

Interactive comment on “Characteristics of the tropical tropopause inversion layer using high-resolution temperature profiles retrieved from COSMIC GNSS Radio Occultation” by Noersomadi Noersomadi et al.

Anonymous Referee #2

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Comments to “Characteristics of the tropical tropopause inversion layer using high-resolution temperature profiles retrieved from COSMIC GNSS Radio Occultation” by Noersomadi Noersomadi et al.:

This study investigated the characteristics of the tropopause inversion layer using the high vertical resolution GNSS-RO data. It gave more details of the TIL sharpness and depth compared to previous studies, including the climatological mean and the intra-seasonal to interannual variations. In particular, this work gives a special focus on two different longitude regions (the Maritime Continent and the Pacific Ocean). It extended

C1

previous work by related the interannual and intra-seasonal variations of the TIL to ENSO and MJO, respectively. It is well laid-out and well written. However, there are still some problems need to be fixed before publication.

Introduction The most relevant previous work to my understanding is Grise et al. 2010. Grise et al. 2010 already presented a global survey of the TIL strength (including annual cycle, horizontal distribution and interannual variations related to QBO) using the GPS-RO data with a vertical resolution also 0.1 km. However, it is not introduced in the introduction. It would be necessary to introduce results from Grise et al. 2010 and clearly describe what kind of improvement does this study want to have compared to them.

P2L12: “A very low temperature in the TIL”, TTL should be better here

P3L6-10: I think it is now commonly known that the vertical resolution of the GPS/GNSS-RO data is up to 0.1 km. This sentence misleads the authors with a impression that the vertical resolution of GPS/GNSS-RO data is 1 km. Please rephrase this paragraph here.

Data P3L35-40: To my experience, the cosmic data from CDAAC should has data available for 0.1 km vertical resolution, e.g. wetPrf. Also note, most of studies as I know (Randel et al. 2007; 2010; Grise et al., 2010; Kedzierski et al., 2016 etc.) using cosmic data from the CDAAC and has vertical resolution of 0.1 km. I am not sure whether it is true that the cosmic2013 smoothed the data over a 0.5 km scale. Please check that carefully.

Figure 1: For the cosmic2013 data. The GPS-RO data is well known to be very accurate with high vertical resolution. From the Figure shown in Figure 1, the temperature profile is heavily smoothed. I strongly doubt for the results shown here. Please check carefully whether you are using the correct type of product from the cosmic2013 data.

TIL definition: There has been a lot of definitions to TIL strength, sharpness or

C2

thickness. Beside the authors mentioned, please also include Randel et al. 2007; 2010 and Wang et al. 2013 for the TIL definition using the temperature gradient. Randel, W. J., Wu, F., and Forster, P.: The Extratropical Tropopause Inversion Layer: Global Observations with GPS Data, and a Radiative Forcing Mechanism, *J. Atmos. Sci.*, 64, 4489, doi:10.1175/2007JAS2412.1, 2007. Randel, W. J. and Wu, F.: The Polar Summer Tropopause Inversion Layer, *J. Atmos. Sci.*, 67, 2572–2581, doi:10.1175/2010JAS3430.1, 2010. Wang, W., Matthes, K., Schmidt, T., and Neef, L.: Recent variability of the tropical tropopause inversion layer, *Geophys. Res. Lett.*, 40, 6308–6313, doi:10.1002/2013GL058350, 2013.

Definition of the TIL thickness: I don't know whether it is necessary to have new definitions of TIL sharpness and thickness since there have been so many kinds of definitions. If the authors feel it is necessary, please address the reason clearly here. In particular, why a 80% is used for the dH. Are there any physical or statistical reasons? Otherwise, I would suggest to using the existed definitions, for example, the maximum of N2 above the tropopause for the TIL sharpness.

Results: For the global distribution and seasonal variations of the N2 and TIL, it would be very helpful to have some comparison to previous work like Grise et al. 2010. Please describe clearly whether the results are consistent with each other and what are new findings from the previous work.

Figures 5 and 7. The values of N2 above the tropopause is not clear. Please update the color map used for these figures.

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