Uncertainty in Satellite estimate of Regional Mean Sea Level trends

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Satellite altimetry missions now provide more than 25 years of accurate, continuous and quasi-global measurements which are used to build the Global Mean Sea Level (GMSL) record, an essential climate change indicator. Recently Ablain et al. (2019) derived uncertainty levels for the GMSL record, trend and acceleration. In some regions local SLR up to 5 times greater than the global mean rise (i.e >12 mm/yr) since 1993 are observed, thus increasing significantly the exposure of the local coastal communities to flooding. Estimating a realistic uncertainty of the regional sea level records is of crucial importance for impact studies.

In this study we use the SL-CCI monthly sea level dataset over 1993-2014 and downscale the approach of Ablain et al. (2019) to build local error variance-covariance matrices with a yearly resolution. The error prescription relies on an empirical estimate of the different contributions to the SLR measurement error budget: long term drifts in orbit solutions, long-period oscillations in geophysical corrections and local altimeter noise level. We use a least square approach and the error variance-covariance matrix to estimate the local SLR trend uncertainties. Results suggest that local uncertainty levels range between 1.9 and 2.2 mm/yr (at the 90% confidence level). Such uncertainty values imply that the majority (about 60%) of global ocean is rising at a statistically significant rate. A sensitivity analysis shows that the regional uncertainty pattern is robust to changes in the empirical error estimates. Further work aims at providing a complete description of the time/space structure of altimetry errors.