



## North Sea storminess from a novel storm surge record since AD 1843

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The detection of potential long-term changes in historical storm statistics and storm surges plays a vitally important role for protecting coastal communities. In the absence of long homogeneous wind records, we present a novel, independent and homogeneous storm surge record based on water level observations in the North Sea since AD 1843. Storm surges are characterized by considerable inter-annual to decadal variability linked to large-scale atmospheric circulation patterns. Time periods of increased storm surge levels prevailed in the late 19th and 20th centuries without any evidence for significant long-term trends. This contradicts with recent findings based on reanalysis data, which suggest increasing storminess in the region since the late 19th century. We compare the wind and pressure fields from the 20th century reanalysis (20CRv2) with the storm surge record by applying state of the art empirical wind surge formulas. The comparison reveals that the reanalysis is a valuable tool which leads to good results over the past 100 years; previously the statistical relationship fails, leaving significantly lower values in the upper percentiles of the predicted surge time series. These low values lead to significant upward trends over the entire investigation period, which are in turn neither supported by the storm surge record nor by an independent circulation index based on homogeneous pressure readings. We therefore suggest that these differences are related to higher uncertainties in the earlier years of the 20CRv2 over the North Sea region.

### Reference:

Dangendorf, S., Müller-Navarra, S., Jensen, J., Schenk, F., Wahl, T., and Weisse, R. (revised after minor revision): North Sea storminess from a novel storm surge record since AD 1843, *Journal of Climate*.