Regional changes in storm surges along the North Atlantic coasts, since 1850

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We investigated regional changes in winter storm surges along the North Atlantic coasts, over the last century. We analysed 36 tide gauges, with at least 80 years of data. We conducted a Generalized Extreme Value analysis on a 21-yr sliding window, to investigate variations in the 10-yr storm surge return level. We then applied a clustering algorithm, to identify regions where storm surges vary similarly. Large geographical areas with similar changes suggest that observed changes are mainly driven by large-scale processes. Climate indices such as North Atlantic Oscillation and Atlantic Multidecadal Oscillation play a role in observed changes. Interestingly, several tide gauges display different variations from any tide gauge around, despite located in a coherent region, which suggests predominant local effects (e.g. harbour development). At most of the stations, we found no significant trend over the last century (1920-2010). However, if we focus on shorter periods (1960-2000), trends become significant. These more pronounced trends mainly reflect the large decadal to multidecadal variability of storm surges rather than a long-term trend.