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Deterministic post-processing of the wind speed numerical weather prediction

Iris Odak Plenkovic (1), Luca Delle Monache (2), Kristian Horvath (1), and Mario Hrastinski (1)

(1) Meteorological and Hydrological Service, Zagreb, Croatia, (2) Research Applications Laboratory, NCAR, Boulder, CO, USA

The performance of analog-based and Kalman filter post-processing methods is tested in climatologically and topographically different regions, for point-based wind speed predictions at 10 m above the ground. This study shows that the deterministic analog-based predictions 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. While the Kalman filter approach generally outperforms the analog-based predictions in bias reduction, the combination of the Kalman filter and analog approach can be similarly successful. In the coastal complex area, characterized by a larger frequency of strong winds, the analog-based predictions are more successful in reducing the dispersion error than the Kalman filter approach. Differences among starting model and post-processed forecasts in other types of terrain are less pronounced. The application of the Kalman filter algorithm to the analogs in the so-called analog space (KFAS) is the least prone to the noted standard deviation underestimation among the analog based predictions. All analog-based predictions improve prediction of larger than diurnal motions. The KFAS is the superior among all analog-based methods in predicting wind variability on time scales shorter than a day. Additionally, results of the post-processing methods are further improved if higher-resolution starting model data is used in the coastal complex terrain. Introducing the higher resolution modelling in nearly flat continental terrain results with very similar power spectral density curves. The post-processing methods exhibit at least as good result when using the coarser horizontal resolution, if not better. Therefore the need for using 2- opposed to 8-km grid spacing model may be questioned. Finally, future contributions could also focus on probabilistic predictions, taking the full advantage of the distribution sampled by the ensemble, which may be more suitable particularly for the prediction of rare events.