Estimation of Pressure Drop within the Tropical Cyclone and Height of Associated Storm Surge Using Doppler Velocity Data

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Strong winds and high storm surge are the critical factors associated to Tropical cyclones in the Bay of Bengal (India).The exact prediction of landfall location, time, wind velocity and expected storm surge may save thousands of human lives. The large pressure drop within the eye and the storm surge height are functions of maximum velocity in the eye wall region. These factors are basic indicators of severity of a cyclone. A study of four tropical cyclones during post-monsoon seasons in the Bay of Bengal has been conducted using Doppler Weather radar to estimate the pressure drop in the eye of the cyclone and the height of storm surge by Doppler Velocity. The existing empirical relation between maximum velocity and central pressure drop has been modified in terms of radial velocity measured by the Doppler radar. The storm surge height is also calculated for these cyclones using an empirical relation suggested by SAARC Meteorological Research Centre, Dhacca (Bangladesh) and is found that the values are very close to the actual occurrence as reported by media and measured by meteorological agencies. The study concludes that apart from intensity of a cyclone in terms of eye diameter, radar reflectivity (precipitation contents and estimated rainfall) and wind speed, central pressure drop and storm surge height may also be estimated with a very high accuracy using radial velocity data from Doppler weather radar in the range of 250 km. So far no study had been carried out for measurement of central pressure drop and storm surge height using DWR data in the Bay of Bengal coast, hence present study gives better estimates and directions for central pressure drop, intensity of the cyclone and expected storm surge height and may be used for the validation of the parameters derived from the satellite before the landfall of a cyclone.

Key Words:-Tropical Cyclone, Storm Surge, Bay of Bengal, Central Pressure drop, Eye wall, Radial velocity, Doppler weather radar.