

Dear Editor,  
many thanks for your effort again and also many thanks to the referee! Here are our replies to the comments of the referee.

Best regards, Ingo Wohltmann

- Model uncertainties: We are aware that model uncertainties are a major uncertainty in our study and that was the reason why we included some discussion and references in the revised version. A quantitative estimation of the uncertainties would require a large number of sensitivity runs and a thorough investigation of the model. We think that this is beyond the scope of this study. It would be more appropriate to publish such a study, which would require a lot of additional discussion, in a separate publication. We hope we have formulated all conclusions and discussion that depend on the model results much more carefully now.
- page 2, top line: Changed.
- page 2, lines 68-73: Indeed, that was confusing. Rephrased the sentences.
- page 2, line 100: There is no sentence starting in this line. Is there a typo in the line number?
- page 3, line 160: Changed.
- page 3, Figure 2, last line and page 8, line 440: If possible, we give OH concentrations, since this is the relevant value for chemical reactions. For the comparison with the Tan et al. paper, mixing ratios are needed. This is the reason why Figure 6 and some of the accompanying discussion use mixing ratios. At Page 8, line 440, we now give both concentrations and mixing ratios. We assume that your reference to Figure 3 is a typo, since Figure 3 contains ozone columns.
- page 3, lines 183/184: Changed.
- page 4, line 227 and Figure 4a caption: Changed in the text. We don't think that changing the color of the circles to yellow improves the readability of the figure.
- page 4, line 283: Omitted "large".
- page 5, line 372 and Figure 4h: Figure 4h shows the percentage of the trajectories in a certain bin divided by the width of the bin. This way, the values do not change when changing the bin width. Added a short explanation in the text.

The statement that both OH and photolysis reactions have been considered was made in lines 433–434.

Note that we do not show the mean value of the residence time here, which is around 30–40 days, but the density distribution, which shows large values in its tail. The residence times are dominated by the residence times near the tropopause. The calculated residence times are crucially dependent on the vertical transport scheme used in the trajectory model. Using vertical winds from certain analysis and reanalysis data sets (e.g. ERA-40) leads to much lower residence times than using heating rates (as done here), since there is a large amount of unphysical noise in the vertical winds in some data sets (see the Krüger et al. reference). A nice discussion of this can also be found in Kremser et al., *Atmos. Chem. Phys.*, 9, 2679-2694, 2009.

- page 8: The values given in line 440 are 24h averages. Added this information to the text.