

Review of ESSD-2021-341: **“Observations of marine cold-air outbreaks: A comprehensive data set of airborne and dropsonde measurements from the Springtime Atmospheric Boundary Layer Experiment (STABLE)”** by Janosch Michaelis, Amelie U. Schmitt, Christof Lüpkes, Jörg Hartmann, Gerit Birnbaum, and Timo Vihma.

Ian Brooks

Overview

This paper provides an overview and brief description of (near) vertical profile measurements in cold air outbreaks in the vicinity of the Fram Strait. The data consist of profiles of mean meteorological data (temperature, winds, humidity), along with position and altitude, from dropsondes and aircraft profiles. They are a subset of measurements from an airborne measurement campaign focused on boundary layer structure.

The paper is generally clear and well written, requiring only minor revision before publication.

Detailed Comments

The introduction focuses primarily on a brief background of cold air outbreaks, and some of the specifics of the papers by Tetzlaff et al. – which used the data documented here – before finally introducing the data and purpose of this paper. This is fairly typical for a science paper, but seems a little awkward for a data paper, where the data set might be better introduced first, before recapping published science using it, and the science areas it is aimed at supporting.

Line 44: “quality-processed” might be better changed to “quality-controlled” (here and elsewhere)

Line 116: “one dropsonde at the same time” -> “only one dropsonde at a time”

Line 123: “a spatial resolution” -> “a vertical resolution” – be explicit that it is vertical resolution here, ‘spatial’ could be read as implying horizontal resolution.

Line 153: “twice the sensor’s accuracy” -> “twice the sensor’s stated accuracy” – there is a distinction to be made here between the stated accuracy from the manufacturer, and the actual accuracy of the measurement, which is found to be rather less than that stated.

Line 155: “the used dropsonde type” -> “the dropsonde type used”

Line 165-196: it would be useful to include within this list the values for the various thresholds etc used to exclude data. Some are given, and it is implied that the others can be found in the cited papers, but it would be a useful reference to have them all listed together in one place here.

Section 4.1: The discussion of quality control & corrections applied to the aircraft data is somewhat limited. The discussion of GPS altitude errors is fine, and does a good job of explaining these. The discussion of temperature corrections is very brief – though perhaps there isn’t a lot more to say. There is no mention here of humidity measurements.

It might make things a little easier to follow – and would certainly help for simple reference – to merge the description of QC-processing from section 3, with the effects it has in section 4: structure by aircraft/dropsonde rather than QC-processing-methods/impacts.

Line 204: ‘subsequently’ seems an odd, and unnecessary, start to the sentence.

Line 205: 'temperatures are generally lower after the correction'...only 'generally' (ie some are higher), or are they not always lower since the dynamic pressure should always be positive?

Line 258-259: 'are not shown for the layer where the meteorological sensors had adapted to the environmental atmospheric conditions...' – shouldn't this be '...sensors had not adapted...' ?

Line 265-266: 'the aircraft had a pitch angle of not more than about ± 2 – ± 10 ' – two issues here. First the statement of the angle is a little confusing as the dash is easily read as a minus sign or the ± 10 as an uncertainty about a range of ± 2 . Is the intended meaning ' $\pm 2^\circ$ to $\pm 10^\circ$ ' – ie between 2 and 10 degrees up or down and thus excluding angles between ± 2 ?

Second point – this range is stated as being the aircraft 'pitch' (angle of orientation wrt horizontal) and it is then stated that the small inclination means the aircraft travels a significant horizontal distance during its ascent/descent profiles. The relevant angle for the horizontal distance travelled is not the aircraft's pitch, but that of its trajectory...it can be descending while pitched upwards.