The Impact of the Eastern Pacific Fresh and Warm Pools on the Bimodal Seasonality of Barrier Layers

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Observations of Argo profiles and TAO/TRITON array confirm the significant seasonality of the barrier layer (BL) and temperature inversion (TI) in the northeastern tropical Pacific (NETP). Statistical result of the occurrence based on the Argo profiles reveals a bimodal variability of the BL, with two peaks in July and October. This bimodal seasonality of BL is attributed to the out-of-phase variations of the eastern Pacific fresh and warm pools. The fresh and warm pools both expand westward from May to July, when the Inter-Tropical Convergence Zone (ITCZ) becomes intense and broad. Heavy rainfall is the dominant contributor to the extension of the fresh and warm pools, leading to a high frequency of thick BL (40%). This frequent thick BL provides a precondition for its another development after August. The fresh pool is stable from August to November, while the warm pool contracts sharply. The cold tongue becomes active due to a prevailing trade wind and horizontal advection transports surface cold water to the northeastern warm pool. This cold advection deepens the isothermal layer and contributes to a frequent TI (30%) and thick BL (46%). The results suggest that the ITCZ rainfall and northward cold advection from equator dominate the upper layer stratification of NETP in summer and autumn, respectively.

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