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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Can a global model chemical mechanism reproduce NO, NO₂, and O₃ measurements above a tropical rainforest?" *by* R. C. Pike et al.

Anonymous Referee #2

Received and published: 5 February 2010

This is a well written and well presented paper about an interesting aspect of atmospheric chemistry. The paper nicely shows that box models (and by extension quite coarse resolution global models) can do a reasonable job of simulating NOx and O3 in a tropical forest, although they are far from perfect. Physical parameterisations are shown to be of primary importance – in particular boundary layer venting and deposition velocities. Sensitivities to chemical parameterisations are less important. Tuning the physical parameterisations (within justified bounds) has a large impact. This result is not a surprise, but it is good to see it well documented, and I think the paper should

be accepted for ACP after attention to a few, relatively minor points listed below.

Specific comments

Is the title a bit misleading? The main finding relates to physical mechanisms in the model, rather than the chemical mechanism. The answer to the title question as it stands is: "Yes, so long as the physical mechanisms are well tuned." I leave it up to the authors to think about the title and make sure it accurately reflects the paper's content.

P27614, l20. 'Production of tropospheric ozone is non-linear. . .' This is a bit vague – I think 'production of ozone is a non-linear function of its precursor concentrations. . .' is more accurate.

P27615, l3. The local ozone lifetime can span a wider range than this: a few days (in the tropical BL) to several months (in the polar UT).

P27616 l17. What is 'Zero air'?

P27617 l6. Similar to the last comment, how do you carry out a 'zero'?

P27618 l14-16. For the RHS of Fig.2, are the diurnal cycles the median (or mean) of the four days?

P27618 l20. 'O3 shows little vertical structure compared to ground measurements'. How can ground measurements show vertical structure? Clarify what you mean.

P27620 l24. My guess is that lightning, biomass burning, soil and isoprene emissions are very important for NOx and O3 at this particular site. I'd like a little more information and reassurance that the global model is representing these emissions in a reasonable way.

P27622 l5. How far from the coast is the observation site? In the model, does the grid-box cover part land and part sea? You should clarify this.

P27628 l15-16. '. . .averaged over a 24 h day. . .' Are there any other types of (Earth)

day?

P27630 l28 '. . .explain the observations in the global model. . .' Rephrase, so that is clear you aren't getting observations from a model!

Figure 1 could be clearer. Other figures are excellent.

Technical comments

Typo in affiliation 4.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 27611, 2009.