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Strategies for describing change in storminess – illustrated for the case of Northern Europe, the Subarctic Atlantic, Eastern Canada and East Asia.

The determination of changing storm conditions and their impacts on storm surges and waves is difficult, simply because almost no long homogeneous series of observations of strong winds exist. This is valid for all kinds of storms, ranging from Polar Lows, baroclinic extra-tropical storms and tropical storms. At the Institute for Coastal Research of the GKSS Research Center we have developed two strategies to deal with the problem.

The first approach uses proxies of storminess such as the range of intra-annual water level variations at tide gauges or intra-annual statistics of air pressure variations, such as percentiles of low pressure readings or strong 12-hourly pressure falls. This methodology has shown to operate fine, and allows extension up to 200 years, conditional upon the availability of data, in case of baroclinic storms in the Atlantic. It was found that storminess exhibits inter-decadal variations, but a systematic intensification took not place in the last century in E Canada or in N Europe, which is consistent with model projections for the coming 100 years.

The second approach operates with regional atmospheric models (LAM), which dynamically downscale global re-analysis, such as NCEP-NCAR. To do so, the LAM is constrained to that its large-scale dynamics follows closely that of the driving global analysis (“Spectral nudging”). This set-up has been run for Northern Europe, for the Subarctic Atlantic (Polar Lows) and East Asia (typhoons). It runs out that it is possible to reproduce storm statistics with spatial and temporal detail – but not all real events are faithfully described. Again, no systematic changes, neither upward nor downward, can be detected in the past 60 years.