATF	cy
59783.6868	59783.6892	>17.140	0.031	3	ASN	g
59783.7563	59783.7563	22.029	—	1	ZTF	zr
59783.7888	59783.7888	21.437	—	1	ZTF	zg
59784.7747	59784.7747	21.476	—	1	ZTF	zr
59784.8405	59784.8405	21.739	—	1	ZTF	zg
59785.7330	59785.7330	21.480	—	1	ZTF	zg
59785.9319	59785.9319	20.616	—	1	ATF	cy
59786.7278	59786.8107	21.582	0.006	2	ZTF	zg
59786.7778	59786.7778	21.459	—	1	ZTF	zr
59787.6936	59787.6961	>17.673	0.059	3	ASN	g
59787.7568	59787.7568	21.287	—	1	ZTF	zg
59787.7913	59787.7913	21.718	—	1	ZTF	zr
59789.7564	59789.7564	21.315	—	1	ZTF	zr
59790.0076	59790.0076	20.191	—	1	ATF	cy
59790.6570	59790.6570	>14.776	—	1	ASN	g
59790.7153	59790.8077	21.524	0.168	2	ZTF	zg
59790.7582	59790.7582	21.330	—	1	ZTF	zr
59791.6917	59791.6917	20.920	—	1	ZTF	zr
59792.8152	59792.8177	>17.379	0.009	3	ASN	g
59793.7568	59793.7568	21.496	—	1	ZTF	zg
59793.7778	59793.7803	>17.407	0.008	3	ASN	g
59793.8239	59793.8239	20.497	—	1	ATF	cy
59794.7158	59794.7158	21.650	—	1	ZTF	zg
59794.7351	59794.7351	21.577	—	1	ZTF	zr
59795.5017	59795.5042	>16.910	0.067	3	ASN	g
59795.8114	59795.8114	21.111	—	1	ZTF	zg
59797.5405	59797.5430	>16.634	0.054	3	ASN	g
59797.7362	59797.7977	21.302	0.131	2	ZTF	zg
59797.8393	59797.8393	21.306	—	1	ZTF	zr
59802.7992	59802.8017	>15.573	0.024	3	ASN	g
59804.7913	59804.7938	>15.525	0.032	2	ASN	g
59804.7925	59804.7925	15.375	—	1	ASN	g
59805.5259	59805.5284	>16.557	0.093	3	ASN	g
59807.5872	59807.5896	>17.176	0.039	3	ASN	g
59807.6694	59807.6694	21.687	—	1	ZTF	zr
59808.8397	59808.8397	20.537	—	1	ATF	o
59809.5738	59809.5763	>17.142	0.062	3	ASN	g
59809.7492	59809.7492	21.350	—	1	ZTF	zg
59809.7589	59809.7589	21.337	—	1	ZTF	zr
59810.8489	59810.8489	20.718	—	1	ATF	cy
59812.6985	59812.6985	21.357	—	1	ZTF	zr
59814.5715	59814.5739	>17.229	0.035	3	ASN	g
59814.7816	59814.7816	21.147	—	1	ZTF	zg
59816.5792	59816.5817	>17.078	0.027	3	ASN	g
59816.7062	59816.7071	21.456	0.147	2	ZTF	zg
59817.7730	59817.7918	20.565	0.185	2	ATF	cy
59819.5467	59819.5492	>17.197	0.037	3	ASN	g
59820.7030	59820.7055	>17.428	0.026	3	ASN	g
59822.7706	59822.7706	20.709	—	1	ATF	cy
59823.6719	59823.6719	21.364	—	1	ZTF	zr
59824.7000	59824.7000	21.489	—	1	ZTF	zg
59825.7795	59825.7795	20.323	—	1	ATF	o
59826.5248	59826.5274	>16.529	0.051	3	ASN	g
59828.5132	59828.5157	>16.338	0.088	3	ASN	g
59832.6400	59832.6425	>15.824	0.106	3	ASN	g
59835.7910	59835.7910	20.092	—	1	ATF	o
59836.7470	59836.7570	20.541	0.040	2	ATF	o
59839.6922	59839.6922	21.266	—	1	ZTF	zg
59839.7324	59839.7518	2.409	0.033	2	ATF	cy
59840.6203	59840.6228	>17.461	0.072	3	ASN	g
59840.6662	59840.7028	21.432	0.064	3	ZTF	zg
59843.6730	59843.6730	21.216	—	1	ZTF	zr
59844.6541	59844.6541	21.452	—	1	ZTF	zr
59844.6744	59844.6744	20.922	—	1	ZTF	zg

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.9 Log of observations of the 2020 outburst in ASASSN-20eq
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59849.7185	59849.7385	20.000	0.027	2	ATF	o
59850.6638	59850.6638	21.328	—	1	ZTF	zg
59856.4839	59856.4851	>15.785	0.083	2	ASN	g
59857.6729	59857.6729	20.840	—	1	ZTF	zr
59864.7409	59864.7409	19.957	—	1	ATF	o
59866.6101	59866.6126	>16.988	0.030	3	ASN	g
59866.7423	59866.7423	20.331	—	1	ATF	o
59867.6224	59867.6224	21.435	—	1	ZTF	zg
59872.5710	59872.5735	>17.329	0.120	3	ASN	g
59873.7296	59873.7296	19.411	—	1	ATF	cy
59876.5646	59876.5671	>17.263	0.031	3	ASN	g
59880.5546	59880.5571	>17.104	0.015	3	ASN	g
59883.7126	59883.7126	20.241	—	1	ATF	o

* BJD - 2400000.0

[†] Mean magnitude.

[‡] 1σ of mean magnitude.

[§] Number of observations.

^{||} Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX[‡] (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

[#] "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10: Log of observations of the 2021 outburst in ASASSN-21au.

