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Multiscale Features and Triggering Mechanisms of the Warm-Sector Heavy Rainfall Accompanied by Warm Shear Along the Yangtze–Huaihe Coastal Regions

Abstract

This study employs the K-means method to classify 32 cases of warm-sector heavy rainfall events accompanied by a warm-type shear line (WSWR) along the Yangtze–Huaihe coastal region (YHCR) from April to September during 2010–17. Using high-resolution hourly precipitation data and ERA5 reanalysis data, the synoptic features of WSWR by K-means uncovers 15 southwest type (SW-type) and 17 south-biased type (S-type)WSWR events.

Composite analysis highlights the dynamic and thermodynamic features of each type. The S-type WSWR shows peak water vapor in the boundary layer. Before the initiation of WSWR, a warm, humid tongue indicated by pseudoequivalent potential temperature is present in the boundary layer, implied by substantial unstable energy. The boundary layer jet (BLJ) attributes to mesoscale ascent and enhancing convergence along the coastline, which also transports unstable energy and water vapor, causing significant rainfall. Conversely, SW-type WSWR water vapor maximum value is around 850 hPa. The YHCR is located at exit area of the 850 hPa synoptic low-level jet (SLLJ) and the entrance area of the 600-hPa jet. The suction effects, combined with BLJ, favors the triggering of convection. Scale analysis shows mesoscale dynamic field are critical in WSWR, while the largescale and meso-a-scale dynamic field the transportation of moist and warm airflow.

Keywords

WSWR (Warm-sector heavy Rainfall events accompanied by a Warm-type Shear line)

Cluster Analysis

Reference

Yu, Y., L. Zhang, L. Song, W. Li, L. Zhou, and L. Ouyang, 2024: Multiscale Features and Triggering Mechanisms of the Warm-Sector Heavy Rainfall Accompanied by Warm Shear Along the Yangtze–Huaihe Coastal Regions. *J. Hydrometeor.*, **25**, 465–478, https://doi.org/10.1175/JHM-D-23-0142.1.