

ANSWER TO TAMBKE'S COMMENTS

"On the wind stress formulation over shallow waters in atmospheric models" Pedro A. Jiménez and Jimmy Dudhia.

Short comment 2

GENERAL COMMENT

There is no doubt that this very interesting and well written paper is of high relevance for modelling the wind flow in the marine boundary layer. But especially the used FINO1 observations require a very critical examination.

I agree with all of the comments from the reviewers and discussion participants. My special concern is to caution against an all too trustful use of the FINO1 data. Many people have been analysing this data for 10 years, and from the beginning until now, new problems, measurement errors and inconsistencies have been occurring again and again. Many reviewers have rejected submitted papers due to the use of FINO1 data. Unfortunately, this has not stopped others to publish studies using this defective data without caution. Just a few of the problems: - There are no anemometers below 30 m height, and the one at 30 m is affected by the helicopter platform and the containers at 23 m height. - The wind speed measurements are not only affected by the mast shadow, but also by strong flow distortion (dynamic pressure as well as speed-ups) around the quite massive lattice mast, with relatively short boom lengths. - All single temperature measurements have biases and uncertainties of around 0.5 Kelvin, which is too much to calculate a reliable Richardson number. The temperatures from the three sonic anemometers exhibit deviations of up to 6 Kelvin, rendering the covariance $w'T'$ relatively useless.

As Gerald Steinfeld has pointed out in his comment, since 2009, a further restriction is added due to the construction and trial operation of the offshore wind farm alpha ventus directly next to FINO1: twelve 5MW-turbines with hub heights of about 90 m and rotor diameters between 116 m and 126 m. This means that for all (easterly) wind directions between 0 and 180, the FINO1 data cannot be used for the purpose of the present article.

In short: An independent, scientific examination and approval of the whole technical measurement system of FINO1 has never been done. The technical documentation of the whole cam-

paign is very poor. There is not enough evidence to trust in this data for micro-meteorological studies.

At last a minor question: Have the authors compared hourly averages of the standard 10-minutes-wind speed observations to the hourly WRF output, or have they used just one 10-min-average every hour on the hour?

ANSWER

We appreciate the overall positive perspective that this short comment has of the manuscript.

Figure 1 of this document shows the wind rose for the 2009 year. The predominant winds are from the SW which is the direction that should produce the least distortion in the observations given the orientation of the sensors. The NW and SE winds, where the data that should show the largest perturbations, are much less frequent than the predominant direction. Regarding the wind farm, the first turbine was installed on August 2009 and the farm started operation on November so the potential disturbances associated with the wind farm can only occur during a small fraction of the year. In addition, the easterly winds are not very frequent which suggests that the potential perturbations of the wind farm should be small on the climatologies herein presented. In order to quantify these statements, we calculated the bias using all the observations, and only using the SW winds. The bias is 0.38 m/s and 0.44 m/s, respectively. The difference is only 0.06 m/s which is small and thus we do not expect to alter the conclusions of the study.

We didn't use temperature observations. We only used wind observations. The stability was calculated using the simulated z/L parameter L being the Obukhov length. This will be clarified in the revised version of the manuscript.

Anyway, we will add in the conclusions a phrase indicating that results from this study should be confirmed by independent observations given the poor documentation of the data recorded at FINO1. In this direction, the contents of the manuscript support the observations recorded at FINO1 since the model agrees well with the data especially when the wind stress is in agreement with shallow waters observations.

We averaged the 10-min data into hourly data. We will mention this in the revised version of the manuscript.

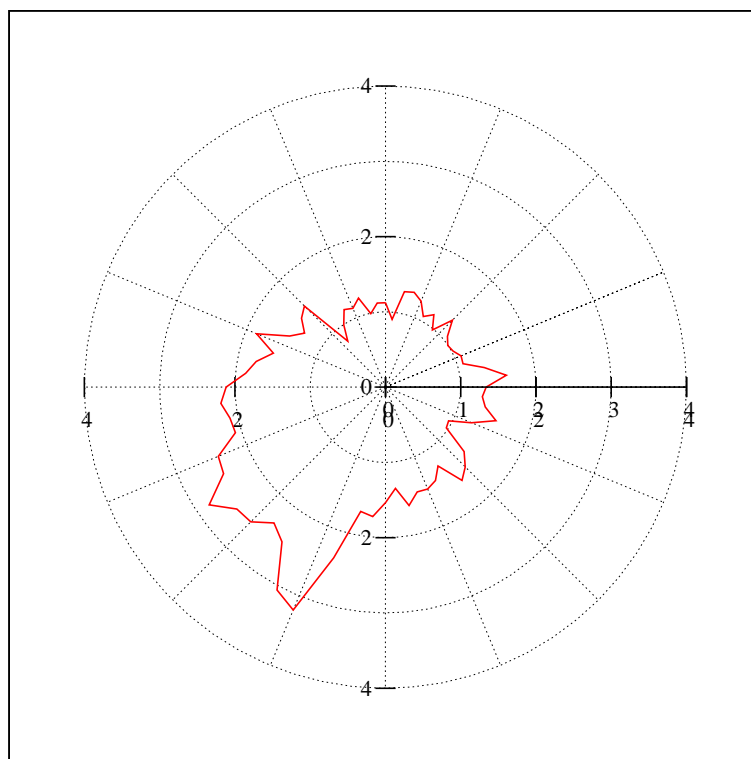


Figure 1: Wind rose at FINO1 for the year of 2009.