Start*	End*	Mag	Error	N	Obs	Filter#
1322	>17.388	–	1	ASN	g	
59210.9148	59210.9172	>16.555	0.005	3	ASN	g
59211.9195	59211.9219	>16.351	0.028	3	ASN	g
59213.1021	59213.1046	>15.908	0.037	3	ASN	g
59213.9110	59214.1166	>15.888	0.022	9	ASN	g
59214.6220	59214.6960	19.920	0.014	2	Gai	G
59215.1166	59215.1191	>15.993	0.063	3	ASN	g
59217.9034	59218.1065	>16.533	0.023	9	ASN	g
59217.9487	59218.0057	19.851	0.181	3	ZTF	Vis
59218.8682	59218.9896	19.999	0.112	2	ZTF	Vis
59218.9002	59219.1026	>16.739	0.024	9	ASN	g
59219.1572	59219.1572	19.371	–	1	ATF	o
59219.9540	59219.9685	19.944	0.184	2	ZTF	Vis
59221.0016	59221.0040	>16.945	0.062	3	ASN	g
59221.0116	59221.0116	19.104	–	1	ZTF	Vis
59221.1498	59221.1594	19.421	0.180	2	ATF	o
59221.9250	59221.9888	19.476	0.131	2	ZTF	Vis
59222.0131	59222.0245	>17.136	0.059	6	ASN	g
59222.9756	59222.9756	19.524	–	1	ZTF	Vis
59223.0213	59223.0238	>17.549	0.073	3	ASN	g
59223.1207	59223.1526	19.521	0.132	4	ATF	o
59223.9754	59224.0339	19.817	0.189	2	ZTF	Vis
59224.9950	59225.0284	20.041	0.348	2	ZTF	Vis
59225.1209	59225.1209	>17.319	–	1	ASN	g
59226.0021	59226.0715	>15.899	0.337	6	ASN	g
59226.9741	59227.0312	19.605	0.209	3	ZTF	Vis
59226.9977	59227.0002	>17.661	0.091	3	ASN	g
59227.1064	59227.1165	19.934	0.111	3	ATF	cy
59227.9725	59228.0104	19.775	0.315	2	ZTF	Vis
59228.8679	59229.0794	>17.658	0.079	9	ASN	g
59228.9350	59228.9924	19.782	0.119	2	ZTF	Vis
59229.9120	59229.9120	19.676	–	1	ZTF	Vis
59230.9420	59231.0174	>17.496	0.056	9	ASN	g
59231.0336	59231.0336	19.847	–	1	ZTF	Vis
59231.1053	59231.1253	20.248	0.274	3	ATF	cy
59231.8511	59231.8523	>17.805	0.062	2	ASN	g
59231.9931	59231.9931	19.710	–	1	ZTF	Vis
59232.9459	59233.0260	19.271	0.189	3	ZTF	Vis
59234.0272	59234.0297	>17.062	0.048	3	ASN	g
59234.3706	59234.4446	19.456	0.048	2	Gai	G
59236.9251	59237.0114	>16.946	0.178	7	ASN	g
59238.9477	59238.9637	19.235	0.193	3	ATF	o
59239.0562	59239.0673	>17.170	0.014	6	ASN	g
59239.8432	59239.8457	>16.587	0.016	3	ASN	g
59241.9067	59241.9243	>16.324	0.056	6	ASN	g
59243.0984	59243.1049	18.943	0.171	3	ATF	o
59245.1074	59245.1298	19.265	0.188	4	ATF	o
59246.0561	59246.0586	>16.260	0.067	3	ASN	g
59246.8033	59247.0194	>16.645	0.031	12	ASN	g
59246.8980	59247.1205	19.407	0.072	5	ATF	o
59248.8037	59248.8934	>16.771	0.164	9	ASN	g
59248.9509	59248.9755	19.320	0.235	2	ZTF	Vis
59249.8658	59249.9547	18.123	0.176	3	ZTF	Vis
59250.0003	59250.0028	>15.252	0.378	3	ASN	g
59250.9215	59250.9239	13.314	0.011	3	ASN	g
59250.9349	59250.9718	13.522	0.197	2	ZTF	Vis
59251.2253	59251.3394	14.014	0.005	72	Ioh	C
59251.9166	59251.9681	15.046	0.244	2	ZTF	Vis
59252.0609	59252.3503	15.862	0.012	245	Kub	C
59252.2508	59252.3714	3.303	0.006	329	KU1	C
59252.2979	59252.2979	>15.200	–	1	Mhh	Vis
59252.8410	59253.0119	17.133	0.022	2	ZTF	Vis
59252.8898	59253.0408	17.015	0.103	8	ASN	g
59253.0396	59253.0396	>17.646	–	1	ASN	g
59253.1220	59253.1498	17.144	0.031	4	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59253.3897	59253.3897	>16.400	–	1	Myy	C
59253.8528	59253.9155	16.956	0.090	6	ASN	g
59253.8887	59253.9915	16.994	0.146	2	ZTF	Vis
59254.1605	59254.1605	16.700	–	1	Myy	C
59255.0328	59255.0328	16.491	–	1	ZTF	Vis
59255.1063	59255.1205	16.376	0.048	4	ATF	cy
59255.8419	59255.9381	16.034	0.059	3	ZTF	Vis
59256.1016	59256.1117	16.061	0.023	6	ASN	g
59256.1597	59256.1597	16.020	–	1	Ioh	C
59256.1631	59256.3667	3.368	0.006	169	KU1	C
59256.2158	59256.2158	>15.100	–	1	Myy	C
59256.2993	59256.2993	>15.200	–	1	Mhh	Vis
59257.0878	59257.1030	15.646	0.037	4	ATF	cy
59257.8893	59257.8902	15.008	0.020	2	ZTF	Vis
59257.9357	59257.9951	14.875	0.065	6	ASN	g
59258.1759	59258.3784	1.399	0.006	543	KU1	C
59258.1916	59258.3574	13.961	0.007	343	Ioh	C
59258.2250	59258.5991	13.597	0.007	453	Trt	CV
59258.2604	59258.2604	13.800	–	1	Mhh	Vis
59258.3008	59258.3025	13.964	0.013	3	Van	CV
59258.9543	59259.2138	13.690	0.003	203	Kub	C
59259.0413	59259.1278	13.708	0.012	8	ATF	cy
59259.0994	59259.3649	13.924	0.003	964	Ioh	C
59259.1627	59259.3752	1.497	0.004	421	KU1	C
59259.2247	59259.2247	13.900	–	1	Myy	C
59259.3007	59259.3023	14.116	0.013	3	Van	CV
59259.3553	59259.6829	14.144	0.005	464	Trt	CV
59260.0049	59260.0728	15.186	0.011	153	Ioh	C
59260.3008	59260.3025	14.340	0.013	3	Van	CV
59260.4180	59260.6298	13.484	0.002	300	Trt	CV
59260.9056	59261.3559	13.514	0.001	389	Kub	C
59261.0529	59261.3604	13.558	0.001	1010	Ioh	C
59261.1225	59261.2264	1.066	0.001	874	KU1	C
59261.1683	59261.1708	13.531	0.020	3	ASN	g
59261.2841	59261.3686	13.477	0.002	121	Trt	CV
59261.3206	59261.4718	0.723	0.001	208	CRI	C
59261.3227	59261.7616	13.707	0.001	269	Van	CV
59261.3410	59261.3410	12.900	–	1	Mhh	Vis
59261.9191	59262.3620	13.598	0.001	1527	Ioh	C
59261.9226	59262.3430	13.561	0.002	356	Kub	C
59262.0984	59262.1181	1.073	0.004	87	KU1	C
59262.3857	59262.5771	0.726	0.001	263	CRI	C
59262.5644	59262.7610	13.703	0.001	221	Van	CV
59262.8454	59263.0143	13.710	0.127	5	ZTF	Vis
59262.9010	59263.3394	13.490	0.002	372	Kub	C
59262.9155	59263.3620	13.674	0.001	1584	Ioh	C
59262.9175	59263.0605	13.455	0.016	6	ASN	g
59262.9688	59263.0417	13.557	0.015	8	ATF	cy
59263.1570	59263.3766	1.086	0.001	1126	KU1	C
59263.3438	59263.3438	13.000	–	1	Mhh	Vis
59263.3520	59263.4045	13.508	0.003	64	Trt	CV
59263.5579	59263.7541	13.718	0.001	225	Van	CV
59263.9746	59264.3585	13.502	0.001	329	Kub	C
59263.9767	59264.3605	14.223	0.008	2782	Ioh	C
59264.3115	59264.3404	13.613	0.005	42	Trt	CV
59264.5707	59264.7549	13.780	0.001	214	Van	CV
59264.8499	59264.8509	13.510	0.013	2	ZTF	Vis
59264.9221	59265.3607	13.771	0.001	1440	Ioh	C
59264.9302	59265.3468	13.604	0.001	355	Kub	C
59265.1293	59265.1698	1.207	0.001	211	KU1	C
59265.1932	59265.3872	0.854	0.002	264	CRI	C
59265.2575	59265.2575	13.800	–	1	Myy	C
59265.3611	59265.3611	13.200	–	1	Mhh	Vis
59265.8451	59265.8451	14.193	–	1	ZTF	Vis
59265.9243	59266.3608	13.821	0.002	1269	Ioh	C
59266.0034	59266.3437	13.759	0.002	282	Kub	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59266.1485	59266.3709	1.329	0.002	604	KU1	C
59266.3042	59266.3042	13.200	–	1	Mhh	Vis
59266.3420	59266.3641	1.196	0.004	16	Vih	C
59266.8288	59266.9988	13.983	0.030	4	ZTF	Vis
59266.9174	59267.3589	14.419	0.006	1586	Ioh	C
59267.0863	59267.3525	14.488	0.008	226	Kub	C
59267.1284	59267.1526	14.350	0.007	8	ATF	cy
59267.1562	59267.3701	2.107	0.004	513	KU1	C
59267.5797	59267.7496	15.224	0.007	199	Van	CV
59267.7554	59267.7887	15.164	0.022	10	RFD	CV
59267.8886	59267.8911	15.637	0.046	3	ASN	g
59267.9258	59268.3571	15.861	0.008	949	Ioh	C
59268.0998	59268.3441	15.959	0.011	126	Kub	C
59268.2674	59268.5495	3.350	0.008	121	Vih	C
59268.2686	59268.5329	16.019	0.006	372	Trt	CV
59268.3250	59268.3504	3.486	0.017	29	KU1	C
59268.3563	59268.3563	15.400	–	1	Mhh	Vis
59268.3577	59268.4793	16.027	0.012	67	CGR	CV
59268.3759	59268.3759	16.300	–	1	Myy	C
59268.5477	59268.6586	16.201	0.006	130	Van	CV
59268.8427	59269.0190	16.276	0.063	4	ZTF	Vis
59268.9297	59269.3270	16.294	0.029	60	Ioh	C
59268.9725	59268.9738	16.331	0.011	2	ASN	g
59268.9750	59268.9750	>16.355	–	1	ASN	g
59269.1653	59269.3673	3.722	0.005	223	KU1	C
59269.5472	59269.6558	16.454	0.006	99	Van	CV
59269.9167	59269.9362	>15.998	0.104	6	ASN	g
59270.0119	59270.3508	16.502	0.010	441	Ioh	C
59270.2222	59270.3524	3.945	0.007	147	KU1	C
59270.2915	59270.6320	3.792	0.005	155	Vih	C
59270.8204	59270.9100	16.652	0.016	4	ZTF	Vis
59270.9877	59271.0314	16.489	0.022	8	ATF	o
59271.7091	59271.7091	16.323	–	1	RFD	V
59271.8302	59271.8302	16.571	–	1	ZTF	Vis
59272.7631	59272.7631	16.514	–	1	RFD	V
59272.8841	59272.9489	16.471	0.008	4	ZTF	Vis
59272.9219	59273.3554	16.687	0.008	584	Ioh	C
59273.1907	59273.3470	16.609	0.014	106	Kub	C
59273.3058	59273.4149	16.438	0.011	141	Trt	CV
59273.9204	59274.3558	16.793	0.011	372	Ioh	C
59274.2351	59274.5397	16.512	0.007	351	Trt	CV
59274.3049	59274.3049	>14.300	–	1	Mhh	Vis
59274.7184	59274.9061	16.528	0.068	3	ZTF	Vis
59274.7205	59274.8615	>15.948	0.064	6	ASN	g
59274.9167	59274.9167	16.300	–	1	Ioh	C
59275.3281	59275.6264	16.416	0.010	214	Trt	CV
59275.4124	59275.5358	3.727	0.009	58	Vih	C
59275.8025	59275.8939	16.539	0.035	2	ZTF	Vis
59276.2142	59276.3540	16.699	0.020	101	Ioh	C
59276.3228	59276.5019	16.500	0.014	129	Trt	CV
59276.3268	59276.6311	3.862	0.006	114	Vih	C
59276.7214	59276.7214	16.238	–	1	ZTF	Vis
59276.7500	59276.7525	16.234	0.080	3	ASN	g
59277.0283	59277.3341	16.524	0.033	63	Ioh	C
59277.0726	59277.3581	3.895	0.008	265	KU1	C
59277.3022	59277.4485	3.707	0.009	56	Vih	C
59277.5037	59277.8048	16.017	0.216	5	RFD	V
59277.7349	59277.7969	14.515	0.177	5	ASN	g
59278.8282	59278.9670	15.004	0.272	2	ZTF	Vis
59278.8529	59278.8529	14.792	–	1	RFD	V
59278.9032	59278.9056	14.901	0.025	3	ASN	g
59279.0398	59279.0500	15.421	0.042	4	ATF	o
59279.9917	59279.9917	16.810	–	1	Ioh	C
59280.3011	59280.5587	4.402	0.007	119	Vih	C
59280.7732	59280.8686	17.125	0.133	3	ZTF	Vis
59280.8162	59280.8186	17.265	0.167	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59281.4019	59281.5578	4.705	0.007	70	Vih	C
59281.5191	59281.7311	17.445	0.047	11	RFD	V
59281.7219	59281.7219	>17.769	–	1	ASN	g
59281.7231	59281.8575	17.493	0.080	5	ASN	g
59281.7658	59281.7658	17.182	–	1	ZTF	Vis
59282.1061	59282.3223	4.825	0.011	144	KU1	C
59282.2899	59282.5778	4.868	0.005	131	Vih	C
59282.6673	59282.7648	17.613	0.050	11	RFD	V
59283.0708	59283.1521	17.730	0.042	2	Ioh	C
59283.2137	59283.3123	4.830	0.029	71	KU1	C
59283.2581	59283.3079	4.902	0.014	24	Vih	C
59283.9382	59283.9382	17.990	–	1	Ioh	C
59284.3021	59284.3021	>15.300	–	1	Mhh	Vis
59284.3403	59284.5848	4.896	0.003	114	Vih	C
59284.6939	59284.6984	17.481	0.026	2	RFD	V
59285.0694	59285.0694	17.160	–	1	Ioh	C
59285.7378	59285.8831	>15.186	0.313	5	ASN	g
59286.9756	59286.9867	17.417	0.043	4	ATF	o
59287.1472	59287.1472	18.260	–	1	Ioh	C
59288.0972	59288.0972	17.580	–	1	Ioh	C
59288.2050	59288.2416	4.826	0.045	26	KU1	C
59288.8963	59288.9931	>17.445	0.096	3	ASN	g
59288.8975	59288.9919	17.414	0.114	3	ASN	g
59289.0358	59289.0519	17.658	0.032	4	ATF	cy
59289.0958	59289.0958	17.600	–	1	Ioh	C
59289.9229	59289.9229	>16.800	–	1	Ioh	C
59290.3208	59290.3208	17.860	–	1	Ioh	C
59290.5400	59290.5443	17.601	0.092	2	RFD	V
59290.8240	59290.8669	17.661	0.148	2	ZTF	Vis
59291.1153	59291.1153	17.860	–	1	Ioh	C
59291.7000	59291.7012	>17.590	0.081	2	ASN	g
59291.7025	59291.7025	17.575	–	1	ASN	g
59291.7801	59291.8434	17.709	0.131	3	ZTF	Vis
59292.1039	59292.1064	>17.293	0.015	3	ASN	g
59292.1395	59292.1893	5.141	0.046	30	KU1	C
59292.8029	59292.8664	17.549	0.093	2	ZTF	Vis
59292.9663	59292.9688	17.376	0.036	2	ASN	g
59292.9676	59292.9676	>17.615	–	1	ASN	g
59293.0919	59293.1017	4.813	0.044	5	KU1	C
59293.3840	59293.5333	4.892	0.004	70	Vih	C
59293.5903	59293.5975	17.888	0.216	2	RFD	V
59293.7453	59293.7886	17.536	0.157	2	ZTF	Vis
59294.7061	59294.9015	>16.992	0.059	5	ASN	g
59294.7380	59294.7380	17.552	–	1	RFD	V
59294.9028	59294.9028	16.963	–	1	ASN	g
59295.0707	59295.0707	17.430	–	1	Gai	G
59295.0753	59295.1226	17.401	0.033	4	ATF	o
59295.5783	59295.5783	17.501	–	1	RFD	V
59295.7479	59295.8674	17.527	0.105	3	ZTF	Vis
59295.8109	59295.8787	>16.404	0.053	6	ASN	g
59296.1090	59296.1090	17.720	–	1	Ioh	C
59296.1451	59296.2757	4.924	0.018	82	KU1	C
59296.7368	59296.7368	17.650	–	1	RFD	V
59296.8150	59296.8150	16.972	–	1	ASN	g
59296.8162	59296.9044	>17.185	0.086	5	ASN	g
59296.8326	59296.8911	17.679	0.119	2	ZTF	Vis
59297.0451	59297.0451	17.200	–	1	Ioh	C
59297.2121	59297.3054	5.046	0.048	11	KU1	C
59297.6864	59297.7621	17.647	0.228	2	ZTF	Vis
59297.7789	59297.7789	17.554	–	1	RFD	V
59298.3257	59298.3257	>16.300	–	1	Ioh	C
59298.9392	59298.9417	>16.458	0.034	3	ASN	g
59299.0228	59299.1049	17.485	0.034	4	ATF	o
59299.0576	59299.0576	16.900	–	1	Ioh	C
59299.1310	59299.3293	4.915	0.016	172	KU1	C
59300.1412	59300.1981	5.038	0.042	27	KU1	C

