

Interactive comment on “Evaluation of MEGAN-CLM parameter sensitivity to predictions of isoprene emissions from an Amazonian rainforest” by J. A. Holm et al.

Anonymous Referee #2

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Evaluation of MEGAN-CLM parameter sensitivity to predictions of isoprene emissions from an Amazonian rainforest

J.A. Holm et al.

The authors apply multiple versions of the Community Land Model (CLM) with the Model of Emissions of Gases and Aerosols from Nature (MEGAN) to estimate and evaluate isoprene emissions in the Central Amazon. In addition to evaluating isoprene estimates, the authors also evaluate some of the inputs to the MEGAN model to provide a more complete context for the isoprene performance. The authors notably found

C8949

that MEGAN-CLM 4.0 overestimated isoprene emissions in the Central Amazon. A more recent version of CLM (4.5) with reductions in LAI resulted in general agreement with isoprene observation data, but when model prediction biases for key MEGAN inputs including leaf temperature are taken into account the CLM 4.5 also overestimates isoprene in the Central Amazon.

Overall, this seems like a notable conclusion although it is often hard to find amid the often confusing literature review that shows up in each of the sections. The logic behind some of the flow of discussion when research in other manuscripts is described can be rather hard to follow and sometimes makes the work done for this manuscript get lost in the shuffle. The manuscript would read better if the authors emphasize their own work more and summarize supporting and related work more succinctly and at a higher level without providing acronyms or model names that are not terribly relevant (if people are interested in those details they can find the original referenced papers).

Introduction

Page 23997, Lines 10-11; The authors mention sensible heat flux. How is that used in MEGAN? Does it calculate sensible heat flux or is that an input? Why wasn't sensible heat flux included in the monte carlo analysis?

Other similar work looking at MEGAN estimates of Amazon isoprene emissions should be referenced for completeness of literature review: (Ferreira et al., 2010; Müller et al., 2007). Others have compared multiple biogenic models and also looked to some degree at the impact of temperature and PAR on MEGAN emissions: (Carlton and Baker, 2011).

Page 23997, Lines 15-16; I recognize there is more gray literature than peer reviewed literature on comparing multiple biogenic models but I suggest using peer review literature in place of gray literature where possible.

Results

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Page 24013: There are a lot of acronyms used in this manuscript, please ensure they are well defined. Most are obvious to the reader (e.g. PAR and PFT) but not all are that common to climate modelers. GPP for instance does not seem to be defined anywhere (at least nowhere near this section).

Page 24016; Lines 1-4; Do these 4 studies use the same or similar vegetation species maps (e.g. based on MODIS or USGS categories) for the G95 emissions algorithms?

Page 24016; Lines 25-30; Did Karl et al 2007 similarly overpredict isoprene before environmental corrections were made? The authors note CLM 4.5 had reduced (presumably better) LAI. Would previous emissions studies of the Amazon such as Karl et al 2007 have used similarly overestimated LAI? Again, would this study have used similar vegetation speciation to drive the isoprene emissions estimates?

Page 24017; Lines 1-4; The caveat that if meteorological performance was better isoprene overpredictions would be expected would be good here.

Page 24017; Lines 4 to 25; These paragraphs read more like a summary than discussion.

Page 24019, lines 17-18: This line is kind of hard to follow. It is not clear if isoprene production increased by 100% or 1% (from 1% to 2%). Clarification would be helpful here.

Page 24020, lines 6-17: I think the authors are making a very strong point here that vegetation speciation is critically important for accurate isoprene emissions estimates. One challenge is to get site specific vegetation speciation information and based on the arguments presented by the authors the aggregation of vegetation speciation into plant functional types introduces systematic bias in isoprene estimates depending on the aggregation approach. However, the discussion of the Harley 2004 paper does not make this totally clear. Did Harley 2004 use more accurate vegetation speciation? It is not clear that vegetation speciation is one of the 3 factors described by the authors;

C8951

"isoprene-emitted biomass" could possibly be tree speciation information but it is not clear what that means. Also, if emissions were still overestimated couldn't other factors such as the canopy model or other part of the MEGAN emissions model lead to this systematic over prediction after more site specific data is used?

It would be interesting if the authors considered vegetation speciation as part of the sensitivities presented here rather than totally relying on other manuscripts to support what is an important aspect of biogenic emissions estimation. Presently the manuscript is not terribly novel (a lot of people have looked at temperature and PAR impacts on isoprene emissions), especially for ACP, so this type of assessment would make this work stronger.

Discussion

Again, the authors use a lot of acronyms that are not that common. Some may be the names of models but it is not clear. I suggest trying to use more general terms where possible, especially when the specific model or algorithm isn't that important for the discussion providing a scope of estimated emissions. In this section there are all kinds of terms like LPG-GUESS, IBIS, MOSES2-TRIFFID that are not always written out (e.g. LPG-GUESS), referenced (e.g. MOSES2-TRIFFID), and some that are never used again (MLV). In the end it is probably not all that important the reader is presented with that kind of detail in this manuscript. It makes the discussion hard to follow.

Much of section 4 (discussion section) reads like a literature review that might be more appropriate in the introduction.

References

Carlton, A.G., Baker, K.R., 2011. Photochemical Modeling of the Ozark Isoprene Volcano: MEGAN, BEIS, and Their Impacts on Air Quality Predictions. *Environmental Science & Technology* 45, 4438-4445.

Ferreira, J., Reeves, C., Murphy, J., Garcia-Carreras, L., Parker, D., Oram, D., 2010.

C8952

Isoprene emissions modelling for West Africa: MEGAN model evaluation and sensitivity analysis. *Atmospheric Chemistry and Physics* 10, 8453-8467.

Müller, J.-F., Stavrou, T., Wallens, S., Smedt, I.D., Roozendaal, M.V., Potosnak, M., Rinne, J., Munger, B., Goldstein, A., Guenther, A., 2007. Global isoprene emissions estimated using MEGAN, ECMWF analyses and a detailed canopy environment model. *Atmospheric Chemistry and Physics Discussions* 7, 15373-15407.

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