

Interactive comment on “Peroxy radicals in the summer free troposphere: seasonality and heterogeneous loss” by A. E. Parker et al.

Anonymous Referee #1

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This paper presents the peroxy radicals data collected on the Jungfraujoch during the late summer of 2005. Based on the formula proposed by Mihele and Hastie (2003), the authors discussed the possible reasons to explain the radical production and loss. By comparing the snow and snow-free days, the authors attributed the extra losses in snowy days to heterogeneous losses. Then the authors compared this work with previous studies at the same location and discussed the seasonality of the peroxy radicals and the ozone production. This paper is well within the scope of ACP. I would recommend this paper published in ACP after the following questions are answered:

1. The reason for setting $RH=76\%$ for ”snowy” is unclear to me. Is it an arbitrary number in a certain range or based on some supporting evidence? How about the temperature conditions during these snowy days?

2. The conclusion of the heterogeneous losses to snow particles is based on the derived negative gamma values. The uncertainty of the calculated gamma values needs to be provided. To support the conclusion, these gamma values need to be proven statistically significant for being negative or positive.

3. In section 3.3, the authors should also include the contribution from the photolysis of H₂O₂. According to Ren et al. (2008), this is a bigger contribution for HO_x than HCHO at this altitude. If this measurement was not available, some typical values should be used to investigate its contribution.

4. In equation (9) about net ozone production, the reaction OH+NO₂ should also be subtracted. More recently E. Wood (<http://www.cosis.net/copernicus/EGU/acpd/8/S5350/acpd-8-S5350.pdf>) suggested that, only the portion that was formed by HO₂ oxidation of NO should be subtracted. Nonetheless, the contribution from this reaction could be insignificant but this term should be mentioned at least in the context.

5. I am also wondering how long did the snowfall generally last. Since the authors attribute the extra losses to heterogeneous losses (and it looks like a big loss), the measurements should be able to show the difference of peroxy radicals during and after snowfall, if the snowfall stops in the daytime and the radical sources do not change much during and after snowfall. Was this investigated?

6. What is possibly driving the seasonal trends of peroxy radicals? This needs further discussion.

Minor comments:

7. In Fig.10, the filter1 and filter2 should be described instead of referring to other papers.

8. P17845 L14: some references should be included here about the calibration set-up of the instrument.

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9. Fig.2 should be merged with Fig.1.

References

Ren, X.R., Olson, J.R., Crawford, J.H., Brune, W.H., Mao, J.Q., Long, R.B., Chen, Z., Chen, G., Avery, M.A., Sachse, G.W., Barrick, J.D., Diskin, G.S., Huey, L.G., Fried, A., Cohen, R.C., Heikes, B., Wennberg, P.O., Singh, H.B., Blake, D.R. and Shetter, R.E., 2008. HO_x chemistry during INTEX-A 2004: Observation, model calculation, and comparison with previous studies. *Journal of Geophysical Research-Atmospheres* 113, 13.

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