Importance of Satellite Derived Sea Surface Height Anomaly in Cyclone Predictions

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Improvements in predicting the cyclone track and intensity has been a challenging problem for disaster management practices in order to reduce loss of life and the economical vulnerability due to the sudden and unexpected intensification. This problem is more critical when the coastal bathymetry varies significantly, like in the case of Indian coast, where even a slight error in the prediction of landfall point and the intensity can lead to a totally different storm surge height. While attempts are being made to improve the predictions through statistical and dynamical models, it is also worthwhile to attempt improving the input parameters and/or incorporating new parameters to the models. This presentation suggests the use of sea surface height anomaly (SSHA) derivable from satellite altimeters in the atmospheric models, particularly, in the cyclone models, in place of sea surface temperature (SST).

SST is the only oceanographic input in most of the cyclone models though cyclones interact not only with the surface but with the deeper oceans. This depth depends upon the strength of the wind mixing. The latent heat release that fuels the system reduces SST due to the wind induced mixing even before the center of the cyclone passes a given area. This reduction is intense (negligible) if the upper warmer ocean is shallow (deep) that can be indirectly obtained from altimeter derived SSHA.

In this presentation, the impact of oceanic eddies/dynamic topography on the intensification and dissipation of two cyclones (10-19 May 2003 and 15-22 December

2005) was demonstrated over the Bay of Bengal. The intensity of the May 2003 cyclone has increased after the cyclone passed over a cooler SST region and decreased after passing over a warmer region. While almost a one to one correspondence is present between the cyclone intensity (CI) and SSHA, no such relationship was observed between CI and SST. Similarly, December 2005 Bay of Bengal cyclone dissipated in the ocean itself after passing over a cold-core eddy with less oceanic heat content. Besides, the unusual westward movement of the 6-11 May 2002 Arabian Sea cyclone was also attributed to the presence of two anti-cyclonic eddies, through a fifth generation National Centre for Atmospheric Research Mesoscale Model (MM5).