

## **Explaining observed sea level trends and variability in the North Sea**

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Long-term trends and decadal variability of sea level in the North Sea have been studied over the period 1958-2014. We model the spatially non-uniform sea level and solid earth response to large-scale ice melt and terrestrial water storage changes.

GPS observations, corrected for the solid earth deformation, are used to estimate vertical land motion at tide gauge locations. We find a clear correlation between sea level in the North Sea and open-ocean steric variability in the Bay of Biscay and west of Portugal, which is consistent with the presence of wind-driven coastally-trapped waves.

The observed nodal cycle is consistent with tidal equilibrium. We are able to explain the observed sea level trend over the period 1958-2014 well within the standard error of the sum of all contributing processes, as well as the large majority of the observed decadal sea level variability.