Analysis of Mid-latitude System effect on ENSO Evolution over the Tropical Pacific

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Recently, El Nino/Southern Oscillation (ENSO) has irregular characteristic, including its period and strength. Due to the Variation of sea temperature is an important factor in the diagnosis of ENSO. Our study analyzed 1951-2010 NOAA sea surface temperature, which found that interannual Pacific SST has obvious characteristics of the Pacific decadal oscillation (PDO). Therefore, in accordance with the time section of PDO to distinguish cold (warm) epoch, the analysis showed that the ENSO event features of 1975-2000 (warm epoch) is stronger than 1951-1975 (cold epoch), while the ENSO event features of 2000 (cold epoch 2) is weaker than warm epoch. In addition, our analysis found that most of ENSO events after 1970 in spring have common features that before the ENSO occurs there are warming SST in the central Pacific. Many studies have pointed out that this phenomenon resulted from westerly wind bursts in the spring in the tropical western Pacific.
Westerly wind bursts in the tropical Pacific often occurred during the early spring in most ENSO events and which is a key factor triggering an ENSO event. Past studies have pointed out that the source of the westerly wind burst is tropical cyclone, Madden-Julian Oscillation and mid-latitude cold-air outbreak. This study would like to know more about the mid-latitude system.
In this study, a simple hybrid coupled model was used to examine the effects of cold-air outbreak on ENSO evolution. The experiment results show that the mid-latitude cold-air outbreak causes SST become cooler in the tropical western Pacific, and there is a divergence over the cold SST. Furthermore, the divergent effect not only enhances the surface westerly wind component in the tropical western Pacific, but also causes SST in the tropical central Pacific become warmer. The downdraft over the tropical western Pacific cold SST and the updraft over the tropical central Pacific warm SST combine into a vertical circulation, which may cause westerly wind bursts over the western Pacific in the subsequent early spring, and the associated anomalous westerlies then induce an ENSO event in the coming winter.

Keywords: El Nino/Southern Oscillation, westerly wind burst, cold-air outbreak

