

Review of the manuscript

Unmanned aircraft system measurements of the atmospheric boundary layer over Terra Nova Bay, Antarctica

by S.L. Knuth et al.

This paper describes data obtained during 8 flights with an unmanned aircraft over the Terra Nova Bay polynya between 14th and 26th September 2009 which have been submitted to the United States Antarctic Program Data Coordination Center.

Our present knowledge of atmospheric processes over polynyas and their interaction with ice formation is mainly based on modeling. Thus observations as those presented in this paper are unique and helpful to obtain a more solid basis for the validation and to improve our understanding. The paper shows furthermore that the use of UAV technique has reached already a high level.

The focus in the present version of the paper is - as it should be for this journal - on the technical description of the experiments and instrumentation. My impression (as a non-expert for technical questions related to the instrumentation) is that the description is well done. However, I think that the number of possible readers or data users could be larger when the meteorological background would be described in some more detail.

Revisions

- 1) The description of the experiment given in Section 2 could be improved. I guess that those who are most interested in the data are (mesoscale) modelers. A modeler would like to have some background information about the synoptic conditions. Was the main wind direction always as in Figure 3? A rough estimate of air temperature would be helpful to understand the conditions.
- 2) What was the usual height of horizontal flight sections? The present information (between 150 and 3000 m) is not helpful. The user of data would like to know in advance if the main part of the data (horizontal flights) is above the internal boundary layer (ABL) forming over the polynya or within the ABL. Another reason is that the observations of the surface temperature and of the freeboard measurements are less accurate when the aircraft is flying at larger heights. Is the height in horizontal sections approximately constant along the path?
- 3) An information about the typical ice situation in the polynya would be helpful (concentration, ice type). Not all readers are familiar with the conditions around TNB. A satellite image showing the typical ice situation in the whole flight region would be helpful.
- 4) Is there always a flight section with the flight oriented along the mean wind as in Figure 3?
It remains unclear if vertical profiles are taken along along this line or somewhere else. I propose to show each panel of Figure 2 in the same size as in Figure 6 and to mark each position where a vertical profile is available.

- 5) Page 1037, Lines 17 to 28: There is a mixture of tenses. I propose to replace sentences with 'would' by past tense as in line 25.
- 6) Page 1037, line 20: skip "of TNB near the coast" ??
- 7) Page 1037, line 21: I understand that the position and altitude of strongest wind is given to the mission scientist. For which scientific goal is this information used?
- 8) The quality of some figures should be improved. Figure 2: Enlarging of the figure could help. Labels and text in its present form are nearly unreadable. Also Figure 5 has poor quality. I suggest also to label the topography lines.
- 9) Page 1038, Line 27: I did not understand how wind is measured '...during aircraft maneuvers...'
- 10) Page 1039, line 14: ' monitor the weather ', what is 'weather' in this connection?
- 11) Section 4: Information on the accuracy of the different measured variables (wind, temperature etc.) would be helpful.