Supplement to ‘On the quality of RS41 radiosonde descent data’

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S1 Details of descent reports

As stated in Sect. 2, in 2019 the dropsonde BUFR sequence 3 09 053 (WMO 2019) was being used as an interim measure. At ECMWF a pre-processor was used to convert to the new ‘descent’ sequence 3 09 056 and it is these converted reports that have been made available. The main disadvantage of the dropsonde sequence was that the only identifier allowed was an aircraft identifier - this was set to missing by the MW41 software (newer reports generated directly in 3 09 056 have the WIGOS station identifier). This makes matching ascent and descent reports non-trivial - the last time/position of the ascent and the first time/position of the descent have to be compared. For the collocations in Table 2 a few percent of the descent reports were not matched up.

The BUFR reports give the start point of the profile and time/position offsets from the start point. They do not contain the vertical velocity, but this can be derived from the sequence of heights and time offsets. (In UK RS41 reports from 2018 the time offsets for standard levels, 10/20/30/50 hPa etc, seemed inconsistent with those for other levels by up to about 12 seconds, so standard and other levels should not be mixed when calculating vertical velocity.)

ECMWF provides an openly available package called ecCodes to decode or encode BUFR reports, it is available from https://confluence.ecmwf.int/display/ECC/ecCodes+Home and has Fortran, Python and C bindings. Other decoding packages are available, e.g. https://github.com/NOAA-EMC/NCEPLIBS-bufr/tree/master.

S2 Extra images of balloon remnants after landing

These images were supplied by Timo Laine of the Finnish Meteorological Institute.

