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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tropopause height at 78 N 16 E: average seasonal variation 2007–2010" *by* C. M. Hall et al.

Anonymous Referee #2

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General comments

This paper presents the seasonal variation of the tropopause height derived from radar observations (SSR2 radar) in the period 2007 to 2010. These variations are observed in order to better understand the processes governing the tropopause height which is presumably a sensitive metric of the global climate change. The main results are the followings: a minimum of tropopause height occurs in spring (early April) about one month after the minimum of surface temperature. That minimum is coincident with the maximum in the O3 column. The tropopause height is observed to increase in summer as the surface temperature increases and total O3 decreases, the maximum height occurring in August. A secondary maximum in the tropopause height is also observed in January.

Undoubtedly, the paper brings valuable informations about the seasonal variability of the tropopause height and presumably related quantities. The authors reached the conclusion that the tropopause height variations are primarily thermally driven, controlled by both the the tropospheric and the stratospheric temperatures. However, to my opinion, part of the conclusions is not very convincing. Also, I found the conclusive discussion rather short.

My suggestions for improvement of the manuscript follow: once these are addressed to the satisfaction of the editor, I recommend publication.

Major comments

1. The authors used the surface temperatures and the total O3 as the two relevant quantities for describing the tropopause height variations. Why limiting the comparisons to those? It seems pertinent to compare tropopause heights with the mid-troposphere temperatures (500 hPa for instance) or stratospheric temperatures. Even if they are not co-located, radiosondes (RS) measurements can be sufficient for describing monthly means of temperature.

2. The secondary maximum of the tropopause height is not observed at all in 2009. Do you have any explanation? (The fact that radiosondes measurements do not extent over the same period as radar measurements appears rather limiting in that case).

3. I do not understand the conclusion that "The winter ozone depletion coincides with the secondary maximum in tropopause altitude". Figure 5 shows that the minimum in total O3 is observed in October, total O3 being then increasing from November to April (it is maybe more conclusive here to directly compare with stratospheric temperatures).

4. The tropopause height is likely controlled by several interacting processes. What part of the observed variability can clearly be related to thermal effects? What part can not? Is the position of the radar location relatively to the polar vortex a relevant information?

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Minor comments

1. l 12, p 3 : “79” should read “78”

2. Why using a Lee filter – usually used for image processing - in that context? Please explain.

3. Figure 3, numbers and legend are too small (difficult to read). Furthermore, no uncertainties can be visible in the bottom panel. Also, legends of Fig. 5 are too small.

4. The origin of the systematic difference between the radar and meteorological tropopause heights should be discussed, at least briefly, in this paper.

5. The reference to Santer in incomplete in the reference list.

6. Zängl is misspelled in the reference list.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 39, 2011.