

Combining Effects of IOD, ENSO and Deforestation on the Maritime Continent Rainfall

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Abstract

During northern autumn, the mature phase of Indian Ocean Dipole (IOD) and the developing phase of El Niño/Southern Oscillation (ENSO), maritime continent rainfall is strongly affected by both the IOD and the ENSO. When the IOD and the ENSO are in the same phase, for example, an event that the El-Niño is coupled with the IOD positive phase, the autumn rainfall of the maritime continent is significantly reduced compared to the climatology. Recent years, the maritime continent undergoes large-scale land cover change due to deforestation and agricultural expansion, and further changed surface energy budget and water cycle: reducing evaporation and then increasing surface temperature, which in turn potentially affects the local convection and precipitation. However, during the period of IOD coupled with ENSO, when large-scale deforestation occurs, will rainfall change linearly? We hypothesize that the impacts of deforestation might be enhanced under La Niña + IOD negative phase. This study will analysis the reanalysis data, try to understand the role of land-atmosphere interaction in MC precipitation at the first, and then will conduct several ideal numerical simulations through the Community Earth System Model (CESM 1.2.2), attempt to answer the above questions and explain the mechanisms behind them.

Key words: Maritime Continent, IOD, ENSO, Land-Atmosphere interaction, Deforestation

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