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Extreme wind events in the Mediterranean in regional simulations with different resolutions

Nico Becker (1), Gregor C. Leckebusch (2), Uwe Ulbrich (2), and Andreas Will (3)

(1) Institute of Meteorology, Free University Berlin, Germany (nico.becker@met.fu-berlin.de), (2) Institute of Meteorology, Free University Berlin, Germany, (3) BTU Cottbus, Germany

The influence of meso-scale horizontal model grid resolution on the simulation of extreme wind events in the Mediterranean region is analysed. The the results for the 10m wind fields will be discussed. The study is based on a systematic series of simulations with the regional climate model COSMO-CLM at four different horizontal model grid resolutions between 7 to 49 km.

Since some physical parameterisations and numerical properties of the model change with the model grid resolution, the differences between the simulation results can not be attributed to resolution only. The evidence for the relation between the results discussed further below
and the model grid resolution will be given.

In general, the mean wind fields show increasing wind speeds with increasing model resolution of up to 6 %. The size and location of the largest differences change with the seasonal cycle. Frequency distributions show a shift to larger wind speeds with higher maximum wind speeds at higher resolutions.

Regional extreme wind events are analysed, regarding the frequency of their occurrence and their spatial characteristics, as well as their temporal evolution. Regional winds like the Adriatic Bora are often induced by orographic effects and therefore exhibit a particular sensitivity to the shape of the model topography. The formation of bora related low level jets is enhanced at higher resolutions.

The model results are compared with station measurements and reanalyses. The correlations of simulation results with station measurements are increasing with the model resolution. Furthermore, it can be shown that the overall model errors are smaller than the reanalysis data errors.