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ea Level Variations in the Regional Seas around Taiwan

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Patterns and trends of sea level rise in the regional seas around Taiwan are investigated through the analyses of long-term tide-gauge and satellite altimetry data. The 50 year-long time series reveal decadal and interannual variations and spatially-inhomogeneous patterns of generally rising sea level. The East Asia tide-gauge stations around Taiwan show an average trend of +2.4 mm/yr from 1961-2003 which is larger than the reported global rate of +1.8 mm/yr for the same period. These stations also show significantly larger sea level rise rates (5.7 mm/yr) than global values (3.1 mm/yr) during the period from 1993-2003. Consistent with the coastal tide-gauge records, satellite altimetry data show similar increasing rates (5.3 mm/yr) around Taiwan during the same period. The slightly higher values from the tide gauges could be due to local subsidence. Further comparisons with temperature anomalies in the upper ocean suggest that thermal expansion and heat advection in the upper layer contribute significantly to the long term sea level variations in this area with correlations > 0.9 for observations after 1992. The thermosteric sea-level variations may explain the interannual and decadal variations of the observed sea level rises around Taiwan. Our analysis also indicates that the altimetry data is only a part of a long-term and larger-scale signal. Finally, we find that a non-linear smoother, namely LOESS, is more suitable for extracting long-term trends in sea level than the traditional linear regression approach.