**Biogeosciences
Discussions**

Interactive comment on "Assessing variability and long-term trends in burned area by merging multiple satellite fire products" *by* L. Giglio et al.

L. Giglio et al.

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We thank the reviewer for his or her helpful comments. In this reply we provide a point-by-point response. Reviewer comments (in some cases paraphrased) are italicized.

1) [I]t would be nice to have a short paragraph stating the main differences between the burned area products presented with respect to the algorithm and data sources... and maybe regional differences in performance, at a level which could guide the user... in their choice of the product...

We will add a paragraph near the beginning of the manuscript that outlines the

algorithm differences between the burned area products in more detail.

2) Looking at the time resolution of the MODIS data it should at least be possible to go down to a half monthly dataset. The authors should discuss their reasoning and if there are other issues... preventing this.

During the MODIS era it is indeed possible to produce a burned area data set at much higher (up to daily) temporal resolution. The limiting factor is the data available during the *pre*-MODIS era. For the ATSR sensor, the ability to predict burned area from fire counts at the $0.5°$ GFED3 spatial resolution is essentially nil at time scales much less than one month. VIRS shows a similar (though not as rapid) degradation, but is more importantly limited to one-month time steps to avoid strong diurnal sampling biases arising from the orbital precession of the TRMM satellite. We will add text to Section 3 discussing these constraints in the revised manuscript.

Although outside the scope of the present manuscript, we note that we are developing a shorter-time-step version of GFED3 from 2001 onward when the availability of MODIS data makes this practical.

3) It would... be good to have this kind of information [proportion of burned area estimated with the regression trees] as a layer in the dataset available on a monthly basis.

We have a data layer in the monthly burned area data set which indicates both the data source (ATSR, VIRS, or MODIS) and the method used to produce the estimate for each grid cell.

4) It would... also be useful to have a discussion about the feasibility to replace this [the 2001 VCF] dataset.

For GFED3 we had to use the Collection 3 2001 MODIS VCF data because that is the

only year for which this product is currently available. Production of a newer, multi-year MODIS VCF product will commence this spring. When available, we will incorporate these data into a subsequent version of GFED.

In any event, it is unlikely that the static 2001 VCF maps introduced significant errors in the GFED3 burned area estimates spanning the MODIS era since only a small fraction of the area burned globally was estimated using the regression trees (neither the direct mapping nor the local regression approaches required the VCF data).

5) ...I am missing an evaluation of the performance of... [the pre-MODIS] burned area generation. Would it be possible to compare for some small regions with estimates based on Landsat scenes... and not only to MODIS data like in fig 5?

We show a limited evaluation of our pre-MODIS burned area estimates in Figure 15 (red diamonds) based on CIFC and NIFC data. Figure 5 shows an example of how we derived correction factors to improve consistency; it was not meant as an evaluation of the pre-MODIS burned area estimates (though to some extent it could be used for this purpose).

We believe that validation of our pre-MODIS estimates using Landsat (or equivalent) imagery presents formidable obstacles and is unfortunately not practical. Among other problems, a Landsat scene typically provides complete coverage of at most a few $0.5°$ grid cells. Unmapped areas in the Landsat scenes – due to cloud cover or bad scan lines, for example – would reduce this small number of grid cells even further because these unmapped areas cannot be "removed" from the larger $0.5°$ GFED grid cells. The need to use *two* Landsat scenes (pre- and post-burn) to map recent burns consequently reduces this small number further still.

Further complicating this situation is the fact that one has no control over the acquisition dates of the pre- and post-fire Landsat images. For comparison to the monthly GFED3 estimates, these dates would have to occur on (or very near) the first and last

day of a calendar month. The number of usable scenes becomes still smaller. One could alternatively attempt to use a pre-fire-season and post-fire-season image pair, but this is confounded by post-burn regrowth and, in the tropics, a lower likelihood of obtaining cloud-free scenes.

6) I would also be interested in what source of data lies behind the NIFC data...

The NIFC estimates are primarily compiled from a combination of ground-based reports and airborne measurements. In a small number of instances estimates for large burns are produced using high-resolution satellite imagery, typically Landsat, but always at a spatial resolution much higher than our 500-m MODIS burned area maps.

7) Figure 1 giving the distribution of the regions could be removed since this one is identical to the one used in previous publications of GFED..., alternatively it could be superimposed on one of the other figures.

A coarser resolution version of Figure 1 has indeed appeared in several earlier GFED papers. If acceptable to the editor, however, we would prefer to keep the figure intact for the convenience of those readers not already familiar with the regions. We did consider superimposing Figure 1 on one of the other figures, but this proved unwieldy since the map would appear unnecessarily late in the text, long after it was referenced.

8) Readability of figures, specifically Figures 6 and 10.

We will reformat the plots and increase the size of the labels in Figures 6 and 7 to improve legibility. We will also increase the size of the text in Figure 10.

9) Figure 16 reports as a unit kha/year... ...I would suggest a relative instead of an absolute unit to report differences between the different products.

We will change the figure to show relative differences (difference in fractional area burned in each grid cell).

10) The panels in Figure 17 could be labeled more clearly...

We will increase the size of the labels in the figure.

11) Figure 6 font size.

We will reformat the plots and increase the size of the labels in Figures 6 and 7 to improve legibility.

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