The Role of ENSO in Modulating the Impacts of Deforested Maritime Continent

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The Maritime Continent (hereafter MC) has suffered from severe deforestation in the past few decades. Studies have shown that deforestation will lead to local warming. Chen et al. (2019) used CESM (Community Earth System Model) to investigate the effect of deforested MC based on using the climatological sea surface temperature (SST), and found an increasing zonal surface temperature gradient in tropical Pacific, which is accompanied with intensified trade wind. They also indicated that even the evapotranspiration was reduced due to deforestation over the MC's islands, the moisture convergences from ambient oceans increase, leading to increased precipitation. The amount of the increased precipitation is comparable to the positive anomalous precipitation in La Niña years. However, the interaction of deforested MC and ENSO (El Niño–Southern Oscillation) is not clear. In this study, we try to find out the role of local atmospheric response induced by deforested MC during ENSO and particularly focus on changes in the trade wind over the central Pacific by using CESM CAM (Community Atmosphere Model) and CLM (Community Land Model) with prescribed El Niño and La Niña SSTs, respectively. The model simulation shows that the zonal temperature gradient (surface temperature in MC minus Niño3.4 SST) are highly correlated to zonal wind at 850hPa (140E to 170W). After deforestation, the temperature in MC increased. Preliminary results show that the rising zonal temperature gradient accompanies with intensified easterly wind anomaly in La Niña simulations. However, the westerly wind also intensified under the decreasing zonal temperature gradient in El Niño simulations.

Keywords: Deforestation、ENSO、CESM、Equatorial trade wind

References

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