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Northern European Storminess since 1850

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Severe winter storms represent a major natural hazard for Central to Northern Europe. Observed positive trends in storminess over the last six decades together with a NE-shift of the storm track position appears to be consistent with scenario simulations for the end of 21st century under increased greenhouse gas concentrations. Less is however known about long-term changes in storminess since the late 19th century where most local storm indices point towards a rather stationary wind climate.

A detailed review of existing long-term storminess information collected for upcoming regional climate assessment reports for the North and Baltic Sea (session CL4.13) yields dissenting views in recent publications. Both, the reliability of some early geostrophic wind indices and 20th Century Reanalysis (20CR) long-term trends are challenged.

Here, we make use of a statistical reconstruction to evaluate low-frequency variations and trends of annual storminess over Northern Europe since 1850. We use homogeneous daily pressure observations to construct analogue-based daily pressure and wind fields sampled from a regional climate model. Spatiotemporal variations of deep cyclones and high wind percentiles are compared with the 20CR data since 1871 on annual and decadal scale and different indirect storm indices.

Analogue-based storminess shows no long-term trends in agreement with a novel storm surge record of Cuxhaven since 1843 or most pressure-based storm indices since the late 19th century. In contrast, positive trends in 20CR caused by lower storminess before around 1920-1940 are not confirmed. The analyses of the deep lows reveals an unprecedented high spatial impact at the end of the 20th century consistent with a NE-shift of storm tracks since the 1970s found in reanalysis data. We conclude that the storm climate since 1850 is rather stationary with large decadal variations. The large influence of deep lows at the end of the 20th century is unprecedented but shows no significant long-term trend so far.