Biogeosciences Discuss., 8, C4659–C4662, 2011
www.biogeosciences-discuss.net/8/C4659/2011/

Interactive comment on "Biomass burning emissions estimated with a global fire assimilation system based on observed fire radiative power" *by* J. W. Kaiser et al.

J. W. Kaiser et al.

j.kaiser@ecmwf.int

Received and published: 2 December 2011

Thank you very much for this encouraging review and the helpful corrections. In the final version, we will address all the technical corrections (below in **bold face**) as follows.

Page 7341, line 11. Please provide reference after this sentence: "... a rise in atmo- spheric CO2".

For example, Westerling et al. (2006)

Page 7346, line 14. Please provide definition of "alfa" in equation 16 in order to

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

facilitate the reader to understand the terminology.

We will clarify that Eq. 16 is the definitin of $\tilde{\alpha}_j$ and Eq. 15 follows from Eq. 11.

Page 7350, line 22. Could you include the reference for Kronecker's delta?

For example, Wüst (2009, p. 370).

Page 7356, line 10. Could you explain why it is important to represent hydrophilic and hydrophobic organic matter and black carbon in the model?

It is importand to differentiate between hydrophilic and hydrophobic aerosols in the model because they have different physical properties; mostly prominently, hydrophilic aerosols can grow depending on the humidity of the air. This leads to an increased optical depth and to and increased deposition rate in more humid conditions. Note that hydrophobic aerosols are converted to their hydrophilic counterparts during aging of the aerosols.

Page 7364, line 14. Why is the main effect attributed to a lower detection threshold of the FRP-based approach than the approach based on burnt area? Could you explain it in more detail?

The detection of small fires with burnt area observations is limited by the pixel resolution; when a fire burns less than half of one of the 500 m $\times$ 500 m MODIS SWIR grid cells that underly the GFED inventory it is not detected (Giglio et al., 2009). On the other hand, FRP observations require at least emission of about 4.5–40 MW of thermal radiation in order to be detected in the MODIS MIR channel, depending on their distance to the sub-satellite track (Freeborn et al., 2010). Fig. 5 shows that there are many grid cells with small combustions of 1–10 g(C)$a^{-1}m^{-2}$ in GFAS but vanishing combustion rates in GFED. The more quantitative analysis by Heil et al. (2011) confirms this and also shows that GFAS has fire emissions in virtually all GFED grid cells with fire emissions. Since the grid cells with small combustion rates in GFAS are not arbitrarily distributed they are thought to contain a real signal in GFAS, which is missing in

BGD

8, C4659–C4662, 2011

GFED. Consequently, the underlying MODIS FRP observations have a lower detection threshold than the MODIS burnt area observations.

Page 7367, line 2. Tipping error: "there a various interactions..."

OK.

Figure 1-3 and 5. Please include a scale reference in every map. If the projection system change from one map to the other please indicate in the caption the projection used to represent the data.

All maps are cylindrical projections and equidistant in latitudes and longitudes. We will ensure a constant ratio of height/width in the final manuscript. All maps except Fig. 8 (AOD) are plotted with 0.5 deg resolution.

Figure 12 and 13. the color "olive" selected to represent the data is not clearly visible in the printed version. It's also recommended to use a more intense blue color to represent the AERONET observations or represent them as in figure 13.

We will update Figs. 12 and 13 accordingly.

References

Freeborn, P. H., Wooster, M. J., and Roberts, G.: Addressing the spatiotemporal sampling design of MODIS to provide estimates of the fire radiative energy emitted from Africa, Remote Sensing of Environment, 115, 475–498, 2010.

Giglio, L., Loboda, T., Roy, D. P., Quayle, B., and Justice, C. O.: An active-fire based burned area mapping algorithm for the MODIS sensor, Remote Sensing of Environment, 113, 408–420, 2009.

Heil, A., Kaiser, J. W., Schultz, M. G., et al.: On the use of MODIS Fire Radiative Power for Global Fire Emission Estimation, ???, in preparation, 2011.

Westerling, A. L., Hidalgo, H. G., Cayan, D. R., and Swetnam, T. W.: Warming and earlier spring increase western US forest wildfire activity, Science, 313, 940–943, 2006.

BGD

8, C4659–C4662, 2011

Wüst, R.: Mathematik für Physiker und Mathematiker, vol. 1: Reelle Analysis und Lineare Algebra, WILEY-VCH GmbH & Co. KGaA, 3. edn., 2009.

Interactive comment on Biogeosciences Discuss., 8, 7339, 2011.

BGD

8, C4659–C4662, 2011