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59300.3076	59300.3076	16.680	–	1	Ioh	C
59300.8539	59300.9348	17.641	0.093	2	ZTF	Vis
59300.9003	59300.9651	>16.179	0.117	6	ASN	g
59301.0743	59301.1059	17.010	0.382	3	ATF	o
59302.6637	59302.8404	>16.114	0.028	9	ASN	g
59302.8507	59302.9367	17.606	0.161	2	ZTF	Vis
59302.9118	59302.9118	>15.800	–	1	Ioh	C
59303.9018	59303.9043	>16.140	0.040	3	ASN	g
59303.9909	59303.9909	17.289	–	1	ZTF	Vis
59304.1241	59304.1869	4.756	0.043	38	KU1	C
59304.7615	59304.8616	17.425	0.086	4	ZTF	Vis
59304.9533	59304.9901	>16.214	0.158	6	ASN	g
59304.9639	59304.9749	17.510	0.049	4	ATF	o
59305.0405	59305.3087	4.869	0.034	40	KU1	C
59305.6961	59305.6961	>17.683	–	1	ASN	g
59305.6973	59305.6985	17.409	0.074	2	ASN	g
59306.8662	59306.8687	17.086	0.001	2	ASN	g
59306.8675	59306.9143	>17.149	0.112	4	ASN	g
59306.8888	59306.8888	17.387	–	1	ZTF	Vis
59307.0553	59307.0775	17.466	0.039	4	ATF	o
59307.1549	59307.1723	4.869	0.056	10	KU1	C
59307.7418	59307.9014	17.536	0.090	4	ZTF	Vis
59307.8497	59307.8521	>16.928	0.066	3	ASN	g
59307.9542	59307.9542	>16.300	–	1	Ioh	C
59308.9281	59308.9689	17.435	0.047	4	ATF	o
59309.6795	59309.9693	17.579	0.067	5	ZTF	Vis
59310.1951	59310.1951	17.490	–	1	Ioh	C
59310.9301	59310.9479	17.751	0.040	4	ATF	cy
59310.9583	59311.0193	17.444	0.099	3	ASN	g
59310.9596	59311.0218	>17.550	0.111	3	ASN	g
59311.7178	59311.8051	17.730	0.069	4	ZTF	Vis
59311.8482	59311.8507	>17.233	0.132	2	ASN	g
59311.8495	59311.8495	17.197	–	1	ASN	g
59312.1448	59312.2554	4.986	0.018	97	KU1	C
59312.2042	59312.2042	17.730	–	1	Ioh	C
59312.8652	59312.8652	17.562	–	1	ZTF	Vis
59313.0103	59313.0103	17.198	–	1	ASN	g
59313.0115	59313.0128	>17.498	0.127	2	ASN	g
59313.6658	59313.6697	17.808	0.139	2	RFD	V
59313.7694	59313.9272	17.755	0.049	4	ZTF	Vis
59313.8482	59313.9816	>17.181	0.061	6	ASN	g
59314.8303	59314.8327	>17.387	0.086	3	ASN	g
59314.9454	59314.9561	17.883	0.008	4	ATF	cy
59315.1986	59315.1986	>15.300	–	1	Mhh	Vis
59315.7632	59315.9906	17.638	0.046	5	ZTF	Vis
59315.8230	59315.9057	>17.240	0.072	9	ASN	g
59316.3118	59316.3118	>16.800	–	1	Ioh	C
59316.6717	59316.6717	17.178	–	1	ASN	g
59316.6729	59316.6936	>17.242	0.193	3	ASN	g
59317.6862	59317.6887	>17.229	0.025	3	ASN	g
59317.7651	59317.9253	17.817	0.101	4	ZTF	Vis
59318.8429	59318.9156	>17.458	0.030	6	ASN	g
59318.8441	59318.9169	17.330	0.015	3	ASN	g
59318.9836	59319.0452	17.695	0.038	4	ATF	cy
59319.7596	59319.7673	17.738	0.074	3	RFD	V
59320.8512	59320.9337	>17.382	0.076	4	ASN	g
59320.8525	59320.8537	17.432	0.098	2	ASN	g
59320.9033	59320.9853	17.550	0.031	7	ATF	o
59321.7625	59321.9106	17.709	0.062	7	ZTF	Vis
59322.2396	59322.2396	>14.800	–	1	Mhh	Vis
59322.7596	59322.8263	17.770	0.121	2	ZTF	Vis
59322.8718	59322.8917	17.619	0.029	4	ATF	o
59322.8832	59322.9730	>17.399	0.037	13	ASN	g
59322.9036	59322.9452	17.359	0.302	2	ASN	g
59323.3090	59323.3090	>15.800	–	1	Ioh	C
59323.7413	59323.8012	>16.836	0.047	5	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59323.7437	59323.7437	17.102	–	1	ASN	g
59323.7881	59323.8522	17.770	0.063	6	ZTF	Vis
59324.1701	59324.1701	>15.300	–	1	Mhh	Vis
59324.8301	59324.8301	17.491	–	1	ZTF	Vis
59324.8572	59324.8596	17.419	0.086	3	ASN	g
59324.9264	59324.9264	16.300	–	1	Ioh	C
59324.9264	59324.9264	>15.800	–	1	Ioh	C
59324.9310	59324.9334	>17.662	0.037	3	ASN	g
59325.0381	59325.0830	17.814	0.020	4	ATF	o
59325.7807	59325.8458	17.881	0.049	8	ZTF	Vis
59326.1868	59326.1868	>14.800	–	1	Mhh	Vis
59326.2875	59326.2875	18.200	–	1	Ioh	C
59326.8580	59326.9738	>16.738	0.040	9	ASN	g
59326.9653	59327.0299	17.820	0.048	4	ATF	o
59327.9333	59327.9333	>16.800	–	1	Ioh	C
59328.6919	59328.9020	>16.342	0.059	9	ASN	g
59328.7522	59328.8400	18.000	0.101	4	ZTF	Vis
59328.9340	59328.9340	>16.800	–	1	Ioh	C
59329.0161	59329.0693	17.986	0.011	3	ATF	o
59329.7608	59329.9145	17.893	0.054	8	ZTF	Vis
59329.8855	59329.8880	>16.079	0.047	3	ASN	g
59330.6157	59330.6157	17.760	–	1	Gai	G
59330.9929	59330.9929	17.727	–	1	ATF	o
59331.0028	59331.0028	17.930	–	1	Ioh	C
59331.9465	59332.0965	>15.909	0.052	9	ASN	g
59332.9586	59333.0188	17.787	0.010	4	ATF	o
59333.1076	59333.1101	>15.985	0.034	3	ASN	g
59333.8093	59333.8117	>16.839	0.086	3	ASN	g
59334.7275	59334.9284	18.050	0.092	5	ZTF	Vis
59334.8986	59334.9223	17.853	0.041	4	ATF	o
59335.1340	59335.1340	>15.200	–	1	Mhh	Vis
59335.7780	59335.8306	18.030	0.070	8	ZTF	Vis
59336.7646	59336.8641	18.000	0.055	4	ZTF	Vis
59336.7803	59336.9468	>17.231	0.071	9	ASN	g
59337.1285	59337.1285	>15.200	–	1	Mhh	Vis
59337.7684	59337.7823	>16.828	0.182	9	ASN	g
59338.8746	59338.9651	18.127	0.053	8	ZTF	Vis
59339.7415	59339.8268	17.917	0.065	4	ZTF	Vis
59339.7493	59339.7505	>17.755	0.002	2	ASN	g
59339.7517	59339.7517	17.581	–	1	ASN	g
59340.7105	59340.7129	>17.241	0.036	3	ASN	g
59340.8100	59340.9042	18.139	0.049	8	ZTF	Vis
59341.7669	59341.7669	17.913	–	1	ZTF	Vis
59342.7888	59342.8373	>17.003	0.092	6	ASN	g
59342.8631	59342.9308	18.070	0.086	4	ZTF	Vis
59342.8923	59342.9179	17.990	0.032	4	ATF	o
59343.7744	59344.0170	>17.460	0.035	9	ASN	g
59344.0035	59344.0035	>16.300	–	1	Ioh	C
59344.1674	59344.1674	>15.200	–	1	Mhh	Vis
59344.7670	59344.9972	>17.516	0.055	8	ASN	g
59344.7683	59344.7683	17.253	–	1	ASN	g
59344.8431	59344.8431	17.995	–	1	ZTF	Vis
59344.9636	59345.0021	18.704	0.088	3	ATF	cy
59345.8308	59345.8837	18.300	0.068	4	ZTF	Vis
59345.8957	59345.8969	>16.474	0.504	2	ASN	g
59346.8824	59346.8972	18.027	0.058	4	ATF	o
59347.8055	59347.9045	18.087	0.117	3	ZTF	Vis
59347.9624	59347.9649	>17.393	0.072	3	ASN	g
59348.1750	59348.1750	>15.200	–	1	Mhh	Vis
59348.8676	59348.9164	18.298	0.133	2	ZTF	Vis
59349.8068	59349.8725	18.284	0.221	2	ZTF	Vis
59350.7427	59350.8062	>16.987	0.183	6	ASN	g
59350.9456	59350.9897	18.198	0.016	4	ATF	o
59351.6108	59351.7760	>17.080	0.180	9	ASN	g
59352.7882	59352.7882	18.311	–	1	ZTF	Vis
59353.7821	59353.7821	17.979	–	1	ZTF	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59353.8958	59353.9174	>17.164	0.046	6	ASN	g
59354.7466	59354.7466	>16.388	–	1	ASN	g
59354.7614	59354.8733	18.507	0.124	4	ZTF	Vis
59354.8733	59354.9407	18.498	0.048	8	ATF	o
59355.7417	59355.7927	>16.871	0.024	6	ASN	g
59356.8319	59356.8451	>16.275	0.141	6	ASN	g
59356.8512	59356.8512	18.146	–	1	ZTF	Vis
59357.0093	59357.0306	18.365	0.003	4	ATF	o
59357.9159	59357.9184	>16.445	0.041	3	ASN	g
59358.7903	59358.9337	18.431	0.087	4	ZTF	Vis
59358.8610	59358.9109	18.284	0.057	8	ATF	o
59358.8749	59358.8926	>16.245	0.031	6	ASN	g
59359.8478	59359.8478	18.295	–	1	ZTF	Vis
59360.6862	59360.8475	>15.798	0.040	6	ASN	g
59360.8731	59360.8924	18.623	0.103	4	ATF	o
59361.7803	59361.8479	18.712	0.081	4	ZTF	Vis
59362.3523	59362.5285	18.385	0.021	2	Gai	G
59362.7751	59362.8409	>16.412	0.052	9	ASN	g
59362.8525	59362.8525	18.194	–	1	ZTF	Vis
59362.8980	59363.0029	18.755	0.126	8	ATF	o
59363.8049	59363.8449	18.389	0.091	3	ZTF	Vis
59364.8429	59364.9023	>17.299	0.105	8	ASN	g
59364.8454	59364.8454	17.468	–	1	ASN	g
59364.8577	59365.0600	18.375	0.042	8	ATF	o
59365.7898	59365.7898	17.480	–	1	ASN	g
59365.7910	59365.8038	>17.563	0.062	5	ASN	g
59365.8067	59365.9564	18.750	0.066	4	ZTF	Vis
59366.8647	59366.8659	>17.081	0.033	2	ASN	g
59367.7639	59367.8840	18.551	0.200	3	ZTF	Vis
59367.9639	59367.9639	>16.800	–	1	Ioh	C
59368.7006	59368.8036	18.875	0.228	2	ZTF	Vis
59368.8274	59368.9534	18.663	0.027	8	ATF	o
59368.8364	59368.9444	>17.539	0.028	6	ASN	g
59369.7406	59369.8253	18.885	0.164	2	ZTF	Vis
59369.8486	59369.8511	>17.347	0.071	3	ASN	g
59370.7029	59370.8445	18.603	0.121	3	ZTF	Vis
59370.9310	59370.9733	18.935	0.072	4	ATF	cy
59370.9631	59370.9656	>17.574	0.054	3	ASN	g
59371.6995	59371.8282	18.730	0.161	2	ZTF	Vis
59371.9245	59371.9308	>17.479	0.064	6	ASN	g
59372.7918	59372.9362	>17.480	0.035	18	ASN	g
59372.8669	59372.9659	18.671	0.049	8	ATF	o
59373.6964	59373.8422	18.700	0.144	3	ZTF	Vis
59374.7407	59374.7407	19.031	–	1	ZTF	Vis
59374.8426	59374.8451	>17.172	0.044	3	ASN	g
59374.8489	59374.8706	19.039	0.023	4	ATF	cy
59374.9583	59374.9583	>17.300	–	1	Ioh	C
59375.7844	59375.8870	18.837	0.237	2	ZTF	Vis
59375.8004	59375.8908	>17.589	0.032	6	ASN	g
59376.7061	59376.8646	18.795	0.146	3	ZTF	Vis
59376.9338	59376.9569	18.923	0.108	4	ATF	o
59376.9641	59376.9666	>17.334	0.050	3	ASN	g
59377.7420	59377.7420	18.643	–	1	ZTF	Vis
59377.8923	59377.9289	>17.586	0.040	6	ASN	g
59378.7028	59378.8011	18.803	0.224	2	ZTF	Vis
59378.8355	59378.8952	>17.598	0.033	9	ASN	g
59378.8436	59378.8638	18.873	0.056	4	ATF	cy
59379.6681	59379.7814	>17.336	0.075	6	ASN	g
59379.8067	59379.9422	18.944	0.130	3	ZTF	Vis
59380.7800	59380.8636	18.867	0.218	2	ZTF	Vis
59381.6956	59381.7171	>17.378	0.043	9	ASN	g
59381.8069	59381.8809	19.122	0.063	2	ZTF	Vis
59382.8451	59382.9012	19.102	0.193	2	ZTF	Vis
59382.8690	59382.8797	19.165	0.094	3	ATF	o
59383.7049	59383.7869	18.926	0.113	3	ZTF	Vis
59383.8221	59383.8749	>16.895	0.076	12	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59384.8258	59384.8464	18.890	0.097	4	ATF	o
59384.8316	59384.8316	18.836	–	1	ZTF	Vis
59384.8330	59384.8830	>17.266	0.038	7	ASN	g
59385.7640	59385.8282	19.064	0.221	2	ZTF	Vis
59385.8092	59385.8867	>16.718	0.041	9	ASN	g
59386.7210	59386.8456	18.875	0.115	3	ZTF	Vis
59386.8608	59386.8943	>16.530	0.038	12	ASN	g
59386.9199	59386.9479	18.998	0.207	4	ATF	o
59387.8164	59387.8164	19.132	–	1	ZTF	Vis
59388.0604	59388.0604	>14.200	–	1	Mhh	Vis
59388.7081	59388.8058	>15.555	0.088	6	ASN	g
59388.8656	59388.8761	18.851	0.221	2	ATF	o
59390.7243	59390.9152	19.053	0.059	3	ZTF	Vis
59390.7976	59390.8129	19.207	0.284	2	ATF	o
59390.9852	59390.9877	>15.688	0.025	3	ASN	g
59391.7432	59391.8031	19.080	0.148	2	ZTF	Vis
59391.7615	59391.7640	>14.522	0.092	3	ASN	g
59392.7554	59392.8466	>16.683	0.143	8	ASN	g
59392.7621	59392.8462	19.162	0.123	2	ZTF	Vis
59392.8054	59392.8261	18.912	0.019	3	ATF	o
59393.7087	59393.8210	19.245	0.120	2	ZTF	Vis
59393.7731	59393.8682	>17.467	0.079	12	ASN	g
59394.2694	59394.3434	19.130	0.000	2	Gai	G
59394.7607	59394.8634	19.325	0.270	3	ZTF	Vis
59394.8368	59394.8562	19.235	0.146	4	ATF	o
59395.7633	59395.7633	19.364	–	1	ZTF	Vis
59395.8620	59395.9463	>17.333	0.193	6	ASN	g
59396.7840	59396.8500	19.349	0.190	2	ZTF	Vis
59397.7821	59397.8497	19.165	0.224	3	ZTF	Vis
59398.8073	59398.8264	19.372	0.135	4	ATF	o
59398.9355	59398.9380	>17.338	0.103	3	ASN	g
59399.8268	59399.8268	19.273	–	1	ZTF	Vis
59400.7197	59400.8193	19.224	0.178	3	ZTF	Vis
