

IUGONET

A Metadata DB for Upper Atmosphere

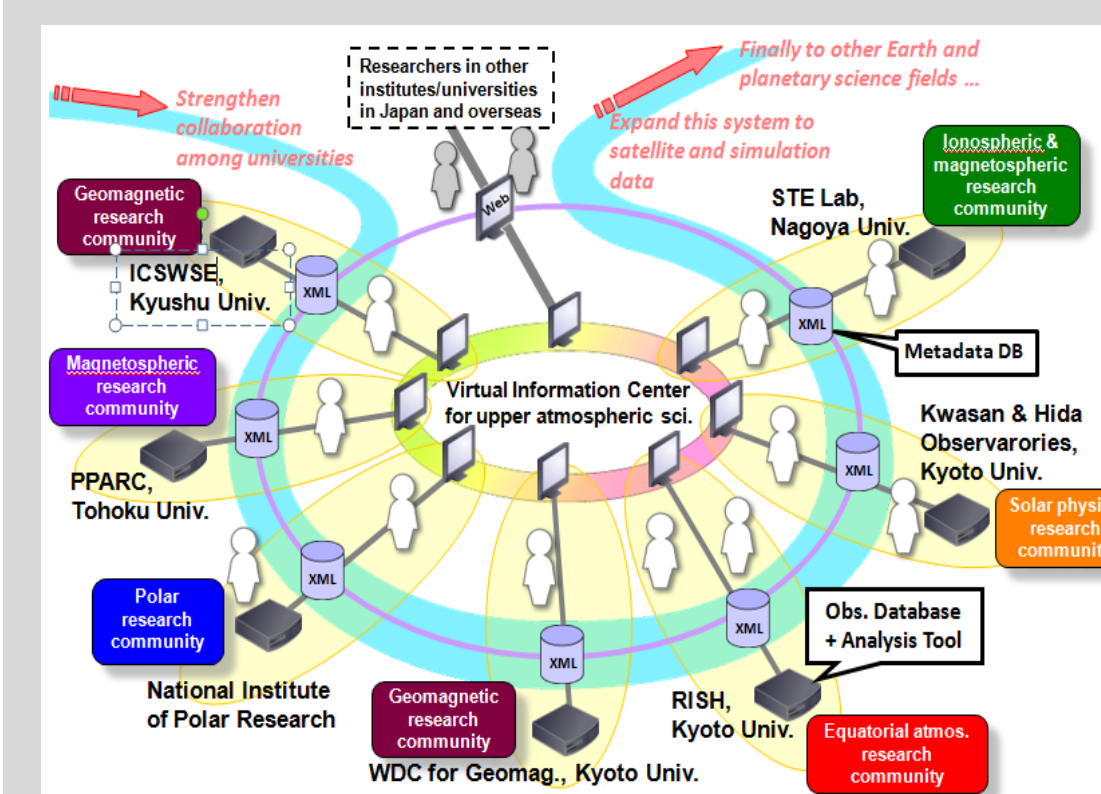
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Inter-university Upper atmosphere Global Observation NETWORK (IUGONET)

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<http://www.iugonet.org/en/>



The Inter-university Upper atmosphere Global Observation NETWORK (**IUGONET**) is a Japanese inter-university project for 6 years (Apr. 2009- Mar.2015) by the **National Institute of Polar Research (NIPR)**, **Tohoku University**, **Nagoya University**, **Kyoto University**, and **Kyushu University** to **build a database of metadata for ground-based observations of the upper atmosphere**. The IUGONET institutes/universities have been collecting various types of data by radars, magnetometers, photometers, radio telescopes, helioscopes, etc. at various locations all over the world and at various altitude layers from the Earth's surface to the Sun. The metadata database will be of great help to researchers in efficiently finding and obtaining these observational data spread over the institutes/universities. This should also facilitate synthetic analysis of multi-disciplinary data, which will lead to new types of research in the upper atmosphere. The project has also been developing a software to help researchers download, visualize, and analyze the data provided from the IUGONET institutes/universities.

