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Intraseasonal Variability in Barrier Layer Thickness in the Bay of Bengal and its Causes

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Based on SODA reanalysis data set from 1980 to 2016, this paper combined with a variety of mathematical statistical methods to study the intraseasonal variability characteristics of barrier layer thickness and its physical correlation with climate modes in the Bay of Bengal, and quantitatively explored the dynamic mechanism of intraseasonal variability of barrier layer in different sea areas in the Bay of Bengal by means of Marine dynamic diagnosis method. The relative contributions of different physical processes, such as oceanic advection, Kelvin waves, Rossby waves and freshwater fluxes (rainfall and river runoff), to the barrier layer were evaluated. The physical relationship between the seasonal variation of barrier layer thickness and the Indian Ocean dipole (IOD) is also discussed. The results show that the thickness of the barrier layer varies most obviously in the northern coast of the bay of Bengal and the western coast of Sumatra, and the maximum value of the barrier layer occurs in November ~ December every year, while the variation of the barrier layer in the northern coast is more regular than that in the southern coast. Horizontal advance and entrainment affect the thickness of barrier layer by affecting the salinity of the mixed layer. However, the thickness of barrier layer is mainly caused by the change of isothermal layer due to the obvious stratification of sea surface salinity in the Bay of Bengal. In the southern part of the Bay of Bengal near the equator, during the positive IOD events, the isothermal layer shallowness was caused by the negative anomaly of equatorial zonal wind stress from October to December. In negative IOD events, the equatorial zonal wind stress appears positive abnormality after June, which leads to the increase of isothermal layer in this period. As a result, the thickness of barrier layer In positive IOD years is smaller than that in normal years from October to December, and that in negative IOD years is greater than that in normal years from June to September. However, in the northern Bay of Bengal, the seasonal variability of barrier layer caused by different IOD events was not obvious. At the same time, the net heat flux upward at the air-sea interface will lead to instability and deepen the local mixed layer.