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A study of a heavy rainfall event during YESR2021 using IBM_VDRAS

Abstract

Using IBM_VDRAS (Immersed Boundary Method Variational Doppler Radar Analysis System) to analyze a heavy rainfall event on 26 November 2021, this study identified four stages of precipitation. The precipitation was located along the SMR (Snow Mountain Range) in Stage 1, began to develop in the NCMR (Northern Central Mountain Range) and expanded northeastward into the plain in Stage 2, and then as the precipitation decreased over the interior, the rain band began to move to the east side of the NCMR, leading to continuous rainfall in Suao in Stage 3, and finally the systems dissipated over the plain in Stage 4.

The simulation results were validated against wind profiler observations and mosaic radar reflectivity, demonstrating the ability to capture the low-level northeasterly winds, upper-level southwesterly winds and the temporal evolution of the precipitation system. The research showed that a local high-pressure system, modulated by the strengthening northeasterly winds, played a key role in the location of the precipitation hotspot and the eastward movement of the rain band. From the kinematic and thermodynamic field of IBM_VDRAS, this study can clearly describe the evolution of wind, convergence, temperature perturbation, relative humidity and pressure field in the three-dimensional atmosphere.

Keyword

Yilan Experiment of Severe Rainfall