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Post-processing method for wind speed ensemble forecast using wind speed and direction

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Statistical methods are widely applied to enhance the quality of both deterministic and ensemble NWP forecasts. In many situations, like wind speed forecasting, most of the predictive information is contained in one variable in the NWP models. However, in statistical calibration of deterministic forecasts it is often seen that including more variables can further improve forecast skill. For ensembles this is rarely taken advantage of, mainly due to that it is generally not straightforward how to include multiple variables. In this study, it is demonstrated how multiple variables can be included in Bayesian model averaging (BMA) by using a flexible regression method for estimating the conditional means. The method is applied to wind speed forecasting at 204 Norwegian stations based on wind speed and direction forecasts from the ECMWF ensemble system. At about 85 % of the sites the ensemble forecasts were improved in terms of CRPS by adding wind direction as predictor compared to only using wind speed. On average the improvements were about 5 %, but mainly for moderate to strong wind situations. For weak wind speeds adding wind direction had more or less neutral impact.