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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A Tropical West Pacific OH minimum and implications for stratospheric composition" *by* M. Rex et al.

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Dear reviewer,
thank you for reviewing our paper and your helpful comments.

General changes

- We restructured the paper by introducing a new section structure, divided into "Measurements", "Modeling" and "Effect on chemical species". The introduction has been expanded considerably by moving paragraphs from later sections at the beginning of the paper. The appendixes have been integrated into the main text, with the exception of Appendix A. Several paragraphs have been moved to

positions where they fit better into the context. A "Conclusions" section has been added. A description of the sections has been added to the introduction. The abstract has been extended. Some more specific changes can be found at the end of this reply under "Additional changes".

Comments

- 1) Based on our experience with ECC ozonesondes we agree that assuming a very rapid drop of the background current after launch is an extreme approach. But as we discuss in the paper, there is a broad range of suggestions for background current corrections in the literature, which also includes the Voemel and Diaz paper. In this situation we think showing our "robust upper limit", which is based on not subtracting any background current is useful. You may be right that this is a fairly conservative approach to establish the upper limit of our measurements but we think this is a particular strength of our study – our findings are robust even for the most extreme assumption on in flight background current decline, since we find extremely low ozone mixing ratios throughout the troposphere even then.

- 2) Overall we toned down these conclusions considerably and have focussed the study more on the main findings, which are much more robust. We have formulated the statement that the changes in aerosol may lead to more global warming more carefully and have removed it from the abstract. We do not claim that "the perturbed chemistry is global". It is clearly stated that the "perturbed" chemistry is restricted to the West Pacific. Nevertheless, since the main source region of stratospheric air is in the West Pacific, changes in composition in the West Pacific troposphere can have a disproportionally large and global effect on stratospheric composition. Also, the paper does not claim that the "entire" photochemical balance of the lower stratosphere is "dominated" by the chemistry

of the Western Pacific. We have reworded parts of the paper to avoid such a misunderstanding.

Additional changes

- Changed “Much of our understanding of transport of short-lived species into the stratosphere is based on studies that assume fixed uniform lifetimes” to “Some important studies were based on fixed uniform lifetimes of OH in the past”.
- We rephrased section 2.1 to discuss more ozone measurements and to discuss the CEPEX measurements in more detail. In particular, we added a reference to the Appendix, where we propose that there is a low bias in the CEPEX measurements compared to our measurements. We added discussion on additional ozone sonde measurements (Fujiwara et al., Takashima et al.).
- We have split Figure 4 (old manuscript) into two Figures. These are the Figures 9 and 10 in the new manuscript.
- Figure A4 (now Figure 5) was blurry. A new version is included in the new manuscript.
- A new Figure 6 showing OH profiles from the model run and discussion in the text comparing these profiles to the PEM-Tropics B measurements has been added.
- In the description of the back trajectories, the information that the trajectories were started in January was missing and has been added.
- Added discussion of OH modeling uncertainties.
- We have removed Figure A2 and the corresponding paragraph and moved the discussion into the main text.

- Added discussion on interannual variability and relation to ENSO, including two figures.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 28869, 2013.