A sea surface salinity dipole mode in the tropical Indian Ocean

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Ocean salinity is a natural freshwater tracer in the global hydrological cycle and its changes represent large-scale ocean-atmosphere coupled climate signals such as the El Ni?o/Southern Oscillation (ENSO). Studies of ocean salinity are much less than those of temperature since salinity observations are more sparse. Based on the sea surface salinity (SSS) data from Argo and reanalysis dataset, we identified a salinity dipole mode in the tropical Indian Ocean, termed S-IOD: a pattern of interannual SSS variability with anomalously low-salinity in the central equatorial and high-salinity in the southeastern tropical Indian Ocean (IO). The S-IOD matures in November-December, lagging the Indian Ocean dipole (IOD) mode derived from sea surface temperature (SST) by two months. For the period of observations, the S-IOD persists longer than the IOD, until the following September-October. Oscillations of the two S-IOD poles are governed by different processes. Ocean advection associated with equatorial current variability dominates the SSS anomalies of the northern pole, while surface freshwater flux variability plays a key role in the SSS anomalies of the southern pole, where anomalous precipitation is sustained by preformed sea surface temperature anomalies. The S-IOD concurs with the strong IOD, reflecting an ocean-atmosphere coupling through the SST-precipitation-SSS feedback.

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