EMS Annual Meeting Abstracts
Vol. 14, EMS2017-433, 2017

Postprocessing and Calibration of Wind-Gusts of the COSMO-DE-EPS Ensemble

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Physical parameterisation of wind gusts from prognostic variables of numerical weather mod-els is problematic as wind gusts depend on sub-grid-scale variables and processes (e.g. rough-ness length, turbulence). For ensembles, the representation of the initial and evolving spread poses additional challenges, as it is often too small for near surface variables and wind gusts when compared to observations.

At DWD, a statistical postprocessing method based on MOS (Model Output Statistics) has been set up in order to optimise and calibrate deterministic and probabilistic forecasts of the ensemble system COSMO-DE-EPS. Special focus has been given to strong wind gusts as they result in harmful weather events and are a main matter for weather warnings, but also other relevant events like thunderstorms and heavy precipitations are addressed.

The basic idea of the Ensemble-MOS system is to use mean and standard deviation of the ensemble as predictors for the statistical modeling towards observed wind gusts from synoptic stations. Since extreme wind gusts are rare events, fortunately, reliable statistical modeling and verification need large sample sizes. Long time series of five years are used by now and climatologically similar observation stations are aggregated in order to gather relevant statisti-cal samples. Furthermore, probabilities of wind gusts exceeding high thresholds are derived in two steps: Firstly, optimised deterministic wind gusts are derived from the ensemble in a stepwise linear multiple regression that selects statistically significant predictors and elimi-nates biases and other systematic errors. These unbiased estimates for wind gusts are excellent predictors for statistical modeling of threshold probabilities in a second step. Logistic regres-sion is applied there in order to provide calibrated threshold probabilities that can be used further for qualified risk assessment and warning management.

The resulting regression equations can be evaluated naturally at the observations sites to provide operational forecasts at these locations. But it is also possible to apply these equations at locations with similar climatology in order to derive gridded forecast maps of wind gusts and threshold probabilities.