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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Simulating organic species with the global atmospheric chemistry general circulation model ECHAM5/MESSy1: a comparison of model results with observations" *by* A. Pozzer et al.

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The positive comments of the anonymous referee are greatly appreciated.

Summary

As replied to the anonymous referee #3, a detailed model description has been published in the same special issue of ACP(D), with a complete description of all the reactions as electronic supplement, (Jöckel et al., 2006).

Detailed points

Abstract

This information will be added in the revised version.

Section 2

We completely agree with the referee that no clear statement about biogenic emissions is present. They have been compiled following Guenther et al (1995) as described in Ganzeveld et al (2006), where also the totals are calculated. Most of the biogenic emissions are off-line emissions. Since this information is important for the understanding of this work, we completely agree to include in the revised version a better description of the biogenic emissions.

Section 3.1

As presented in Taylor (2001), the information plotted in a Taylor diagram are four: correlation (R), standard deviations (σ of observations and models) and centered pattern root-mean-square (E'). We consider the standard deviations as a single information, because of the normalisation. Please refer to Taylor (2001), Figure 1, which explains the relationship between these variables.

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Section 5.2

We completely agree with the anonymous referee #2. The revision of the coefficient is probably not giving a sufficient improvement. We agree that emissions are probably not correctly prescribed everywhere, although this could not explain the fast depletion observed in the free troposphere. Moreover, since the mixing ratios are very low (in the low ppt range close to the detection limit), it cannot be excluded that the measurements are biased (Singh, personal communication). We think that a combination of factors is responsible of the underestimation of C_3H_6 in the free troposphere. Hence, the understanding of this tracer is still an open issue and more studies are indeed needed, combining both observations and simulations. In the revised version this part will be corrected and this topic better addressed (in connection with Sect.8).

Section 6

We completely agree that this sections is not clearly formulated. The nudged set-up is weakly forcing the model to be constantly in a “perturbed state” (Jeuken, 1996). The forcing in the circulation obviously has effects on the hydrological cycle, and in our case, it results in a too warm and dry Amazonia during NH summer. The problem is locally constrained over Amazonia, and we suspect that this is due to an in inconsistency between our model and the dataset we nudged with. However, this needs much deeper investigation. We also do not think that a cold bias of surface temperature would solve the problem. Being Amazonia the largest source of isoprene, this localized problem induced unrealistic high emission of this tracer. After a test simulation of the first year resulting in an emissions of 580 Tg/yr, we decided to scale the emissions in order to achieve 350 Tg/yr, and repeated the simulation. Since the isoprene emissions are calculated on-line, they exhibit an interannual variability resulting in emissions between 305 and 325 Tg/yr for the years 1999-2004.

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To avoid a large increase in the number of pages, this section will be completely rewritten and shortened in the revised version of the paper.

Figure 17

Figure 17 contains data from different sources (differently sampled) compared with the simulation S1. As noticed the correlation between observations and model simulation is quite poor. Nevertheless the magnitude of the emission is correctly reproduced. The few points presented in the figure also do not give us the opportunity to draw a complete picture of the simulation of isoprene. Because the figure does not add any information, we well remove it in the revised version of this work.

In the model it is possible to use prescribed off-line emission of isoprene. Nevertheless we disagree with the use of them, pointing out that an on-line approach has been preferred in order to be more coherent with the model physics and to avoid unrealistic emissions from low temperature regions which could appear in a off-line approach.

Finally, the focus of the simulation S1 was not the simulation of isoprene and its effect. In this chapter it has been shown that the global emission amount of isoprene is correctly reproduced although some unresolved problems are present. A detailed study of isoprene affecting climate is well beyond the scope of this paper.

Section 7.1

The H_2O_2, as noticed by the anonymous referee, is overestimated in North America in the simulation S1. The simulated CO in the same region is lower than observed. This implies a high biased concentration not only of HO_2 but also of OH. The high concentration of OH is confirmed by Fig.9 in the paper (top right). In this case C_2H_6 is highly underestimated in the same location, due to a strong oxidation of this compound.

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All the information indicate an overestimation of the HO_x in North America as observed by the referee. New text will be added in the revised version of the paper addressing this topic.

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