Interactive comment on "Observations of the atmosphere and surface state over Terra Nova Bay, Antarctica using unmanned aircraft systems" *by* J. J. Cassano et al.

Anonymous Referee #2

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Review on the manuscript "Observations of the atmosphere and surface state over Terra Nova Bay, Antarctica using unmanned aircraft systems" by Cassano et al.

General comments

The authors report on a data set obtained during several flights with unmanned aerial systems in the Antarctic, above a polynya with open water and above sea ice. The data set is of high scientific interest, and will be used for different meteorological studies as well as serving as input for modelling activities. The data set is definitely unique – obtained at a remote region, and using unmanned aerial systems operating outside direct eye contact. The data set is useful for studying the interaction of ocean, sea ice

and atmosphere, and especially for estimation of the sensible and latent heat flux from open water in very cold surroundings. The authors provide the complete data set that was obtained during the field experiment. Altogether, the significance of the data set is very high.

The data quality seems ok at a first glance. However, I would suggest including more information, either directly in the data set, or at least in the manuscript. For example, it would be interesting for the reader to know if the temperature data are raw data, or if any kind of post processing was applied. For example was a correction for the response time of the sensor applied? In Fig. 5, only temperature profiles of ascents are presented. How does this fit with the descents? Is there a shift in the atmospheric features, which might be an artifact caused by sensor response time (which is specified as < 20s in Table 2)? Did the authors calculate the static air temperature from the observed air temperature?

This criticism holds true even more for the wind. In the article, the accuracy of the wind speed is not specified, not even in Table 2. On the other hand, the wind speed values in u and v component are provided with values like 5.3 m/s, suggesting that it is possible to derive such exact values from the data. The method for deriving the wind vector without a five-hole probe should be explained more in detail, with an estimation of measurement uncertainties. At least a reference should be given, where the calculation is shown in detail.

The section about data availability should contain more information about the percentage that the individual sensors were working and provided correct data. By going through the data set, I noticed that the surface temperature was not recorded for entire flights. Maybe it would be useful to include this information in Table 3, which sensor was working how much of the time.

The section about data processing and quality control should contain more precise information about how the raw data were screened and treated to get the values in the

repository. E.g. p. 1004, l. 8 "found the values to be reasonable and within the range of expectations" – did you perform a sensor calibration? Did you maybe compare with measurements of a ground-based site, or with a radiosonde? Instead, the paragraph starting at p. 1003 l. 21 could be removed.

The presentation quality is overall good.

Specific comments

On p. 998, l. 3, there could be some more references added about research activities, measurements and modelling at other places in the polar regions, that require atmospheric data above polynyas, to highlight the importance of the data set.

Please quantify what you mean with "strong winds" (p. 998, l. 5). In this case you are talking about wind speed of typically xx m/s, or up to xx m/s?

On p. 998, l. 24 I suggest that you already state that some flights were performed simultaneously parallel and perpendicular to the wind. This underlines the uniqueness of the data set.

On p. 999, l. 19, please specify the limits up to which wind speed the Aerosonde can be used.

On p. 1000, l. 6 ff, please provide at least an estimation of the error bar of the derived wind speed and wind direction. For sure you have done intercomparison flights with a meteorological tower or tested the data quality in another field experiment.

P. 1000, l. 11: Please quantify the cold bias of the surface temperature, to make clear if the effect is acceptable or a problem for other studies on a first glance.

P. 1000, l. 19: Was icing a problem for the measurements? It sounds as if there was a lot of humidity transported into the cold atmosphere. . . maybe you can comment on this?

P. 1001: For the reader, it would be nice to get information about the dimensions of

this polynya. What was the length and width? Is this typical for this season? Maybe you could give the dimensions of the polynya in Fig. 6 and 7? This is also important for comparing to measurements and modelling results above other polynyas. In the literature, usually the effect of polynyas on the air temperature is most pronounced below 100 m, where you did not measure. But maybe the other polynyas were typically of smaller dimensions.

P. 1002, l. 4: please rephrase "neither of the 14 . . .flights made it to TNB". This sounds as if no flight reached the goal of investigating TNB.

P. 1003, l. 15: Did I understand correctly that during 14 flights, 2 aircraft were lost? This seems quite a risky operation. Can you give an explanation? Was it due to icing?

P. 1004, l. 21: Please describe more in detail thee wind finding maneuvers

p. 1005: why do you use the GPS altitude and not the barometric altitude?

In Fig. 5 it would be nice to know at what distance from the beginning of the polynya the profiles were obtained. Maybe you can add it in the caption.

Fig. 6: would it be possible to choose another colour scale? It is really difficult to know about the change in the temperature with just similar blue colours.

Interactive comment on Earth Syst. Sci. Data Discuss., 8, 995, 2015.

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Interactive Discussion

Discussion Paper