The potential of assimilating wind power data for future reanalysis

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Abstract

Reanalyses are continuously developed towards smaller grid spacing. Thus, the representation of processes influenced by surface heterogeneity is expected to improve but accompanied by a growing impact of model errors. This affects downstream applications, e.g. renewable energy, where boundary layer (PBL) data are crucial. Recent studies also suggest to further improve near-surface winds in NWP products. While DA can help to attenuate errors, it relies on the availability of long time series of relevant observations.
The FAIR project, in which the German Meteorological Service (DWD) participates, aims at better utilizing weather and climate data. Specifically, DWD benefits from using third party data for product improvement. In this context, our goal is to investigate the potential of wind power output DA for improving future reanalysis products.
Wind power output data are provided by BayWa re GmbH with record lengths of up to 20 years. These data may provide the necessary retrospective information on wind speeds in the lower PBL. The data is assimilated into DWD's operational NWP framework (ICON-LAM, LETKF) for Central Europe. To successfully assimilate wind power data the construction of a forward operator is crucial. We can rely on specific power curves also provided by BayWa. We present comparisons and evaluations of identical twin experiments stretching over several weeks long periods in different seasons to assess the benefit for reanalysis.

Keywords: wind power, renewable energy, boundary layer, reanalysis, LETKF

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