59400.8266	59400.8987	>17.449	0.032	12	ASN	g
59401.7445	59401.8493	19.373	0.001	2	ZTF	Vis
59402.7690	59402.8073	19.642	0.150	2	ZTF	Vis
59402.8154	59402.9338	>17.477	0.033	18	ASN	g
59402.8215	59402.8691	19.451	0.098	8	ATF	o
59403.8030	59403.8830	19.546	0.112	2	ZTF	Vis
59404.8034	59404.8259	19.432	0.259	2	ZTF	Vis
59404.8041	59404.8229	19.708	0.180	4	ATF	cy
59404.8732	59404.8757	>17.500	0.004	3	ASN	g
59405.8028	59405.8028	19.657	–	1	ZTF	Vis
59405.8037	59405.8370	>16.081	0.413	4	ASN	g
59406.7183	59406.7475	19.570	0.289	2	ZTF	Vis
59406.7744	59406.8317	19.337	0.046	8	ATF	o
59407.7661	59407.7661	19.743	–	1	ZTF	Vis
59408.7212	59408.7212	19.389	–	1	ZTF	Vis
59408.7801	59408.8172	>17.453	0.023	9	ASN	g
59408.7830	59408.8028	19.655	0.120	4	ATF	cy
59409.7211	59409.7881	19.536	0.206	2	ZTF	Vis
59410.6905	59410.7145	>17.258	0.072	8	ASN	g
59410.7007	59410.8278	19.530	0.196	3	ZTF	Vis
59410.7158	59410.7158	15.489	–	1	ASN	g
59410.7683	59410.8373	19.710	0.102	8	ATF	o
59411.7001	59411.7414	19.710	0.126	2	ZTF	Vis
59411.7171	59411.9217	>17.157	0.024	6	ASN	g
59412.7204	59412.7396	19.540	0.050	2	ZTF	Vis
59413.7715	59413.8816	>16.802	0.031	12	ASN	g
59414.7156	59414.8123	>16.450	0.153	6	ASN	g
59414.7547	59414.8167	19.591	0.105	7	ATF	o
59414.7574	59414.7893	19.681	0.139	2	ZTF	Vis
59415.6996	59415.7748	19.361	0.105	3	ZTF	Vis
59416.6848	59416.9084	>15.938	0.145	7	ASN	g
59416.7587	59416.7647	19.097	0.277	2	ATF	o
59418.6498	59418.6523	>15.489	0.050	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59418.8024	59418.8024	19.402	–	1	ZTF	Vis
59418.8197	59418.8400	19.264	0.040	2	ATF	o
59419.7852	59419.7877	>16.056	0.053	3	ASN	g
59419.7967	59419.7967	19.638	–	1	ZTF	Vis
59420.7650	59420.7746	19.511	0.179	3	ATF	o
59420.7927	59420.8379	>16.228	0.084	6	ASN	g
59422.8008	59422.8189	19.722	0.180	2	ATF	o
59422.8546	59422.8546	19.724	–	1	ZTF	Vis
59423.8612	59423.8637	>16.775	0.090	3	ASN	g
59424.7223	59424.8284	>17.043	0.118	6	ASN	g
59424.7552	59424.7766	19.968	0.280	3	ATF	o
59425.7421	59425.7798	19.911	0.161	2	ZTF	Vis
59425.8503	59425.8528	>17.331	0.024	3	ASN	g
59426.8059	59426.8085	>17.556	0.019	3	ASN	g
59427.6674	59427.8123	>17.457	0.075	6	ASN	g
59427.7827	59427.8241	20.029	0.318	2	ZTF	Vis
59428.7513	59428.7925	>17.223	0.110	5	ASN	g
59428.7538	59428.7538	17.209	–	1	ASN	g
59428.8486	59428.8486	19.863	–	1	ATF	o
59429.7440	59429.8316	20.150	0.120	2	ZTF	Vis
59430.7725	59430.7919	20.104	0.125	4	ATF	cy
59431.7461	59431.7563	>17.009	0.189	6	ASN	g
59432.5781	59432.5781	19.900	–	1	Gai	G
59432.6792	59432.7674	>17.462	0.044	6	ASN	g
59432.7799	59432.7923	19.944	0.132	2	ATF	o
59433.6522	59433.7234	>17.195	0.093	6	ASN	g
59434.6994	59434.7578	20.108	0.006	2	ZTF	Vis
59434.7692	59434.7905	19.909	0.169	4	ATF	cy
59434.7989	59434.8015	>17.584	0.009	3	ASN	g
59435.6245	59435.6652	>17.235	0.174	5	ASN	g
59436.6864	59436.7611	19.914	0.085	2	ZTF	Vis
59436.7755	59436.7755	20.174	–	1	ATF	o
59437.7469	59437.7571	>15.530	0.301	6	ASN	g
59438.8315	59438.8341	>17.346	0.054	3	ASN	g
59439.7634	59439.7634	20.013	–	1	ZTF	Vis
59440.6798	59440.6798	19.768	–	1	ZTF	Vis
59440.7495	59440.8058	>17.128	0.022	6	ASN	g
59441.7034	59441.7403	20.020	0.213	2	ZTF	Vis
59443.7828	59443.7828	19.885	–	1	ZTF	Vis
59443.8181	59443.8206	>16.481	0.061	3	ASN	g
59444.7745	59444.7770	>16.573	0.075	3	ASN	g
59445.8045	59445.8071	>16.282	0.076	3	ASN	g
59446.7454	59446.7454	19.892	–	1	ATF	o
59447.7570	59447.7595	>16.173	0.097	3	ASN	g
59448.8101	59448.8127	>15.807	0.024	3	ASN	g
59449.6814	59449.6814	20.238	–	1	ZTF	Vis
59451.6529	59451.6555	>16.430	0.031	3	ASN	g
59451.6781	59451.6781	20.178	–	1	ZTF	Vis
59452.7385	59452.7914	>17.233	0.075	6	ASN	g
59452.7528	59452.7528	20.285	–	1	ATF	o
59453.6769	59453.7592	20.193	0.037	3	ZTF	Vis
59453.7492	59453.7518	>17.546	0.018	3	ASN	g
59454.7524	59454.7549	>17.400	0.028	3	ASN	g
59455.6838	59455.7193	20.311	0.060	2	ZTF	Vis
59456.5920	59456.5945	>15.923	0.067	3	ASN	g
59457.7695	59457.7720	>17.365	0.062	3	ASN	g
59458.6664	59458.7431	20.237	0.122	2	ZTF	Vis
59460.6631	59460.7394	20.076	0.022	3	ZTF	Vis
59462.6802	59462.7202	20.227	0.148	2	ZTF	Vis
59463.5972	59463.5997	>17.189	0.082	3	ASN	g
59463.7477	59463.8217	20.271	0.068	2	Gai	G
59465.7605	59465.7630	>17.366	0.068	3	ASN	g
59466.5909	59466.5921	>16.800	0.012	2	ASN	g
59466.6979	59466.6979	20.002	–	1	ZTF	Vis
59466.7626	59466.7626	18.610	–	1	ATF	o
59467.5886	59467.7773	>17.116	0.144	5	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59469.7261	59469.7261	20.378	–	1	ZTF	Vis
59471.7490	59471.7515	>16.725	0.050	3	ASN	g
59475.7546	59475.7571	>16.077	0.028	3	ASN	g
59476.7463	59476.7489	>16.061	0.117	3	ASN	g
59477.7501	59477.7526	>15.922	0.085	3	ASN	g
59478.6791	59478.6791	19.752	–	1	ZTF	Vis
59480.6546	59480.6765	20.207	0.176	2	ZTF	Vis
59480.7422	59480.7447	>16.998	0.029	3	ASN	g
59482.7260	59482.7286	>17.173	0.045	3	ASN	g
59485.7280	59485.7305	>17.333	0.028	3	ASN	g
59486.6384	59486.6384	20.463	–	1	ZTF	Vis
59488.6448	59488.6601	20.224	0.167	2	ZTF	Vis
59489.6449	59489.6449	19.919	–	1	ZTF	Vis
59489.7177	59489.7202	>17.114	0.042	3	ASN	g
59492.5866	59492.5878	>17.190	0.003	2	ASN	g
59494.7033	59494.7058	>15.894	0.148	3	ASN	g
59495.5784	59495.5797	>16.857	0.372	2	ASN	g
59496.3091	59496.3091	20.410	–	1	Gai	G
59497.5594	59497.5619	>16.356	0.158	3	ASN	g
59501.5604	59501.5628	>16.533	0.086	3	ASN	g
59532.0204	59532.0204	>16.012	–	1	ASN	g
59533.0192	59533.0205	>16.131	0.124	2	ASN	g
59534.0162	59534.0187	>16.638	0.154	3	ASN	g
59539.1461	59539.1486	>16.002	0.049	3	ASN	g
59540.9955	59540.9980	>14.465	0.067	3	ASN	g
59544.1499	59544.1524	>16.612	0.063	3	ASN	g
59549.0252	59549.0277	>16.461	0.132	3	ASN	g
59551.0116	59551.0116	20.568	–	1	ZTF	Vis
59556.0026	59556.0242	>16.778	0.155	6	ASN	g
59557.9992	59558.0017	>15.706	0.189	3	ASN	g
59563.9584	59563.9609	>17.319	0.045	3	ASN	g
59565.0275	59565.0300	>16.571	0.158	3	ASN	g
59568.9194	59568.9966	>16.210	0.044	6	ASN	g
59571.9512	59571.9537	>15.682	0.343	3	ASN	g
59572.9509	59572.9534	>15.987	0.147	3	ASN	g
59575.0193	59575.0256	>15.240	0.179	6	ASN	g
59575.9631	59575.9992	>17.168	0.025	9	ASN	g
59578.9577	59578.9602	>17.581	0.019	3	ASN	g
59586.0677	59586.1086	>17.567	0.033	6	ASN	g
59587.9497	59588.1305	>17.608	0.042	6	ASN	g
59589.1231	59589.1231	20.052	–	1	ATF	cy
59590.6191	59590.6191	>18.500	–	1	LMN	V
59591.0941	59591.0954	>17.441	0.046	2	ASN	g
59591.1094	59591.1094	20.214	–	1	ATF	o
59592.0411	59592.0513	>17.507	0.025	6	ASN	g
59593.0868	59593.0893	>17.234	0.196	3	ASN	g
59593.0915	59593.0915	20.292	–	1	ATF	cy
59594.0075	59594.0411	>17.149	0.252	6	ASN	g
59596.0056	59596.0081	>16.448	0.007	3	ASN	g
59596.9971	59597.1646	>16.154	0.058	9	ASN	g
59599.0712	59599.0737	>16.188	0.077	3	ASN	g
59599.9870	59600.0052	>16.235	0.023	6	ASN	g
59600.9854	59600.9854	20.299	–	1	ZTF	Vis
59603.0306	59603.0602	>16.746	0.052	6	ASN	g
59604.9935	59605.0074	>17.154	0.014	6	ASN	g
59605.9967	59606.1109	>17.038	0.077	15	ASN	g
59607.9630	59608.0621	>17.481	0.032	6	ASN	g
59609.9545	59610.0495	>17.434	0.031	9	ASN	g
59611.9182	59611.9909	>17.089	0.379	4	ASN	g
59613.9006	59613.9006	20.050	–	1	ATF	o
59615.9427	59615.9452	>17.462	0.063	3	ASN	g
59617.9347	59618.0144	>17.518	0.049	6	ASN	g
59619.9300	59619.9941	>17.233	0.109	6	ASN	g
59621.9228	59622.0067	>16.651	0.058	6	ASN	g
59622.8626	59622.8831	>16.464	0.237	5	ASN	g
59623.8251	59623.8251	20.308	–	1	ZTF	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59623.8610	59623.9838	>16.757	0.070	12	ASN	g
59624.9081	59625.0134	20.272	0.044	2	ZTF	Vis
59624.9600	59624.9626	>16.715	0.094	3	ASN	g
59625.9961	59625.9986	>16.124	0.013	3	ASN	g
59627.0383	59627.0409	>16.069	0.060	3	ASN	g
59627.9199	59627.9224	>16.254	0.021	3	ASN	g
59628.9126	59628.9151	>15.852	0.263	3	ASN	g
59629.9184	59629.9209	>16.369	0.066	3	ASN	g
59630.9121	59630.9121	20.725	–	1	ZTF	Vis
59631.1011	59631.1037	>16.609	0.111	3	ASN	g
59631.9200	59631.9226	>16.642	0.054	3	ASN	g
59632.0629	59632.0629	20.041	–	1	ATF	o
59632.9605	59633.1196	>16.893	0.057	6	ASN	g
59634.9982	59635.1241	>17.283	0.029	6	ASN	g
59635.9046	59635.9071	>17.430	0.050	3	ASN	g
59636.0580	59636.0580	20.430	–	1	ATF	o
59636.9656	59636.9681	>17.550	0.058	3	ASN	g
59637.0321	59637.0321	20.462	–	1	ZTF	Vis
59637.8250	59637.8250	20.779	–	1	ZTF	Vis
59637.9624	59637.9649	>17.455	0.021	3	ASN	g
59638.8831	59638.9010	>17.527	0.039	6	ASN	g
59639.9331	59640.0122	>17.556	0.070	6	ASN	g
59640.0146	59640.0146	20.236	–	1	ATF	cy
59640.9300	59640.9300	20.561	–	1	ZTF	Vis
59641.8040	59641.8464	20.694	0.101	3	ZTF	Vis
59642.0169	59642.1572	>17.324	0.129	6	ASN	g
59643.7557	59643.9362	>17.723	0.095	6	ASN	g
59644.9526	59645.0066	>17.610	0.022	7	ASN	g
59645.8319	59645.8344	>17.821	0.070	3	ASN	g
59646.9179	59647.0619	>17.224	0.280	6	ASN	g
59648.9465	59649.0848	>17.403	0.088	5	ASN	g
59650.9041	59650.9066	>16.470	0.034	3	ASN	g
59651.8352	59651.9507	>17.115	0.149	9	ASN	g
59653.8441	59653.9010	>16.223	0.025	9	ASN	g
59654.8251	59654.9225	>16.471	0.031	15	ASN	g
59655.7818	59655.9534	>16.220	0.027	15	ASN	g
59658.0265	59658.0265	19.271	–	1	ATF	o
59658.9386	59658.9411	>16.204	0.033	3	ASN	g
59660.0315	59660.0328	>16.238	0.072	2	ASN	g
59660.8418	59660.9583	>15.939	0.350	5	ASN	g
59662.6993	59662.8695	>17.613	0.106	6	ASN	g
59663.8703	59663.8729	>17.316	0.031	3	ASN	g
59664.9169	59664.9720	>17.235	0.040	6	ASN	g
59665.8213	59665.8347	>17.373	0.031	6	ASN	g
59665.9930	59666.0346	19.634	0.009	2	ATF	o
59667.0951	59667.0977	>17.449	0.102	3	ASN	g
59668.0265	59668.0369	>16.320	0.297	6	ASN	g
59669.9646	59669.9671	>17.484	0.069	3	ASN	g
59670.9236	59670.9236	20.371	–	1	ZTF	Vis
59671.0648	59671.0673	>17.523	0.043	3	ASN	g
59671.9933	59671.9933	20.713	–	1	ZTF	Vis
59672.1043	59672.1068	>17.265	0.059	3	ASN	g
59672.1549	59672.1549	>15.200	–	1	Mhh	Vis
59672.8234	59672.8234	20.840	–	1	ZTF	Vis
59673.1859	59673.1859	20.540	–	1	Gai	G
59673.8583	59673.9246	>14.794	0.233	5	ASN	g
59674.9643	59674.9643	20.810	–	1	ZTF	Vis
59675.7198	59675.8667	20.827	0.201	2	ZTF	Vis
59676.0128	59676.0153	>16.535	0.157	3	ASN	g
59676.9736	59677.0115	>17.460	0.036	9	ASN	g
59678.6889	59678.6989	>17.072	0.061	6	ASN	g
59678.8885	59678.8885	20.917	–	1	ZTF	Vis
59679.7689	59679.7689	20.677	–	1	ZTF	Vis
59679.8084	59679.9065	>17.364	0.084	9	ASN	g
59679.9415	59679.9415	19.692	–	1	ATF	cy
59680.4873	59680.4873	>17.900	–	1	LMN	V

