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Evaluation of an air pressure based proxy for storm activity

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Yearly percentiles of geostrophic wind speeds serve as a widely used proxy for assessing past storm activity. Here, daily geostrophic wind speeds are derived from a triangle of surface air pressure measurements and used to build yearly frequency distributions. It is commonly believed, however unproven, that the variation of the statistics of strong geostrophic wind speeds describes the variation of statistics of ground level wind speeds. This study evaluates and validates this approach by examining the correlation between quantiles of geostrophic and of real wind speeds to determine whether the two distributions are linearly linked. The dependence on the size of underlying surface triangles or on surface properties is considered for that purpose.

Such investigations require long, homogeneous, and physically consistent data. As such data are barely existent, regional climate model generated wind and surface air pressure fields in a fine spatial and temporal resolution are made use of. The chosen regional climate model is the spectrally nudged and NCEP driven REMO that covers Europe and the North Atlantic. Required distributions are determined from diagnostic 10m and geostrophic wind speed, which is calculated from model air pressure at sea level.