Atmos. Chem. Phys. Discuss., 4, S3358–S3360, 2004
www.atmos-chem-phys.org/acpd/4/S3358/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Water vapour and ozone profiles in the midlatitude upper troposphere" *by* G. Vaughan et al.

Anonymous Referee #2

Received and published: 19 January 2005

General remarks:

The main scientific result is the RH statistics of the upper troposphere. It provides little new information, compared to the cited literature, i,e, Spichtinger et al (2003) using Lindenberg corrected RS80 data and Gierens et al (1999) using MOZAIC data. The differences to these studies have not been well worked out.

The main technical result is stated in the middle of the paper: "The main conclusion of this study is the A-type humicap performs better in the upper troposphere than the Snow White, provided the Miloshevich et al (2001) correction is applied" (page 5). Although possibly correct, this statement is not well supported. Both the RS80 and

the Snow White have their difficulties. While the calibration of the Snow White has little uncertainty, it suffers from a wet bias both at very dry and very wet conditions as well as some performance uncertainties in the upper troposphere. These issues were pointed out by the authors and have been reported in the literature. The Vaisala RS80-A suffers from calibration issues, which were addressed by Miloshevich et al. and by Wang et al. (2002).The age related contamination issue raised by Wang et al. has not been addressed, although it likely plays a role in this study. The RS80 sondes used in the comparison with the Snow White most likely had the protective cover over the sensor arm, which minimizes the contamination of the humidity sensor inside the package. The RS80 sondes flown between 1991 and 2000 did not have this cover and were subject to contamination, therefore showing slightly different characteristics. This issue needs to be addressed, when applying the conclusions drawn from the Snow White comparison to the larger data set.

Specific comments:

The authors compare their RH statistics to Gierens et al (1999). Gierens report their data between 175 and 275 hPa, corresponding roughly to the 10-13 km layer. The authors consider their own data in this layer not very reliable and don't even show the RH distribution plot. Comparing the MOZAIC distribution for RHice$>$100% and 275hPa$>$P$>$175hPa with their data in the 6-8km and 8-10 km layer does not appear to be a valid comparison.

Fig 4 shows reasonable (not excellent) agreement on the mean behaviour between the two sensors, but given, that they are on the same balloon, the scatter is purely instrumental. The 10-13 km correlation plot shows a larger scatter, which cannot be called excellent. The lines seem to be forced through (0,0). A linear regression would be more appropriate and the fit parameters could be shown in the figure.

The limits to which RS80-A humidity measurements can be considered reliable are somewhat inconsistent. A 50 ppmv limit - depending somewhat on altitude and as-

ACPD

4, S3358–S3360, 2004

suming saturation- would correspond more to a frost point temperature of -60 C and would imply that measurements below -60 C ambient temperature should no longer be used. This would completely eliminate the altitude region 10-13 km. It is possible, that the Snow White gives measurements to colder temperatures, but this needs be looked into very carefully.

Technical corrections:

1st paragraph of introduction: The Vaisala RS90 radiosonde is no longer in production. The newer generation Vaisala radiosonde is the RS92.

Page 2, 1st paragraph: The A-type polymer is faster than H polymer, not slower.

Reference for Spichtinger (2003) has incorrect page number. Reference for Vance et al (2004) is missing

Vance used an older Snow White version, which may have contributed to the wet bias they found.

Page 10, paragraph b): 50 ppbv should be 50 ppmv.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 8357, 2004.