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Sea surface temperature and sea-level variability from T/P and JASON-1

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The description of sea-level variability from global to regional scales has been revolutionized by the availability of continuous high-quality observations from satellite altimetry missions. A key question concerns the role of thermal expansion in the observed variations. The assessment of the steric contribution to sea-level change is constrained by the availability of in-situ hydrographic measurements. Sea surface temperature on the other hand is retrieved from space at regular spatial and temporal scales. The availability of SST data renders compelling the comparison of sea surface temperature and satellite altimetry measurements, although sea-level values from altimetry, unlike SST, represent variations in the whole water column. A joint analysis of SST observations from the NOOA OI SST dataset and sea-level observations from TOPEX/Poseidon and JASON-1 altimetry missions is carried out. The merged sea-level dataset has been processed with updated pre-processing corrections in order to make it as accurate as possible and avoid instrumental errors. Data cover a 2 degree spatial grid and extend over 12 complete years, from 1993 to 2004. The coherency between SST and sea-level observations is assessed at each gridpoint for different temporal scales, including monthly, semi-annual, annual and long-term scales. The agreement between sea-level and SST observations is found to be largest at the seasonal scales, in all areas, and particularly strong in the Atlantic Ocean. A constraint in the analysis of long-term sea-level variability is the short period for which satellite measurements are available, particularly taking into account that the available time series cover what seems to have been an exceptional period in terms of climate variability and the very strong 1997-1998 ENSO event. Therefore, the long-term relation between SST and sea-level observations is examined on consecutive overlapping time windows of fixed length, in order to capture non-stationary joint variability patterns.