



## Characterization of changes in extreme storm surges along the North Atlantic coasts, since 1850

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Severe storms that hit the North Atlantic coasts over the last decades, such as Xynthia storm in Europe, showed the vulnerability of coastal populations to extreme sea levels. There is a need to quantify the changes in extreme sea levels, to enable the implementation of appropriate coastal adaptation measures. Extreme sea levels are the joint contribution of mean sea level, tide and storm surges. Several authors investigated changes in storm surges. Storm surges display strong interannual and multidecadal variability, but no clear long-term trends at most sites globally (Mawdsley and Haigh, 2016; Marcos and Woodworth, 2017). The objective of the present study is to characterize changes in extreme storm surges along the North Atlantic coasts, since 1850. We selected long-term tide gauges with at least 100 years of data, from GESLA-3 dataset (Haigh et al., 2022). This conducted to consider around 30 tide gauges along the U.S. and European coasts. Extreme storm surges were evaluated yearly, using different approaches: (1) the maximum value over a period (e.g. annual maximum), the  $n$ -th percentile (e.g. 99<sup>th</sup> percentile) and (3) the return level associated to a return period (e.g. 1 year return level); this last value is obtained by fitting a Generalized Extreme Value distribution on data. At each station, we characterized changes in extreme storm surges over the last century. We compared the different approaches. We estimated long-term trends and analyzed storm surge variability in link with large-scale atmospheric forcing (e.g. North Atlantic Oscillation index). Regions of similar variations were also identified. These results are a first step towards the understanding of the physical causes behind the observed changes of extreme storm surges in the North Atlantic.

### References

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