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The Indo-Australian monsoon and IOD-ENSO interactions in the CMIP models

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In this presentation, we first analyze the ability of 60 CMIP3 and CMIP5 models to capture connections between the Indian and Australian summer monsoon rainfall and the Indo-Pacific modes of variability (ENSO and IOD). The cross-model analysis allows to highlight factors driving the strength of the monsoon-ENSO or monsoon-IOD relationship. Then, we assess the IOD-ENSO relationship in these models, in order to understand the inter-decadal variability of the connections between the Indian and the Australian summer monsoons.

Most models reproduce the observed ENSO-Australian monsoon teleconnection, with the strength of the relationship dependent on the strength of the simulated ENSO. However, over the Maritime Continent, the monsoon-ENSO connection is generally weaker than observed, depending on the ability of each model to realistically reproduce the ENSO signature in the Warm Pool region. The Indian monsoon-ENSO relationship is affected by overly persistent ENSO events in many CMIP models.

A recent study (Izumo et al. 2010) suggested that the Indian Ocean Dipole (IOD) could affect the phase of the El Niño Southern Oscillation (ENSO) during the following year. We find that the IOD seasonality is generally better reproduced that ENSO phase locking, and that the synchronous relation between ENSO and the IOD (i.e. tendency of ENSO to induce an IOD just before the ENSO peak) is reasonably well reproduced, and improved in CMIP5. A remarkable finding is that, as in observations, the IOD tends to lead ENSO by $\sim$14 months in the longer CMIP3 and CMIP5 records; while there is no tendency for ENSO to precede an IOD $\sim$10 months later. Consequences in terms of Indian-Australian monsoon connections are investigated.