

Interactive comment on “Classification of tropospheric ozone profiles over Johannesburg based on MOZAIC aircraft data” by R. D. Diab et al.

Anonymous Referee #2

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The intent of this paper is excellent and the authors have done a very good job of introducing a new tool for the analysis of tropospheric ozone profiles. Their conclusions are mostly consistent with the current understanding of the tropospheric ozone budget on the limited set of data they analyse. It is important to get this study into the refereed literature so that other researchers will be able to apply the methodology presented to other tropospheric ozone data sets. The primary problem I had with the paper was the constant flipping between figures to follow the discussion. Thus, although my technical comments are presented to improve the general quality and richness of the paper (and I will leave it to the authors to decide how much of those comments should be addressed), I would strongly suggest that the figures be improved so that future readers will not have to perform the "flipping back and forth" that I experienced.

These logistical solutions are fairly simple.

1. On Figure 2, each of the panels should be labelled, (single mid-trop. peak, etc.)
2. On Figure 3, each of the panels should similarly be labelled, and a small insert from each of the Figure 2 panels should be included. A colour legend within each of these plots would also be helpful.

Technically, the concerns and suggestions are less critical, but should be addressed:

1. On the top of page 7, it is not clear from which point trajectories have been calculated. For each altitude, are the trajectories calculated at the actual location of the airplane, or are they calculated at an altitude above Johannesburg? If the latter is true, does it make a difference? Some clarification and additional text should be added.
2. On page 11, the authors state that the "most distinguishing feature... is the descending air" but that the figure is "not shown here." I think the paper would be improved with the inclusion of the figure that is not shown.
3. For the Type 2 profiles (Steady tropospheric increase) discussed on pages 12–13, it appears that South America may be source region for this upper tropospheric enhancement. Would the authors care to expand the discussion along these lines?
4. The analysis and discussion accompanying Figure 5 is very good and insightful. However, instead of using ppbv on the X-axis, using molecules of O₃ per cm³ on the X-axis might provide a somewhat different interpretation, and possibly a more insightful one. The authors should consider adding such a discussion.

Finally, here are some minor points:

1. spelling of Kirchhoff on page 4 and in the references (although I have seen it spelled incorrectly in the scientific literature).
2. the authors might want to go back and review some of the earlier papers in the literature that first examined ozone profiles from aircraft and the attempts to characterize these profiles. For the most part, there was an excellent discussion of variability and

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the origin of the air sampled in Fishman et al. (1980, *Tellus*, 32, 456-463), Seiler and Fishman (1981, *J. Geophys. Res.*, 86, 7255-7265) and Fishman and Seiler (1983, *J. Geophys. Res.*, 88, 3662-3670). Furthermore, the information from these 1974 flights showed how aircraft measurements of the type that are now routine on MOZAIC flights could be enormously insightful to help understand tropospheric chemistry.

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