

Interactive comment on “Annual and diurnal African biomass burning temporal dynamics” by G. Roberts et al.

Anonymous Referee #2

Received and published: 1 October 2008

General Comments:

The paper: “Annual and diurnal African biomass burning temporal dynamics” by G. Roberts, M. J. Wooster, and E. Lagoudakis presents a detailed spatial and temporal analysis of a full year’s collection of fire radiative power (FRP) measurements throughout the African continent from the SEVIRI sensor aboard the Meteosat 8 and 9 Geostationary satellites. Utilizing the temporal advantage offered by the sensor’s 15-minute measurement time interval, the authors were able to obtain daily total fire radiative energy (FRE) values by integrating the high-frequency instantaneous FRP measures through their full diurnal cycles. They further used the FRE to derive the burned biomass amounts for different land-cover types and countries. The study represents a very important contribution to the biomass-burning and carbon-cycling literature and

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deserves publication.

The paper is well written and the illustrations are informative. However, there are a few issues that may need to be addressed to clarify certain aspects of the paper and correct errors, as indicated below.

Specific Comments:

(1) Although the work itself is quite well done, the objective is not explicitly stated in the introduction. For instance, just before the last paragraph that begins with “This paper concentrates . . .”, I would have expected to see a paragraph that clearly highlights the fact that there is need to do what has been done, perhaps in the form of a convincing argument demonstrating that what is currently available is inadequate. Fortunately, there is a subparagraph in section 2, which does not fit properly where it currently is and, with appropriate adjustment, could make a great paragraph before the last one in the Introduction. It is the second half of the last paragraph of section 2, starting with “The burning fuel is ~48% carbon . . .” all the way to the end of that section (i.e. page 3630, lines 3 – 13).

(2) It was not very clear how “burned biomass” from the FRP method compares with “burned biomass” from the burned-area-based method. I was expecting to see the result of this comparison in the last paragraph of section 4.2, but instead the authors seemed to give the impression that the burned-area-based method only provided the pre-burn available biomass, and the comparison allowed them to infer the combustion completeness. It made the discussion somewhat confusing, because the objective was to compare the same products from two methods rather than to combine different products from two methods to infer a third product. I think it would be better for them to apply the literature combustion completeness, which they cited as 83 – 98%, to the burned-area method and actually calculate the “burned biomass”, which they can then compare with the FRP-based result, so that the reader may appreciate the level of agreement between the results of the two methods. It does not matter if they do not

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agree, as any discrepancy can be investigated in future research.

(3) Although the authors converted FRE to burned biomass using the biomass combustion factor derived in Wooster et al., (2005), the value of that factor was not mentioned anywhere in the paper. I think, for the sake of completeness, it would be good to mention the value of the combustion factor (or even the conversion equation, since it is very short) in an appropriate place in the paper.

Technical Corrections:

I list the corrections I consider necessary simply in the order they appear in the paper:

Page 3624, Lines 3-4: Technically, the satellite observation is made at discrete “time intervals”, while the pixels are finite areas, which represent “spatial resolution”. Therefore, I would change the relevant segment of the sentence to “15-min temporal interval and 3-km spatial resolution”.

Page 3624, Lines 13-14: The second part of the sentence i.e. “, indicating the importance of optimizing the fire pixel detection strategy performance” is not necessary because it does not convey any useful information here. I suggest that it be removed.

Page 3625, Line 3: The author’s name is spelt “Merlet”. Also, I would start the sentence after that with “Depending on” rather than “Varying with”.

Page 3625, Line 4: Hao et al is 1996 (not 1990) in the reference list. Verify which date is correct.

Page 3625, Line 6: IPCC (2001) is not listed in the reference list.

Page 3625, Line 18: I would write, “remote sensing from Earth Observation (EO) satellites”, to avoid using the word “observation” twice so closely.

Page 3626, Line 4-5: Right after “Despite their relatively coarse spatial resolution” I think it is good to actually give the resolution in parenthesis, e.g. “(4 km at nadir)” before continuing the sentence, so that a reader who is not familiar with GOES may

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not be wondering what it is exactly.

Page 3626, Line 10: Here again, replace “sampling distance” with “spatial resolution”, because the pixels are not “points” located every 3 km, but contiguous “areas” each ~3 km wide. Please try to check the rest of the paper and make the correction.

Page 3626, Line 17: This sentence is somewhat long, and gets a little fuzzy in the middle. I would end it after the word “measures”, then start a new sentence by replacing “a parameter that” with “FRP”.

Page 3627, Line 23: This is the first time you mentioned “MIR”. Therefore, it is necessary to write it out like “mid infrared (MIR)”.

