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The Evolution Process of Warm Season Intense Regional Rainfall Events in Yaan

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Accurate simulation and prediction of intense precipitation events require better understanding of their physical mechanisms. This study uses Yaan—a place with regional maximum rainfall in central China—to investigate the cause and process of intense precipitation. Hourly rain gauge records and the new ERA5 reanalysis are used to characterize the evolution process of warm season intense regional rainfall events (RREs) in Yaan and its associated three-dimensional circulation. Results show that before the start of the Yaan intense RREs, moderate rainfall amount (frequency) appears northeast of the key region. The rainfall then moves southward in the following several hours along the eastern periphery of the Tibetan Plateau where it reaches peak. It then moves to and end up in the south and southeast Sichuan Basin. The progression of the RREs is found to be associated with a counter-clockwise rotation of anomalous surface winds associated with a developing mesoscale surface low-pressure center, which is further associated with the southeastward progression of a large-scale synoptic scale wave. The easterly phase of the winds in the counter-clockwise rotation causes upslope motion perpendicularly toward the terrain that leads to maximum rainfall. The findings illustrate how large-scale circulations, mesoscale systems, and specific topographic features interact to create the RREs evolution in Yaan.