

Response to Co-Editor comments

Reviewer comments are in **bold**. Author responses are in plain text. Modifications to the manuscript are in *italics*. Page and line numbers in the responses correspond to those in the ACPD paper.

1 - Reviewer 1, Point 4 - Figure S2 does not indicate if the model is actually doing a good job; please be more specific and discuss the validation

We thank the reviewer for the perspective.

To respond both to this question as well as the next (see 2 below), aircraft data from GoAmazon2014/5 are used in the updated manuscript.

Figure S2(a) is included to show the comparison between aircraft and simulated data for the ozone precursor NO_x .

The discussion about Figure S2(b) has also been further developed.

Section 3, Line 248:

A comparison between measurements of NO_x and O_3 onboard the G-1 aircraft over and downwind of Manaus during GoAmazon2014/5 and simulation results is presented in Figure S2 for Case B. Figure S2a shows agreement between median and interquartile ranges of observed and simulated NO_x concentrations. These concentrations above the natural regional background arise as primary pollutant in Manaus emissions. Likewise, simulated O_3 concentrations also show good agreement with aircraft data (Figure S2b). Ozone is a secondary pollutant, and the agreement supports the validity of the emission inventory of ozone precursors and the chemical mechanisms used in the simulation. Overall, the comparison shows that the simulations satisfactorily represent average regional afternoon concentrations of NO_x and O_3

2 - Reviewer 1, Point 5 – This point has not been answered. Reviewer 2 has stressed this point: “However, my other concern, that how realistic is new emission inventory is, hasn’t been addressed. Why not include a comparison for ozone precursors in Figure S2 to address this? For almost any environment, if NO_x emission is reduced by 60% or 89% in the model, simulated ozone levels will be for sure reduced dramatically. So, it is important to know if the new developed emission inventory/scenario can really reflect the real world. Again, this is fundamental to justify this study.”

Figure S2(a) shows good agreement between the NO_x concentration measured by the aircraft and the mean simulated values of the present study, demonstrating that the

simulation developed herein is able to represent observed concentrations of NO_x and O₃ (Response 1).

A full evaluation of the emissions inventory is out of scope of the present study.

3 - Reviewer 2, Point 3 - You have at least the ozone concentrations during GoAmazon? Please use them.

We acknowledge the Co-Editor comment.

There are no surface ozone data available for Manaus urban region during the study period of the manuscript.

Airborne ozone data are available for several flights.

A comparison between observed aircraft data and simulated ozone concentrations is included in Figure S2. The discussion about that figure also is improved in the revised manuscript. In this regard, please see Response 1.

4 - Reviewer 2, Point 4 - The meteorological background needs more information. The reference to the Bolivian High is thrown in without further explanation; indeed, it is associated with low rainfall in the Amazon but is not the explanation, or the cause. Also, the reviewer asked for a description of eventual mesoscale systems acting in the region during the time period.

We thank the Co-Editor for the comment.

In order to address this point, the following paragraph was rewritten and improved:

Section 2.1, Line 143

The climatology has differences between dry and wet seasons, with minimum values of monthly precipitation reached in August (47 mm) and maximum values found in March (335 mm) (Ramos et al., 2009). The month considered herein (February) has a climatological average of 290 mm. For February 2014, there was a deficit of 21.5% for meteorological stations in Manaus (Figure S1), with high precipitation above 20 mm on five days. The February deficit might correlate with a shifted position of the Bolivian high to the west of its normal position. This anticyclonic circulation at high atmosphere is associated with latent heat release during austral summer (Silva Dias et al., 1983; Jones and Horel, 1990). By comparison, the Intertropical Convergence Zone (ITCZ) was at its climatological position in February 2014, and exceptional events related to the South Atlantic Convergence Zone (SACZ) or other frontal systems in the region were absent (CPTEC-INPE, 2014).

We thank the Co-Editor and reviewers for their time, input, and resulting improvements of the manuscript.

References

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- Jones, C., and Horel, J. D.: A circulação da Alta da Bolívia e a atividade convectiva sobre a América do Sul, *Revista brasileira de Meteorologia*, 5, 379-387, 1990.
- Ramos, A. M., dos Santos, L. A. R., and Fortes, L. T. G.: Normais climatológicas do Brasil, 1961-1990, 2009.
- Silva Dias, P. L., Schubert, W. H., and DeMaria, M.: Large-scale response of the tropical atmosphere to transient convection, *Journal of the Atmospheric Sciences*, 40, 2689-2707, 1983.