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Reply on RC2

Bruce Ingleby et al.

Author comment on "On the quality of RS41 radiosonde descent data" by Bruce Ingleby et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-183-AC1, 2021

RC2 Reviewer 2
This manuscript represents the first comprehensive study to evaluate the quality of radiosonde descent data, develop a correction scheme for temperature warm bias and evaluate its impact on NWP. It has great potential significance to double our global in-situ soundings for various applications.

Thank you.

Specific Comments:

Abstract: How about any results for humidity? It would be useful to mention that the descent data with parachute and pressure sensor are better.

We added a sentence to the end of the abstract: "With current processing the best results are for radiosondes with parachutes and pressure sensors and some of the wind, temperature and humidity data are now assimilated in the ECMWF forecast system."

Besides the biases of the descent data studied here, another important question is which part of descent data are usable. In other words, how to quality-control the descent data? For example, if the sensors are covered by pieces of balloons, the data should be QCed out. Is there a way to identify them? Fig. 4 shows how the balloon, parachute and radiosonde can be tangled together. It is even harder to figure out what they look like during the course of descending.

One obvious measure is to screen out sections when the radiosonde is falling particularly fast (we don't want to be prescriptive at this stage because revised Vaisala processing might change the recommendation). If there are balloon remains wrapped around the temperature and humidity sensors then we don't want to use the data – but it is difficult to know when this is the case. If the data are particularly bad then they should be screened out, either by the Vaisala processing or by the check against the NWP background fields; but smaller errors might be used undetected (a problem not unique to descent data).

L328-329: It is awkward to show the correction results before describing the corrections.
Agreed. We have moved figure 17 to the end of section 4.1.

Section 4 didn't specifically discuss the impact of parachutes. Table 4 shows that Lindenberg has the largest coefficient A, which means the largest biases at the same fall rate. It would be useful to add Lindenberg and Sola data to Fig. 20.
We tried adding Lindenberg and Sola to Fig 20 but it was too 'busy'. Instead we added them to Fig 21 (now Fig 17) - discussed and agreed with Junhong Wang.

NCAR dropsonde team made a lot of efforts to carefully design the dropsonde parachute (see Hock and Franklin 1999), such as the shape, size, material and so on. For future development, is it worth to use better parachutes for radiosondes? How about develop a better balloon-cutting device, so the balloon remnants would not affect the data?
Better parachutes would be good (but would need to be fairly cheap for regular use). A 'balloon-cutter' might be useful, but as we comment (section 2.5, search for 'guiliotines') doing it reliably on the ascent would mean slightly shorter ascent profiles.