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Long-term trends, interannual and seasonal variations in high water levels based on a quasi-global tide-gauge dataset

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Understanding the variability of extreme sea levels events is essential to evaluate the flooding risk in coastal areas since it has an important impact on coastal populations and fragile ecosystems. In this study, we use a non-stationary extreme value approach (Menendez et al., 2009) to investigate the worldwide patterns of historical extreme sea level changes.

The approach is applied to the total elevations and surges of a quasi global tide-gauge dataset for the period 1970 onwards and a subset of this data to study changes over the 20th century. The work explores the spatial variations of: (a) the month within a year in which a higher water level is more probable, (b) the relation of the interannual variability in high water levels with other ocean and atmosphere variations (represented by climate indices) and the influence for perigean and nodal astronomical tidal components in the extremes, and (c) a discussion of long-term trends in high water levels and storm surges. The climate variability in the extreme sea levels over and above changes in mean sea level is also investigated.