

EGU2020-1819

<https://doi.org/10.5194/egusphere-egu2020-1819>

EGU General Assembly 2020

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The relative roles of the South China Sea summer monsoon and ENSO in the Indian Ocean dipole development

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The influence of El Niño-Southern Oscillation (ENSO) on the Indian Ocean Dipole (IOD), a coupled ocean-atmosphere mode of interannual climate variability, has been widely investigated over recent decades. However, a latest study indicates that the South China Sea summer monsoon (SCSSM) might also be responsible for IOD formation. Furthermore, an abnormal SCSSM does not always coincide with ENSO during boreal summer (June–August, JJA); consequently, the individual and combined effects of the SCSSM and ENSO on the IOD remain elusive. This study shows that the amplitude of the IOD tends to be much stronger under the coexistence of SCSSM and ENSO than that under individual SCSSM or ENSO events during JJA and autumn. The findings also indicate that the SCSSM and ENSO play the dominant role around the eastern and western poles of the IOD, respectively. An anomalous local Hadley circulation closely related to the stronger SCSSM favors anomalous southeasterly of Sumatra and Java during JJA, which enhance oceanic upwelling and subsequently result in cooling of the sea surface temperature (SST) over this area. Similarly, it can be envisaged that the contemporaneous ENSO could influence JJA SST anomalies over the western Indian Ocean via the Walker circulation coupled with oceanic variations.