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Relative contributions of the Indian Ocean and local SST anomalies to the maintenance of the western North Pacific anomalous anticyclone during El Niño decaying summer

Bo Wu (1), Tim Li (2), and Tianjun Zhou (1)

(1) LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China , (2) IPRC, and Department of Meteorology, University of Hawaii at Manoa, Honolulu, Hawaii

To investigate the relative role of the cold SST anomaly (SSTA) in the western North Pacific (WNP) or Indian Ocean basin mode (IOBM) in maintaining an anomalous anticyclone over the western North Pacific (WNPAC) during El Niño decaying summer, a suite of numerical experiments are performed using an atmospheric general circulation model, ECHAM4. In sensitive experiments, the El Niño composite SSTA is specified in either the WNP or the tropical Indian Ocean, while the climatological SST is specified elsewhere. The results indicate that the WNPAC is maintained by the combined effects of the local forcing of the negative SSTA in the WNP and the remote forcing from the IOBM. The former (latter) contribution gradually weakens (enhances) from June to August. The negative SSTA in the WNP is crucial for the maintenance of the WNPAC in early summer. However, due to a negative air-sea feedback, the negative SSTA gradually decays, and so is the local forcing effect. Enhanced local convection associated with the IOBM stimulates atmospheric Kelvin waves over the equatorial western Pacific. The impact of the Kelvin waves on the WNP circulation depends on the formation of the climatological WNP monsoon trough, which does not fully establish until late summer. Therefore, the IOBM plays a crucial role in late summer via the Kelvin wave induced anticyclonic shear and boundary layer divergence.