



The Asymmetry Relationship between the Winter NAO and Precipitation in Southwest China

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The relationship between the winter North Atlantic Oscillation (NAO) and the winter precipitation in Southwest China is investigated using the NCEP/NCAR reanalysis dataset and 160 stations monthly rainfall in China during 1951-2010. The result shows there is a significantly positive correlation between boreal winter NAOI and the winter precipitation in Southwest China, and the positive correlation is asymmetry. During winter of the weak NAO years, the circulation pattern in East Asian is not favorable for precipitation in Southwest China. Contrastingly, during the winter of strong NAO years, the relationship between them is not significant. Further analysis shows that the main circulation pattern which influences the precipitation in Southwest China is a teleconnection pattern existed in the Caspian Sea-Arabian Sea-Tibetan Plateau and the downstream area (CAT teleconnection). We find that the CAT teleconnection pattern has an asymmetric relationship with winter NAO, and the relationship is significant only in the winter when the NAO is in its negative phase. The results from the composite of wave ray and wave-activity flux during strong and weak winter NAO years show that in weak winter NAO years the wave rays which aroused by the wave sources in Mediterranean could consistent with the route of CAT teleconnection pattern, and the wave-activity flux shows that the stationary wave could spread to the downstream along the Caspian Sea-Arabian Sea-Tibetan Plateau and South of China, while in strong winter NAO years, the wave rays are to the north of the CAT teleconnection and the stationary wave could spread only to Indian Peninsular. These results indicate the asymmetric relationship between winter NAO and Southwest China winter rainfall maybe determined by the asymmetric influence of NAO on the CAT teleconnection.