Response to referee #2 for manuscript :

S. Remy and J.W. Kaiser, Daily global fire radiative power fields estimation from one or two MODIS instruments, Atmos. Chem. Phys. Discuss., acp-2014-327.

Dear Editor,

Please find below the answer to the remarks raised by referee #2 prior to the discussion stage. The manuscript have been modified accordingly.

Best regards,

The authors

Dear Referee #1,

Thanks for your constructive comments and suggestions. Please find our answers below.

One issue I recommend is that early on the reader should be explicitly reminded that GFAS produces a best estimate of "daily average" FRP for each 0.1 or 0.5 degree grid cell, based on a combination of all the FRP observations available for that grid cell that are available over a 24 hr period, weighted by their cloud cover and their viewing geometry. This "daily average" FRP is then used to produce a "daily average emission rate" of the various chemical species mentioned, and they can be referred to Kaiser et al. (2012) for more detail on this. Currently the FRP observations come from just the two MODIS instruments. The way the emissions rate actually changes over the daily cycle is not currently given by GFAS, and is not tackled here either. So the aim here is to try to best reproduce the "daily average" FRP value that is obtained currently with GFAS when assimilating both AQUA and TERRA MODIS FRP observations, but to do so when only one or other of these datasets is available. This needs to be explained very clearly very early on so the reader knows the exact task to be undertaken, and also the functionality of the GFAS system. All these things are stated in various parts of the paper – but I suggest it should also be stated early on around the current line 80.

Thanks for the suggestion, it is indeed important to stress that here only daily average is considered. While the diurnal cycle of fires impacts how Aqua and Terra observations differ, our aim is to provide daily estimates of FRP and biomass burning emissions. A few sentences have been added in the introduction, between lines 105 and 110, to emphasize that point.

Ellicote et al (2009) already show that Terra alone can reproduce global biomass burning estimates relatively well, and this paper should be referenced and perhaps have its results compared to the current work.

A reference has been added to Ellicott et al (2009). There are quite a few differences between the system used by Ellicott et al. and GFAS : they are using geostationary FRP

observations that are not used in GFAS, there is no assimilation step in their system and they aim to produce monthly and not daily FRP estimate. While the qualitative conclusion is the same, i.e. that Terra alone can reproduce relative well biomass burning estimates, in my opinion quantitative comparison would not be so relevant.

The explanation "The value of this distance depends on the size of the vector; instead of normalizing it with the number of fires, it was preferred to use this distance only for the relative comparison of the various algorithms that were tried. " needs further detail to explain it fully.

A sentence has been added to explain that in more detail.

"and show a decreasing accuracy as the viewing angle increases." Reference should be provided

Thanks! Reference added.

"The diurnal fire cycle is reflected in a significant bias in the FRP observations from the two MODIS instruments. This bias has a strong geographic dependency because the diurnal cycle of fire intensity depends on the land cover type: for example, peat fire's intensity hardly vary between day and night while savannah fires nearly extinguish at night." References are required for this e.g.

References added, thanks for the suggestion.

Line 185 "to produce a best estimate of the daily average FRP", rather than just "daily". Since it is important to get across to the reader that GFAS does not produce information on FRP at better than "daily average" temporal resolution (at least this version of GFAS does not).

Corrected.

Figure 6 and 7. I think it would be instructive to include a figure like that of Figure 7 but for an area smaller than global, which will provide more evidence for the reader of the improved ability of Aqua alone to estimate the full GFAS (TERRA+AQUA) values compared to Terra alone (as seen in Figure 6). Only showing the global results means a lot of the differences are averaged out and Terra and Aqua only values look very similar (after the adjustments). If you use a smaller geographic area I suggest that the Aqua-only values will be much less "noisy" with regard to the Aqua+Terra values than are the Terra-only values (judging by the scatterplot shown as Figure 6).

A new figure have been added, figure 8, that shows average FRP over Africa, Indonesia, North and South America, for Full GFAS, Terra- and Aqua- GFAS. In them, a well known problem of GFAS appears prominently : an oscillation of FRP estimates with a 2 day frequency, caused by the fact that the detection threshold of Aqua varies with the viewing angle. This figure adds much information as to how Aqua and Terra differ, and how the correction of observations improve Aqua- and Terra-GFAS. Thanks a lot for this idea!

Figure 8 and 9 - It would surely be useful to include the Aqua results in Figure 8 and the Terra results in Figure 9 would it not ? So all permutations can be seen by the reader for each event and the clear story that "Aqua only" is better than "Terra only" is easily apparent to them (i.e. this will probably be the case for both fire events, even though they are of rather different types of fire).

These results have been added to figures 8 and 9 (now 9 and 10). This completes nicely with the new figure 8, and shows indeed that a correcting Aqua observations is more efficient than correcting Terra observations.

Best regards,

The authors