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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone production and transport over the Amazon Basin during the dry-to-wet and wet-to-dry transition seasons" *by* M. M. Bela et al.

Anonymous Referee #1

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This paper describes observations of ozone and meteorological variables made over the dry to wet seasons as part of the BARCA-A and BARCA-B aircraft campaigns over the Amazon region. The observed profiles of ozone and meteorological parameters are compared against results from two chemistry transport models. The results of this study indicate that in general the models were unable to reproduce the observed O3 levels in clean conditions but performed within error under polluted conditions. Improvement in the models ability to reproduce the observations was found by modifying the deposition velocity of O3 and the rate of emissions of NOx from soils.

The major criticism I have of this paper is the lack of detailed information about the

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process controlling chemical production of O3 from the models. At present the model results are compared against the observed O3 but few details are given as to why the model results agree or disagree with the observations from a chemical point of view. There is some focus on the role of NO (from soil) and indeed comparisons are made to NO profiles, but other important O3 precursors (e.g. PAN) are neglected. Similarly there is hardly any mention of the role of VOCs in the paper. For example, isoprene acts as an important O3 precursor. How sensitive are the model results to isoprene emissions and chemistry? A cursory comparison of isoprene fluxes from observations and the MEGAN model is included. But there is little to no discussion on the impacts biases in isoprene oxidation may cause. A large amount of the model-observation comparison focuses on comparison with meteorological data. Whilst this is undoubtedly a key component to the story I suggest perhaps some of this could be cut down and more analysis on the O3 budgets could be included. Or more links could be drawn between the chemistry and meteorology. What impact does biases in temperature have on O3? The wet scavenging of soluble species should impact O3 too, the effect of which can be relatively easily tested in the model simulations.

In general the manuscript is well written, however, I think the paper could benefit from a number of changes, below, before being published in ACP.

General comments (line number, page and comment):

Line 1, page 14017: The authors have not included the role of VOCs (in particular BVOCs) as O3 precursors in the Amazon basin. Is this because they have no net effect on O3?

Line 20-27, page 14020: Are there likely to be any issues with using land use data from c.a. 2000 when comparing to observations made in 2008/9?

Line 18, page 14022: Other modeling groups will, I hope, find the observations very useful for model evaluation. As it may prove problematic to sample other models in the manner the authors have could the authors comment on the biases from averaging

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the observed O3 in large areas compared to the sampling they perform in the current manuscript (i.e. if they were to average the model O3 from -3N to 4N, -58E to -68E (roughly speaking the clean sector in Figure 2 (a), how would that compare to the results presented in Figure 2(a)?).

Line 5, page 14023: The authors need to include the geographic extent that "west, north etc" refer to in Figure 2 (and Figures 18-21).

Technical corrections (line number, page and comment):

Line 24, page 14013: Typo. "increased" should have "be" inserted before it.

Line 24, page 14015: Typo. "northem" should be "northern".

Line 18, page 14030: Typo. Amazonia needs correcting.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 14005, 2014.