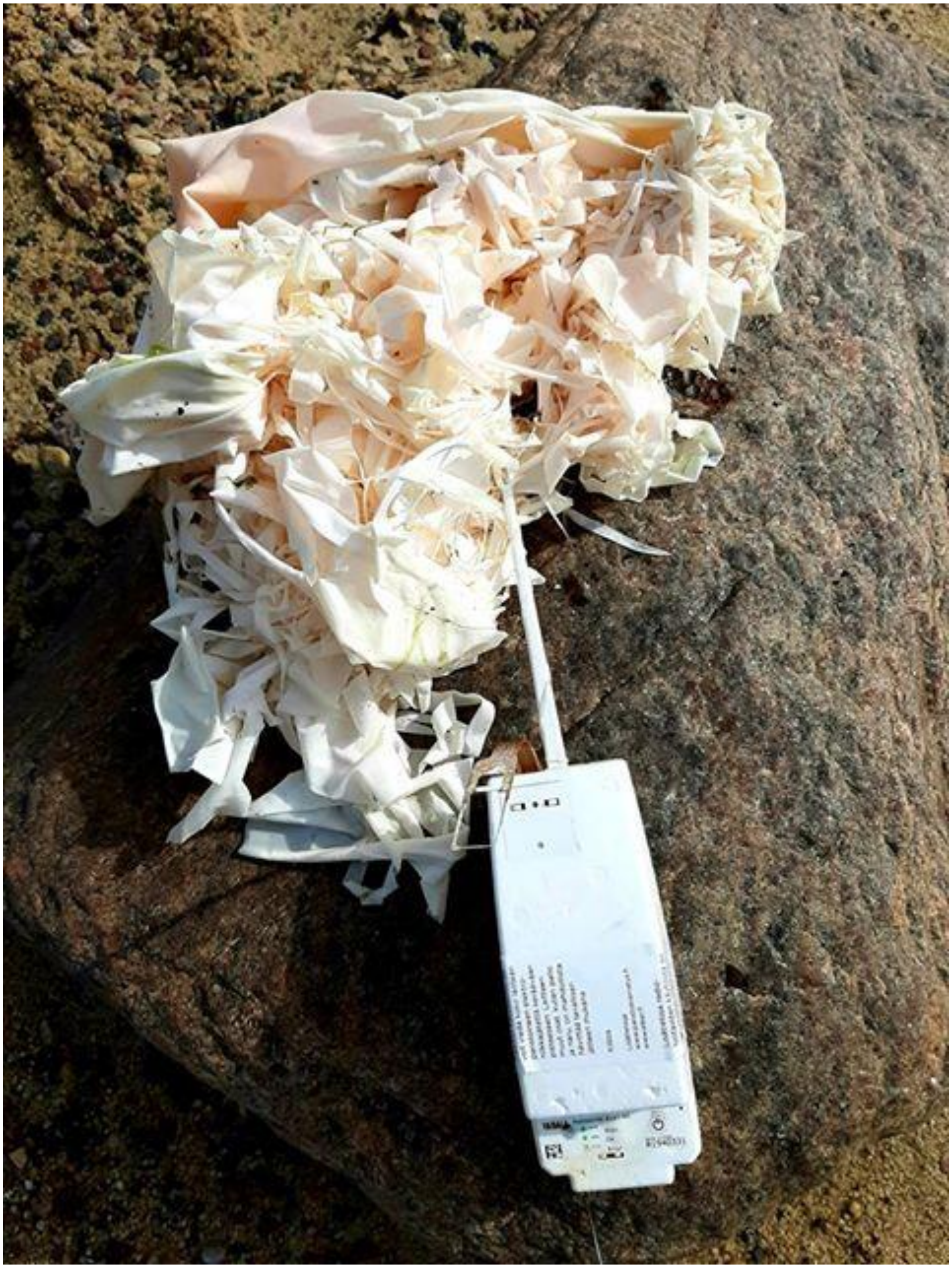

Figure S1. Estonia, Hiiumaa, Tahkuna Beach. This finding was reported to FMI on the 3rd of May, 2020 by Miina Krabbi.

Figure S2. Finland, Tuusula Ruotsinkylä (near Helsinki airport), reported by TV-meteorologist Mrs. Seija Paasonen. The sonde was discovered swinging in a tree, 16th of April, 2020.

S3 Descent rate profiles for Lindenberg

Figures S3 and S4 for Lindenberg, Germany can be compared with Figure 6 for Sola, Norway. Even with parachutes the Lindenberg descents show a lot of variability in descent speeds, but probably less than for Sola.

