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## Sea state trends and variability: consistency between the ESA Sea State Climate Change Initiative dataset, ERA5 winds and microseisms

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**Abstract:** Wave hindcasts of long time series (> 30 years) have been instrumental in understanding the wave climate. However, it is still difficult to have a consistent reanalysis suitable for study of trends and interannual variability. Here we explore the consistency of wave hindcast with independent observations from moored buoys, satellite altimeters, and microseism data. We use the ECMWF 5th generation re-analysis (ERA5) winds to drive two wave models, using either ECMWF WAM (Bidlot et al. 2019) or WAVEWATCH III (The WAVEWATCH III Development Group 2019, Alday et al. 2020). We also use seismic data in the dominant double-frequency band, around 5 s period, that are generated by opposing waves of equal frequencies and compare these to modeled microseisms. We find that the inter-platform corrections in the ESA CCI Version 1.1 dataset (Dodet et al. 2020) introduced a trend that differs from the microseism trends. However, the results converge when using a revised correction of this dataset. We also look at the microseism spectral signature of large storms in the North Atlantic and discuss how we may compare the severity of different storms that move over different ocean bathymetry with different wave to microseism conversions.

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