SCOPE of the IUGONET project

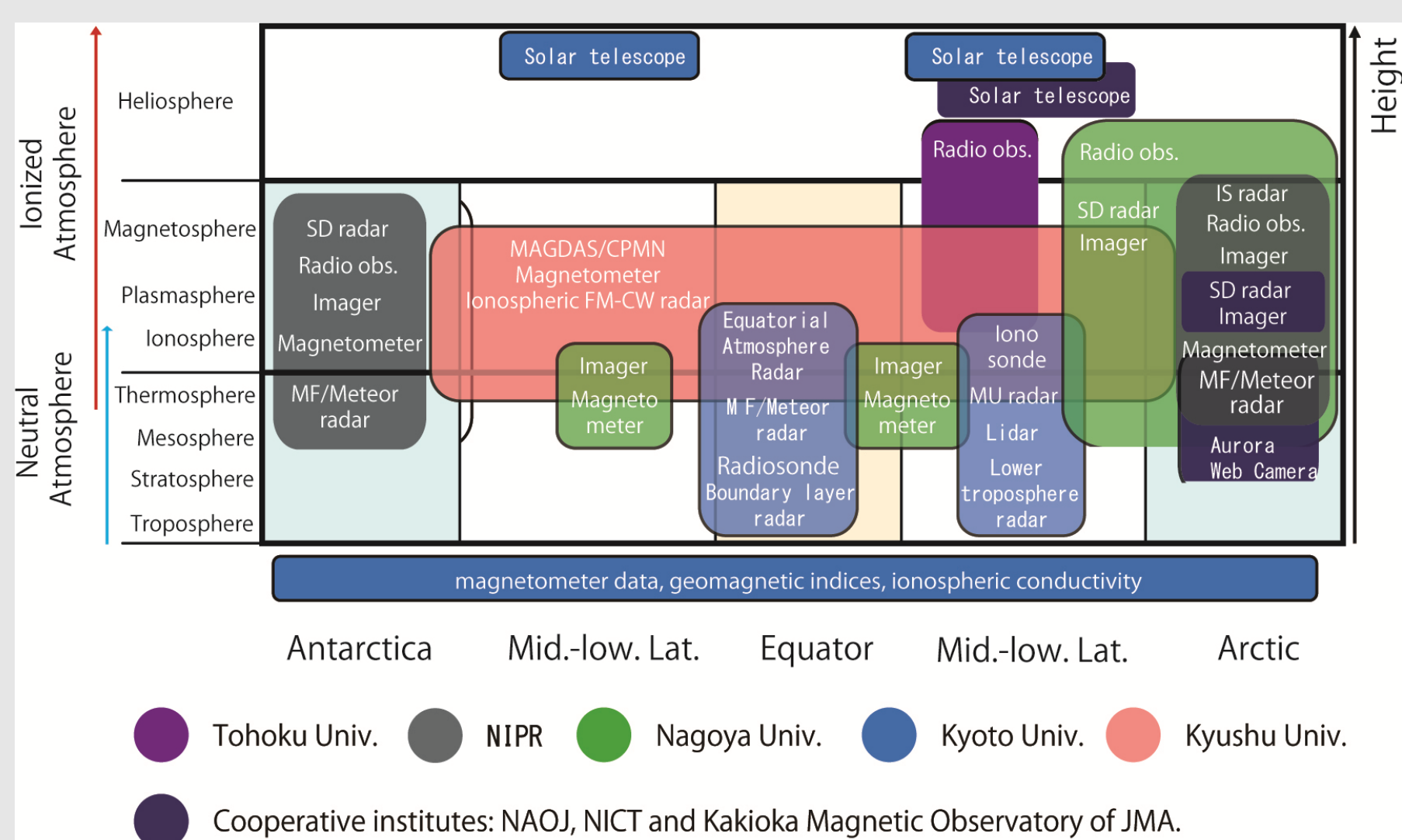
The upper atmosphere is considered a compound system consisting of the mesosphere, thermosphere, ionosphere, and magnetosphere. Although the different atmospheric layers are often referred to as independent regions, they are closely coupled by exchange of materials, momenta, and energies through complicated physical processes, for example,

- Energy input from the sun (e.g., ultraviolet radiation and the solar wind, drive convection of both neutral and charged particles,
- Momenta and energies from the stratosphere and troposphere injected by atmospheric waves,
- Many internal phenomena (e.g., electromagnetic energy transport, plasma convection, chemical reaction).

