Post-processing of the wind speed numerical weather prediction using analog-based method

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The analog approach is a statistical post-processing method used to generate deterministic and probabilistic forecasts. The analogs are past numerical weather predictions similar to the current prediction across several variables (i.e. predictors). The measurements corresponding to the analogs form an analog ensemble. The predictors can be deterministic and / or ensemble NWP forecast output.

The analog method is first applied to the deterministic ALADIN NWP model, producing a point-based wind speed forecast 10 m above the ground. The performance is tested in climatologically and topographically different regions of Croatia. It is shown that the deterministic analog-based predictions (ABPs) improve the correlation between predictions and measurements while reducing the forecast error (with respect to both the starting model predictions and the Kalman filter based correction). All ABPs improve prediction of larger than diurnal motions while the application of the Kalman filter in so-called analog space is the superior among all ABPs in predicting alternating wind regimes on shorter-than-diurnal time scales.

Additionally, the austrian ALADIN-LAEF system ensemble forecasts are used as a starting model. The results show that there is often no need to use all ensemble members as predictors. It might be enough to use only summarized information (such as ensemble mean and spread), which is computationally less demanding. Further improvements can be achieved by optimizing and adapting the analog searching procedure (i.e. the predictor-weighting strategy). Finally, an analog-based method is comparable to (or even outperforms) an ensemble model output statistic (EMOS) approach, even for high wind speed thresholds.

Overall, the results encourage the use of analog approach in an operational environment.

Key words: statistical post-processing, NWP, wind speed forecast, analog-based method