Contrasting Development and Decay Processes of Indian Ocean Dipoles during Recent Decades

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Using moored buoy data together with satellite and atmospheric reanalysis datasets, we investigated ocean mixed layer temperature (MLT) balance in the eastern Indian Ocean during positive and negative Indian Ocean Dipole (IOD) events observed in recent decades. We mainly focused on TRITON buoy data at 5S, 95E where in situ measurements of more than 15 years by a TRITON buoy were available. Heat balance analysis demonstrated that during the development phase of positive IOD events, horizontal heat advection mainly produced MLT anomalies and that air-sea heat fluxes had a damping effect. During the decay phase, air-sea heat fluxes had a primary role in suppressing MLT anomalies and caused decay of the anomalous IOD conditions. For the development of negative IOD events, warm MLT anomalies are developed via a combination of net air-sea flux and warm advections. During the decay phase, anomalous horizontal advection mainly acted to cool the MLT in the eastern Indian Ocean. The contributions of horizontal heat advections differed in events, which may cause the observed diversity of IOD evolutions. These results suggest that IOD involves variety of feedback processes in positive/negative events and the development/decay phases.

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