**Atmospheric
Chemistry
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Discussions**

Interactive comment on "Diagnostics of the Tropical Tropopause Layer from in-situ observations and CCM data" *by* E. Palazzi et al.

Anonymous Referee #1

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Review of "Diagnostics of the Tropical Tropopause Layer from in-situ observations and CCM data" by Palazzi et al.

This paper compares the E39C-MESSy model with high altitude Aircraft observations from tropical campaigns with the Geophysica aircraft to examine the structure of the Tropical Tropopause Layer (TTL). Diagnostics recently developed for the extratropical Upper Troposphere and Lower Stratosphere (UTLS) are applied. The application of the new diagnostics is useful and interesting. However conclusions are thin and not quantitative. It is hard to discern if the model is 'good' or 'bad' in any objective sense from this analysis. This paper may be suitable for publication in ACP subject to major revisions.

The major issues that need to be addressed include:

1. Methodology: in particular, how is averaging conducted? It looks like everything is averaged and then tropopause relative coordinates are applied. Is that valid? On the detailed scales you are looking at below the tropopause (10-40hPa, maybe 1-2km) local deviations might matter.

2. More quantitative results: is the model good or bad? Can it reproduce the observations successfully or not? In many cases, the model variability range lies outside of the range of observations. The ozone gradients in Figure 4 seem out of range of observations.Can you make a quantitative metric using the observations (e.g.: depth of TTL based on ozone gradient) and report model values and variance compared to observations in a quantitative way? Some more quantitative metrics of the pdfs in figures 7-9 are also necessary.

3. In addition to making the paper more quantitative, the conclusions need to be made sharper. In its current form, starting from the abstract on, there is really no definitive statement made about the model fidelity, quality or balance of processes going on. Again, focusing on ozone: why are the observations and model different? What does that mean. Why is ozone off for APE-THESEO, but N_2O off for TROCCINOX? This paper needs more analysis.

4. There are numerous grammar mistakes that should be corrected in a revision as well (mostly minor).

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 11659, 2009.