Abstract Details

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Title: (IWG7) Impacts of the monsoon-warm ocean interaction on the variability of the Asian-Australian Monsoon System

Abstract:

ENSO is the strongest signal of interannual climate variability while the Asian monsoon is the most energetic annual variation on the Earth. Since the dominant interannual variability of the Asian-Australian monsoon (A-AM) ties up with ENSO, the former has been regarded as a response to the SST forcing in the eastern tropical Pacific. Here we show observational evidence and numerical model results, which demonstrate that the major monsoon anomalies are not solely determined by the remote ENSO forcing; a large portion of the monsoon variability comes from the local monsoon-warm ocean interaction. The atmosphere-ocean interaction plays a critical role in the interannual variability of A-AM system. The seasonal dependent monsoon anomalies are dominated by two surface anomalous anticyclones from the developing to decaying year of an El Nino event. The southern Indian Ocean anticyclone dominates A-AM anomalies in the El Nino developing year while the western North pacific anticyclone dominates the monsoon anomalies in the decaying El Nino year. The interannual atmosphere-ocean anomalous conditions in the Southern Indian Ocean and western North Pacific are similar, both are characterized by an east-west anomalous SST dipole with cold water to the east and warm water to the west of the anticyclone centers. These conditions result from a positive feedback between the anomalous descending atmospheric Rossby waves and SST dipole. Remote El Nino forcing is a major trigger for setting up this warm pool-monsoon interaction Pattern. But the local air-sea interaction plays an essential role in maintaining these anomalies. The air-sea interaction in the two regions share common wind-SST and cloud-SST feedbacks but differ in the roles of oceanic dynamics in SST variability. The understanding obtained from this study leads to a new paradigm for tropospheric biennial oscillation (TBO). The TBO is a result of the ENSO-A-AM interaction. It is most prominent during the turnabout of the El Nino or La Nina. It is attributed to three critical factors, i.e., the annual cycle of monsoon circulation, local monsoon-warm ocean interaction, and remote El Nino/La Nina forcing. The seasonal march of the background monsoon flows control the nature of the monsoon-ocean feedback and remarkably modify the atmospheric response to remote forcing. It is, also notice that the atmosphere-land interaction may enhance this TBO signal

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