

Interactive comment on “Validation of meteorological analyses and trajectories in the Antarctic lower stratosphere using Concordiasi superpressure balloon observations” by Lars Hoffmann et al.

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Dear editor and reviewers,

following the first review comment of Andreas Stohl, we contacted scientists and support staff at ECMWF, NASA, and NCEP/NCAR to clarify the question if the Concordiasi data have been assimilated by the respective centres.

Unfortunately and unexpectedly, it turned out that this was case for both ECMWF data sets and MERRA, but not for NCEP/NCAR. In particular, we learned that 15-min time averaged data from the Concordiasi balloons have been transmitted over the Global

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Telecommunication System (GTS) (Rabier, 2013). The data transmitted over GTS were then assimilated by the respective centers.

We agree that the Concordiasi data can not be considered as an independent data source for direct validation of the large-scale state of the ECMWF products and MERRA.

However, we think that after clarifying the role of the data assimilation in this case, the data can still be used for a useful assessment and intercomparison of the meteorological data sets along these lines:

1) Restrict the intercomparison to ECMWF products and MERRA, but remove NCEP/NCAR from the list. Indeed it would not be a fair comparison, if the Concordiasi data have been assimilated for ECMWF and MERRA, but not for NCEP/NCAR. Following a comment of reviewer #2, we already started to analyze MERRA-2 data, which we would like to include in this assessment instead.

2) Remove statements referring to studies of comparisons with other balloon campaigns, such as Vorcore and PreConcordiasi, where data have not been considered for data assimilation, for the same reason.

3) Analyses are a result of using various observations (satellite and in-situ), a forecast model, and an assimilation procedure. A comparison with the assimilated balloon data does not provide validation in a strict sense, but it still provides information regarding the performance of the overall system. Our study showed notable and significant differences between the ECMWF operational analysis, ERA-Interim, and MERRA, despite the fact that the balloon data have been assimilated (with a potentially large impact). Observing system experiments could help to clarify this question, but are beyond our capabilities. Therefore we propose to significantly shorten the discussion regarding the direct comparison of the analyses and the balloon data in Sect. 3.

4) Instead, we would like to put the focus of the paper on the assessment of repre-

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sentation of small-scale structures in the analyses due to gravity waves, a topic which is already addressed in Sect. 3 of the paper. This analysis remains valid despite the fact that the Concordiasi data have been assimilated, because they were subject to downsampling and/or data thinning. At ECMWF about 40,000 observations have been assimilated according to reviewer #3, whereas our assessment of small-scale structures considered the nearly complete data set of about 2,500,000 observations.

5) Clarify in Sect. 4 that another major aim of the study is the validation of trajectory calculations with the rather new Lagrangian particle dispersion model MPTRAC itself, which was the main reason of conducting this study initially. This purpose can be fulfilled with the Concordiasi GPS balloon tracks, despite the fact that wind and temperature measurements have been assimilated.

We think that a major revision of the paper as outlined above is possible in the remaining time frame. However, before we conduct this revision, we would like to ask for editor approval.

Best regards

Lars Hoffmann (on behalf of all authors)

Reference

Rabier, Florence, et al. (2013), The Concordiasi field experiment over Antarctica: first results from innovative atmospheric measurements., B. Am. Meteo. Soc., 94.3, ES17-ES20, doi:10.1175/BAMS-D-12-00005.1.

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