

Interactive comment on “Tracer measurements in the tropical tropopause layer during the AMMA/SCOUT-O3 aircraft campaign” by C. D. Homan et al.

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This paper presents CO₂, N₂O, CO, and O₃ measurements taken in-situ from the Geophysica high-altitude research aircraft during the SCOUT-AMMA campaign of 2006. The manuscript clearly sets out its aims (and the context of those aims from the peer-reviewed literature) and then clearly sets out its results and the inferences that can be drawn from the results. The results are compared to earlier data from the same group (for ozone profiles) and from another group (ASHOE-MAESA lower-stratospheric tracer-tracer slopes). I recommend that the manuscript is accepted, subject to the following minor comments.

Minor comments:

P25050, abstract and lines 12ff of the Introduction: If the abstract is to discuss the TTL using potential temperature coordinates, please provide a sentence defining the limits of the TTL for the purposes of the study (i.e., using literature definitions or directly from the SCOUT-AMMA observations).

P25050, abstract: please distinguish more clearly between the “subtropical tropopause” and the “subtropical barrier”.

P25050, abstract: for clarity, I would suggest “was mostly located at potential temperatures between 350 and 360 K”

P25050, abstract: please be more specific than “not fresh, but of older origin” – assign rough time periods to “fresh” and “older”.

P25050, abstract: I think the phrase “TTL composition during AMMA” should be qualified to read “gas-phase tracer TTL composition during AMMA” or something similar, to avoid the water vapour story.

P25051, abstract: 0.2 (20%) is usually thought of as a significant fraction, so this sentence and the sentence prior to it, should be re-written.

P25051, abstract: the final sentence does not deliver what is promised earlier in the abstract (to analyze... horizontal transport across the subtropical barrier) but rather shows why this analysis is difficult. Perhaps there should be some re-wording earlier in the abstract.

P25052, line 10: HCL should be HCl

Introduction: I think it is appropriate to cite the three previous papers that discuss TTL tracer structure from Geophysica measurements: MacKenzie et al. (2006), Cairo et al. (2008) and Vaughan et al. (2009).

P25052, line 22: I think “trade-off” is not quite right in this context. It is not that in-

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creased subtropical jet dynamics results in decreased tropical convection (is it?) but rather that the TTL composition results from the combined effects of both. P25052, line 26ff, please modify the discussion here to include Ricaud et al (2009) as well as Ricaud et al (2007).

P25054, line 9, the CALIPSO satellite is not spelled with a “Y”.

P25055: The impact of convection on the TTL depends not only on mass flux and maximum altitude of outflow, but also on the composition of the air entering the convection. Of particular current interest is the proportion of free tropospheric air entrained into the convection and detrained in the TTL, and what implications that has for the amount of boundary layer air detrained in the TTL (Fridland et al., 2004). The introduction to this section should be amended to reflect this.

P25056: I think that the discussion of the importance of overshooting should cross-reference other SCOUT-O3 papers on this topic, particularly Ricaud et al., 2009; Khaykin et al., 2009; and Arteta et al., 2009.

P25066: “shapen” should be sharpen.

References

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