

Intraseasonal coastal upwelling and heat balance in the mixed layer along the southeastern coasts of Sumatra and Java

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Coastal upwelling along the southwestern coasts of Sumatra and Java brings cool and nutrient-rich water to the coastal region, and plays an important role in the ocean surface heat and biogeochemical balance in the eastern Indian Ocean. In this study, to understand the coastal upwelling system, we investigated intraseasonal-scale thermodynamic balance in the mixed layer of the coastal region. We used satellite-based observational datasets of surface heat flux, SST, sea level, and ocean surface currents. Ocean mixed layer depth was estimated by Argo floats. During summer monsoon, intraseasonal-scale anomalous cold SST south of Java developed with anomalous southeasterly winds in the southeastern tropical Indian Ocean. The wind anomalies enhanced climatological southeasterly winds and hence latent heat loss. The anomalous latent heat loss was partly canceled by enhanced shortwave radiation, and the SST cooling could not fully explained by the net air-sea flux variations. Local sea level anomalies were lowering at this phase, suggesting that coastal upwelling played a role in the SST cooling. On the other hand, anomalous SST variations off of Sumatra were mainly controlled by anomalous surface heat flux variations. The implications of these results for regional and basin-scale air-sea interaction will be discussed.

Keywords: Eastern Indian Ocean, Sumatra and Java, Coastal Upwelling, Mixed Layer, Surface Heat Flux