Page 3628, Line 5: There is only one Giglio et al 2003 (without alphabetic suffix) in the reference list.

Page 3628, Line 8: remove “by” just before “MODIS”.

Page 3628, Line 10: It is better to say “fairly significant” or “non-negligible” rather than “not insignificant”.

Page 3628, Line 21-26: This is a long winding sentence, and needs to be broken into two.

Page 3629, Line 10: There is no van der Werf et al 2004 in the reference list (only 2003 and 2006). Find others and correct.

Page 3629, Line 26: Delete the comma after “Across”.

Page 3629, Line 27: The value for Chad is well below 50 Tg. Check the chart carefully.

Page 3630, Line 2: I think you mean “apparently largest” not “largest apparent”.

Page 3630, Line 15: Insert “of” between “amount” and “fuel”.

Page 3630, Line 21: Despite the dictionary meaning of “decadal” as designating tens, it has come to be regarded in common usage as representing tens of “years”. To avoid

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confusion, I think it is best to remove “decadal” everywhere you have used it to refer to “days”. It is enough to write it simply as “10-day mean”.

Page 3631, Line 4: Yevich and Logan is 2002 (not 2003) in the reference list.

Page 3631, Line 13: If you look at the plot carefully, shrubland did not show a steady increase at the beginning of the season, but fluctuates.

Page 3631, Line 21: The plot shows the increase starting from April (not June).

Page 3632, Line 5: If you look at the chart carefully, it is actually the “deciduous woodland” that covers the largest area, more than twice that of the “deciduous forest”. Therefore, you need to interchange those two biome types in the sentence.

Page 3632, Line 17: Giglio et al 2006 has “a” or “b” suffix in the reference list.

Page 3632, Line 19: You need to add a comment here about the “montane forest” type, which has the highest mean per-pixel FRP value unlike the other forest types.

Page 3632, Line 27: not “relate” but “related”.

Page 3633, Line 10: Roberts and Wooster should be 2008 (not 2007).

Page 3633, Line 12: delete “s” from “fires”. It should be “fire pixels”.

Page 3633, Line 19: Jost et al is 2003 (not 2002) in the reference list.

Page 3634, Line 14: Swap et al (2003) is not in the reference list.

Page 3635, Lines 15-16: “they are believed” should be replaced with a more scientific clause such as “they have been shown” followed by an appropriate reference. If there is no prior paper that “showed” that they are “less perturbed by errors of commission”, then you need to make a more tangible statement to justify your claim.

Page 3636, Line 12: Veroustraete et al. (1996) is not in the reference list.

Page 3636, Lines 25-26: “g C/m²” and “g/m²” are not the same. You need to check all

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your units carefully to make sure they are accurate and consistent.

Page 3637, Line 19: add “s” to “fire”.

Page 3637, Line 26: delete “the” after “each”.

Pages 3638-3639: There was a recent attempt at roughly perceiving FRP diurnal signature from the four-times-a-day MODIS data, which may deserve to be cited somewhere in this section. It is in: Ichoku, C., L. Giglio, M. J. Wooster, and L. A. Remer, Global characterization of biomass-burning patterns using satellite measurements of Fire Radiative Energy. *Remote Sens. Environ.*, 112, 2950-2962, 2008.

Page 3640, Line 7: the singular form of the word is “phenomenon”. See also Line 13, and check everywhere else.

Page 3640, Lines 24-25: This last sentence tends to leave the reader wondering “Why?”. It would be good if, based on your experience with the data analysis, you could try to find (or even hypothesize) a reason or two why highest number of pixels translates to highest mean FRP in these biomass types.

Page 3641, Line 5: insert “a” after “at”.

Page 3641, Line 15: After publication, this will no longer be just a “manuscript”. Replace it with “paper” or “study”.

Page 3641, Line 16: replace “Africa” with “individual African countries”.

Page 3641, Line 17: replace “African” simply with “the”.

Page 3642, Line 7: “agrees quite well” is not really appropriate here. It would be better to use something like “falls within the range”.

Page 3655, Figure 6: The vertical axes need a proper title that indicates exactly what is represented rather than just “percentage”.

References Overall:

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There are too many references in the reference list that are not cited anywhere in the text. Please search and find them, and either remove them from the list or cite them appropriately in the article.

Figures Overall:

On many of the figures, the lines (especially the dotted or broken lines) are still very thin, making them difficult to follow, some of the text fonts are very small, and the items of the legends too close together even when there is sufficient room to spread them out. I think that the authors need to improve the graphics overall. They should do their best to make every text and line on every figure clearly legible and distinguishable at the publication scale, even on a photocopy.

Interactive comment on Biogeosciences Discuss., 5, 3623, 2008.

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