Atmos. Chem. Phys. Discuss., 11, C10181–C10184, 2011
www.atmos-chem-phys-discuss.net/11/C10181/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The Wildland Fire Emission Inventory: emission estimates and an evaluation of uncertainty" *by* S. P. Urbanski et al.

Anonymous Referee #2

Received and published: 13 October 2011

Dear Authors,

First, thank you for an excellent manuscript, it describes a very well-constructed and very labor-intensive study, and it was a pleasure to read.

The particular contribution of this paper that I think will make the greatest impression on the scientific community is the systematic study of scale-dependent errors, which adds detail above what previous uncertainty estimates have been able to accomplish. The feature of biomass burning uncertainty that relative uncertainty in area burned scales inversely with domain total area burned is a very important one and should be taken into account by any application that requires fire area and fire emissions data over a specific domain.

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In the case of burned area, this scaling of uncertainty reflects the random sources of error in burned area estimation, that produce positive and negative biases in estimation of burns on a per-pixel basis. With more burned area, two things happen: first, the fraction of interior pixels that represent 100% burned area increases, reducing error resulting from estimation of pixel fractional area burned; second, the positive and negative errors (omission and commission) cancel, and assuming the burned area retrieval has been tuned to be unbiased, these (essentially) random errors cancel out.

I lay this out because the errors in fuel loading (and in fact emissions factors) may work much the same way, but there are not enough accurate measurements to characterize this behavior. I think it is worth keeping in mind that the aggregation of fires of uncertain emissions will cause some kinds of uncertainty to shrink, and not just for burned area.

I have organized my comments into 3 groups, roughly from most important to least.

Group 1:

This paper covers CONUS only, and the title should reflect that.

23365-1 Just to be clear, you do not have a filter to exclude post-season prescribed burns, correct?

23365 A slope was estimated like this: The DB burned area data were purged of burn scars not matching an MTBS entry, and a filter was applied to exclude pre-season prescribed burning. After that, MTBS and DB areas were gridded to 25km and a regression slope was calculated. The DB burned area was corrected by this slope (decreased by 7%). This leaves me with lots of questions about the MODIS DB burned area used for the rest of the study. Is the pre-season prescribed burning filter applied to the whole 2003-2008 dataset? Is the MTBS exclusion applied? How does the MODIS DB total area compare to the MTBS total area, with and without the exclusions? Hopefully these questions can be answered without expanding the section too much.

Your burned area uncertainty is based on an analysis at a scale of 25km, which is

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then used across all scales in the Monte Carlo analysis. This is imperfect, but probably OK, so long as it is not used for scales <10km. It does need to be stated upfront somewhere.

Group 2:

Section 2.1 should stop after introducing the components: the information here on the burned area is better pushed to Section 2.1.1. It is especially confusing that you make statements about how you estimate burned area in Section 2.1 and reference Li et al. 2004, and not your own paper (Urbanski et al., RSE 2009)!

23372-4 “The pattern is similar, though not as extreme, at g10 km,1 d(k,t), 64% of total ECO arose from 10% of the elements. . .” may want to rewrite for clarity. I recommend comparing scales by similar percentages of emissions, rather than fractions of bins, e.g. 50%/90% of emissions from XX%/XX% of bins.

Figure 8. I think Figure 8 could be much more informative if structured with the Cumulative Distribution Function instead of the histogram. The CDF plot enables one to exactly extract numbers like “XX% of the total CO comes from XX% of the bins,” which can only be qualitatively inferred from the histogram plot.

23373-23 “average pixel duff consumption” what is the “pixel” in this analysis? Do you just mean the average fraction of duff consumed?

23371-25 Is this weighting of California fires toward October a result of the huge 2007 events, or is it a pattern repeated across years?

Group 3:

23354-5 “may not be applicable” -> “may seriously misrepresent the relevant uncertainty”

Equation 1: k is location, t is time, i is species

23360-18 Harington typo

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23360-21 UnitedStates typo

23360-22 “avoids introducing additional uncertainty” Well, not exactly. Maybe “avoids introducing additional variability”

23364-27 “nearby” -> “near”

23373-20 “COMSUME”

23379-18 “emission model sensitivity to the mapping of fuel models.” This sentence is a bit clunky, I had to read it 3 times. Maybe just say “sensitivity to the mapping of fuel models”.

22381-28 “Reducing the uncertainty in EFPM2.5 would reduce uEFPM2.5” I think here, and elsewhere in the rest of this paragraph, you mean uEPM2.5. Also “may significantly reduce uEFX,” I think you want to say “may significantly reduce uEX”

23386-25 “Society of Range Manger”

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 23349, 2011.