2.37 USING A FOUR-DIMENSIONAL VARIATIONAL RADAR AND SURFACE DATA ASSIMILATION SYSTEM TO INVESTIGATE THE PROCESS LEADING TO A HEAVY PRECIPITATING EVENT OVER COMPLEX TERRAIN: A CASE STUDY IN NORTHERN TAIWAN

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The complex terrain in Taiwan area makes it challenging to forecast convection initiation, propagation and intensification. In this research, a heavy rainfall event occurred on 19 August, 2014 in northern Taiwan is selected. We use a newly-developed four-dimensional Variational Doppler radar assimilation system (IBM_VDRAS), which is capable of simulating the topographic effect by adopting the so-called Immersed Boundary Method, and assimilating radar observations and surface station data. The products of IBM_VDRAS are a series of frequently-updated three-dimensional analyses fields over the complex terrain. In this case study a total of eight analysis fields are generated with a temporal interval of 17.5 min over a period of 2.5 hours.

From the surface observations and the high temporal/spatial resolution analysis fields generated by IBM_VDRAS, it is found that the rainfall process starts from the initiation of individual convective cells. The outflow of one of the convective cells merges with another convective system, and helps to intensify the latter. The intensified major convective cell moves into the Taipei metropolitan, and produces 80 mm of heavy precipitation within 2 hours. The role played by the topographic forcing on the development of the convective system is investigated. A series of experiments are also designed by taking into account the surface heat and moisture flux to examine IBM_VDRAS′ performance in short-term rainfall forecast.