

We thank the reviewer for his/her comments. Below are our responses in blue.

The main changes were:

- We added the main conclusion to the abstract
- We modified the symbol size for the ozonesondes and lidar in figure 1
- We added a rationale for the period and datasets used.
- We added a rationale for the usage of “zonal” means.
- We added a brief discussion of the WMO multiple tropopauses and tropopause breaks
- We added several references as suggested by the reviewers.

### Reviewer 3

This is a well-focused, well-constructed, and well-executed study evaluating the use of various reference coordinates for examining upper troposphere lower stratosphere ozone distributions. Numerous datasets are leveraged to carry out the analysis and the results are consequently very robust. While it is lean on new discoveries, the study is nevertheless a worthwhile precursor to more extensive efforts expected in the future. I have nothing but a handful of minor suggested revisions below.

The Abstract: some text should be added to the abstract to capture the main conclusions of the work. As it stands now, the abstract is a bit too vague and descriptive of the effort rather than the outcomes. A synthesis of the bulleted items from Section 5 or at the very least the most important elements of them would suffice.

We added at the end of the abstract: Overall, the use of equivalent latitude-potential temperature leads to the most substantial reduction in binned variability across the UTLS. This coordinate pairing uses PV on isentropic surfaces thus following the transport of tracers in adiabatic frictionless flow.

In several places within Section 3 & 4, the text would benefit from a discussion of the tropopause break, tropopause errors, and some other common features. The WMO tropopause would be impacted most by some of these challenges and it is important to emphasize why such is problematic and why (physically) alternatives such as PV or simply potential temperature would/should/could perform better.

We changed the first sentence discussing the WMO versus PV tropopauses: In general, Figure 6 suggests that dynamical tropopause based coordinates resolve the ozone gradients across the tropopause region better than the WMO tropopause based coordinate. **This is not unexpected as the WMO tropopause results in breaks and multiple tropopauses between the tropics and the extratropics (e.g., Randel et al,**

**2007, Pan et al., 2009, Homeyer et al., 2010) rather than a continuous transition as provided by the dynamical (PV) tropopauses.**

Line 106: "effective resolution" should be "effective **vertical** resolution". [Done](#)

Line 114: Add "2008" before the open paren as there was also a START05 that preceded this mission. [Done](#)

Line 184: suggest adding Tian & Homeyer 2019 here too. [Added](#)

Line 331: recommend deleted "sub-" as "categories" seems sufficient. [Done](#)

Line 332: "coordinates" should be "coordinate". [We changed the sentence from “the use of a tropopause-relative altitude coordinates” to “the use of tropopause-relative altitude coordinates”](#) Fixing the plural error