



Mass-induced sea level variations in the Red Sea from steric-corrected altimetry, GRACE, in-situ bottom pressure records, and hydrographic observations

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An annual amplitude of ~ 18 cm mass-induced sea level variations (SLV) in the Red Sea is detected from steric-corrected altimetry and the Gravity Recovery and Climate Experiment (GRACE) satellites from 2003 to 2011, which dominates the mean sea level in the region. Seawater mass variations here generally reach maximum in late January/early February. The steric component of SLV calculated from oceanographic temperature and salinity data is relatively small and peaks about seven months later than mass variations. The phase difference between the steric SLV and the mass-induced SLV indicates that when the Red Sea gains the mass from inflow water in winter, the steric SLV fall, and vice versa in summer. In-situ bottom pressure records in the eastern coast of the Red Sea validate the high mass variability observed by steric-corrected altimetry and GRACE. Furthermore, we compare the horizontal water mass flux in the Red Sea from steric-corrected altimetry and GRACE with that estimated from hydrographic observations.