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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A global climatology of stratosphere-troposphere exchange using the ERA-interim dataset from 1979 to 2011" *by* B. Skerlak et al.

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First of all I would like to say that I have found this a very interesting and nice paper. In my view the authors have done a great work putting numbers on results that to the date just were climatological descriptions. That said I would like to point out a few details and previous and very recent research. Altough it can seem slightly self-serving I think that it will help the authors to support their results and with them the readers will have a more profound view of the subject.

- The authors mention several times in the manuscript the maximum height of the PBL

and more explicitely over the Himalayas. They say that it is so high as 3km above ground level. The could not be aware of a two recent studies that show that the PBL over the Tibet can reach in fact 9.4 km above sea level and study the STT and TST exchange during such event:

Chen et al. (2013) The Deep Atmospheric Boundary Layer and Its Significance to the Stratosphere and Troposphere Exchange over the Tibetan Plateau. PLoS ONE 8(2): e56909. doi:10.1371/journal.pone.0056909 Chen et al. (—-) A record 9.4 km measurement of top of the atmospheric boundary layer over the Tibetan Plateau (submitted to Q. J. R. Meteorol. Soc.) and available from http://users.ox.ac.uk/∼smit0069/ABL_Tibet.pdf

Having into account that they use a lagrangian transport model and their discussion on deep exchange events, these two references no doubt will improve the discussion of their results.

- It is good having tested different PV values, but it is an obvious question that it is clarified to the end of the paper. I think that it would be better to clarify it at the beginning of the point 2.2. Maybe it would be good to mention the results by Klaus P. Hoinka in his paper on the tropopause in the Monthly Weather Review (1998). There is there a nice discussion of the problem of matching the PV field with the tropopause.

- From point 3.1.1 I would like to bring the attention of the authors to the patterns found by Randel et al. (2007) and Añel et al. (2008). The patterns found here by the authors (Figs. 5 and 6) clearly match the previous results mentioned of maximum occurrece of multiple tropopauses. This is at the same time an obvious result and extremely interesting. Multiple tropopauses from reanalisis and radiosondes should agree with the results from Sprenger et al. (2003) but at the same time continues to be a lot of controversy on the origin of the air massess for this multiple tropopause/deep exchange/folding events (if it is predominantly tropical or extratropical and if TST or STT is predominant on a given region). This has been studied and recently published

combining langrangian analysis and radiosondes for Boulder (Añel et al. 2012). I think that the authors would improve the manuscript it they discuss their results on the light of these previous findings.

Randel et al. (2007) Observational characteristics of double tropopauses, J. Geophys. Res., 112, D07309, doi:10.1029/2006JD007904. Añel et al. (2008) Climatological features of global multiple tropopause events, J. Geophys. Res., 113, D00B08, doi: 10.1029/2007JD009697. Peevey et al. (2012), Investigation of Double Tropopause Spatial and Temporal Global Variability Utilizing HIRDLS Temperature Observations, J. Geophys. Res., 117, D1, doi: 10.1029/2011JD016443. Añel et al. (2012) On the Origin of the Air between Multiple Tropopauses at Midlatitudes, The Scientific World Journal, vol. 2012, Article ID 191028, 5 pages, 2012. doi:10.1100/2012/191028.

The results found here on time series (point 3.5) probably has something to do with (and are supported by) the detected trends of UTLS baroclinicity and percentages of double tropopause ocurrences. I find that citing the following reference in this manuscript would help to support a result not so deeply discussed:

Castaheira et al. (2009) Increase of upper troposphere/lower stratosphere wave baroclinicity during the second half of the 20th century, Atmos. Chem. Phys., 9, 9143-9153 Castanheira et al. (2010) Corregindum to "Increase of upper troposphere/lower stratosphere wave baroclinicity during the second half of the 20th century",Atmos. Chem. Phys., 10, 9057-9058

Finally one more time my congratulations to the authors for this nice work.

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