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Hourly forecasts of renewable energy sources by an operating MOS-system of the German Weather Service

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Model Output Statistics (MOS) is a powerful tool for optimizing the direct output of numerical weather forecast models. By developing multiple linear regressions with predictors, derived from observations and numerical weather prediction (NWP) at DWD (German Meteorological Service), a reduction of 50% of the error variance in the forecast has been achieved. Moreover, statistical post-processing yields numerous advantages in forecasting, e. g. down-scaling to point forecasts at observation stations with specific topographic and climatologic characteristics, correction of biases and systematic errors produced by numerical models, the derivation of further predictands of interest (e. g. exceedance probabilities) and the combination of several models.

In the German project EWeLiNE (Simultaneous improvement of weather and power forecasts for the grid integration of renewable energies), which is carried out in collaboration by DWD and IWES (Fraunhofer Institute for Wind Energy and Energy System Technology), one of the main goals is an adjustment of the DWD-system MOSMIX (combining numerical forecasts of the global models IFS and ICON) to the demands of transmission system operators (TSO). This includes the implementation of new predictands like wind elements in altitudes > 10m or solar radiance.

To meet the demands of the TSOs the temporal resolution of MOSMIX, currently delivering forecasts in 3-hour time-steps, needs to be enhanced to 1-hour time-steps. This can be achieved by adjusting the statistical equations to take account of hourly SYNOP observations. Thus, diverse input parameters and internal processing schemes have to be re-specified for example in terms of precipitation. We show a comparative verification of 1-hour MOS and 3-hour MOS for different forecast elements.

Raw data comprising of acquired point measurements of wind observations have been converted and implemented into the MOS-system. Sensitivity studies have then been conducted investigating the fit of the forecasts to observations of wind speed at 30m, 80m, 100m and 150m and direct and diffuse radiation at selected locations. These studies consider the choice of predictors and weighting of employed NWP models, as variability has been generated by changing e. g. the length of training periods, internal MOS parameterizations (as described above) and the vertical interpolation of wind speed in heights where measurements are absent.

Following up to these studies, which amongst others have been conducted by assessing the RMSE, the advanced MOS-system already containing the new wind elements has been enabled in a parallel suite since December 2015. This allows a comprehensive investigation of forecast skills and uncertainties for the recent winter.

Further improvements of the operating MOS-system at DWD aim at providing spatially forecasts of the described meteorological fields.