Geophysical Research Abstracts
Vol. 12, EGU2010-2073-1, 2010
EGU General Assembly 2010

Study on the Relationship between the Subtropical Upper-tropospheric Westerly Jet and the East Asian Winter Monsoon

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Abstract:The spatial and temporal variation characteristics of the East Asian subtropical upper-tropospheric westerly jet (EAWJ) in winter are examined by using the NCEP/NCAR monthly reanalysis data. The intensity index of the EAWJ is defined as the time coefficient of the first EOF eigenvector of the zonal wind at 200hPa for investigating its association with the East Asian winter monsoon (EAWM). The results indicate that the intensity index of the EAWJ is in accordance with the thermal contrast between western Pacific Ocean and the continent over high-latitudes, which is reflected in the intensity variations of the Siberian cold high and the Aleutian low pressure. The significant correlations between the intensity index of the EAWJ and sub-systems at different levels of the EAWM reveal that the EAWM is a deep system with the in-phase variations of intensity of the Siberian cold high and Aleutian low pressure at low level, the East Asian trough and European ridge at middle level and EAWJ at upper level. Moreover, the decadal and interannual components of the intensity index of the EAWJ and Arctic oscillation (AO) index, and their relationships with the EAWM are compared. The intensity index of the EAWJ mainly reflects the thermal contrast of the East Asia regions whereas the AO reflect the out-phase variation between the SLP at polar region and that at mid-latitudes, which implies that the EAWM is rather closely related with the former than the latter. Furthermore, there exists the significant negative correlation at decadal scale component of the intensity index of the EAWJ and that of AO index, which is possibly linked with the variation of the thermohaline circulation in the Atlantic Ocean and need further study.
Key words: Subtropical upper-tropospheric westerly jet, East Asian winter monsoon, Arctic Oscillation