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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling trends in OH radical concentrations using generalized additive models" *by* L. S. Jackson et al.

Anonymous Referee #1

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The paper "Modelling studies in OH radical concentrations using Generalized Additive Models" by Jackson et al. analyses OH data measured during the TORCH campaign with an empirical approach in comparison to a detailled model calculation.

The aim of this paper is to find and to compare the major influence factors for OH both in the measured and the calculated OH data. Both OH data sets are dominated by the influence of photolytic processes but deviate in the next important factors containing the impact of VOC.

Major remarks:

The paper is well written but the conclusions are not fully supported by the results of the statistical analysis.

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My major concern is the lack of discussion of experimental uncertainties of the OH measurements. The comparison of an empirical approach to a detailled chemical model calculation needs a detailled analysis of experimental uncertainties. The paper of Smith et al., 2006, states the accuracy of the FAGE instrument to be 22% and the precision to be 20% at OH=3*10ˆ6 cmˆ-3. This gives a total uncertainty of 30% at [OH]=3*10ˆ6 cmˆ-3.

The number "30%" is the only reference to experimental uncertainties in the text. A much more detailled analysis is needed. The following arguments may be a guideline.

The comparison of the absolute level of predicted concentrations to the measurements is not fair. With an estimated experimental accuracy of 22%, the difference between MCM results and measurements of 16.3% is not significant.

The very good (0.2%) comparison of GAM_ME to the measurements is not an argument because the GAM results are scaled to the measurements. GAM_ME and ME are not independent and a mean deviation around 0% is an implicid result of the GAM method.

The experimental precison defines the maximum magnitude of variation which can be explained by any model even by the best one.

A rough estimate of the influence of the precison of OH measurements gives a value of 74% of variation which can be explained by any model. This "noise" influence is missing when MCM results are fitted by the GAM method.

As a result the 67.6% explained deviance by photolic processes for GAM_ME is very much better than the 68.3% for GAM_MO.

So either table 2 or table 3 should incorporate the influence of experimental noise.

And may be the conclusions have to be rewritten if the results of a detailled analysis show a much larger impact of photolytic processes in the measurements that in the MCM calculations.

ACPD

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Interactive Comment

Minor remark:

- This paper should cite some recent publications like Rohrer and Berresheim, Nature 2006, and others cited within which present a similar empirical approach with similar results.

- The paper of Lelieveld et al., Nature 2008, should be cited also. Lelieveld et al. demonstrate a lack of understanding in OH chemistry because measured OH showed very much lower variability than expected from state-of-the-art photochemistry models.

- The term "deviance explained" should be defined.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 14607, 2008.