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Extreme wind projections over Europe in the high-resolution Euro-CORDEX ensemble

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Extreme weather events represent one of the most visible and immediate hazards to society. Many of these types of phenomena are projected to increase in intensity, duration or frequency as the climate warms. Of these extreme winds are among the most damaging historically over Europe yet assessments of their future changes remain fraught with uncertainty. This uncertainty arises due to both the rare nature of extreme wind events and the fact that most model are unable to faithfully represent them. Here we take advantage of a 15-member ensemble of high-resolution Euro-CORDEX simulations (~12km) and investigate projected changes in extreme winds using a peaks-over-threshold approach. Additionally, we show that - despite lingering model deficiencies and inadequate observational coverage - there is clear added value of the higher resolution simulations over coarser resolution counterparts. Further, the spatial heterogeneity and highly localized nature is well captured. Effects such as orographic interactions, drag due to urban areas, and even individual storm tracks over the oceans are clearly visible. As such future changes also exhibit strong spatial heterogeneity. These results emphasize the need for careful case-by-case treatment of extreme wind analysis, especially when done in a climate adaptation or decision-making context. However, for more general assessments the picture is clearer with increases in the return period (i.e., more frequent) extreme episodes projected for Northern, Central and Southern Europe throughout the 21st century. While models continue to improve in their representation of extreme winds, improved observational coverage is desperately needed to better constrain and obtain more robust assessments of future extreme winds over Europe and elsewhere.