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Using numerical model for detailed spatial calculation of extreme wind climate

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Extreme wind speed events cause regularly significant damage over mountainous forested areas in Central Europe. The landscape dynamics is heavily affected. In order to evaluate such impact, a landscape model of the corresponding domain must be supplied with spatial distribution of extreme wind speed statistics. Suggested method employs the non-hydrostatic model WRF to dynamically downscale selected extreme wind events over time period 1979-2013.
The selection of the events to be simulated was based on classification of ERA Interim reanalysis pressure level data at the grid point in the center of the domain. The situations were clustered using the wind speed and direction at 850 hPa level and thermal stability expressed as temperature gradient between 850 hPa and 925 hPa levels. One representative event for each cluster was downscaled with WRF. More advanced parameterization schemes were chosen for calculation of radiation and surface layer to properly address orographic effects in the domain. Finally, the results of simulation were statistically processed to obtain parameters of extreme value distribution in each grid point of the domain.
The method was demonstrated on the area of Bohemian Forest that represents one of largest and most compact forested mountains in Central Europe. The selected domain contained a professional meteorological station with suitable history of wind speed measurements. The observations were cleaned of inhomogeneity and classified to convective and non-convective cases using the index CAPE. The resulting values allowed validation and calibration of previously downscaled data.