



## Present status and future plan of storm surge forecasting in the North Indian Ocean

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### Background

The destruction due to storm surge flooding is a serious concern along the coastal regions of the countries around the North Indian Ocean. Recently the Nargis cyclone of May 2008 killed about 140,000 people in Myanmar as well as caused enormous property damage. Thus, provision of precise prediction and warning of storm surges is of great interest in the region.

### Objectives

Location specific operational storm surge prediction models have been developed for the coasts of India, Bangladesh, Myanmar, Pakistan, Sri Lanka, Thailand, and Oman. Under the auspices of TCP/WMO the technology (IIT Model) has been transferred to the NMHSs of the region. This model predicts only residual storm surge at the coast line (i.e., water level over and above normal astronomical tides). With the advantage of simplicity in operation, this model has been used to produce and disseminate timely warnings to serve public safety. From cyclone season of 2009, RSMC New Delhi is using IIT Model for providing ‘storm surge guidance’ to the countries of the region.

This paper discusses recent developments in storm surge forecasting in the Bay of Bengal and the Arabian Sea. Initiatives of the India Meteorological Department and other national agencies to improve infrastructure required for improved prediction of cyclone and associated surges have been detailed. Paper also describes future plan to enhance the present forecasting capability following the recommendations made at the IOC-UNESCO/JCOMM workshop held during 14-17 July 2009 at New Delhi (<http://www.jcomm.info/SSIndia>).

### Results

The operational performance of the IIT Delhi model in forecasting of storm surge in the North Indian Ocean during cyclone season of 2009-10 has been evaluated. The model predicted surges are found to be reasonably satisfactory. Although, presently not used operationally, results from the model by incorporating nonlinear interaction of tide and surge indicate further improvement in storm surge amplitude as well as time of its occurrence. Some of the preliminary results of river-ocean coupled models show that the discharge of fresh water carried by the major rivers joining in the northern Bay of Bengal may modify the surge heights.

## **Conclusions**

While the storm surge prediction for India in particular, and for the North Indian Ocean region in general, was generally satisfactory, improvements are needed both in storm surge model as well as meso-scale NWP model to further enhance storm surge forecasting capability in the region.

Present IIT model predicting only residual storm surge require improvement in order to forecast total water level (TWL) occurring as a result of the combined effect of the interaction of storm surge with tides, wind waves, and several other factors. Inclusion of precipitation, river flows, meso-scale forcing and remote forcing in the model may also be examined.

IIT Delhi and RSMC, New Delhi are jointly working to implement the recommendations of the IOC-UNESCO/JCOMM workshop held during 14-17 July 2009 at New Delhi (<http://www.jcomm.info/SSIndia>) to improve the storm surge forecasting.