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59680.8848	59680.9173	>17.479	0.103	6	ASN	g
59681.7170	59681.7574	>16.544	0.034	6	ASN	g
59682.6976	59682.6976	20.075	–	1	ZTF	Vis
59682.7477	59682.7769	>16.731	0.038	6	ASN	g
59684.9664	59684.9844	>16.218	0.025	6	ASN	g
59686.7344	59686.7368	>16.221	0.051	3	ASN	g
59687.8693	59687.8718	>16.317	0.034	3	ASN	g
59688.9547	59688.9804	>15.897	0.064	6	ASN	g
59689.9218	59689.9417	>16.561	0.049	6	ASN	g
59690.8479	59690.8479	20.384	–	1	ZTF	Vis
59690.8955	59690.8980	>16.979	0.054	3	ASN	g
59691.6651	59691.6676	>17.706	0.052	3	ASN	g
59692.6682	59692.7134	>17.691	0.027	6	ASN	g
59693.7801	59693.7801	20.612	–	1	ZTF	Vis
59693.8109	59693.8134	>17.878	0.057	3	ASN	g
59694.7972	59694.7998	>17.312	0.058	3	ASN	g
59694.9119	59694.9119	20.538	–	1	ZTF	Vis
59696.9205	59696.9230	>17.487	0.028	3	ASN	g
59697.8109	59698.0583	>16.907	0.350	5	ASN	g
59699.9725	59699.9725	>15.759	–	1	ASN	g
59699.9733	59699.9733	19.205	–	1	ATF	cy
59700.7852	59700.8973	>17.084	0.206	6	ASN	g
59700.7866	59700.8051	20.583	0.304	2	ZTF	Vis
59702.8123	59702.8670	20.691	0.074	2	ZTF	Vis
59704.1701	59704.1701	>15.200	–	1	Mhh	Vis
59704.8623	59704.8649	>16.953	0.143	3	ASN	g
59705.6393	59705.6418	>17.598	0.019	3	ASN	g
59707.7375	59707.7401	>17.094	0.077	3	ASN	g
59708.1614	59708.1614	20.680	–	1	Gai	G
59708.6147	59708.6543	>16.889	0.081	6	ASN	g
59709.8261	59709.8261	20.232	–	1	ZTF	Vis
59710.6985	59710.9277	>16.668	0.032	9	ASN	g
59710.7987	59710.7987	20.071	–	1	ZTF	Vis
59711.8730	59711.9058	>15.936	0.048	6	ASN	g
59712.7762	59712.7762	20.351	–	1	ZTF	Vis
59713.7846	59713.7846	20.527	–	1	ZTF	Vis
59713.9223	59714.0341	>16.272	0.038	5	ASN	g
59714.6877	59714.8028	>16.080	0.049	6	ASN	g
59715.8029	59715.8055	>15.598	0.067	3	ASN	g
59716.7933	59716.7933	15.601	–	1	ASN	g
59716.7947	59716.7960	>15.738	0.064	2	ASN	g
59718.8995	59718.9022	>16.595	0.064	3	ASN	g
59720.7418	59720.7876	>17.228	0.279	5	ASN	g
59721.7421	59721.7434	>15.995	0.227	2	ASN	g
59721.9092	59721.9092	20.000	–	1	ATF	o
59722.7425	59722.7751	>17.262	0.243	4	ASN	g
59722.8653	59722.8865	20.784	0.207	2	ZTF	Vis
59723.1028	59723.1028	>17.300	–	1	Hrm	C
59723.6978	59723.8012	20.816	0.121	3	ZTF	Vis
59723.7416	59723.7441	>15.966	0.117	3	ASN	g
59724.0924	59724.0924	>14.800	–	1	Mhh	Vis
59724.7706	59724.7731	>17.246	0.032	3	ASN	g
59725.8049	59725.8296	20.792	0.134	3	ZTF	Vis
59725.8960	59725.9985	>17.402	0.027	9	ASN	g
59725.9082	59725.9138	19.789	0.277	2	ATF	o
59726.8262	59726.8440	>17.404	0.029	6	ASN	g
59726.9292	59726.9292	20.498	–	1	ZTF	Vis
59727.8128	59727.9306	>17.103	0.030	9	ASN	g
59729.9634	59730.0313	>17.273	0.030	9	ASN	g
59730.8701	59730.9135	20.884	0.137	3	ZTF	Vis
59730.9486	59730.9590	>17.519	0.017	6	ASN	g
59731.7869	59731.7894	>17.397	0.028	3	ASN	g
59732.6996	59732.7668	20.663	0.075	2	ZTF	Vis
59732.9414	59732.9439	>17.373	0.016	3	ASN	g
59733.0632	59733.0632	>17.300	–	1	Hrm	C
59733.8534	59733.8534	19.686	–	1	ATF	o

