

Role of Climate Variations in Multiple Scale Land-Ocean-Atmosphere Processes

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Modes of climate variations in tropics have significant influences on the human society, which is now anxious about the consequences of global warming caused by the anthropogenic climate change. While it will take some time to develop resilience against the global warming, there is a greater need to reinforce our research on the natural climate variations and associated disasters that are expected to rise under the warming stress.

Natural modes of climate variations such as Indian Ocean Dipole (IOD), El Nino/Southern Oscillation (ENSO) and recently identified ENSO Modoki have huge impacts on many parts of the world. These climate phenomena influence the socio-economic conditions of affected regions by mainly changing the seasonal distribution of rainfall and temperature. For example, some of the extreme flooding events in East Africa are associated with the positive IODs. The IOD influences the East African region so much so that it overwhelms the influence arising from ENSO. On the eastern side of the Indian Ocean, IOD and ENSO have comparable impacts on Indonesia. During positive IOD and El Nino events, Indonesia suffers from severe droughts and forest fires. Most rivers run dry.

These climate phenomena also influence high-frequency weather events by either favoring or destroying their generation mechanisms. By doing so, climate phenomena could directly influence the amount of river discharge and the material exchanges among land, river and oceans through a range of interacting processes. We will examine a few cases from some of the affected regions to corroborate the complex chain of interactions.

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