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Role of intraseasonal oscillation in the persistent extreme precipitation over Yangtze River Basin during June 1998

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The period of 12-27 June 1998 witnessed the most severe persistent extreme precipitation event (PEPE) over the Yangtze River Basin (YRB) in recent 60 years. In this period, the YRB rain belt featured significant intraseasonal oscillation (ISO) with two migrations and three stagnations, which was mainly determined by the 10-30-day intraseasonal rainfall, while the 30-60-day counterpart generally maintained the shape and intensity. The 30-60-day intraseasonal rainfall was generated by a meridional dipole mode of low-level water vapor flux straddling the YRB over the eastern China, which was in turn caused by the positive SST anomalies in the northeastern Indian Ocean via local convection-induced diabatic heating. The two migrations of the 10-30-day intraseasonal rainfall divided the PEPE into 3 stages. In Stage 1 (2), because of the northwestward propagation of the 10-30-day ISO originated from the northwest Pacific, suppressed (enhanced) convective activities occurred centering over the Philippine Sea, where the corresponding diabatic cooling (heating) stimulated a downstream northeastward propagated Rossby wave train extending from the South China Sea (SCS) into the mid-latitude North Pacific, therefore, an anomalous low-level anti-cyclone (cyclone) formed over south of YRB, and it then constantly transported moisture from the SCS (western Pacific) to the YRB. However, in Stage 3, the significantly enhanced convective activities appeared over the central SCS, which mainly came from northeastward propagating 10-30-day ISO initiated in the southwestern-most SCS, and thus a similar Rossby wave train formed as that in Stage 2, the southeasterly wind brought moisture from both the SCS and western Pacific into the YRB, inducing a southwest-northeast-oriented rain belt over there. In general, at 10-30-day time scale, the northwestward propagation of air-sea coupling system in the northwestern Pacific played an essential role in the south-north swing of the PEPE rain belt.