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Atmospheric water vapor transport associated with typical anomalous summer rainfall patterns in China

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This paper attempts to reveal the atmospheric water vapor transports associated with typical anomalous summer rainfall patterns in China. The results show that origins of water vapor supply related to anomalous rainfall patterns are different from those related to the normal monsoon rainfall. Anomalous Pattern I with a heavier rainbelt along the middle and lower reaches of the Yangtze River valley follows from a convergence of the tropical southwest water vapor transport with the midlatitude northeast water vapor transport; the tropical water vapor transport comes directly from the Bay of Bengal and the South China Sea but originally from the Philippine Sea. The anomalous water vapor transport is associated with a southwestward extension of the western Pacific subtropical high and a southward shift of the upper East Asian jet stream. Anomalous Pattern II with a main rainbelt along the Huaihe River valley is supported by the convergence of the subtropical southwest water vapor with the midlatitude water vapor transport. The subtropical branch comes directly from the South China Sea but originally from the East China Sea and the adjacent subtropical Pacific to the further east along 20-25°N. The background large-scale circulation change includes a northwestward extension of the western Pacific subtropical high and an eastward shift of the upper jet stream. Although the cross-equator flows including the Somali jet supply abundant water vapor for the normal condition of JJA rainfall over China, the tropical water vapor transports related to typical anomalous rainfall anomalies originate from the tropical western Pacific Ocean. The northward transport of anomalous warm water vapor occurs mainly in the lower troposphere, while the transport of middle latitude cold water vapor occurs briefly in the upper troposphere.

Keywords: Atmospheric water vapor transport; Typical summer rainfall patterns