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Applying renewable energy power data for improved weather forecasts

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A very high potential for improving the power forecasts for wind and photovoltaic (PV) lies in improving the underlying weather forecasts, since these energy sources are highly weather dependent and as such fluctuating in time. In the new German research project EWeLiNE, the overarching objective is to improve the power forecasts of the power production from these renewable energies. Within EWeLiNE, DWD is aiming both to improve the deterministic and probabilistic weather forecasts and to develop new user optimized products. One of the main research topics includes the assimilation of newly available observations from e.g., wind or PV power plants to optimize the initial conditions of the numerical weather prediction (NWP) model. These observations have the advantage of rather high temporal and spatial resolution and provide the benefit of measurements at the site of the power production. PV measurements complement existing data sets given by satellites and lidars with strong relevance to clouds, establishing a new and interesting view into the atmosphere with properties different from classical and emerging remote sensing approaches. To include such data in the NWP-system, forward operators are required for the transformation between meteorological model variables and the wind or photovoltaic power. Also, the ambient conditions such as temperature, atmospheric stability, terrain, and height of the power source have to be taken into account. The developments take place within an Ensemble Kalman Filter (EnKF) scheme driven by a global Hybrid EnKF Variational method (VarEnKF) which is under development at DWD. An overview of the concept and initial results will be presented.