

Numerical diagnosis of situations causing heavy rainfall over the Western Himalayas

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Abstract: Heavy rainfall events frequently occur over the western and central Himalayas during the monsoon season causing losses of lives and damages to properties over the fragile mountain environment. A heavy rainfall event that occurred over Uttarkashi (30.73°N, 78.45°E) in the Western Himalayas on 3rd August 2012 is investigated. The formation of the storm, its evolution and the initial physical mechanisms responsible for this event are analyzed using a double nested Weather Research and Forecasting (WRF) model. The model skill is evaluated against available observations and analysis fields. The impact of assimilation of Global Telecommunication System (GTS) data in the model initial condition is also studied. The model simulated rainfall is compared with daily rainfall data from satellite-gauge merged rainfall and 3 hourly Tropical Rainfall Measuring Mission (TRMM) estimated rainfall. The double nested configuration of the model successfully simulates this heavy rainfall event. 3DVAR assimilation of GTS data in the model initial condition improves prediction of precipitation amount and location of heavy rainfall. The results of double nested WRF model simulation with GTS data assimilation are compared with the results of global model forecasts of National Centre for Medium Range Weather Forecasting (NCMRWF), India. Forecast skill of the model with and without data assimilation is computed with respect to TRMM estimated daily rainfall.

Keywords: Cloudburst · Mesoscale · Convective Available Potential Energy (CAPE) · Data Assimilation