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59733.8834	59733.8859	>17.371	0.042	3	ASN	g
59734.7019	59734.7019	20.551	–	1	ZTF	Vis
59734.8632	59734.8850	>17.430	0.031	12	ASN	g
59735.9221	59735.9626	>17.377	0.051	6	ASN	g
59736.7045	59736.7419	20.553	0.006	2	ZTF	Vis
59736.9798	59736.9823	>17.278	0.018	3	ASN	g
59737.6588	59737.9375	>17.290	0.031	9	ASN	g
59738.7388	59738.8877	20.895	0.036	3	ZTF	Vis
59738.8964	59738.8989	>16.905	0.057	3	ASN	g
59739.0479	59739.0479	>17.300	–	1	Hrm	C
59739.8110	59739.9594	>16.868	0.069	6	ASN	g
59739.8743	59739.8743	19.894	–	1	ATF	o
59740.8283	59740.8425	>16.642	0.034	6	ASN	g
59741.7547	59741.8541	>16.563	0.022	12	ASN	g
59741.8970	59741.8970	20.670	–	1	Gai	G
59744.9337	59745.0212	>15.772	0.021	9	ASN	g
59745.9396	59745.9991	>15.965	0.040	9	ASN	g
59746.8132	59746.8157	>16.223	0.041	3	ASN	g
59748.7613	59748.7613	20.424	–	1	ZTF	Vis
59749.7833	59749.7897	>17.511	0.048	6	ASN	g
59750.7248	59750.8643	20.216	0.167	2	ZTF	Vis
59750.7529	59750.9129	>17.175	0.136	9	ASN	g
59751.8136	59751.8553	20.017	0.065	3	ATF	cy
59751.8270	59751.8628	20.394	0.238	2	ZTF	Vis
59751.9227	59751.9945	>17.149	0.059	9	ASN	g
59752.8059	59752.8059	20.424	–	1	ZTF	Vis
59753.7875	59753.8899	20.349	0.055	3	ZTF	Vis
59753.9109	59753.9134	>17.323	0.068	3	ASN	g
59754.8123	59754.9187	>17.511	0.019	6	ASN	g
59755.7714	59755.8110	20.397	0.349	2	ZTF	Vis
59756.8002	59756.8568	>17.460	0.047	6	ASN	g
59756.8215	59756.8215	20.340	–	1	ZTF	Vis
59757.7457	59757.7457	20.749	–	1	ZTF	Vis
59757.9043	59757.9616	>16.791	0.094	9	ASN	g
59758.8031	59758.8031	20.335	–	1	ZTF	Vis
59758.9080	59758.9105	>16.905	0.223	3	ASN	g
59759.8262	59759.8865	>17.431	0.041	9	ASN	g
59759.8307	59759.8307	20.483	–	1	ZTF	Vis
59760.0111	59760.0111	>17.300	–	1	Hrm	C
59760.8036	59760.8036	20.500	–	1	ZTF	Vis
59760.8622	59760.8647	>17.512	0.024	3	ASN	g
59761.8031	59761.8031	20.893	–	1	ZTF	Vis
59762.7579	59762.7644	>16.859	0.064	6	ASN	g
59762.7693	59762.8012	20.551	0.068	2	ZTF	Vis
59763.8667	59763.8667	20.755	–	1	ZTF	Vis
59763.8827	59763.8853	>17.562	0.050	3	ASN	g
59764.7927	59764.9144	>17.279	0.023	6	ASN	g
59765.7420	59765.8311	20.545	0.181	2	ZTF	Vis
59765.7814	59765.7814	19.791	–	1	ATF	o
59765.8620	59765.8876	>15.669	0.248	6	ASN	g
59766.7410	59766.8193	20.846	0.110	2	ZTF	Vis
59766.7541	59766.7681	>16.731	0.109	6	ASN	g
59767.7734	59767.7914	>16.049	0.326	6	ASN	g
59767.7814	59767.8215	19.964	0.189	2	ATF	o
59768.7656	59768.9469	>16.685	0.073	12	ASN	g
59768.8051	59768.8051	20.503	–	1	ZTF	Vis
59771.7108	59771.7108	>14.825	–	1	ASN	g
59771.7120	59771.7132	15.202	0.301	2	ASN	g
59771.8255	59771.8255	20.390	–	1	ZTF	Vis
59771.8565	59771.8565	18.950	–	1	ATF	o
59772.8054	59772.8054	20.372	–	1	ZTF	Vis
59772.9260	59772.9286	>16.011	0.041	3	ASN	g
59773.1405	59773.1405	20.680	–	1	Gai	G
59773.7075	59773.7831	20.232	0.137	2	ZTF	Vis
59773.7491	59773.7516	>15.666	0.064	3	ASN	g
59775.8031	59775.8031	20.367	–	1	ZTF	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59775.8102	59775.8127	>15.385	0.097	3	ASN	g
59776.7616	59776.8255	20.482	0.022	4	ZTF	Vis
59776.8079	59776.8104	>16.361	0.078	3	ASN	g
59777.7194	59777.7194	20.692	–	1	ZTF	Vis
59777.8191	59777.8216	>16.676	0.463	3	ASN	g
59779.7837	59779.7862	>16.844	0.037	3	ASN	g
59779.8211	59779.8211	20.485	–	1	ZTF	Vis
59781.8200	59781.8200	20.697	–	1	ZTF	Vis
59781.8746	59781.8771	>17.247	0.028	3	ASN	g
59783.0292	59783.0292	>17.400	–	1	Hrm	C
59783.7625	59783.8008	20.643	0.221	2	ZTF	Vis
59783.7675	59783.7915	>17.210	0.055	6	ASN	g
59783.7968	59783.7968	20.143	–	1	ATF	cy
59784.7738	59784.7763	>17.472	0.034	3	ASN	g
59785.7857	59785.8504	20.664	0.090	2	ZTF	Vis
59785.9039	59785.9065	>17.261	0.040	3	ASN	g
59787.6859	59787.6884	>17.444	0.048	3	ASN	g
59787.8092	59787.8092	20.540	–	1	ZTF	Vis
59787.8234	59787.8234	20.139	–	1	ATF	cy
59789.7038	59789.7554	>17.303	0.125	6	ASN	g
59789.7396	59789.7396	20.631	–	1	ZTF	Vis
59791.6343	59791.6889	>17.711	0.034	6	ASN	g
59792.7979	59792.8005	>17.320	0.048	3	ASN	g
59793.8092	59793.8789	>17.307	0.035	6	ASN	g
59794.6951	59794.6975	>17.436	0.071	3	ASN	g
59794.7799	59794.7799	20.688	–	1	ZTF	Vis
59797.7286	59797.7286	20.769	–	1	ZTF	Vis
59799.7262	59799.7262	20.368	–	1	ZTF	Vis
59800.8085	59800.8110	>16.326	0.084	3	ASN	g
59801.7502	59801.7527	>16.236	0.101	3	ASN	g
59801.8130	59801.8130	18.492	–	1	ATF	o
59802.6585	59802.8319	>15.992	0.043	6	ASN	g
59803.8142	59803.8142	19.341	–	1	ATF	o
59805.7049	59805.7049	20.458	–	1	ZTF	Vis
59805.7726	59805.7751	>17.423	0.021	3	ASN	g
59806.7387	59806.7400	>15.963	0.153	2	ASN	g
59807.7560	59807.7776	>17.449	0.055	6	ASN	g
59807.7606	59807.7830	20.443	0.059	2	ZTF	Vis
59809.7434	59809.7459	>16.831	0.033	3	ASN	g
59809.7440	59809.7440	20.611	–	1	ZTF	Vis
59811.3015	59811.3015	20.650	–	1	Gai	G
59811.7485	59811.7485	20.390	–	1	ATF	cy
59811.7616	59811.7641	>17.403	0.048	3	ASN	g
59812.7409	59812.7409	20.928	–	1	ZTF	Vis
59812.7569	59812.7595	>17.335	0.078	3	ASN	g
59817.8061	59817.8061	20.059	–	1	ATF	o
59818.6564	59818.6564	>17.488	–	1	ASN	g
59818.6652	59818.6652	21.021	–	1	ZTF	Vis
59819.8050	59819.8050	20.292	–	1	ATF	cy
59821.7360	59821.7385	>16.993	0.076	3	ASN	g
59822.7506	59822.7532	>17.189	0.018	3	ASN	g
59823.7493	59823.7493	20.532	–	1	ZTF	Vis
59824.7301	59824.7824	>16.719	0.155	6	ASN	g
59827.7815	59827.7840	>16.493	0.064	3	ASN	g
59829.7306	59829.7332	>16.078	0.079	3	ASN	g
59830.7558	59830.7583	>16.047	0.036	3	ASN	g
59835.7769	59835.7769	19.289	–	1	ATF	o
59836.7221	59836.7246	>16.456	0.116	3	ASN	g
59837.7560	59837.7585	>17.266	0.046	3	ASN	g
59838.7591	59838.7616	>17.244	0.046	3	ASN	g
59839.7547	59839.7572	>17.220	0.052	3	ASN	g
59841.7456	59841.7481	>17.255	0.055	3	ASN	g
59841.7482	59841.7482	20.089	–	1	ATF	cy
59842.7525	59842.7551	>17.248	0.018	3	ASN	g
59843.6600	59843.6600	20.572	–	1	ZTF	Vis
59843.7489	59843.7514	>17.245	0.026	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
59844.7370	59844.7396	>17.162	0.007	3	ASN	g
59845.7430	59845.7455	>17.250	0.014	3	ASN	g
59847.7172	59847.7172	>16.815	–	1	ASN	g
59848.7255	59848.7281	>17.190	0.109	3	ASN	g
59849.7288	59849.7313	>17.115	0.049	3	ASN	g
59850.7089	59850.7115	>15.850	0.143	3	ASN	g
59851.7236	59851.7261	>17.192	0.050	3	ASN	g
59852.7114	59852.7140	>16.268	0.124	3	ASN	g
59855.5934	59855.5946	>16.712	0.031	2	ASN	g
59858.7065	59858.7065	>15.909	–	1	ASN	g
59864.5659	59864.5683	>17.028	0.057	3	ASN	g
59873.6053	59873.6053	20.680	–	1	Gai	G
59889.3069	59889.3069	>17.600	–	1	Hrm	C
59897.0163	59897.0163	20.867	–	1	ZTF	Vis
59898.0203	59898.0203	>15.544	–	1	ASN	g
59901.1541	59901.1566	>16.158	0.080	3	ASN	g
59909.9925	59909.9925	20.830	–	1	ZTF	Vis
59915.1173	59915.1198	>17.465	0.090	3	ASN	g
59916.9949	59916.9973	>17.225	0.040	3	ASN	g
59922.0181	59922.0206	>15.936	0.059	3	ASN	g
59922.9801	59922.9801	20.564	–	1	ZTF	Vis
59924.0221	59924.0246	>15.952	0.037	3	ASN	g
59928.1077	59928.1591	>16.625	0.046	8	ASN	g
59930.8231	59930.8231	20.780	–	1	Gai	G
59931.0174	59931.0174	20.323	–	1	ZTF	Vis
59933.9314	59933.9338	>17.671	0.062	3	ASN	g
59935.9501	59935.9989	20.918	0.033	3	ZTF	Vis
59937.9328	59937.9924	20.603	0.464	2	ZTF	Vis
59964.9919	59964.9981	>17.581	0.067	6	ASN	g
59965.9781	59965.9806	>17.415	0.061	3	ASN	g
59968.5282	59968.5282	20.820	–	1	Gai	G
59971.9248	59971.9248	>16.968	–	1	ASN	g
59978.8767	59978.8792	>16.073	0.085	3	ASN	g
59980.8684	59980.8709	>15.835	0.030	3	ASN	g
59981.8025	59981.8025	15.655	–	1	ASN	g
59981.8037	59981.8050	>15.749	0.044	2	ASN	g
59982.8256	59982.8546	>15.857	0.133	6	ASN	g
59984.8464	59984.8489	>16.365	0.005	3	ASN	g
59988.4525	59988.4525	20.640	–	1	Gai	G
59990.8611	59990.9479	>16.790	0.165	9	ASN	g
59994.8569	59994.8968	>16.919	0.139	5	ASN	g
59998.8283	59998.8308	>17.243	0.047	3	ASN	g
60000.9129	60000.9414	>16.292	0.115	6	ASN	g
60005.6295	60005.6295	>16.600	–	1	Fnm	cG
60009.8134	60009.8147	>15.290	0.512	2	ASN	g
60014.7255	60014.7255	>17.800	–	1	Fnm	C
60014.7257	60014.7257	>17.900	–	1	MUY	CV
60019.9193	60020.0374	>17.221	0.065	14	ASN	g
60020.8923	60021.0494	>16.664	0.327	8	ASN	g
60023.0704	60023.0729	>17.488	0.066	3	ASN	g
60027.9680	60028.0274	>16.536	0.334	6	ASN	g
60028.8223	60028.9829	>17.332	0.053	6	ASN	g
60029.8568	60029.8592	>17.726	0.050	3	ASN	g
60031.1132	60031.1157	>17.360	0.030	3	ASN	g
60032.7979	60032.7979	>14.630	–	1	ASN	g
60032.8130	60032.8425	20.385	0.122	2	ZTF	Vis
60033.7908	60033.8951	>16.217	0.145	10	ASN	g
60034.8719	60034.8744	>16.570	0.086	3	ASN	g
60035.6922	60035.8765	>15.756	0.330	5	ASN	g
60035.6935	60035.6935	13.294	–	1	ASN	g
60037.7385	60037.7634	>15.764	0.119	6	ASN	g
60039.7795	60040.0187	>15.714	0.074	15	ASN	g
60041.7939	60041.8882	>15.930	0.025	8	ASN	g
60041.7951	60041.7951	15.889	–	1	ASN	g
60044.7238	60044.7238	20.855	–	1	ZTF	Vis
60044.8499	60044.8871	>17.150	0.107	6	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter#
60045.6938	60045.6962	>17.659	0.023	3	ASN	g
60046.7840	60046.7850	20.755	0.013	2	ZTF	Vis
60046.8354	60046.9294	>16.829	0.123	9	ASN	g
60048.9203	60048.9737	>17.295	0.032	9	ASN	g
60048.9854	60048.9854	20.317	–	1	ATF	cy
60049.9294	60049.9621	>17.408	0.035	6	ASN	g
60050.8267	60050.8668	20.838	0.132	3	ZTF	Vis
60050.9381	60050.9621	19.526	0.018	2	ATF	cy
60051.8873	60051.8898	>17.458	0.038	3	ASN	g
60052.7642	60052.7642	20.877	–	1	ZTF	Vis
60052.9142	60052.9651	>16.581	0.168	8	ASN	g
60054.8061	60054.8061	20.574	–	1	ZTF	Vis
60055.9723	60055.9749	>17.389	0.027	3	ASN	g
60056.7352	60056.9513	20.667	0.095	4	ZTF	Vis
60056.8000	60056.8527	>17.237	0.027	6	ASN	g
60057.0798	60057.0798	20.024	–	1	ATF	cy
60058.7392	60059.0307	>17.027	0.105	6	ASN	g
60058.9400	60058.9400	20.307	–	1	ATF	cy
60060.8882	60060.8882	19.861	–	1	ATF	o
60060.9449	60060.9449	20.597	–	1	ZTF	Vis
60062.8874	60062.8893	20.763	0.094	2	ZTF	Vis
60064.9565	60064.9575	20.758	0.041	2	ZTF	Vis
60066.9191	60066.9191	19.639	–	1	ATF	o
60066.9976	60067.0226	>16.311	0.018	6	ASN	g
60070.7366	60070.7378	>15.392	0.494	2	ASN	g
60071.7508	60071.7533	>17.202	0.047	3	ASN	g
60072.8980	60072.9004	>16.284	0.056	3	ASN	g
60072.9219	60072.9219	19.554	–	1	ATF	o
60075.9661	60075.9687	>16.913	0.053	3	ASN	g
60076.7652	60076.7677	>17.556	0.007	3	ASN	g
60076.8900	60076.9650	20.830	0.154	3	ZTF	Vis
60078.8680	60078.8680	20.475	–	1	ZTF	Vis
60079.9079	60079.9079	20.730	–	1	ZTF	Vis
60080.7603	60080.7603	20.790	–	1	ZTF	Vis
60081.8283	60081.8308	>17.592	0.054	3	ASN	g
60082.8498	60082.8508	20.886	0.037	2	ZTF	Vis
60084.8661	60084.8661	20.658	–	1	ZTF	Vis
60086.7628	60086.7628	20.969	–	1	ZTF	Vis
60086.8202	60086.8227	>17.487	0.016	3	ASN	g
60087.8199	60087.8224	>17.492	0.037	3	ASN	g
60088.7843	60088.8659	20.893	0.117	3	ZTF	Vis
60088.8178	60088.8203	>17.567	0.088	3	ASN	g
60090.9195	60090.9195	20.248	–	1	ATF	o
60091.8647	60091.8671	>17.253	0.023	3	ASN	g
60092.7586	60092.9520	20.576	0.030	3	ZTF	Vis
60093.8469	60093.8494	>17.306	0.040	3	ASN	g
60093.9551	60093.9551	20.810	–	1	ZTF	Vis
60094.8433	60094.8458	>16.882	0.052	3	ASN	g
60095.8365	60095.8390	>16.557	0.025	3	ASN	g
60097.8283	60097.8308	>15.479	0.301	3	ASN	g
60098.8299	60098.8324	>16.012	0.051	3	ASN	g
60100.8321	60100.8345	>15.937	0.089	3	ASN	g
60100.8974	60100.8974	19.396	–	1	ATF	o
60101.8160	60101.8185	>15.991	0.122	3	ASN	g
60102.8372	60102.8396	>16.078	0.175	3	ASN	g
60103.8126	60103.8151	>16.567	0.040	3	ASN	g
60103.8433	60103.8433	20.478	–	1	ZTF	Vis
60104.8131	60104.8155	>16.645	0.033	3	ASN	g
60104.8651	60104.8666	20.582	0.077	2	ZTF	Vis
60104.8826	60104.8826	20.294	–	1	ATF	cy
60107.8240	60108.0111	>17.238	0.091	6	ASN	g
60108.8056	60108.8081	>17.330	0.046	3	ASN	g
60108.8732	60108.8732	20.374	–	1	ATF	cy
60109.8015	60109.8495	20.669	0.071	4	ZTF	Vis
60111.7944	60111.7969	>17.596	0.074	3	ASN	g
60111.9326	60111.9326	20.944	–	1	ZTF	Vis

