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

**Anonymous Referee #1**

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Comments on

Annual and diurnal African biomass burning temporal dynamics by G. Roberts, M. J. Wooster, and E. Lagoudakis

In this contribution remote sensing data obtained from a radiometer onboard the Meteosat-8 geostationary satellite have been employed to investigate biomass burning patterns in Africa. The manuscript reports interesting new data. The paper should be rejected, however. There are three reasons for this. The references section is, mildly speaking, sloppy. Several of the figures are difficult to read. The paper is written for a highly specialized community. Especially the latter suggests to consider another journal for submission.

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Addressing a broad audience requires understandability of highly specialized topics. Therefore referring to other journals only may not always be appropriate. SEVIRI could be explained as Spinning Enhanced Visible and Infrared Imager and FRP likewise. The Abstract would have benefitted. But several abbreviations later on in the text remain obscure, if the reader is not a member of the remote sensing community: GTOPO30 DEM, SPOT VGT, DGVM, ...

The references are not always well prepared, either there are misspellings (it is Merlet, not Merlot), or they are missing at the end (Giglio et al., 2003a p. 3628; van der Werf et al., 2004 p. 3629; Giglio et al., 2006 p. 3632; Roberts and Wooster, 2007 p. 3633; Jost et al., 2002 p. 3633; Lui et al., 2005 p. 3633; Swap et al., 2003 p. 3634; Veroustraete et al., 1996 p. 3636; van der Werf et al., 2004 p. 3638. Fourteen citations are given in the references section, which do not appear in the text.

Most disgusting in this manuscript are the figures, explicitly Figure 2, 4, 6, 11, 12, 14. Some colors used are hardly visible, sometimes are lines missing, high magnifications are necessary to find out what the authors want to convey. It is mainly for this reason, and the references section, why the manuscript is not acceptable.

Details: page 3626 What is exactly the sampling distance ? Is it the lateral length of one pixel or is it the length of an agglomerate of pixels which allow recognition of a pattern which can be attributed to a fire ? Especially in the latter case moving fires may escape detection. How large would the '3 km sampling distance' be at the Cape point ?

page 3627 Do burning mine and refuse dumps contribute to the SEVIRI signal and could they be used for "internal calibration" procedures ?

page 3628 The 40% underestimation of SEVIRI is large enough to warrant a more detailed explanation and what is meant with regional scale in the given context ? (Volume 48 of IEEE Transactions on Geoscience and Remote Sensing did not appear yet.)

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page 3629 It remains rather difficult for the reader to assess the influence of clouds on the magnitude of the FRE signal. According to Figure 2 it seems that scaling factors were used. The given numbers (2 and 2.3 Tg; 263 and 290 Tg) say roughly 10%. What about changed fire management procedures due to an overcast sky ? Were the above mentioned 40% underestimation taken into account in the comparison to the other consumption data ? Which inter-annual variability may be expected ?

The generally greater fuel loads in the southern hemisphere could be substantiated by a reference.

Figure 3b does not show Chad to have burned 50 Tg during the time of investigation. How would the graphs of Figure 3 look like, if the country area were taken into account ?

page 3630 Though the carbon fraction of the burning fuel is generally accepted as ~48% , it should be kept in mind that this value refers to dry biomass mostly. In reality the value may be lower due to the fuel moisture. So the area fuel loading should state whether dry or moist is meant. The difference can be significant, see for instance Araujo et al., 1999.

The word trajectory is somewhat irritating here, as the word points to a change of location in space, usually not in time.

The Fire Radiative Energy and the total biomass combusted of Figure 2 are on both y-axes. So they are in a fixed linear relationship. Is that the same factor as in Figure 4a and 4b ?

'African biomass burning appears dominated by fires in woodland ...';. Just for interest: into which category falls savanna ?

page 3631 Is there a mismatch between the sub-graphs 4b and 4c ? And if so, the said correspondence between increasing mean per-pixel FRP and the increasing daily FRE does not become visible. The scatter is too large. How would the variance of the

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ten-day means look like ?

page 3632 The blue crosses in Figure 5c are barely visible and the horizontal axis label is another example of showing disrespect to the readers.

'Forest cover types typically exhibit the lowest mean per-pixel FRPs ...'. Montane forests obviously show a different behavior.

page 3633 The question of persistence of fires as derived from the remote sensing data touches an interesting topic. Unfortunately, nothing has been said about the influence of how sensitive the fuel consumption data are on the 15 minutes data. Also, it remains unclear which method has been used, when reading the two sentences: 'The fact that so many fire pixels fail to be detected in more than on consecutive imaging slot suggests that harsh temporal filtering of the fire pixel results is not an appropriate method for minimising false alarms over Africa.' 'Instead detailed spectral and spatial filtering tests such as those used to derive the dataset used here should be employed.' Was the harsh one used or not ?

Here again the question from above comes up about the lateral length, whether it is of one pixel or it is the length of an agglomerate of pixels which allow recognition of a pattern. It would also be of interest to know how well two consecutive slots render the same area.

page 3634 In which graph of Figure 7 do MOPITT surface data appear ?

The mean per-pixel FRP could only be an indicator of combustion completeness, if fuel density remains constant.

page 3636 Is a notation like  $\text{mgC/m}^2/\text{d}$  is conform with SI rules ? (Not more than one solidus should be used in the same expression unless brackets are used to eliminate ambiguity).

$S(d)$  has been explained, but what is  $S(g,d)$  ?

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page 3637 Could the absence of measured Fire Radiative Power during night be due to pyrogenic haze formation in the shallow nocturnal boundary layer ?

Combustion completeness of 100% is difficult to believe. By discussing temporal behavior of biomass fires the patchiness, especially at sub-pixel scale, should not be forgotten.

One would like to see the error bars in Figure 9.

That fuel consumption densities generally increase with increasing landcover class woody cover could also simply be a question of available combustible mass.

page 3638 Is the 9 of 309 g m<sup>-2</sup> significant ?

If 'it is likely that a combination of false detections in the SEVIRI data set and an underestimation of burned area in the GFED data set contribute to overestimation', how much likely is that for the other data ? It is unfortunate for the reader to rarely find tools in terms of error margin discussions in this manuscript to assess the "stability" of the reported data.

The time axes look curious with equidistant ticks and labels sometimes 3 and sometimes 4 hours apart. Is it possible that the designation of NHA/SHA and red/black were mixed up ?

For Figures 11 and 12 again as for Figure 8, could haze formation prohibit signal reception on the satellite ? The 'dying of the fires' almost simultaneously with the onset of the evening/nocturnal stratification of the atmosphere may point in that direction, as does the breaking-up of the nocturnal boundary layer in the morning.

page 3639 It is indeed difficult to integrate the pattern found in the landcover types mangrove and croplands, woody vegetation, both red lines, into the given explanations, as is said later on.

trajectory: see page 3636

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What is background in Figures 13a and b ?

page 3640 It is curious to find the maximum per pixel FRP to be typically twice of that of the nighttime value, if Figures 11 and 12 show that nighttime values are close to zero.

page 3641 Does section 6 warrant the title of a discussion ?

Are numbers of 8% and 6% of the total significantly different ?

The references section has been poorly prepared. Fourteen citations do not appear in the text. Several have year mismatch, misspellings or are incomplete, in one, for instance, an author is missing, in another one the year.

Reference: Araujo, T. M., J. A. Carvalho Jr., N. Higuchi, A. C. P. Brasil Jr., and A. L. A. Mesquita. A tropical rainforest clearing experiment by biomass burning in the state of Para, Brazil. *Atmos. Environment* 33, 1991-1998 (1999).

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