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The 2017–2018 Winter Drought in North China and Its Causes

Lijuan Wang (1,2,3), Lin Wang (1,2,4), Yuyun Liu (1), Wen Chen (1,2)

(1) Center for Monsoon System Research, Institute of Atmosphric Physics, Chinese Academy of Sciences, China (wanglj_001@163.com; wanglin@mail.iap.ac.cn; cw@post.iap.ac.cn; lyy@mail.iap.ac.cn), (2) College of Earth and Planetary Sciences, University of Chinese Academy of Sciences, Beijing, China, (3) Public Meteorological Service Center, China Meteorological Administration, Beijing, China, (4) Joint Center for Global Change Studies, Beijing, China

A meteorological drought was observed over North China in the 2017–2018 winter, which was accompanied by record-breaking consecutive non-precipitation days over many regions of central North China. Inspection on historical observations beginning in 1951 suggest that it was the fourth driest winter during the past 67 years. The possible cause of this drought was then analyzed.The possible cause of this drought was then analyzed. It has been suggested that the co-occurrence of the positive phase of the Eurasian (EU) teleconnection pattern and La Niña have played a crucial role. However, neither La Niña nor the positive phase of the EU teleconnection pattern alone could explain the occurrence of the 2017 drought. In contrast, the simultaneous presence of the two was the key to the occurrence of the drought. On one hand, the positive EU-related barotropic cyclonic anomaly over northern East Asia featured enhanced lower-tropospheric northwesterly winds in mid-latitude East Asia. Meanwhile, La Niña also enhanced the lower-tropospheric northeasterly winds in subtropical East Asia by exciting an anomalous lower-tropospheric cyclone near the Philippines. Hence, the northward water vapor transport was suppressed by the enhanced northerly winds over entire East Asia, providing an unfavorable moisture environment for precipitation over North China. On the other hand, the configuration of the positive EU-like wave train facilitates anomalous descending motion over mid-latitude East Asia, provided an unfavorable dynamical condition for precipitation over North China. As a result, both the moisture and the dynamical environment was conducive to less precipitation and drought over North China.