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
60112.7817	60112.7817	20.453	–	1	ZTF	Vis
60112.7910	60112.8434	>17.331	0.032	6	ASN	g
60113.8423	60113.8448	>17.414	0.033	3	ASN	g
60113.8814	60113.8814	20.910	–	1	ZTF	Vis
60114.8107	60114.8401	>17.417	0.038	6	ASN	g
60114.8437	60114.8711	20.197	0.002	2	ATF	cy
60116.7678	60116.7678	20.660	–	1	ZTF	Vis
60116.8670	60116.8670	19.991	–	1	ATF	cy
60116.8683	60116.8709	>17.454	0.077	3	ASN	g
60117.8256	60117.8494	20.830	0.059	4	ZTF	Vis
60117.9913	60117.9939	>17.224	0.077	3	ASN	g
60119.7361	60119.8307	20.917	0.108	3	ZTF	Vis
60119.9111	60119.9137	>17.377	0.018	3	ASN	g
60121.3685	60121.3685	20.740	–	1	Gai	G
60121.6941	60121.7910	>16.701	0.075	5	ASN	g
60121.7047	60121.7047	20.587	–	1	ZTF	Vis
60122.8665	60122.8690	>16.960	0.024	3	ASN	g
60123.7609	60123.7609	20.559	–	1	ZTF	Vis
60123.7702	60123.7732	>16.904	0.007	3	ASN	g
60124.8510	60124.8567	>16.512	0.028	5	ASN	g
60125.8431	60125.8456	>16.585	0.003	3	ASN	g
60126.8363	60126.8363	15.711	–	1	ATF	o
60126.9425	60126.9451	>15.987	0.105	3	ASN	g
60127.8929	60127.8954	>16.095	0.048	3	ASN	g
60129.8311	60129.8336	>15.228	0.103	3	ASN	g
60130.8580	60130.8605	>16.299	0.070	3	ASN	g
60131.9381	60131.9406	>16.213	0.053	3	ASN	g
60132.7009	60132.7019	20.956	0.143	2	ZTF	Vis
60132.8694	60132.8719	>16.986	0.070	3	ASN	g
60133.8354	60133.8379	>17.347	0.061	3	ASN	g
60134.8343	60134.8368	>15.302	0.079	3	ASN	g
60135.7873	60135.7873	20.858	–	1	ZTF	Vis
60136.7803	60136.7828	>17.520	0.109	3	ASN	g
60137.7257	60137.7424	21.008	0.215	2	ZTF	Vis
60137.8994	60137.9444	>17.158	0.029	6	ASN	g
60138.8342	60138.8342	18.992	–	1	ATF	cy
60139.7236	60139.7844	20.744	0.034	4	ZTF	Vis
60139.8138	60139.8162	>17.295	0.090	3	ASN	g
60140.8210	60140.8236	>17.210	0.057	3	ASN	g
60141.7266	60141.7296	>17.281	0.177	3	ASN	g
60141.7615	60141.8045	20.543	0.087	2	ZTF	Vis
60143.7646	60143.8652	21.027	0.346	2	ZTF	Vis
60145.7833	60145.8220	20.981	0.046	2	ZTF	Vis
60146.7832	60146.9227	>17.345	0.093	6	ASN	g
60147.8267	60147.8267	20.847	–	1	ZTF	Vis
60149.7811	60149.8445	>17.149	0.048	6	ASN	g
60151.8446	60151.8446	20.615	–	1	ZTF	Vis
60152.8030	60152.8055	>16.743	0.115	3	ASN	g
60153.7835	60153.7860	>16.599	0.010	3	ASN	g
60154.7947	60154.7972	>16.529	0.074	3	ASN	g
60155.0201	60155.0201	>17.300	–	1	Hrm	C
60155.7446	60155.7446	20.350	–	1	ZTF	Vis
60155.8439	60155.8464	>16.329	0.091	3	ASN	g
60156.7521	60156.7546	>16.187	0.089	3	ASN	g
60157.8278	60157.8303	>15.888	0.039	3	ASN	g
60158.7799	60158.7799	19.290	–	1	ATF	o
60158.7875	60158.8458	>15.953	0.086	5	ASN	g
60159.8496	60159.8521	>16.032	0.052	3	ASN	g
60160.6823	60160.6823	20.965	–	1	ZTF	Vis
60160.8116	60160.8141	>16.724	0.075	3	ASN	g
60161.8752	60161.8776	>16.415	0.062	3	ASN	g
60162.6760	60162.6790	>17.594	0.065	3	ASN	g
60164.6844	60164.6844	20.904	–	1	ZTF	Vis
60166.6712	60166.6712	>17.807	–	1	ASN	g
60166.6877	60166.7624	20.801	0.046	3	ZTF	Vis
60170.8295	60170.8320	>17.316	0.086	3	ASN	g

