Geophysical Research Abstracts
Vol. 18, EGU2016-2269, 2016
EGU General Assembly 2016

Recent Progresses in Impacts of Indo-Western Pacific Ocean on East Asian Monsoon

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Some progresses in impacts of Western Pacific Ocean (WPO) on East Asian monsoon and stratosphere climate are reviewed from the following aspects. (1) Impact of the IPOD (a cross-basin dipole pattern of SSTA variability between the Indo-Pacific warm pool (IPWP) and North Pacific Ocean) on the East Asian summer monsoon (EASM).The IPOD exhibits a considerable correlation with the EASM. In summers with a positive IPOD phase, the western Pacific subtropical high (WPSH) weakens and shrinks with WPSH ridge moving northwards, which favours an intensified EASM and a decrease in summer rainfall in the Yangtze River valley, and vice versa. (2) TheIndo-Western Pacific convection oscillation (IPCO),which is an out-of-phase fluctuation in convection anomalies between the north Indian Ocean and the western North Pacific region,is closely related to the EASM.Negative IPCO phases, which exhibit an enhanced convection over the north Indian Ocean and a suppressed convection over the western North Pacific, favor a weakened EASM and an increase of summer rainfall in the Yangtze River valley with the joint actions of the stronger than normal Ural and Okhotsk blocking highs and the subtropical western Pacific high, and vice versa.(3) Asymmetric influence of the two types of ENSO on summer rainfall in China. The two types of ENSO have asymmetric impacts on summer rainfall over the Yangtze River Valley. The relation between summer rainfall over this valley and the cold tongue (CT) El Niño is significantly positive, while the relation with the CT La Niña is not significant. The negative phase of the warm pool (WP) ENSO has a significant positive influence, whereas no significant relation with the positive phase. They indicated that this asymmetric response of the EASM is likely to be linked to the different spatial patterns of the two types of ENSO.(4) Linkage between recent winter precipitation increase in the middle–lower Yangtze River valley (MLY) since the late 1970s andwarming in the tropical Indian Ocean (TIO). A significant wetting trend over the MLY in winter during the three decades since the late 1970s, forming a “mid-eastChina winter wetting” pattern, which has become an important feature of precipitation change under the weakening East Asian winter monsoon (EAWM). It is found that the increasing TIO SST is the dominant factor responsible for recent increases in precipitation over the MLY. The thermal forcing driven bythe TIO SST warming gives rise to an anomalous cyclonic circulation along the coast of eastern China, which transports more water vapor onto the Chinese mainland, shifts and causes anomalous convergence over the MLY, and generates the increase in precipitation there. As such, the increasing SST in the TIO induces over 80% of the observed wetting trend over the MLY.