

## ***Interactive comment on “Wave Modulation of the Extratropical Tropopause Inversion Layer” by Robin Pilch Kedziersk et al.***

**Anonymous Referee #2**

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ACPD REVIEW

TITLE: Wave Modulation of the Extratropical Tropopause Inversion Layer AUTHORS: Robin Pilch Kedzierski, Katja Matthes, and Karl Bumke

Summary: This paper examines the influence of waves on the middle latitude and polar tropopause, particularly the increase in static stability often found just above the tropopause, (TIL, tropopause inversion layer). The analysis of tropopause structure is based on a detailed analyses of GPS RO observations. Results show that most of the extratropical TIL variability can be explained by synoptic scale Rossby waves. Results also show how changes in stability propagate downward during SSW events. However, the authors also note that there is still significant unexplained variability, especially in the NH polar region. The paper is well organized. The abstract state both the problem

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and the main results. The introduction references and reviews appropriate material. The methodology is explained in detail. Results are clearly presented by hemisphere and latitude. Overall the is an excellent paper that should be of interest to many readers of ACP.

Overall Recommendation: Publish after minor changes.

Major Comments:

Line 278: Regarding Fig. 3: Are the tropopause zonal structures calculated directly from the GPS-RO or from the tropopause-base coordinate? Does it make any difference? Also, if these are zonally averaged tropopause heights, it should state so in the Fig. 3 caption.

The paper mentions summer/winter differences in discussing Figs. 5, 7, and 9, yet it appears as if some the largest TIL events occur more in the spring, assuming the year tick marks denote the start of the new year. Would it be useful to discuss the results in terms of four seasons instead of just two?

Minor Comments:

Line 2: Probably should be something like “. . .how much amplitude and variability of the Tropopause Inversion Layer (TIL) comes from modulation by. . .” (optional)

Line 10: Once again: “The instantaneous modulation. . .” of the tropopause?, the TIL? I think it would read better if it explicitly stats what is being modulated. (optional)

Line 12: “. . .minor importance for the TIL amplitude and variability. . .” (optional)

Line 29: “. . .all latitudes. . .” The paragraph begins with discussing the extratropical TIL so does “all latitudes” include the tropics too or just extratropics?

Line 120: The paragraph beginning on line 120 starts with ERA-Interim and ends discussing GPS-RO. It seems awkward. Also, this appears to be the only mention of the ERA-Interim winds. It might improve the reading to tell how the ERA-Interim winds will

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be used to place the GPS-RO observations into a broader context by identifying SSW events and seasonal wind changes. It also might be a good idea to acknowledge the source of the winds explicitly in the appropriate figure captions as well. (optional)

Line 165: "...all..." Weather sometimes changes more rapidly than 2-days. Maybe the "all" should be qualified to "most of" or "the majority of". (optional)

Line 194: "...and frequency..." "and lower frequency" maybe

Line 333: "...highest period..." maybe "longest period" would read better.

Line 368: "...TIL is clearly discernible in winter..." Maybe eliminate the word "clearly", as these features are relatively small in Fig. 5. Also, the TIL may be more distinct in spring than in winter (see second major comment).

Line 529: "...clear TIL during summer months..." Once again, maybe eliminate the word "clear", and the timing of the maximum TIL may be more toward spring than summer, but it is difficult to tell from the figure.

Other:

Some acronyms/variables are not defined where first introduced. These include: COSMIC GPS-RO (line 5), z (line 115), TPz (line 117), WMO (line 17), NCL (line 173).

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