Development and Applications of the Advanced Regional Eta-Coordinate Numerical Heavy-Rain Prediction Model System in China

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Regional Eta Model (REM) is a limited-area numerical heavy-rain prediction model with Chinese climate and topography features developed by the Institute of Atmospheric Physics (IAP) of Chinese Academy of Science (CAS) in 1990's, in which a ladder topography coordinate is adopted. A two-step shape-preserving advection scheme is designed to assure the computational precision of water vapor transfer directly associated with rainstorms. In recent years, Wuhan Institute of Heavy Rain has made improvements to the REM in areas of resolution, model standardization, lateral-boundary conditions, physical parameterization and data assimilation and established the Advanced Regional Eta Model (AREM). This model has gone through several updates from AremV2.1, AremV2.3 to present AremV3.0. AREM has shown good performances in operational applications in recent years. It depicted well the rain band feature, intensity, vertical structure of precipitation, and evolution of the hourly rainfall for a variety of heavy rain events in regions to the east of Qinghai-Tibet Plateau in China. The next step will be focused on the research of data assimilation using observations from radar, Global Positioning System (GPS), satellite, and gauge data and on the improvement of the AREM physics scheme. Applications of Quantitative Precipitation Forecast (QPF) in hydrology are also under investigation and development.