



Mass and steric sea level variations in the Tropical Asian Seas

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The mass and steric components of sea level changes have been separated in the Tropical Asian Seas (TAS) using a statistically optimal combination of Jason satellite altimetry, GRACE satellite gravimetry, and ocean reanalyses. Using observational uncertainties, statistically optimally weighted time series for both components have been obtained in four regions within the TAS over the period January 2005 to December 2012. The mass and steric sea level variability is regressed with the first two principal components (PC1&2) of Pacific equatorial wind stress and the Dipole Mode Index (DMI). Sea level in the South China Sea is not affected by any of the indices. Steric variability in the TAS is largest in the deep Banda and Celebes seas and is affected by both PCs and the DMI. Mass variability is largest on the continental shelves, which is primarily controlled by PC1. We argue that a water flux from the Western Tropical Pacific Ocean is the cause for mass variability in the TAS. The steric trends are about 2 mm/yr larger than the mass trends in the TAS. A significant part of the mass trend can be explained by the aforementioned indices and the nodal cycle. Trends obtained from fingerprints of mass redistribution are statistically equal to mass trends after subtracting the nodal cycle and the indices. Ultimately, the effect of omitting the TAS in global sea level budgets is estimated to be 0.3 mm/yr.