Atmos. Meas. Tech. Discuss., 7, C1712–C1714, 2014
www.atmos-meas-tech-discuss.net/7/C1712/2014/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Characteristics of tropopause parameters as observed with GPS radio occultation" *by* T. Rieckh et al.

Anonymous Referee #2

Received and published: 15 July 2014

An analysis of tropopause parameters (height and temperature) is presented covering ∼12 years of GPS RO data. The WEGC (authors' affiliations) retrieval product is used and the first and secondary tropopauses are obtained for individual profiles. The authors study the geographical variability, annual cycle, and inter-annual variability of tropopause height and temperature. Known characteristics of these tropopause parameters are confirmed.

Overall I find this paper to be straightforward and very well written. My main concern is that most of the presented results are really just confirmation of what is already known. Many of the more recent tropopause studies (as referenced) also use GPS RO data, although from other retrievals. It is therefore not clear, what new insight comes from the present analysis. Figures 3-6 repeat what has already been shown in previous studies,

but for only one out of the ∼12 years of available data. The ENSO related variability is demonstrated based on only one cold and warm phase, respectively. It is not clear how these results cary over to the longer data record. Figures 10 and 11 include some novel ways of characterizing the stratospheric influence on tropopause height and temperature. One relevant reference for this that I didn't see listed, is: Son et al., Intraseasonal variability of the zonal-mean extratropical tropopause height, J. Atmos. Sci., 64, pp 608-620, 2007. Son et al. show how stratospheric temperatures have a strong influence on tropopause height, which seems relevant for the SSW related analysis here.

In summary, I think the authors need to much more clearly state in what way the present analysis adds to the existing state of the art. Additional analysis and/or discussion may be required to make this contribution sufficiently novel to allow publication.

Minor comments:

To me, the Tables are not needed, as they merely repeat the information given in Figures 3 and 4.

4694, line 14 (and at other places, e.g. 4700 line 15, 4708 line 5): Temperature and wind fields are to a good approximation coupled through the thermal wind balance – in that sense neither "influences" the other, they are simply reacting to the underlying large-scale dynamics in a consistent way. You could simply say something like "due to variability in the subtropical tropopause break".

4695, line 3: Arguably, most of the troposphere-to-stratosphere transport occurs within the upwelling branch of the Brewer-Dobson circulation, which due to adiabatic cooling and freeze-drying also sets the water vapor amount. Deep convection can certainly have an impact, but is usually not considered to be the dominant process.

4696, lines 24-28: In many ways the present analysis also concentrates on the broad scale spatio-temporal mean structure, so I don't fully understand this motivation. Yes,

Figures 3-6 show individual data points, but there are so many of them, that the predominant structures don't look very difference from monthly averaged contours. Also, it's not clear to me why the authors choose to look at the mean and median only, if they'd like to gain more insight into the distributions? Mean and median alone are certainly not sufficient to characterize a distribution.

4700, line 5/6: slightly confusing – tropopause height is primarily a function of surface temperature, tropospheric lapse rate, and stratospheric temperature (which is in part set by the Brewer-Dobson circulation, see e.g. Birner, Residual circulation and tropopause structure, J. Atmos. Sci., 67, pp 2582-2600, 2010); baroclinic waves actually act to lift the tropopause in the extratropics by lowering the lapse rate

4707, line 2: suggest to insert "can" before "increase" – 50 K do not happen for every SSW

Figures 5, 6: the circles / ellipses on the plots need to be explained

Fig. 7: I found showing two full cycles somewhat confusing – how about adding just 3 months on either side of the annual cycle (start in Oct, end in March), that way things should look clear, but one is not mislead into thinking there is a semiannual cycle. If the plot is left as is, it would help to draw a vertical line at January (middle of panels).

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 4693, 2014.