

The relationship between the cross-equator southerly winds and the asymmetry in the eastern Pacific

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Abstract

The goal of this study is to explore the causal relationship among the cross-equator southerly winds, sea surface temperature (SST), and the precipitation asymmetry in the eastern Pacific ($15^{\circ}S - 15^{\circ}N$, $120^{\circ}W - 70^{\circ}W$) on Mar.2003. The second mode of a five-year (from Jan.2000 to Dec.2004) cononical EOF of the Tropical Rainfall Measuring Mission (TRMM) Microwave Imager microwave (TMI) SST and 10-meter QuikSCAT wind stress shows several interesting features: the principle component indicates a peak around Mar.2003; a distinct meridional SST asymmetry with a warmer SST on the north eastern Pacific; a warm Costa Rica Dome; a strong cross-equator southerly winds in the eastern Pacific. In addition, the QuikSCAT winds convergence suggests that the convergence south of the equator is much weaker than the north one on Mar. 2003, and the north convergence zone is far off the equator, which might be associated with the anomalous strong cross-equator southerly winds. The comparison between the TRMM precipitation and meridional SST gradient profile suggested that the meridional SST gradient could be an important factor that contributes to the precipitation asymmetry on Mar. 2003. The SST modification owing to both the wind stress fields based on Chelton et al. linear relationship and the pressure gradient from Lindzen and Nigam hypothesis will also be addressed quantitatively. Finally we will address the possible factors that might contribute to the warm Costa Rica Dome on Mar.2003.