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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Importance of fossil fuel emission uncertainties over Europe for CO_2 modeling: model intercomparison" *by* P. Peylin et al.

KRG Gurney (Referee)

kgurney@purdue.edu

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General comments

A useful contribution to the literature on the subject and carefully completed with adequate explanation and graphics. The only general comment I have is the proportions in the paper are weighted more towards the forward modeling when it seems to me that the inverse sensitivity to the fossil inventories is the crucial scientific advance. The forward modeling is not particularly new, at least insofar as what it says about varying model transport. The critical results are what this all means for the estimate net bio flux. That portion of the paper seems unnecessarily short and probably could incorpo-

rate more detail while shortening the portion on the forward modeling (other reviewers may disagree as this is more of a "personal" preference).

For example, the "smearing" or "blurring" of the high res fossil in the forward modeling portion of the paper may have inversion implications? This speaks to the spatial resolution of the inventory, something that wasn't discussed in the inverse portion of the paper. What would a flat country inventory look like compare to the higher-res treatments? Since the UN reporting is country-level, this would appear to be an important item to test in the inverse framework. You might do this by taking the IER_hourly and spreading it evenly over bigger cells than its current. So, in addition to different spatial patterns in the fossil inventories and different resolution of transport, you can more directly test the spatial resolution of the fossil inventory in the inverse result.

The study might benefit from one additional tracer: a purely seasonal tracer built off of the EDG_hourly for example. Then the reader could see if it is the diurnal or seasonal cycle that has the impact on the temporal domain. Clearly, the spatial patterns are important but I think that when you discuss the impact of the temporal structure on page 7477 you are comparing the fossil difference to the "full" seasonality of the biosphere when I think this is more relevant when compared to the "residual" flux – the non-neutral portion. This is what is essentially solved for and that might be a more pertinent comparison rather than the complete seasonal peak to peak gross flux.

Specific comments

Page 7463, line 18-19: why use SO2 for residential? Residential heating typically uses liquids or gas and sulfur is primarily an issue for coal.

Page 7482: The Vulcan project can be cited:

Gurney, K.R., D. Mendoza, Y. Zhou, M Fischer, S. de la Rue du Can, S. Geethakumar, C. Miller (2009) High resolution fossil fuel combustion CO2 emissions fluxes for the United States, accepted to Env. Sci. & Tech.

Table 5: The flux using edgar annual shows a tremendous difference in West Europe for LMDZ v TM3. . .. Can this be right? I also note that the flux diff in the 3rd numerical column for the LMDZ West Europe would represent greater than 100% adjustment (thought absolute is small). Similarly for the 4th column on this inversion. Is that correct?

Figure 11: so, is the standard deviation build off of 7 model values and 4 inventory values? If so, can that really be considered adequate to calculate a standard deviation? A similar question applies to table 6.

Page 7464, line 1: so the inventory is based on roughly 3 km x 3 km cells? Or do you mean 10 km x 10 km cells which would be 100 km2?

Page 7477, line 24: which fossil inventories are you referring to here when you say, "Differences between fossil fuel maps induces. . ."?

Page 7478, line 19: I calculate percentage of 26-40%. Also, this really does imply a range and technically, this is really only two points – you probably should be explicity by saying something like: ". . .corresponds to 26% difference and 40% difference in the two inversions complete in this study, respectively."

Table 5: The posterior uncertainty of the 1st column fluxes would be useful and would allow the reader to quickly ascertain to what extent the sensitivities are within the 1sigma on the base fluxes.

I cannot get the Pregger et al reference. I don't know what the policy is for ths journal, but perhaps a download link could be supplied so readers can access all cited material.

Technical comments

Please use the word "inventories" instead of "maps" as the fossil fuel numbers are really more than what the word map implies (a simple representation of something in space). I would recommend changing throughout

Page 7464, line 26: Large emissions associated "with" industrial. . ...

Page 7466, line 3: what is "double counting. . ..."?

Page 7467, line 24: ". . . that COMET was primarily designed to observational points. . .". Do you mean to say "observe"?

Page 7468, line 1: "The models were. . .. " add 's' to 'model'

Page 7469, line 6: remove "successively"

Line 15: "will also 'be' spread"

Line 17: try "in order to" instead of "with the aim"

Page 7472, line5: remove 'by' between 'contributes' and 'about'

Page 7473, line 10: do you mean figure 1?

Page 7474, line 18: "Eulerian"

Page 7476, line 11: at both sites – add 's' to 'site'

Line 14: ". . .land) as a background. . ."

Page 7477, lines 16-17: the sentence introducing figure 10 appears out of place since figure 10 is discussed more thoroughly on page 7478, line 22 and on. Perhaps delete the sentence here referring to figure 10?

Line 23: instead of 'in the order of' try "roughly"

Line 26: use "on" instead of "in"

Page 7478, lines 3-6: remove "the differences remain similar" and connect sentences as ". . . of Europe, the impact of the temporal. . ." also note space between "part" and "of"

Line 12: "using the "IER_hourly" emission . . .."

Line 14-15: try “These number are slightly smaller than the annual total European differences in fossil fuel emissions themselves (0.23 Gt C/yr for Europe,..”

Line 18: strike “it should be realized that”

Line 22: focus is mispelled.

Page 7481, line 5: “Although fossil-fuel emissions are often considered as a “well. . ..”

Line 14: “. . . which also addresses the question of whether. . .. “

Line 16: “. . . or if atmospheric CO2 inversions can be used to evaluate fossil fuel. . . “

Table 1: Continuous mispelled

Table 1: title could be a bit more explicit – perhaps: “Fossil fuel CO2 emissions inventory descriptions”

Table 5: title could be: “Annual inverse-estimated biological net fluxes (Gt C/yr) based on the ‘Edgar_ann’ fossil fuel CO2 emissions inventory and inverse-estimated net biological flux differences resulting from use of the other three inventories.

Figure 1: have you considered taking the log base 10 for these values – gives a bit more coverage.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7457, 2009.