

### Long-term Research Visits (Project No.: 28L-03)

Project title: The Use of Real Time Sea Surface Temperature for the Better Numerical Predicting of Tropical Cyclone Evolution in the Bay of Bengal

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Name of visitor (Affiliation): Surireddi SVS Ramakrishna

Period of stay: Aug 04, 2016 ~ Oct 27, 2016

Location of stay: Disaster Prevention Research Institute, Kyoto University

Number of participants in the collaborative research: 7 (provide numbers for 2 DPRI and 1 non-DPRI staff)

- Number of graduate students: 4 students (2 Masters and 2 doctoral students, included number)

- Participation role of graduate students [Assistance of computation, Discussion in seminar]

Anticipated impact for research and education

The knowledge of Typhoon in Northwest Pacific Basin is extended to the tropical cyclone in the Bay of Bengal. The future collaborative research between DPRI and Andhra University is to be explored following to this research.

Research report:

(1) Purpose:

To carry out a study of the the impact of real time Sea Surface Temperature update in the evolution of the Bay of Bengal Tropical Cyclones in collaboration with the scientists at DPRI Severe storm division.

(2) Summary of research progress:

A total of as many as 11 cyclones were simulated using the computing facilities extended by the DPRI Severe Storm Division. Each experiment with two domains used to take about 5 hrs 30 minutes for a five day simulation. Each cyclone has been tested with and without the incorporation of an updated sea surface temperature. The work is continued with the simulation of the latest cyclones that hit the Indian coast.

(3) Summary of research findings:

The results indicate that the update of SST in each cyclone yielded better results in terms of both intensity and track. An improvement of 30% in terms of the landfall with the experiment using an updated SST is clearly achieved. Further the intensity of the winds in all the three component directions have been improved.

(4) Publication of research findings:

A Research Paper entitled “**The role of real time Sea Surface Temperature in the Numerical Simulation of the North Indian Ocean Cyclones**” is under preparation.

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**ABSTRACT**

The Indian Sub continent is often vulnerable to severe cyclones .It is flanked by two seas the Arabian Sea on the west and the Bay of Bengal on the east. These two seas form the two components of the North Indian Ocean (hereafter referred to as NIO) which is the only land locked ocean in the world. The main cyclone seasons of the NIO are April May and October November which are succeeded by two monsoon seasons. Sea Surface temperature is one of the key parameters which is responsible for the dynamics of tropical cyclones. The sea surface temperature (SST) facilitates the release of latent and sensible heat. In the present paper a total of 11 cyclones in a 11 year period (2006-2016) have been selected and studied with respect to their evolution by ingesting Sea surface temperature on a real time basis every three hours derived from the Global Forecasting System (GFS) .The research tool utilized is the state of the art weather research and forecasting model (WRF) with two interactive domains and a pre configured physics. Three experiments have been conducted for each cyclone one with a prescribed SST and the other two with initial SST and SST throughout the life cycle of the cyclone. The evolution of the vortex is described at the mature stages of each respective cyclone and the radius height cross sections of the three component winds along with the rainfall and track are presented. Results indicate that the experiments with real time SST yielded better results with respect to both intensity and track especially with the finer domain (9km).

Key words: SST, Numerical simulation, Tropical cyclones and WRF.