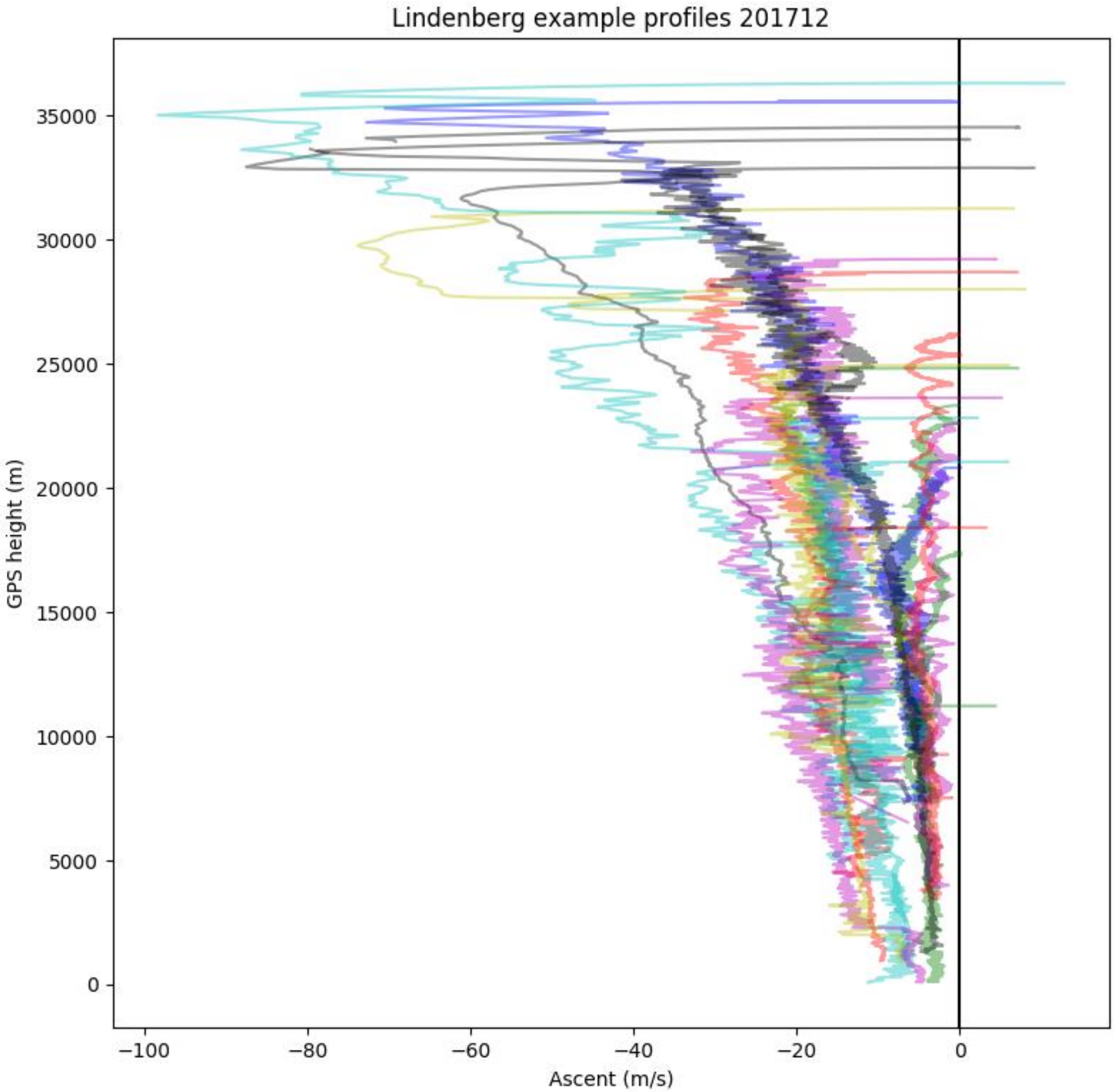

Figure S3. As figure 6, but for Lindenberg descents in December 2017.

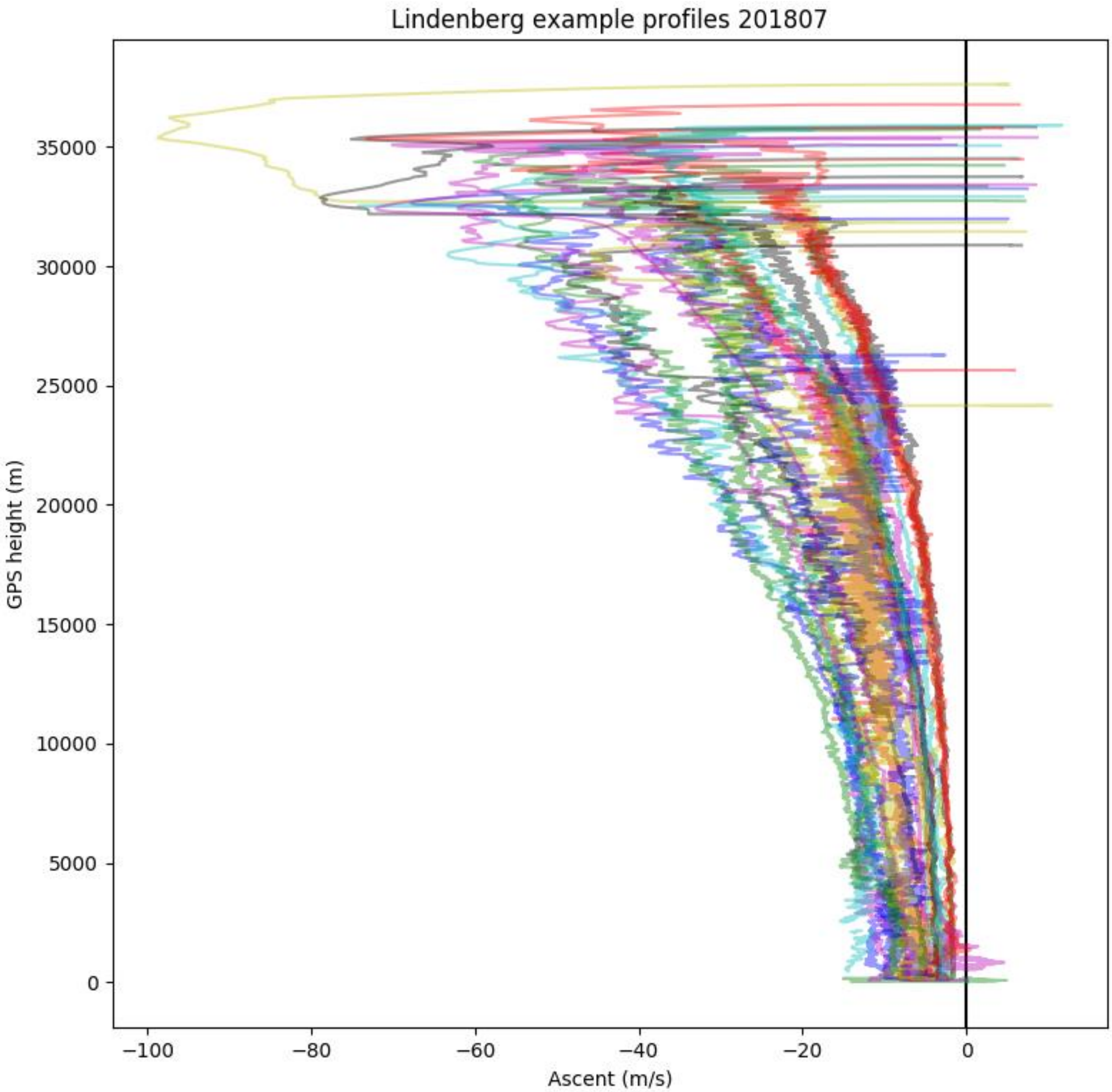

Figure S4. As figure 6, but for Lindenberg descents in July 2018.