Therefore, we need to create integrated and organic links between a variety of ground-based observations made at various locations from the equator to the poles.

The IUGONET project aims at building a metadata database of the upper atmospheric data acquired by ground-based observations so that people can obtain information of various data from the metadata database. This will promote effective use of the observational data spread across international geo-science research communities, and then lead to new interdisciplinary, comprehensive studies regarding the upper atmosphere.

Target of the IUGONET



We are incorporating the metadata of the data obtained by the cooperative institutes such as NAOJ, NICT and Kakioka Magnetic Observatory of JMA.

In addition, we are incorporating the metadata of the tropospheric observations taken by various radars in the Equatorial Atmosphere Radar (EAR) site and that in Shigaraki MU observatory (mid-latitude). Further, the metadata of solar full-disk chromospheric imaging data have been registered. With these updated metadata, research basis of the whole solar-terrestrial system is being established.

Metadata database (MDDB)

The IUGONET metadata database has been released since March, 2012! It is now available at <http://search.iugonet.org/iugonet/>.

IUGONET adopted SPASE as the base format of our metadata. SPASE is widely used in STP and upper atmospheric research community.

Number of current metadata
7,802,574
including observatory (671),
instrument (735)
and data files

free word search

time range search

spatial coverage search

type of metadata

IUGONET adopted DSpace as the metadata database platform. DSpace is a free software widely used by digital repositories at many universities over the world. One of the major differences between Dublin Core used in the library systems and scientific metadata is the description of domain and period of observation.

Metadata Details

The common time filed data of SENSU SuperDARN Syowa South HF radar distributed by ERG-SC

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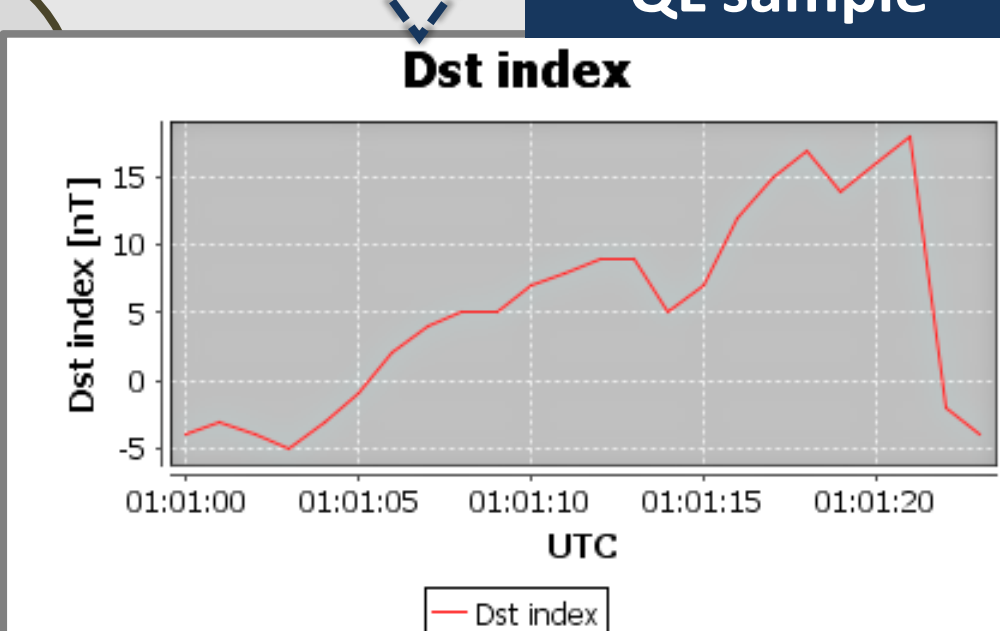
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We are preparing a dictionary which works with "Associative Search" developed by NII.

