Chapter 6
Natural Hazard:
Tropical Cyclone – Evaluation of HE and IMSRA Over CS KYANT

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ABSTRACT

Tropical cyclones are also known as typhoons or hurricanes. Also, special emphasis is given on the various aspects associated with cyclogenesis, like the six essential parameters required for cyclogenesis as given by W. M. Grey, and Dvorak technique is discussed in this chapter. INSAT-3D is an indigenous advanced dedicated meteorological satellite in geostationary orbit, which was launched on 26th July 2013. INSAT-3D was declared operational by IMD on 15th January 2014. INSAT-3D has four payloads, namely. IMAGER, SOUNDER, data relay transponder (DRT), and satellite aided search, aid and rescue (SAR). Three rainfall estimates are being generated from INSAT-3D, namely, hydro-estimator (HE), INSAT multispectral rainfall algorithm (IMSRA), and QPE (quantitative precipitation estimate). It has been found in this study that IMSRA performs better during initial stages of cyclogenesis (i.e., during T1.0, T1.5, and T2.0); during mature stages T2.5 to T3.0, HE performs better. During weakening stages IMSRA gives better results.

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INTRODUCTION

The intensification of the tropical cyclone (TC) is dependent on the sea surface temperature (SST) which also an indicator for its track movement (Emanuel, 2005). The assimilation of amount of precipitation occurred at the vertex is useful for the prediction of intensity of the cyclone (Huang et al., 2006; Karyampudi et al., 1998; Zou and Kuo, 1996). There are some other studies which suggest the occurrence of the spiral cloud bands of convections is also intensity the TC (Guinn and Schubert, 1993; Willoughby et al., 1984). The necessity of accurate cyclone track prediction, intensity estimation and precipitation estimation plays a major role in the wide range of applications like risk assessment, agricultural sector, and disaster in the coastal regions. Now a days, the numerical weather prediction models and its ensemble prediction techniques given a new approach to the risk assessment to the disaster management and other sectors. But the real time approach will helpful for the changes in the systems can be identified by the satellite observations. In many studies various authors have stressed upon the role of sea surface temperature and ocean thermal energy during cyclone genesis (Riehl, 1954; Fisher, 1958; Malkus andRiehl, 1960; Miller, 1964; Leipper, 1967; Perlroth, 1967, 1969; Leipperand Volgenau, 1972).

In 1975 William M. Gray, from Colorado State University, USA summarized the primary cyclone genesis parameters which are essential for the formation of a Tropical cyclone. These parameters are:

1. Low-level relative vorticity
2. Coriolis Parameter
3. The inverse of the vertical shear of the horizontal wind between the lower and upper troposphere
4. A Sea Temperature Factor of the sea temperature above 26.11°C between the surface and 200 feet ocean depth
5. Vertical gradient of Equivalent Potential temperature between surface and 500hPa
6. Middle troposphere relative humidity

The development of Dvorak Technique (1984), is considered as the single most significant development towards understanding of Tropical cyclones and this technique is being used operationally worldwide for estimating intensity and pattern of the tropical cyclones. The intensity of the low-pressure system in Dvorak Technique is defined with a number from 1-8 in an interval of 0.5 and is known as T number. For assigning these T numbers, maximum sustained surface wind speed is taken as the main criteria. In Table 1, the T numbers assigned to various low-pressure systems and the maximum sustained surface wind speeds associated with these low-