



Long term variations in global sea level extremes

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Decadal to multi-decadal variations in sea level extremes unrelated to mean sea level changes have been investigated using long tide gauge records distributed worldwide. A state space approach has been applied that provides robust solutions and uncertainties of the time evolving characteristics of extremes, allowing for data gaps and uneven sampling, both common features of historical sea level time series. Two different models have been formulated for the intensity and for the occurrence of extreme sea level events and have been applied independently to each tide gauge record. Our results reveal two key findings: first, the intensity and the frequency of occurrence of extreme sea levels unrelated to mean sea level vary coherently on decadal scales in most of the sites examined and, second, extreme sea level changes are regionally consistent, thus pointing towards a common large scale forcing. This variability of extremes associated with climate drivers should be considered in the framework of climate change studies.