A Study on the Effect of Nudging on Long-Term Boundary Layer Profiles of Wind and Weibull Distribution Parameters in a Rural Coastal Area.

By use of 1 yr of measurements performed with a wind lidar up to 600-m height, in combination with a tall meteorological tower, the impact of nudging on the simulated wind profile at a flat coastal site (Høvsøre) in western Denmark using the Advanced Research version of the Weather Research and Forecasting model (WRF) is studied. It was found that the mean wind speed, the wind direction change with height, and the wind power density profiles are underestimated with the configuration of WRF used and that the impact of nudging on the simulated mean values was minor. Nudging was found to reduce the scatter between the simulated and measured wind speeds, expressed by the root-mean-square error, by about 20% between altitudes of 100 and 500 m. The root-mean-square error was nearly constant with height for the nudged case (~2.2 m s⁻¹) and slightly increased with height for the nonnudged one, reaching 2.8 m s⁻¹ at 300 and 500 m. In studying the long-term wind speed variability with the Weibull distribution, it was found that nudging had a minor effect on the scale parameter profile, which is closely connected to the mean wind speed. Improvement by nudging was seen on the profile of the shape parameter. Without nudging, the shape parameter was underestimated at all heights; with nudging, the agreement was good up to about 100 m and above that height the shape parameter was underestimated.

General information
Publication status: Published
Organisations: Department of Wind Energy, Meteorology
Contributors: Gryning, S., Batchvarova, E., Floors, R.
Pages: 1201-1207
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Meteorology and Climatology
Volume: 52
Issue number: 5
ISSN (Print): 1558-8424
Ratings:
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.47 SJR 1.942 SNIP 1.499
Web of Science (2013): Impact factor 2.099
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Original language: English
Keywords: Wind shear, Boundary layer, Lidars/Lidar observations, Mesoscale models, Model evaluation/performance, Coastal meteorology
Electronic versions:
A_Study_on_the_Effect_of_Nudging.pdf
DOIs:
10.1175/JAMC-D-12-0319.1

Bibliographical note
© 2013 American Meteorological Society
Source: dtu
Source ID: n:oai:DTIC-ART:ebsco/387042734::28735
Research output: Contribution to journal › Journal article – Annual report year: 2013 › Research › peer-review