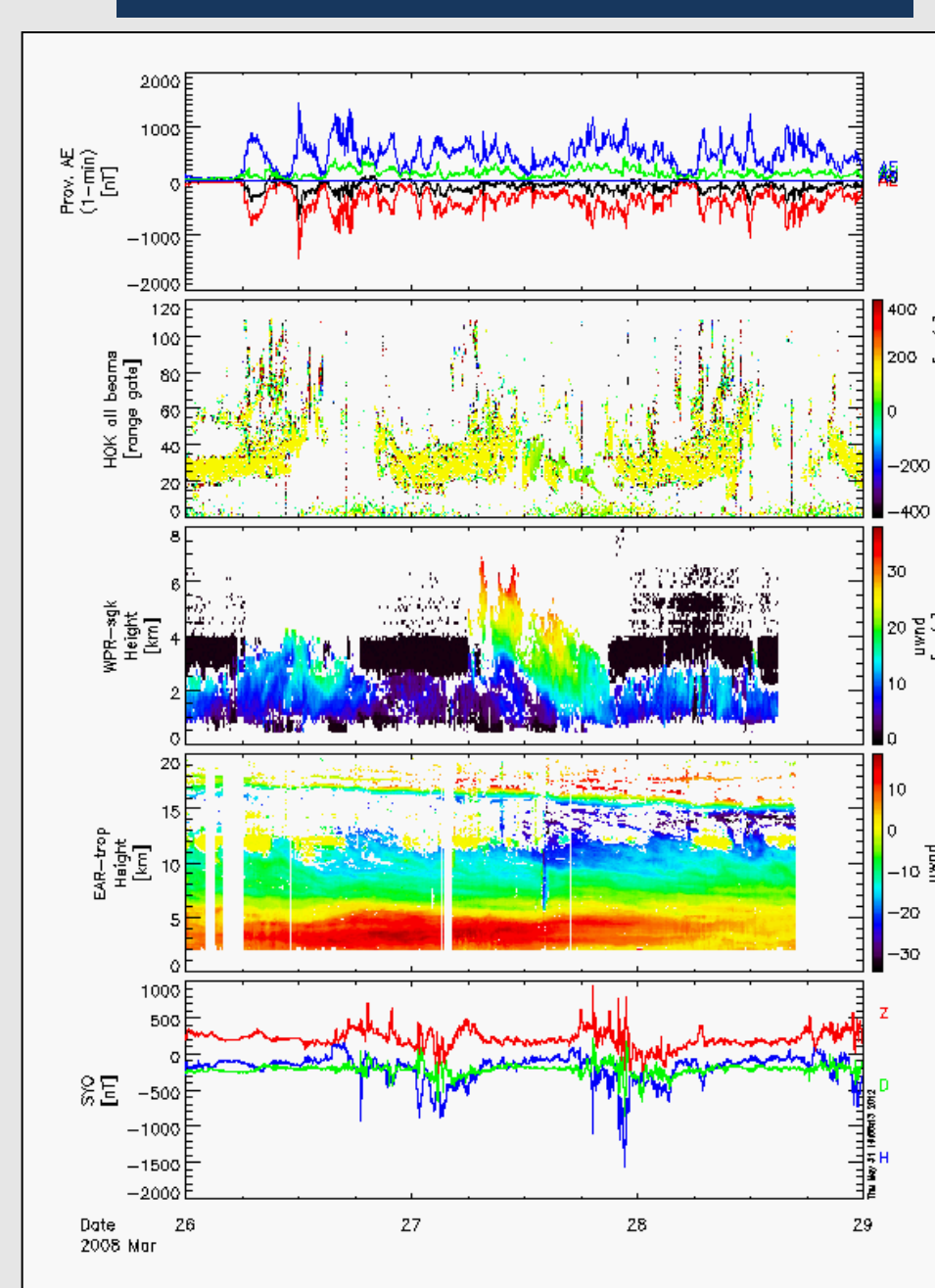
A quick look (QL) viewer of data referred in the MDDB is under development. The viewer with data can be deployed with a single click over the Internet.
•It has not equipped 2D-plot scheme yet.
•We have checked GeoMapApp.



