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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Improved simulation of isoprene oxidation chemistry with the ECHAM5/MESSy chemistry-climate model: lessons from the GABRIEL airborne field campaign" *by* T. M. Butler et al.

Anonymous Referee #2

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Butler and co-authors present an analysis of measurements made during the Gabriel campaign. They claim the need for extra recycling of OH in the isoprene oxidation, and the additional need to lower the OH-isoprene reaction rate due to segregation of the reacting species in the true atmosphere. I find the paper not suitable for publication in ACP in the present form. The major reason is that the authors fail to justify the use of a global model for the analysis of a rather local problem. Added value of a global model could be:

- Import and export calculations (boundary layer, Amazon region)
- Comparison to observations in the vicinity of the Amazon and other isoprene emitting regions
- Impact of the OH recycling on the global scale (e.g. methane lifetime)

Unfortunately, none of these issues have been dealt with in the paper. Therefore, the authors should rethink the reason to use a global model instead of e.g. a regional model or an analysis with a bulk boundary layer model.

The ability of the model to reproduce the variability of the observed isoprene measurements is rather poor. Yet, the main conclusions are based on the improved model performance of the model with enhanced OH recycling and reduced reaction rate. I do not find this a convincing case. Certainly not convincing enough to justify speculation about a 50% reduction in the rate constant due to segregation of reactants.

The Karl (2007) paper presents results from an earlier campaign. Their analysis does include a description of transport, a subject that is hardly discussed in the Butler paper. For instance, Karl et al. (2007) derive a flux of isoprene to the free troposphere that is 30% of the surface flux. From this analysis, they derive the amount of OH required in the boundary layer to oxidize 70% of the surface flux. The Karl et al. 2007 paper, although dealing with exactly the same subject, is unfortunately only briefly quoted. The authors should have extended on this paper, e.g. by calculating the modelled isoprene flux as a function of altitude.

Apart from the speculative nature of the paper, and the fact that the authors could not justify the use of a global atmospheric chemistry model, the presentation quality is far from sufficient. Particularly worrying is the statement in one of the replies that: "We must allow for the possibility that a new pair of eyes may actually notice patterns in our figures that we ourselves have missed". The story should be central in a scientific publication. Based on this story the results should be presented in an orderly and

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convincing way, helping the reader to grasp the scientific case. Just plotting the results in the hope that reviewers or other readers will discover issues missed by the primary investigators is not considered as good scientific practice.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 6273, 2008.

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Interactive Comment