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.10 Log of observations of the 2021 outburst in ASASSN-21au
(continued)

Start*	End*	Mag [†]	Error [‡]	N [§]	Obs	Filter [#]
60171.7269	60171.7835	20.791	0.107	3	ZTF	Vis
60171.7455	60171.7480	>16.965	0.079	3	ASN	g
60172.7784	60172.7784	20.535	–	1	ATF	cy
60173.7195	60173.7466	21.051	0.009	2	ZTF	Vis
60174.7165	60174.7196	>17.269	0.059	3	ASN	g
60177.8215	60177.8240	>17.272	0.064	3	ASN	g
60178.6423	60178.6454	>16.782	0.112	3	ASN	g
60180.7588	60180.7613	>16.985	0.043	3	ASN	g
60184.6847	60184.6847	20.592	–	1	ZTF	Vis
60185.7403	60185.7428	>16.104	0.044	3	ASN	g
60186.8094	60186.8119	>15.663	0.022	3	ASN	g
60187.7354	60187.7379	>15.917	0.037	3	ASN	g
60190.7863	60190.7863	>17.115	–	1	ASN	g
60191.7365	60191.7390	>17.168	0.088	3	ASN	g
60194.7231	60194.7256	>15.987	0.183	3	ASN	g
60198.7457	60198.7457	19.793	–	1	ATF	cy
60198.7773	60198.7798	>17.193	0.077	3	ASN	g
60201.7679	60201.7704	>17.284	0.061	3	ASN	g
60206.7382	60206.7382	17.774	–	1	ATF	cy
60210.7427	60210.7452	>16.395	0.147	3	ASN	g
60220.7098	60220.7123	>16.365	0.141	3	ASN	g
60221.7128	60221.7153	>16.758	0.089	3	ASN	g
60231.5605	60231.5629	>17.111	0.090	3	ASN	g

* BJD - 2400000.0

[†] Mean magnitude.

[‡] 1 σ of mean magnitude.

[§] Number of observations.

^{||} Observer's code: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPe[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

[#] "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.11: Magnitude corrections applied to individual observers for the 2014 superoutburst of SDSS J0902.

Obs code*	Filter [#]	Offset magnitude	Offset error	Number
deM	C	-0.351	0.047	4652
LCO	CV	-0.251	0.034	3566
SWI	V	0	0.038	3060
DPV	C	14.859	0.087	2562
JJI	CV	-0.262	0.030	2537
IMi	C	-0.079	0.038	2284
KU1	C	13.674	0.212	1972
OAR	CV	-0.328	0.047	1754
CRI	C	14.574	0.068	1734
CMM	V	-0.067	0.038	1728
OKU	C	13.973	0.171	1523
Han	CV	-0.326	0.048	1400
Ioh	C	0.194	0.151	1382
Mas	C	11.423	0.031	1172
RPc	V	-0.089	0.079	880
Kis	C	0.18	0.143	631
RJW	CV	-0.076	0.029	596
CMJ	V	-0.07	0.068	499
UJH	CV	-0.009	0.029	477
DKS	CV	-0.241	0.048	446
Mdy	C	-0.355	0.012	379
MIC	V	14.339	0.048	372
Shu	V	14.12	0.056	365
MZK	CV	-0.448	0.045	298
Nov	C	11.66	0.027	177
DKS	C	14.064	0.023	159
Ham	CV	-0.292	0.032	108
MTu	CV	-0.218	0.023	50
MKi	C	0.391	0.056	9
DDE	CV	-0.28	0.013	1
MUY	CV	0.191	0.465	1

*Key to observers: CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), IMi[‡] (I. Miller), JJI[‡] (J. Jones), KU1 (Kyoto University, campus observatory), Kis (S. Kiyota), LCO (C. Littlefield), Mas (G. Masi), Mdy (Y. Maeda), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muylaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RJW (J. Rock), RPc[‡] (R. Pickard), SWI[‡] (W. Stein), Shu (S. Shugarov), UJH[‡] (J. Ulowetz) [†]Visual observation.

[‡]Inclusive of observations from the AAVSO

[#] "C" means no filter (clear).

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.12: Magnitude corrections applied to individual observers for the 2015 superoutburst of NSV 1440.

Obs code	Filter [#]	Offset magnitude	Offset error	Number
MLF	CR	0.493	0.049	10066
MGW	CV	0	0.049	4496
HaC	CV	0.016	0.095	3894
SPE	CV	-0.12	0.059	361
COO	CV	0.12	0.072	316

*Key to observers: COO (L. Cook), HaC (F.-J. Hambsch, remote obs. in Chile), MGW (G. Myers), MLF (Berto Monard), SPE[†] (P. Starr)

[#] “C” means no filter (clear).

Table C.13: Magnitude corrections applied to individual observers for the 2017 superoutburst of NSV 1440.

Obs code	Filter [#]	Offset magnitude	Offset error	Number
MLF	CR	0.443	0.067	2752
HaC	CV	0	0.153	1798

*Key to observers: HaC (F.-J. Hambsch, remote obs. in Chile), MLF (Berto Monard)

[#] “C” means no filter (clear).

Table C.14: Magnitude corrections applied to individual observers for the 2019 superoutburst of NSV 1440.

Obs code	Filter [#]	Offset magnitude	Offset error	Number
HaC	CV	0	0.162	2363
MLF	CR	0.398	0.202	869
SPE	CV	0.163	0.067	533
COO	CV	-0.16	0.043	36

*Key to observers: COO (L. Cook), HaC (F.-J. Hambsch, remote obs. in Chile), MLF (Berto Monard), SPE[†] (P. Starr)

[†]Inclusive of observations from the AAVSO database.

[#] “C” means no filter (clear).

Table C.15: Magnitude corrections applied to individual observers for the 2018 superoutburst of ASASSN-18rg.

Obs code	Filter [#]	Offset magnitude	Offset error	Number
SGE	CV	-12.573	0.077	2558
OKU	C	1.758	0.173	2239
DPV	C	0	0.159	2181
Van	CV	-12.728	0.037	1488
HaC	CV	-12.638	0.208	871
Ioh	C	-12.72	0.181	629
KU1	C	2.86	0.119	456
DFS	V	-12.642	0.015	311
Va2	CV	-12.903	0.012	264
Li2	C	1.094	0.009	178
Lic	C	1.151	0.014	163
DP3	C	1.753	0.209	146
BSM	CV	-12.871	0.021	90
Ha2	CV	-12.707	0.012	59
Io2	C	-12.688	0.038	50
Va3	CV	-12.786	0.012	23
DP2	C	2.286	0.172	22
CRI	C	4.829	0.202	18
MUY	V	-12.552	0.002	1
MUY	CV	-12.958	0.027	1

*Key to observers: BSM (Stephen M.Brincat), CRI (Crimean Astrophys.Obs), DFS (Sjoerd Dufoer), DPV (Pavol A. Dubovsky), DP2 (Pavol A. Dubovsky), DP3 (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ha2 (F.-J. Hambsch, remote obs. in Chile), Ioh (H. Itoh), Io2 (H. Itoh), KU1 (Kyoto University, campus observatory), Lic (Domenico Licchelli), MUY[†] (Eddy Muylaert), OKU (Osaka Kyoiku U.), SGE (Geoffrey Stone), Van (T. Vanmunster), Va2 (T. Vanmunster)

[†]Although the data were obtained by the same observer, the magnitude offset on this night was non-negligible compared to other epochs. Therefore, this night was treated independently, and its offset was estimated separately.

APPENDIX C. LOG OF OBSERVATIONS AND MAGNITUDE CORRECTIONS

Table C.16: Magnitude corrections applied to individual observers for the 2019 superoutburst of ASASSN-19rg.

Obs code	Filter [#]	Offset magnitude	Offset error	Number
MLF	CR	0.393	0.043	1291
HaC	CV	0	0.243	1044

*Key to observers: BSM (Stephen M.Brincat), CGR[‡] (Graeme Coates), CMJ[‡] (Michael Cook), CMM[‡] (Marlin Costello), COO (L. Cook), CRI (Crimean Astrophys.Obs), DDE (D. Denisenko), deM (E. de Miguel), DFS (Sjoerd Dufoer), DKS[‡] (S. Dvorak), DPV (Pavol A. Dubovsky), HaC (F.-J. Hambsch, remote obs. in Chile), Ham (F.-J. Hambsch), Han (Hankasalmi Obs., by A. Oksanen), HSP[†] (Stephen Hovell from AAVSO database), IMi[‡] (I. Miller), Ioh (H. Itoh), JJI[‡] (J.Rock), KU (Kyoto University, campus observatory), Kis (S. Kiyota), Kub (K. Kubotera), LCO (C. Littlefield), Lic (Domenico Licchelli), Mas (G. Masi), Mdy (Y. Maeda), MGW (G. Myers), MIC (R. Michel), MKi (D. Denisenko at MASTER-Kislovods), MLF (Berto Monard), MTu (D. Denisenko at MASTER-Tunka), MUY[‡] (Eddy Muyliaert), MZK (K.Menzies), Nov (Rudolf Novák), OAR (Arto Oksanen), OKU (Osaka Kyoiku U.), RFD (Filipp Romanov), RJW, RPc[‡] (R. Pickard), SGE (Geoffrey Stone), SPE[‡] (P. Starr), SRX^{†‡} (Rod Stubbings), SWI[‡] (W. Stein), Shu (S. Shugarov), Trt (Tamás Tordai), UJH[‡] (J. Ulowetz), Van (T. Vanmunster), Vih (Vihorlat observatory team)

Table C.17: Magnitude corrections applied to individual observers for the 2021 superoutburst of ASASSN-21au.

Obs code	Filter [#]	Offset magnitude	Offset error	Number
Ioh	C	0.091	0.079	13909
KU1	C	12.631	0.087	5948
Kub	C	0.179	0.074	2989
Trt	CV	0.205	0.071	2650
Van	CV	0	0.024	1366
Vih	C	12.786	0.070	1048
CRI	C	12.981	0.026	735
CGR	CV	0.209	0.075	67
RFD	V	0.042	0.190	42
RFD	CV	0.414	0.096	10

*Key to observers: CGR[‡] (Graeme Coates), CRI (Crimean Astrophys.Obs), Ioh (H. Itoh), KU1 (Kyoto University, campus observatory), Kub (K. Kubotera), RFD (Filipp Romanov), Trt (Tamás Tordai), Van (T. Vanmunster), Vih (Vihorlat observatory team)

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