Atmospheric dynamic and thermodynamic processes driving the western North Pacific anomalous anticyclone during El Niño

Bo Wu[1], Tianjun Zhou[1], and Tim Li[2]

[1] *LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences, China*

[2] *International Pacific Research Center, and Department of Atmospheric Sciences, University of Hawaii at Manoa, Honolulu, Hawaii, USA*

The western North Pacific anomalous anticyclone (WNPAC) is an important low-level circulation system that connects El Niño and the East Asian monsoon. In this study, we explored the mechanisms responsible for the formation and maintenance of the WNPAC. Part I of this study focuses on the WNPAC maintenance mechanisms during the El Niño mature winter and the following spring. Moisture and moist static energy analyses indicated that the WNPAC is maintained by both the remote forcing from the equatorial central-eastern Pacific via the atmospheric bridge and the local air-sea interactions. Three pacemaker experiments by a coupled global climate model FGOALS-s2, with upper 700m ocean temperature in the equatorial central-eastern Pacific restored to the observational anomalies plus model climatology, suggest that about 60% (70%) intensity of the WNPAC during the winter (spring) is contributed by the remote forcing from the equatorial central-eastern Pacific.

The key remote forcing mechanism responsible for the maintenance of the WNPAC is revealed. In response to El Niño-related positive precipitation anomalies over the equatorial central-eastern Pacific, twin Rossby-wave cyclonic anomalies are induced to the west. The northern branch of the twin cyclonic anomalies advects dry and low moist enthalpy air into the tropical western North Pacific, which suppresses local convection. The suppressed convection further drives the WNPAC.

Key words: Tropical air-sea interaction, El Nino, Warm pool climate, Interannual variability