Interactive comment on "Ship- and island-based atmospheric soundings from the 2020 EUREC^{4}A field campaign" *by* Claudia Christine Stephan et al.

Anonymous Referee #1

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Summary.

The manuscript "Ship- and island-based atmospheric soundings from the 2020 EU-REC4A field campaign" by Stephan et al. describes the experimental design, measurements, and post-processing of the radiosonde program at EUREC4A, which was distributed across five platforms east of Barbados in January and February 2020. The manuscript is well-written and concise. It provides useful documentation for users of the data sets and is appropriately scoped for ESSD. The description of the level 2 data is disappointing as it does not appear to include additional quality control expected for this stage of processing that could have been implemented using available software,

like ASPEN. I also have some questions about the data acquisition and processing because it is not clear if the baseline corrections were implemented or omitted. The answers to these questions may only require some clarifying statements, or perhaps a more significant revision of the data set is needed.

Major Comments.

(1) You state that the descent data was collected. I am not certain if this applies to MW41, but for older Vaisala systems, collecting descent data meant running in "research mode", which does not include the standard corrections for solar heating or pendulum motions and omits some quality control procedures too. It is therefore not clear to me if this standard Vaisala processing is included in level 1 or not. If it is, please clarify. If it is not, the data likely needs to be reprocessed.

(2) Descent data is subject to some well-documented biases, some of which I noted above. While Figure 6 and discussion provides good documentation of the relative differences observed between up and down data at EUREC4A, the presentation implies the two types of data are equitable when they are not. It should be made clear that the confidence in the ascent data is higher and you should describe the limitations of the descent data.

(3) Level 2 data: ASPEN is mentioned at Line 205, but it is not defined or referenced. The roadmap provided by Ciesielski et al. (2012, https://doi.org/10.1175/BAMS-D-11-00091.1), which you state that your data is consistent with (Line 180), suggests this step is necessary for a level 2 data set, but it is not clear if this algorithm (or similar) was applied to the level 2 data or not. What were the quality control procedures applied in level 2? It is also important to consider additional sources of error: e.g., even with sonde equilibration, previous experiments on the Brown have identified biases associated with localized heating of the sonde by the ship's superstructure during equilibration, pressure errors associated with relative wind direction, spurious data caused by the ship's exhaust, and other problems (Hartten et al. 2018, www.earth-syst-sci-

data.net/10.1165/2018/). Have you considered any of these potential sources of error and if so how did you address them?

Minor Comments.

Introduction: Consider adding a statement clearly indicating that the current manuscript addresses only the surface-based radiosonde program and not the dropsonde program, which are implied to be closely linked in the experimental design of EUREC4A. Also, if you have it, cross-referencing the doi and or paper describing the dropsondes somewhere in the manuscript would be helpful to users.

Figure 2. (a) I realize the array was positioned over a featureless region of open ocean and this is essentially the map. However, more geographical context is needed for the reader. Having this map include the Caribbean Islands and the northern coast of South America would help, but perhaps some of the details of the transects would be too small after zooming out. Instead, maybe you could include a map with this figure with 6-16N and -60 - -50E displayed as a box to highlight the study region. Indeed, Fig. A1, which includes the inset as well as a useful pattern of SST as a backdrop is an improvement over Figure 2. (b) Can you mark the aircraft pattern too? (c) It would also be useful to see the location of BCO on a map of the island with the prevailing wind direction and maybe the drift tracks of the sondes launched from that station (e.g., context for Lines 247-248)

Lines 87-88: (a) This sentence is confusing as written. I think you mean that you launched 6 times per day (every 4 hours) and that this schedule included 2 launches per day that were timed to match the 0 and 12 Z synoptic times. (b) Those synoptic-schedule times would be the 10:45 and 22:45 launches, but this seems early. Normally for a 90 min launch (Line 82) you would launch 45 min early, so 11:15 and 23:15. Is there an explanation for this?

Section 2.1: (a) It is not clear if the operators from the platforms followed an agreed-upon standard set of operational procedures or if they acted independently. For ex-

ample, was the balloon filling amount consistent? Was the balloon size the same? Was the equilibration procedure consistent? Was the met station and use of met data consistent? (b) There was apparently a large temperature difference between the labs where the sondes were prepared and the release point outside, yet only the Brown's procedures note an equilibration period on deck. If the other locations did not equilibrate the sondes, please note this and provide a warning about the potential for thermal instabilities or shock in the lower atmosphere within the data set.

Section 2.2: (a) Please provide the WMO station ID numbers used for the GTS in the text or table for all platforms. (b) Were all soundings sent to GTS or only the subset on the 6 or 12 hour standard schedule?

Section 2.3.2: (a) Are the bin heights centered, top, or bottom of the averages?

Line 215: change "smaller" to "slower"