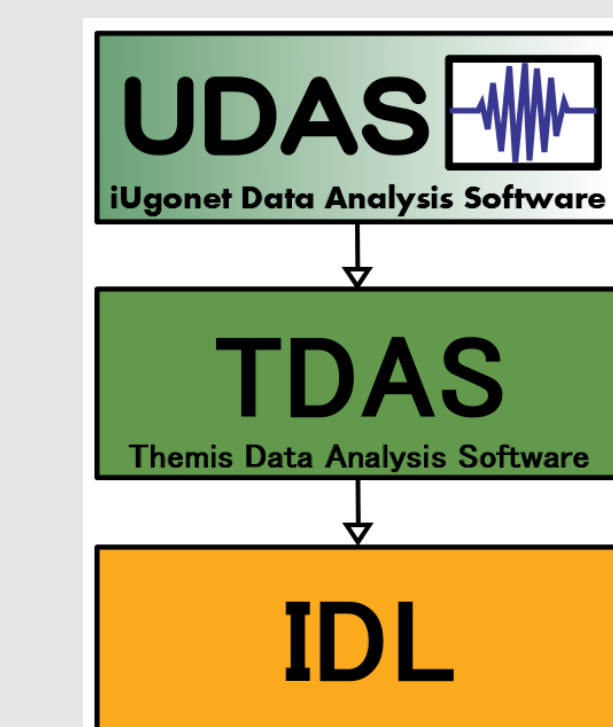
Analysis Software (UDAS)

The official version of UDAS (currently version 2.00.1) has been released since Feb., 2012! It can be downloaded from <http://www.iugonet.org/en/software.html>.

CUI : data plot window



UDAS is a plug-in software for TDAS



GUI : data load window

● The UDAS is written in Interactive Data Language (IDL), which is widely used in the fields of solar and terrestrial physics. We are developing the software on the basis of the THEMIS Data Analysis Software suite (TDAS). The UDAS is distributed as a plug-in software of TDAS to handle data provided by the IUGONET universities/institutes.

● The TDAS already contains a lot of useful functions to enable users to download, visualize, and analyze various kinds of data. It is easy to make stacked plots of time series in order to compare various kind of data at one time.

● The UDAS accesses IUGONET data through the internet, and then the data are automatically downloaded onto the user's computer. Users can get and analyze the data without knowing data file locations.

● Users need not to take care of data formats when analyzing the data. The data downloaded and plots created can be exported to a variety of data format (ASCII, PNG, JPEG, PS, EPS, etc.).

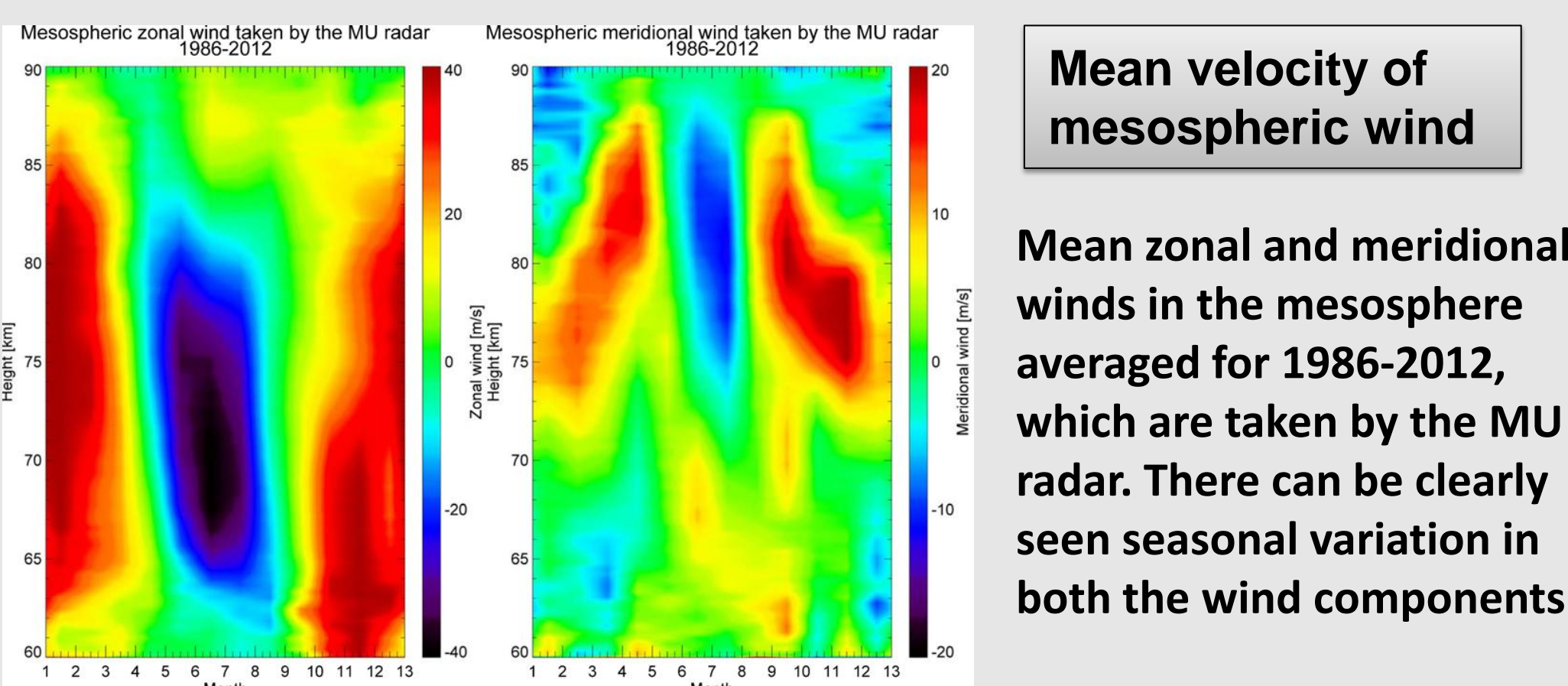
● Graphical User Interface (GUI) as well as Character User Interface (CUI) is available so that even users who are not familiar with the data can visualize and analyze them.

