

Asymmetric relationship between the winter North Atlantic Oscillation and the precipitation in Southwest China

Hanlie Xu[†]; Jianping Li; Juan Feng

[†] Institute of Atmospheric Physics Chinese Academy of Sciences, China, People's Republic of

Leading author: xuhanlie@mail.iap.ac.cn

The relationship between the winter North Atlantic Oscillation (NAO) and the precipitation in Southwest China is investigated using the NCAR/NCEP reanalysis dataset and 160 stations monthly rainfall in China during 1951--2010. The result shows there is a significantly positive correlation between boreal winter NAO and the precipitation in Southwest China, and the relationship is asymmetry. In winter when NAO is negative phase, the precipitation in Southwest China decreased obviously, but the precipitation in Southwest China does not increased significantly in the NAO positive phase's years. Further analysis show that in winter when the NAO is negative phase, the anomalous easterlies prevail in Southwest of China, meanwhile there exists an anomalous anticyclone in Bay of Bengal, so the south branch trough actives weakly. Such a situation is inconvenient for the warm air and water transporting from sea to the inland. At the same time, both the ridge to the north of the Tibetan Plateau and the East Asia major trough are weakened, which induced to the meridionality of circulation weakened anomaly, and the cold air could not reach Southwest China easily, corresponding to the decreasing precipitation in Southwest of China. Moreover, the strength of upper level subtropical west jet has an asymmetric correlation to NAO and westerly affects the zonal water vapor transporting of Southwest China, so the water vapor transporting in negative NAO years is less than the climatological situation, while in positive NAO years, the difference between them is not obvious. This might be one reason to the asymmetric relationship between the NAO and the precipitation in Southwest China. In winter, NAO could produce a teleconnection pattern in upper level which extends from Caspian Sea to South China, and this teleconnection pattern maybe link NAO and precipitation in Southwest China.