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An Observational Analysis of a Torrential Rainstorm in the Warm Sector of South China Coastal Areas

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Abstract: On May 20th 2016, a brief but severe downpour rainstorm occurred in the coastal areas of Maoming and Yangjiang with rainfall of 115mm per hour. Data from NCEP/NCAR reanalysis with $1^\circ \times 1^\circ$ resolution, Doppler weather radar, conventional surface observations, high-altitude radiosonde and wind profiler radar were used to analyze characteristics and contributions of synoptic scale and mesoscale systems during this torrential rainstorm. The results showed that: (1) the storm was caused by a quasi-linear mesoscale convective system (MCS) and the slow-movement of this system was the primary trigger of the torrential downpour; (2) water vapor was abundant, nearly saturated and in steady state throughout the atmosphere before the storm; intrusion of the weak dry and cold air in the middle level and a striking [U+2015]dry above and wet below [U+2016] structure had increased the atmospheric instability.(3) low-level southwesterly airflow from a low pressure (trough) at the Gulf of Tonkin provided abundant water vapor in the onset of the rainstorm; a deep dry layer was formed by dry and cold air behind the high-level trough, which facilitated latent heat release; upper-level divergence and low-level convergence circulations also provided vertical uplift for warm and moist air at the lower level; (4) Topography only played a minor role as the MCS developed and strengthened over relatively flat coastal terrain. Low level density flow induced by convection triggered new convective cell generation at the leading edge of the convective system, thereby playing a key role in the change of temperature gradient at lower layers, and resulting in strengthening atmospheric instability.
Keywords: South china coastal areas, Rainstorm in the warm sector, synoptic scale systems, Mesoscale process