Available UDAS load procedures

List of load procedures for UDAS

<Heliosphere>			<Magnetosphere, ionosphere and atmosphere>		
UDAS load procedures	Observation data	Institutes	UDAS load procedures	Observation data	Institutes
ing_load_iprt	Solar HF radio spectrum	Tohoku Univ.	ing_load_hlr_rish	Boundary layer radar	RISH, Kyoto Univ.
			ing_load_itr_rish	L-band Lower Troposphere radar	RISH, Kyoto Univ.
<Geomagnetism and its activities>			ing_load_ear	Equatorial atmosphere radar	RISH, Kyoto Univ.
UDAS load procedures	Observation data	Institutes	ing_load_mu	MU radar	RISH, Kyoto Univ.
ing_load_gmag_wdc	AE, Dist. ASY/SYM indices, Geomagnetic Field Data at the Observatories (hourly values, 1 minute values)	WDC, Kyoto Univ.	ing_load_meteor_rish	Meteor radar	RISH, Kyoto Univ.
erg_load_gmag_nipr	Geomagnetic Field Data at Syowa and Iceland stations	NIPR	ing_load_mf_rish	MF radar	RISH, Kyoto Univ.
erg_load_gmag_mm210	210-degree Magnetic Meridian magnetometer network	Nagoya Univ., Kyushu Univ.	ing_load_wpr_rish	Wind Profiler radar	RISH, Kyoto Univ.
ing_load_gmag_serc	MAGDAS ground magnetometer	Kyushu Univ.	erg_load_sdfit	SuperDARN radar	NIPR; Nagoya Univ.; NICT
			erg_load_eiscat	EISCAT radar	NIPR; Nagoya Univ.

