Confidence and sensitivity of sea-level reconstructions

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For the last two decades, satellite altimetry has provided a near-global view of spatial and temporal patterns in sea surface height (SSH). When combined with records from tide gauges, a historical reconstruction of sea level can be obtained; while tide gauge records span up to 200 years back, their combined quality for reconstruction purposes is limited by the sparsity of their geographical distribution and other factors.

We examine both a traditional EOF analysis of sea surface height, and another method known as minimum/maximum autocorrelation factors (MAF), which takes into account the spatial nature of the data fields. We examine the sensitivity of a reconstruction with respect to the length of calibration time series, and the spatial distribution of tide gauges or other proxy data. In addition, we consider the effect of isolating certain physical phenomena (e.g. ENSO) and annual signals and modelling these outside the reconstruction.

The implementation is currently based on data from compound satellite datasets (i.e., two decades of altimetry), and the Simple Ocean Data Assimilation (SODA) model, an existing reconstruction, where a calibration period can be easily extracted and our model's basic performance can be relatively easily assessed. This means that we will consider only the last 50–60 years of sea level data.

This is a preliminary analysis to pave the way for an improved reconstruction in the Arctic area, a major focus of my PhD project.