

Interactive comment on “In-situ airborne measurements of atmospheric and sea surface parameters related to offshore wind parks in the German Bight” by Astrid Lampert et al.

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Answers to the referees on the article "In-situ airborne measurements of atmospheric and sea surface parameters related to offshore wind parks in the German Bight"

March 17, 2020

1 Answers to referee 2

The authors would like to thank Christof Lüpkes for the interesting comments.

In the following, each comment is addressed. The comments are given in italic, and the answers are given in normal letters. Changes to the text are provided in quotation marks.

General

In this paper an aircraft campaign is described, which has been carried out in 2016 over North Sea in the environment of wind parks. The instrumentation, flight patterns

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and data sets are explained, which have been made publicly available in the world data center PANGAEA. The paper is generally well written and the unique data sets will be helpful to better understand the impact of wind turbines on atmospheric processes and the water surface. I recommend publication after some revisions mentioned below have been carried out.

We would like to thank the referee for the positive feedback.

Revisions 1) I understand that the goal of the authors is to just describe the data sets and to leave the interpretation to later work. However, it might be possible to show in this paper at least one example illustrating the impact of the wind parks, which is missing in the current version. This would attract more readers.

We included an example of changes of the wind when crossing the coast line. The analyses show that the development of the wind profiles from the coast to the open sea are difficult to understand and require more detailed analyses.

2) Figures 5 and 6 show an unusual structure of the atmospheric boundary layer (ABL). The authors interpreted the peak at 500 m as the ABL top. Usually, a capping inversion is found at the top but here, at least in the average profile, the contrary (unstable stratification) is found. Even more pronounced is such a behavior at 950 m. This situation needs to be explained. I recommend showing two or three examples of individual (thus non-averaged) profiles in addition, since this might help to understand the mean profiles.

We included individual profiles of Flight 7 (stable), Flight 15 (unstable), Flight 31 (stable) in the figures of temperature, potential temperature, water vapour mixing ratio and wind speed.

We added in the text:

"Below 60 m, data are only available during take-off and landing. Therefore, the temperature inversion below 60 m is not a typical feature above the North Sea, and

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therefore provided as dotted line. The averaged and maximum temperature profiles show a sudden decrease at an altitude of around 500 m and around 950 m. This is probably an artifact from the averaging method, and it is not visible in individual temperature profiles."

"In the mean profile of the potential temperature, a clear increase is observed for the altitude interval 60 to 100 m. Also up to the altitude of 200 m, in the range of the rotor blades, an overall small increase of potential temperature with height is observed. The decrease of average and maximum potential temperatures with height at around 500 m and 950 m are probably artifacts from the averaging method and are not visible in the profiles of individual flights."

3) Measurements below 50 m height are obtained during take-off or landing and thus over land. So, it has nothing to do with the situation over sea and therefore, I would either mark these results with another color or skip them since this might lead to misinterpretation. The average surface temperature is however interesting, but again, the land part should be excluded from the average.

We now provide the profiles below 60 m, which were obtained above land during take-off and landing, in dotted lines.

4) The language is ok in general, but I found some misprints and also some unclear sentences:

line 9: it should be written ...data set has been shown already by...

We changed as suggested.

line 27: submitted by Baerfuss

We did as suggested.

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line 29: as well as for (skip 'a')

Done.

line 30: WIPAFF has been...

Done.

line 37: probably, the authors mean resolution is more than 1 m (or larger than...)

We changed the text to "the spatial resolution of the measurements is better than 1 m"

line 39: and in particular over the sea ice...

We changed as suggested.

line 58: meteorological

We corrected the spelling.

line 60: sentence with resolution is a repetition of the introduction. The corresponding sentence of the introduction could perhaps occur here (?)

We moved the sentence from the earlier section here as suggested.

line 73: give value of kappa.

We changed the text to: " κ is the heat capacity ratio with a value of 1.4."

Line 105: and to derive

We changed the text to: "The scanning laser system VZ-1000 of RiegI, Austria, is deployed to record the relative sea surface deflection and to derive parameters like the significant wave height."

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Line 112: explain sigma

We changed the text to: "since this simple calculus only depends on the standard deviation σ_η in sea surface deflection"

line 142: instead of behind write 'downstream'

We changed as suggested.

line 165: I do not really understand the double averaging procedure for mean values. Does the first average mean the application of a filter so that, e.g., 1 Hz data result?

To clarify, we changed the text to: "During each flight, different vertical profiles were obtained. First, a mean profile for each flight was calculated. Then all 41 profiles from the 41 flights were averaged again. The minimum and maximum values are combined from the 41 mean profiles."

line 166: Not completely clear how to understand the minimum and maximum. At each height, the minimum and maximum values were determined from all available profiles together?

We changed the text to: "For each height, the minimum and maximum values were determined from the 41 profiles representing each one particular flight."

Line 206: better write something like: data base to date, from which the impact.... can be derived.

We changed the text to: "The WIPAFF flights are the only available data base to date, from which the impact of long-range wakes can be derived systematically and independent of infrastructural constraints like the location of masts."

Figures: Figures 3 and 4: use text size for label size as in the other figures. Times

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cannot be read. Either skip them or mark them in a different manner. German headings should be skipped as well and information should be given in the captions. Explain scale for wind speed.

We now use larger label size and omitted the times and the German headings. The colours indicating the altitude and the indications for wind direction are explained in the caption: "The colours show the flight altitude. The wind barbs indicate wind direction and a first idea of wind speed, which is proportional to the length of the wind barbs."

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