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Comment

Interactive comment on “Propagation of radiosonde pressure sensor errors to ozonesonde measurements” by R. M. Stauffer et al.

Anonymous Referee #3

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Propagation of radiosonde pressure sensor errors to ozonesonde measurements

by R. M. Stauffer, G. A. Morris, A. M. Thompson, E. Joseph, G. J. R. Coetzee

General comments

The authors present the statistical analysis of the impact of the pressure sensors bias on the ozone mixing ratio profiles. The pressure sensor bias is determined by comparison to the pressure scale estimated from the altitude given by a GPS device and the hydrostatic equation. This pressure error is one of the two less well characterised uncertainty sources for the ozone sondes measurements, the other being the pump efficiency correction.

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Interactive Discussion

Discussion Paper



This paper is relevant for the AMT journal and I recommend its publication after the authors have addressed the remarks below.

The authors should comment on their choice to analyse mixing ratio instead of partial pressure which is the physical parameter derived from the ozone sonde measurements. I think that for example fig 10-b gives a clearer message than fig 10-a to illustrate the pressure scale bias consequence, especially if the paper is primarily addressed to the ozone stations manager.

It is common practice in case of a change of sensors to make direct in-flight comparisons of their response and if it is not possible to reconcile the data to calculate a transfer function. In this paper, the GPS altitude data are used to indirectly link different pressure sensors: for example RS80 \Leftrightarrow GPS and RS92 \Leftrightarrow GPS allow to compare indirectly RS80 \Leftrightarrow RS92 pressure sensors. The authors should comment on the reason why they have not corrected the pressure bias (e.g. fig 4 median bias profiles) at first and estimated the errors in the ozone data in a second step.

Specific comments

Abstract

7772-7: “historical” is a bit misleading since data from 2006 are fairly recent. The question if historical record is not addressed in this paper since no clue is given how to treat historical record going back to 2-3 decades ago.

7772-9 to 7772-11: all the details on the different sondes could be put in the main text and not in the abstract. One sentence from line 8 to 14 !

7772-25 to 7772-29: these statements have to be made with extreme caution. They are valid only if a clear understanding of the data processing (imbedded in the sonde) shows the independence of the pressure sensor and GPS based pressure scales.

Introduction

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Interactive Discussion

Discussion Paper

7773-8 : the results of the more recent intercomparison are available at the WMO site (INSTRUMENTS AND OBSERVING METHODS REPORT No. 107, WMO INTER-COMPARISON OF HIGH QUALITY RADIOSONDE SYSTEMS, Yangjiang, China, 12 July – 3 August 2010 by J. Nash et al.)

7773-25 : the SI2N project could be explicitly mentioned especially if this paper is part of the AMT special issue.

7774-13 : Hurst et al. also report systematic temperature bias that should be discussed in regards to the use of the hydrostatic equation (see for example Richner and Viatte, The Hydrostatic Equation in the Evaluation Algorithm for Radiosonde Data, Journal of Atmospheric and Oceanic Technology, vol. 12, pp 649-656, 1995)

7775-3 : consider the more recent study by Logan et al. (2012), Changes in ozone over Europe: Analysis of ozone measurements from sondes, regular aircraft (MOZAIC) and alpine surface sites, J. Geophys. Res., 117, D09301, doi:10.1029/2011JD016952)

7775-7 : 10 m resolution is valid for fast response sensor like temperature but certainly not for ozone sonde with ~30 sec. response time.

Methodology

7776-17 : the data used in the analysis have to be freely available to the scientific community which is not always the case for campaign data. The information on the campaign and the data availability could not be verified due to US government being “on furlough” at the time of the review.

7777-8 : the difference between iMet sondes types is not explained in the paper and since this manufacturer is not common within the European aerological stations network, some explanation is required.

7777-26 : see General comments, second §.

7778-22 : refer to 7774-13 comment.

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Interactive Discussion

Discussion Paper



7779-3 : better refer to actual comparison (if available) than specifications (see ref. under 7773-8).

7779-8 : please quantify the statement "... considered quite small ..." (see 7774-13)

Results

7780-27 : a comment is necessary regarding the ozone sondes and data processing used at UH and RBH (e.g. manufacturer, solution concentration, PCF, normalisation).

7781-6: is this improved agreement corroborated by a similar comparison of the temperature profiles comparison ? This would give a convincing argument since the temperature sensors are responding faster than ozone sondes.

7781-10 : in reference to the comment 7772-25: is it clear enough that Vaisala internal software do not apply any correction explaining this convergence ? (see same argument at 7772-25)

7781-17 : considering that table 3 contain the numbers, the parenthesis are not necessary (same comment apply to coordinates at lines 7776-21 / 22)

7781 – 20 : on fig 5, the addition of the values at each 0.5 hPa for the different series goes up to 100% except for RS92 apparently. Please check.

7782-4 : fig A2 should appear close to fig 6 (in the main text) since it shows the relatively low impact of a +/- 2hPa offset on the altitude below 15 km.

7782-25/26 : reverse left and right

7783-13 : fig 8, use the same y-scales between A and B (e.g. -30 to 50 DU). The points above 100 DU are not useful to display or if they illustrate something important, adding a comment would be more appropriate.

7783-15 : the assessment that the O3 column is "... too high ..." require the comparison to an independent column measurement (e.g. Dobson, Brewer) and not assuming

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a priori that the column calculated with pGPS gives the true value. This remark is valid for the whole discussion in this paragraph.

7784-23 : in fig. 10 caption, the pressure offset of this particular case should be given. This is also valid for fig. 3.

7786-21 : recommendation 1 doesn't help for historical data !

7786-21 : recommendation 2 is only valid if a proof is given that pGPS is definitively a better pressure scale (see 7783-15).

7787-2 : recommendation 4 makes sense in the light of the point mentioned in the last paragraph under "General comments". Otherwise the authors should give more details on the recalculation procedures they have in mind.

Appendix A

7787-5 to 11 : this part of the appendix discussing a technical point is not useful and can be suppressed.

7787-12 to 16 : see comment 7782-4

7787-18 : for figures A3 and A4, I suggest a different order e.g. column of "RS92"-stations, column of "RS80"-stations, column of "IMet"-stations and finally Houston and "all" figures. This would ease the identification of the bias profile according to sonde type.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 7771, 2013.

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