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Defining a neural network and data mining forecast model for wind speed and wind power nowcasting in Austria

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An artificial neuronal network (ANN) forecasting setup for wind speed and wind power nowcasting (0 – 6 hours ahead) and medium-range (7 – 40 hours ahead) prediction is investigated.
A baseline setup was defined as “control” forecast model using a simple feed-forward neural network with a defined set of input, hidden and output neurons and hidden layers. For statistical robustness an ensemble of neural network forecasts is used with the mean as deterministic forecast.
Given the specific terrain of Austria and the, at some regions related complexity in forecasting wind speed and power production, different ANN setups were investigated to find an optimal forecasting framework. The number and type of input data – NWP models, observations, and parameters – was varied and the number of hidden layers tested. For the training length of the network using data of the same time of the year of previous years to increase the amount of available data but remove seasonality (i.e. strong winter inversion data used for training in spring) was investigated.
The different model forecasts are evaluated and validated for selected Austrian observation and wind farm sites against raw NWP forecasts, a model output statistics forecast and the ZAMG nowcasting system INCA. Results show that the method improves the NWP forecasts in both nowcasting and medium-range forecasts and outperforms in most cases, too, the currently used nowcasting system.