



## **Large-scale Circulation Anomalies Affecting the Subseasonal-to-seasonal Precipitation over the Yangtze River Basin in China during summer**

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The Yangtze River Basin (YRB), a typical East Asian monsoon region, experiences a large year-to-year variability in summer precipitation and is subject to both floods and droughts. There is a well-known seesaw relationship in precipitation between the tropical western North Pacific (WNP) and the YRB, but more than half of the variance in precipitation in the YRB cannot be explained by this seesaw pattern. Therefore, we firstly investigated other physical factors that might affect precipitation in the YRB. The results indicate that the northeasterly anomaly in the lower troposphere to the north of the YRB plays an important role in the variability in precipitation. This northeasterly anomaly is paired with the southwesterly anomaly to the south of the YRB. They both play an important role in water vapor accumulation over the YRB, and intensify the meridional gradient of the equivalent potential temperature ( $\theta_e$ ) over the YRB by bringing dry and cool air from the north and wet air from the south. This intensified  $\theta_e$  gradient favors convective instability and heavier rainfall in the YRB. Furthermore, it is found that the zonally oriented teleconnection along the Asian westerly jet and the meridional displacement of the jet can affect circulation in the lower troposphere and precipitation in the YRB.

In addition, the seesaw WNP–YRB precipitation experiences a subseasonal change, that is, the relationship is strong during early summer but much weak during mid-summer. Further results suggest that the YRB rainfall is mainly affected by the tropical circulation anomalies during early summer, while it is mainly affected by the extratropical circulation anomalies during mid-summer. These results have an important implication on subseasonal-to-seasonal forecast of the YRB rainfall.