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Upper ocean heat content and surface current variability associated with the Pacific Decadal Oscillation (PDO)

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Changes in the northeast Pacific Ocean during 1993-2004 are examined as an example of upper ocean heat content variability associated with the Pacific Decadal Oscillation (PDO). The leading empirical orthogonal functions (EOF) of both sea surface temperature (SST) and sea surface height (SSH) in this region are highly correlated with the basin-wide PDO index, which transitioned from the warm to the cold phase in 1999. Sea surface velocities (SSV) constructed from satellite-observed SSH, SST, and vector winds indicate that Ekman and gesotrophic components changed with similar magnitudes but different spatial structures. Combining SSV with the SST field, in situ sub-surface temperature data, and surface heat fluxes from an atmospheric model makes it possible to construct an approximate SST budget. The results demonstrate a principal role for anomalous Ekman advection of the mean temperature gradient and relatively smaller contributions from the other terms, which agrees generally with similar analysis by others using an ocean general circulation model.