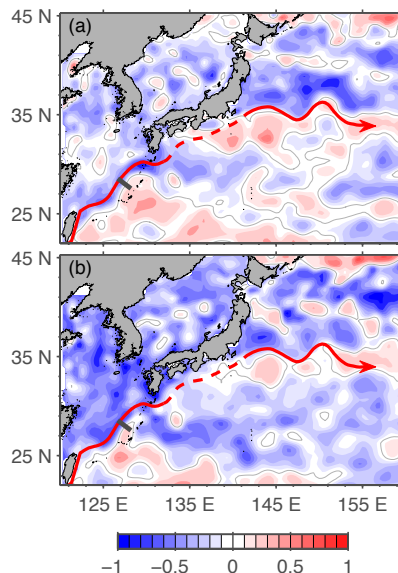


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Barotropic and Baroclinic Responses to Basin-Wide Wind Forcing: Insights on the Kuroshio from Observations and a 2-layer Model

Observations show that the Kuroshio in the East China Sea (ECS-Kuroshio) responds to the large-scale wind stress curl field at two time scales. These two responses are related to barotropic and baroclinic modes that reach the ECS via different waveguides. Variability in the ECS-Kuroshio is assessed by comparing satellite altimetry, historical hydrography, and the Pacific Decadal Oscillation index (PDO) with the latter used as a proxy for the large-scale wind stress curl forcing. Sea-level difference across the ECS-Kuroshio is positively correlated with PDO at zero-lag and negatively correlated at 7-year lag. In contrast, pycnocline-steepness and PDO are uncorrelated at zero-lag and negatively correlated at 7-year lag. These signals in the ECS-Kuroshio, considered together with wind stress curl anomalies in the open ocean, are consistent with a barotropic response to the wind at zero-lag. The barotropic response is likely forced in the central North Pacific by wind stress curl anomalies of opposite sign, one of which is centered at ECS latitudes ($\sim 27^\circ\text{N}$) while the other sits further north ($\sim 35^\circ\text{N}$). In contrast, the signals that lag PDO by 7 years are consistent with a baroclinic mode, which represents the ocean's time-integrated response to the wind stress curl along a single latitude band between 24°N and 27°N .



Correlation maps comparing yearly mean SLA (1993–2008) at each location (a) with yearly mean PDO at zero lag and (b) with wind stress curl PC-1 at zero lag. Contour interval is 0.1. Red indicates the Kuroshio path.