

# Enhancing Global Sea Level Anomaly Reconstruction Pre-Altometry Using Tide Gauges and Scattering Covariance Analysis on the Pangeo-EOSC Platform

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Global sea level anomalies (SLA) are crucial for climate monitoring and have traditionally been studied using spatial altimetry for the past three decades. This research introduces a novel method to refine historical sea level reconstructions by integrating Scattering Covariance Analysis (SCA) with traditional tide gauge data, which spans over a century. This innovative approach allows for an enhanced understanding of past SLAs in the absence of altimetry data.

Our methodology utilizes SCA to capture and interpret scale correlations observed during the altimetry period, thereby improving the interpolation of global SLA data from historical coastal tide gauges. We validate our model using altimetry data and CMIP6 climate projections on the Pangeo-EOSC platform. This platform exemplifies the practical implementation of the 'compute continuum', enhancing the scalability and accessibility of computing resources through its cloud-based datasets, parallel processing infrastructures using Dask Kubernetes clusters, and GPU optimization.

The findings from our study, compared against traditional Empirical Orthogonal Function (EOF) decomposition methods, reveal that SCA provides a more nuanced understanding of the spatial and temporal dynamics of SLA. These insights uncover complex interactions and dependencies that were previously unobserved with the EOF approach. This enhanced methodological framework not only improves the accuracy of historical sea level reconstructions but also expands the potential for future climate impact assessments based on long-term sea level records. Utilizing the Pangeo-EOSC platform, our model leverages federated data from multiple sources and cloud technologies, ensuring efficient handling of large-scale datasets and advancing environmental research through integrated scientific computing environments.

## Topic

Needs and solutions in scientific computing: Artificial Intelligence

**Primary authors:** Dr DELOUIS, Jean-Marc (UMR LOPS CNRS-IFREMER-IRD-Univ.Brest-IUEM); Dr ODAKA, Tina (UMR LOPS CNRS-IFREMER-IRD-Univ.Brest-IUEM)

**Presenter:** Dr DELOUIS, Jean-Marc (UMR LOPS CNRS-IFREMER-IRD-Univ.Brest-IUEM)

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