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Identification of and handling of critical irradiance forecast uncertainties using a Random Forest scheme – a case study for southern Brazil

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For the secure operation of the utility grid, especially in grid with a high penetration of volatile wind or solar generation forecasts of the respective power flows are essential. Full profit of the forecasts can, however not been taken without the knowledge of their uncertainties.

Based on irradiance data from southern Brazil we present a scheme for the identification of situations for which elevated forecast errors are to be expected. For this, the classification technique Random Forests applied, using the history of the site specific irradiance data forecast errors together with a set of auxiliary meteorological variables. As byproduct, extracted systematic forecast errors are used to update the forecasts. The predictive performance of the Random Forest models are assessed by the predictions ability to reduce the number of hours or days with forecast errors exceeding the limits, and on the resulting overall forecast RMSE. Limited to none improvements are obtained when predicting next-hour forecast errors, while significant improvements are obtained when predicting next-day forecast errors. Setting a relatively low limit for forecast error exceedance is found to give the largest improvements in terms of reduction of forecast RMSE.