

HIGH RESOLUTION NUMERICAL SIMULATION OF CONVECTIVE CELLS IN THE RAINBAND OF CYCLONE SIDR

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Abstract

Tropical cyclone Sidr, which hit Bangladesh on 15 November 2007, is one of the most ten fierce cyclones for the last 131 years from 1876 to 2007 in this region. The hazardous consequence by its strong wind, flash flooding and intense rain made the evidence of high death rate and damages of the socio-economic condition of the country. The numerical model CReSS (Cloud Resolving Storm Simulator) has been used to simulate Sidr for the period of 48 hr from 0000 UTC of 14 to 0000 UTC of 16 November 2007. For the simulation, the domain size of 84.5-96.7E and 12-26.4N are considered with grid resolution of 1 km in horizontal and 0.5 km in vertical. Initial and boundary conditions are taken from 6 hourly JMA (Japan Meteorological Agency) - GSM (Global Spectral Model) data with 0.5 degree resolution. From the simulation it has been observed that convective cells in the rainband of Sidr are produced owing to the convergence effect of strong moist southerly. Veering of wind at low level also produces horizontal vorticity in the convergence region. The value of wind shear and CAPE (instability) are found to be the modest. The purpose of the study is to find out the characteristics of the convective cells in the rainband of Sidr. Considering this, a few cells are analyzed to be acquainted with their evolution, structural organization, maintenance process and strength. The moist, intense convective updraft (15 ~ 25 m/s) of the cells extended upto 10 to 12 km in height are tilted by the shear and make the horizontal vortex into the vertical cyclonic and anticyclonic vortex couplets of mesocyclone. Maximum vorticities of 1×10^{-2} /sec (approx.) are noticed around at the level of 9 to 11 km. After 30-40 minutes of formation, cells are split into two mesocyclone pairs. The pattern of the clockwise curved hodograph also signifies the strong right and weak left moving supercells. The horizontal diameter of each cell is about 15-20 km. The longevity of the supercell is more than 90 minutes. Obviously this long lived high precipitation supercell (precipitation more than 200 mm/hr at mature stage) formed in the rainband of Sidr results the cruelty after landfall.

Keywords: supercell, rainband