

International Research (Project No.: 30W-02)

Project name: Towards the International Collaboration to the Implementation of the Early Warning System for the South Himalayan Cloudburst Disaster

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Name of DPRI collaborative researcher: Hirohiko ISHIKAWA, Professor

Research period: April 1, 2018 ~ March 31, 2020

Research location: India, Japan

Number of participants in the collaborative research: (DPRI staff: 1, non-DPRI staff: 49)

- Number of graduate students: (Master students: 10, Doctor Students: 4)

- Participation role of graduate students [They attended an international workshop entitled “Extreme Severe Storms and Disaster Mitigation Strategy (ESSDMS)” organized at Central University of Rajasthan during 24-26 Dec 2018. They are engaged in different project works related severe storms and cloudbursts over the Himalayas]

Implementation status in FY2018

Please see Annexure - 1

Implementation plan in FY2019

Please see Annexure - 2

Implementation status in FY2018

International Workshop on

"Extreme Severe Storms and Disaster Mitigation Strategy (ESSDMS)"

24-26 December 2018, Central University of Rajasthan , India

List of Collaborating Countries: 4 (India, Japan, Nepal and Bangladesh)

Number of participants in the collaborative research: 50

Graduate students: 14

Over the South Himalayan range, many severe atmospheric disasters occur due to extreme rainstorms. In June 2013, a severe rainstorm (also known as cloudburst) caused more than 4000 deaths because of flooding and landslides in Uttarakhand Himalayan region near the Kedarnath shrine in India. Many such events occur annually over the Himalayan region, where the terrain is complex, economy is poorly developed and fragile. Similar event also occurred in West Japan in 2018. Extreme Severe Storms (ESS) cause torrential rainfall, extreme winds and lightning strikes leading to landslides and flash floods. The extreme rainfall events leading to disaster in mountainous region is of utmost priority to understand. To assess the dynamics, there is utmost need of observations, modeling and impact studies.

One of our deep concerns is the impact of global warming on the occurrence of extreme weather events, including ESS. Generally, it is very likely that the extreme weather events will increase in number and intensity under the warmer climate. However, our knowledge of recent trend and future projection of extreme weather in Asian countries is far from enough.

The economic development in South Asian countries on the other hand results in the unplanned human intervention in nature, raising disaster vulnerabilities in these areas. The social aspects of the ESS impact are critical for the mitigation of disaster. In this regard, experiences in Japan that underwent societal changes almost half a century ago should be transferred to South Asian countries. The Indo-Japanese collaboration has another advantage in this regard.

There is an urgent need to facilitate implementation of early warning system in different time scales for the South Himalayan severe rainstorm disasters. We are making an attempt, to foster international linkage and collaboration in this field among interdisciplinary researchers, which will lead to implementation of early warning system in South Himalayan region.

In view of above, an international workshop was organized at Central University of Rajasthan during 24-26 December 2018 in collaboration with the Disaster Prevention Research Institute (DPRI), Kyoto University, and International Consortium for Earth and Development Sciences (ICEDS), Kagawa University, Japan. The objective of the workshop was to foster research ideas for modeling, process studies, rainfall retrievals through in-situ observation, Satellites & Radars, and development of early warning system for severe storms through collaboration with the affected countries. Based on the deliberations, many strategies/ recommendations were made, which will form the basis of our future research projects and collaborations on "Extreme Severe Storms

and Disaster Mitigation Strategy” in the Asian Countries as summarized below.

1. Strategic Theme [1]: Understanding of Extreme Severe Storms:
2. Strategic Theme [2]: Understanding Climate Change Impact on Extreme Severe Storms:
3. Strategic Theme [3]: Towards Advanced Numerical Modelling of Extreme Severe Storms:
4. Strategic Theme [4]: Mitigation strategy for Extreme Severe Storms:

The researchers from India, Japan, Nepal and Bangladesh have expressed interests in collaborations on these strategic themes. In this workshop, 28 research papers were presented, and more than 50 researchers participated from different Asian countries including India, Bangladesh, Nepal and Japan. Based on scientific discussion, this workshop concluded and emitted an agenda for the future research plan and implementation of early warning system of extreme severe storms in Asian countries.

We invited a researcher from the North Eastern Hill University, Shillong, Meghalaya, India from 23-31 January 2019 to DPRI Kyoto University. He is researching about the rainfall pattern and its impact in the extreme rainfall area in the world, the southern slope of Meghalaya Plateau. We had a seminar by him in DPRI and CSEAS on 24 and 30 Jan respectively.

Implementation Plan in FY2019

Results of the 1st ESSDMS workshop has already been reported in the 4th WMO Workshop on Monsoon Heavy Rainfall held in Shenzhen China from 16 to 18 April 2019. Three presentations are also submitted and accepted as paper in AOGS 2019 in Singapore (28 July to 2 August 2019). Based on the Agenda declared in the workshop in 2018, fundamental studies on rainstorms in South Himalayan area will be continued. Focus will be on discussion on implementation of near real-time rainstorm detection and early warning system (EWS) for extreme rainstorms. To solve this problem, we shall pay attention to the score of sub-seasonal to seasonal (S2S) prediction. Several prediction data archives of S2S prediction are available. We shall also implement high resolution mesoscale model and data assimilation system for complex terrain and try to fill up the data gap regions over the Himalayas for accurate warning of the impending disaster. We will apply these dataset for the feasibility study of the near real-time extreme severe storm prediction.

Strategic theme for mitigation strategy for extreme severe storms in the Agenda identifies four points; (1) Development of EWS of extreme storms for disaster mitigation, (2) Building of strong human resources for resilience against extreme storms in the changing climate scenarios, (3) Development of impact based forecasting and communication strategies to the end users, (4) Identifying better science communication techniques (technical information to layman responsive messages). Based on these issues, we will plan for the upcoming EWS, to be implemented under this project.

We will lead the project by the Science Steering Group meeting which will be held on September in Japan. We will discuss about the feasibility of the near-real time rainstorm detection system, and will identify the issues that are to be solved for the implementation. Possible EWS will be initiated based on this discussion.

We shall design a coordinated numerical experiment for the simulations of some selected extreme severe storms over the Himalayas and request all the collaborators to conduct the experiments in a systematic way for better inter-comparison of the results of the selected cases.

We will have the second workshop for the Extreme Severe Storm and Disaster Mitigation Strategy (ESSDMS) in India, as a briefing workshop for rainstorm early warning system.

We shall also survey the vulnerable areas over the western and central Himalayas, which are prone to frequent cloudbursts and assess the ground realities for the need of special observations and field experiments (if any) for improving the EWS in future.