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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global fire emissions and the contribution of deforestation, savanna, forest, agricultural, and peat fires (1997–2009)" *by* G. R. van der Werf et al.

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We greatly appreciate the constructive reviewer, please find a detailed response below.

[Reviewer] 1) Since the paper describes the GFEDv3 methodology and results in detail (and GFEDv2 is widely used currently) i think the title and abstract would beneïňĄt from explicit mention of GFEDv3.

[Reply] We have chosen the title so that it represents the main scientific advancement (the partitioning) and see the database as a product of this work. Adding GFED

would require spelling out the abbreviation and make the title too long. We have added GFED3 in the abstract and more clearly in the introduction and conclusions section and hope the reviewer agrees with us refraining from incorporating GFED from the title.

[Reviewer] 2) In Section 2.1 I would again remind the reader of the prior versions of GFED e.g.incl GFED v2 - and state that this description of the methodology is relevant to the new GFEDv3 inventor y (downloadable at [where])

[Reply] We have added "We publicly released the resulting fire emissions time series that was named the Global Fire Emissions Database version 2 (GFED2). We refer to the improved emissions time series described here as GFED version 3 (GFED3). " In section 2.1, and the link to the database is included in the conclusions section.

[Reviewer] 3) Section 2.3.1. Whilst you do mention "vegetation index" I would perhaps mention more explicitly that the burned areas are now mapped using optical remote sensing measurements that primarily are aimed at directly identifying "burned areas" on the landscape. Active ïňĄre obser vations are now mainly used just to identify the appropriate detection thresholds that discriminate "burned areas" in the landscape, based on changes in a vegetation index derived using [which spectral bands] from MODIS. Then refer to the Giglio et al paper for more detail. Basically i think you want to really get over to the reader that optical remote sensing is now used to map most of the burned area - rather than the more direct "hotspot count" approach used previously.

[Reply] We have added "Over 90% of the area burned over 2001-2009 was mapped this way, and this represents a major advantage over earlier work (Giglio et al., 2006) where less than 10% of the burned area was mapped directly but which relied more heavily on active fire detections."

[Reviewer] 4) Section 2.3.1 - can you detail how the "monthly climatology" was derived. Does this imply that the pre-2001 results are basically not going to show a realistic interannual variability since the burned area will be the same for all years? If this is the case perhaps more should be made of the fact that the more "trustworthy" emissions

estimates in terms of absolute magnitude come from the post-2001 era?

[Reply] The reviewer's comment indicates a lack of clarity in the related text; we used interannual varying burned area also in the pre-MODIS era, but used a climatology for partitioning the burned area. By modifying and adding text in the relevant section we have further clarified this distinction.

[Reviewer] 5) Section 2.4.1 - more detail is needed on how fire persistence" was derived.

[Reply] This comment overlaps with another reviewer and has been modified. We have added "In addition, the number of times an active fire is observed in the same grid cell (fire persistence) yields information on the fuel load and type of burning;..." and "Specifically, the fire persistence was computed as the total number of active fire detections within the 0.5° grid cell each month divided by the number of 1km grid cells where active fires were observed in the month." in section 2.4.1

[Reviewer] 6) Section 2.4.4 - Where does equation (3) and the parameter values it contains come from? For example what evidence is there that 60% tree mortality in fires occurring in areas of 70% or more tree cover? Past work in the boreal region suggests that average mortalityfigures are probably greater in regions of the Canadian boreal forest (where crown fires predominate) than in regions of the Russian boreal forest (where more surface fires predominate). Is this difference reïňĆected in your tree mortality results?

[Reply] These values are indeed uncertain, and we could not find literature data to justify modifying the mortality rates we have used in the past years based on fire experts in these regions. We agree this is a source of uncertainty, and had already discussed this in section 4.1:"Although fuel loads were high in forests, globally the role of forest fires (excluding deforestation fires and woodland burning) was relatively modest; about 15% of total carbon emissions was due to the burning of forests. Our model did not separate ground from crown fires and thus fuel consumption in boreal North America and

boreal Asia was relatively similar. There are indications though that the fire regime in boreal North America is more characterized by crown fires while ground fires are more prevalent in boreal Asia (Harden et al., 2000; Wooster and Zhang, 2004). Even though the aboveground fuel component is relatively small, not including these dynamics is an additional source of uncertainties."

[Reviewer] 7) Section 3.1.1. You talk here of 1998 etc being peak emissions years (probably due to ENSO effects etc) but as far as i understand it these pre-2001 years only use the "climatological values" for burned area..please make this clearer.

[Reply] Please see our reply to question 4; also the pre-2001 years use interannual varying burned area

[Reviewer] 8) Section 4.1 - I think the paragraph on "Agricultural Waste Burning" contains some repetition from the previous paragraphs on this topic.

[Reply] We agree, but feel that in the discussion section this important source of emissions deserved a full description, also keeping in mind that several readers will not read the methods sections and are introduced to the limitations of our work for agricultural waste burning for the first time here.

[Reviewer] 9) In "forest fires" section - Harden et al seems not to be in the reference list.

[Reply] Added

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 16153, 2010.