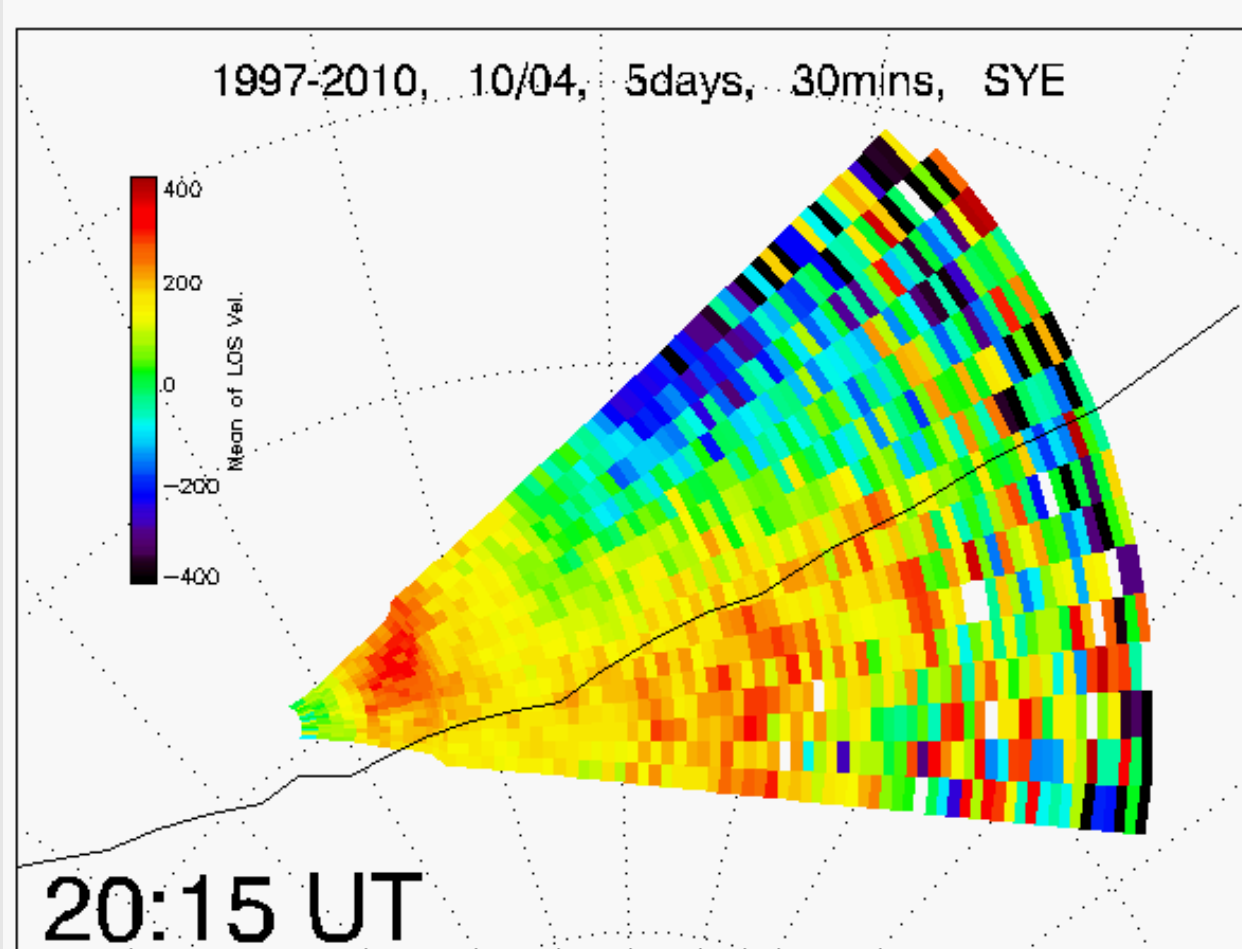
Analysis examples



Mean velocity of mesospheric wind

Mean zonal and meridional winds in the mesosphere averaged for 1986-2012, which are taken by the MU radar. There can be clearly seen seasonal variation in both the wind components.

● Users can easily visualize and analyze a long-term data set by using TDAS and UDAS.



Mean velocity of ionospheric plasma

Two-dimensional (2-D) plot of Doppler velocity of the ionospheric plasma observed with SENSU SuperDARN Syowa East radar around the day/night terminator on Oct. 4. It was averaged over 14 years from 1997 to 2010.

● Routines for loading and plotting 2-D data such as solar images, auroral images, and ionospheric absorption, will be added into UDAS in near future.

Acknowledgement

- This project is supported by the Special Educational Research Budget (Research Promotion) [FY2009] and the Special Budget (Project) [FY2010 and later years] from the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.
- We acknowledge the cooperation and generosity of the THEMIS Science Support Team in allowing us to use TDAS for our data analysis software (UDAS).
- The UDAS has been developed in collaboration with the Energization and Radiation in Geospace (ERG) Science Center.