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Quantifying uncertainties on regional sea level change induced by multi-decadal intrinsic oceanic variability

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A global eddy-permitting ($1/4°$ resolution) ocean general circulation model, driven during 327 years by a repeated climatological atmospheric forcing, is shown to spontaneously generate a strong chaotic Intrinsic Oceanic Variability (IOV) which reaches multi-decadal timescales.

In eddy-active regions, the sea-level imprint of this multi-decadal nonlinearly-driven "noise" is substantial, weakly autocorrelated, and is comparable to (and may clearly exceed) the corresponding imprint of Internal Climate Variability (ICV) produced by CMIP5 coupled climate models, whose laminar ocean components strongly underestimate the IOV.

Deriving sea-level trends from finite-length time series in eddy-active regions yields uncertainties induced by this ocean-driven multi-decadal IOV, which are of the same order of magnitude as those due to the coupled ICV.

These results raise issues about the detection and attribution of sea-level changes in certain regions from the relatively short existing altimeter archive, and from certain tide gauge records.