

Severe Local Storms of Bangladesh and adjoining Indian territory

○Fatima AKTER, Hirohiko ISHIKAWA

Severe Local Storms (SLS) are the most devastating phenomena, which occur frequently in the pre-monsoon season (March – May) in Bangladesh. They inflict huge damages to our lives and properties within a very short time every year. Many of these SLS are called as Nor'wester since they migrate from north-west to south-east. Those are often associated with tornadoes. Every year the SLS of Bangladesh cause the highest death toll in the World. Annual death toll accounts for 179 deaths per year caused by only from tornadoes in Bangladesh from the period of 1967-96 (Ono 2001). This study evaluates the dryline (is a very narrow transition zone of horizontal moisture gradients, where relatively warm, moist maritime air mass meets a relatively hot, dry air mass) as one of the trigger mechanisms of frequently occurring SLS in the pre-monsoon season.

Initially, JRA-25 1.125 degree resolution reanalysis data by Japan Meteorological Agency (JMA) are used to analyze the synoptic features of violent Nor'wester and tornado cases, between 1979 and 2012. 20km resolution analysis data using Global Spectral Model (GSM) of JMA are used to calculate specific humidity gradient. To see the large scale phenomena of the disturbances (cloud movement and cloud structure) the IR imageries of Multi-functional Transport Satellite (MTSAT) of JMA are used. To measure the amount of precipitation during the SLS event the Global Satellite Mapping of Precipitation (GSMaP) are also used in this study.

Surface analysis such as mean sea level pressure, temperature, specific humidity and wind direction of the lower level are investigated in each day of pre-monsoon seasons and SLS event shows typical

diurnal variations from morning to evening. In this season southerly or south-westerly tongue of moist warm wind flows from the Bay of Bengal to the land and dry warm westerly wind flows from the Indian high lands to Bangladesh. Strong horizontal Specific humidity gradient is observed between those warm moist air mass and dry warm air mass that is sometime mentioned as dryline which is also analogous to the dryline features of United States (Weston 1972). Number of climatological studies proves that the initiations of severe storm outbreaks in the United States are triggered by dryline (Reha 1966; Bluestein and Parker 1993; Ziegler et al 1997 and Hane 1997). Therefore, a detailed climatological investigation is carried out to study the effects of dryline on SLS initiation in Bangladesh and the adjoining Indian territory.

The stability indices of Showalter Stability index (SSI), K-Index (KI), Total Index (TT), Lifted Index (LI), Bulk Richardson Number (BRN), BRN-Shear (BRNS), Convective Available Potential Energy (CAPE), Convective Inhibition (CIN), Storm Relative Helicity (SRH), Energy Helicity Index (EHI), Precipitable Water Content (PW), are also calculated to understand the environment condition during the SLS occurrence.

Since upper air sounding is only once or twice in a day and the location is only at Dhaka and Calcutta in the study region, it is difficult to compute stability parameters from the sounding data for forecasting purpose. The use of objective analysis data has been quite promising in place of sounding data in such data sparse region. Further studies are, however needed.