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Revisiting the Global and Regional Steric Sea-level Trends in the Satellite Era

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The steric component of sea-level change comprises variations in the temperature (thermosteric) and salinity (halosteric) of the oceans, which alter the water's density, leading to volumetric variations of the water column. Although its importance is unarguable, throughout the literature there is a disagreement on how much the steric component actually contributes to sea-level change.

Here, we investigate two sources of uncertainty to steric trends, both at global and regional scale. First, we look at how the use of different temperature and salinity datasets influences the estimated steric height. For that, we analyzed 15 datasets, combining different techniques (hydrographic profiles, Argo floats and ocean reanalyses). Second, since the estimation of uncertainties for linear and quadratic trends requires the adoption of a noise model, we compared the performance of several different noise models.

We find that by varying both the dataset and noise-model, the global mean trend and uncertainty from 2005 to 2015 can vary from 0.566 to 2.334 mm/yr and 0.022 to 1.646 mm/yr, respectively. This range becomes even larger at regional scales. At a global scale, the selection of datasets has a larger influence on the trend, while at a regional scale the choice of the noise model dominates the spread in steric sea-level trends. Our results emphasize the need to use an ensemble of datasets to infer steric changes, and to carefully choose a noise model.