Atmos. Chem. Phys. Discuss., 13, C8321–C8323, 2013
www.atmos-chem-phys-discuss.net/13/C8321/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "A novel tropopause-related climatology of ozone profiles" *by* V. F. Sofieva et al.

Anonymous Referee #4

Received and published: 22 October 2013

Review of ''A novel tropopause-related climatology of ozone profiles" by Sofieva et al.

The authors present a tropopause-related ozone profile climatology which is derived from ozonsonde and SAGE-II data. A detailed description of the climatology construction is given including a discussion of tropopause statistics. The overall benefits of the climatology are discussed and a first successful application as a priori in ozone profile retrievals is provided. In general the paper is well written and the results are presented in a clear fashion. The new tropopause-related climatology is of potential interest for various kinds of data users, including data analysists, chemistry-climate modelers aiming at model-measurement comparisons and scientists developing satellite retrievals. The paper is suitable for publication in ACP after addressing the following comments.

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General comments:

The manuscript would benefit from a discussion of how the here presented tropopause-related climatology compares to existing tropopause-referenced climatologies. While the included comparison between the new climatology and the (sea-level referenced) LLM climatology is interesting and important, some demonstration on the exact benefits of the new climatology over existing tropopause–referenced climatologies (which also reduce the variability in the UTLS) are missing.

If both SAGE II sunrise and sunset measurements occur in the same month and latitude band and are averaged separately differences can be observed (e.g., Wang et al., 1996), beginning around 35 km (2%) and increasing with altitude up to a maximum of âĹij10% at 50km. Please clarify if these issues of the SAGE II sunrise-sunset bias have been accounted for during the climatology construction.

Page 21350, Line 12: Please provide a reference for and/or a short discussion of the SAGE II estimated precision. Other estimates of the SAGE II precision are also available in the literature, e.g., 5% (Cunnold et al., 1989) and 4–8% (Fioletov et al., 2006).

Page 21352, Line 1-3: Do the tropopause height histograms for NCEP at the SAGE II occultation locations and for the ozonesondes agree better if only coincidences are used, i.e., is the difference between the two attributable to the different sampling or rather related to the vertical resolution of the data? If possible provide some information on the quality of the tropopause derived from NCEP data.

Page 21354, Line 8-10: If possible, please provide more information on the SAGE II low bias. Is the bias only restricted to the troposphere or does it also impact the UTLS region which is one focus of this study?

Page 21358, Line 15: Why not use the ML climatology right from the start for merging the data where no SAGE II profiles are available. In such a case a comparison would

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not be impacted by the number of ozonsonde profiles included.

Specific comments:

Page 21347, Line 1: Remove ‘’the” in front of ‘’chemical composition”.

Page 21347, Line 4: ‘’whose thickness” – it is not clear if this refers to the transition region or the single altitude.

Page 21347, Line 20: correct ‘e.g Logan” with ‘’e.g., Logan”.

Page 21350, Line 1: ‘’by Homeyer et al. (. . . ” instead of ‘’by (Homeyer . . .”.

Page 21350, Line 18: ‘’in Hassler et al. (. . . ” instead of ‘’in (Hassler . . .”

Page 21355, Line 26: ‘’ozonesonde” instead of ‘’ozone”.

References:

Cunnold, D. M., Chu, W. P., Barnes, R. A., McCormick, M. P., and Veiga, R. E.: Validation of SAGE II Ozone Measurements, J. Geophys. Res., 94(D6), 8447–8460, 1989.

Fioletov, V. E., Tarasick, D. W., and Petropavlovskikh, I.: Estimating ozone variability and instrument uncertainties from SBUV(/2), ozonesonde, Umkehr, and SAGE II measurements: Short-term variations, J. Geophys. Res., 111, D02305, doi:10.1029/2005JD006340, 2006.

Wang, H. J., Cunnold, D. M., and Bao, X.: A critical analysis of Stratospheric Aerosol and Gas Experiment ozone trends, J. Geophys. Res., 101(D7), 12 495–12 514, 1996.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 21345, 2013.