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A linkage of rainfall variability over two continents: Asia–North America Teleconnection

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A close relationship between the leading mode of contiguous U.S. (CONUS) summer rainfall and the East Asian subtropical monsoon rainfall (viz., mei-yu in China, baiu in Japan, and changma in the Korean peninsula) was found. The East Asian subtropical monsoon rainfall and the CONUS dipole rainfall patterns are connected by an upper-level Asia–North America (ANA) teleconnection. The Rossby wave energy propagates along the path of the westerly jet stream (WJS) from East Asia to North America, affecting the CONUS summer rainfall. Mechanisms through which East Asian summer monsoon heating influence North American rainfall are illustrated by idealized anomaly atmospheric general circulation model experiments. In boreal winter, because of the southward shift of the WJS, the Pacific–North American (PNA) pattern can be excited by the tropical central/eastern Pacific heating associated with El Niño, affecting the rainfall over CONUS. In boreal summer, because the WJS is weaker and locates farther to the north, an equatorial heating anomaly cannot directly perturb the WJS. A perturbation heating over subtropical East Asia, however, can trigger an ANA pattern along the path of the WJS, affecting the rainfall over North America. The season-dependent teleconnection scenario illustrates that the predictability source of CONUS rainfall variability is different between winter and summer. While the PNA pattern generated by El Niño is critical for CONUS rainfall in northern winter, the CONUS dipole rainfall variation in boreal summer is mainly governed by the remote forcing over subtropical East Asia via the ANA teleconnection. It is also found that the interdecadal change in strength and meridional location of East Asian subtropical monsoon enhanced the CONUS summer rainfall variability by perturbing the ANA teleconnection.