

**"A novel methodology using MODIS and CERES for assessing the daily radiative forcing of smoke aerosols in large scale over the Amazonia" by E. T. Sena and P. Artaxo**

This paper describes a new methodology to measure the direct aerosol radiative forcing (DARF) at the top of the atmosphere. For this purpose, the authors used the MODIS and CERES satellite instruments during the biomass burning season over the Amazonian region. They compare their DARF results with other studies using a different methodology and with ground-based stations. The structure of the paper is good and we clearly see where the authors go. Results are reasonably well presented and I recommend the paper for publication in ACP after the authors address the following comments.

**General comments:**

1) The abstract is not concise enough. In particular, I would summarize more the 2nd and 3rd paragraph. I am not sure that you need to detail your methodology here (MODIS clean scenes, etc...). I also don't think that correlation equations need to be written. It makes the abstract heavy. I would remove them and slightly modify your last sentences such as "We showed that our methodology agrees well with other satellite remote sensing studies, ground-based measurements and radiative transfer models..."

2) I have concerns about your explanations attributing the 24h-DARF daily variation that you show in Figure 2 and 3, reported in Section 3.

Page 31524

Line 15-17: You attribute the difference of 24h-DARF between 2 days (13th and 15th of August) to the transport and atmospheric circulation.

Page 31525

Line 8-9: You attribute the 24h-DARF daily variation to the change in cloud cover.

Where do you see that these variations are due to the transport, atmospheric circulation or cloud cover? I would like to see a plot of the daily cloud cover area in your region for each day (I think MODIS retrieves this product). Are these clouds over burning areas which could decrease 24h-DARF? In addition, did you look at aerosol emissions for these days (e.g., with a satellite fire product or with a biomass burning inventory (e.g., GFED))? On Figure 3, the 24h-DARF shows lower values for 2007 (down to  $-25 \text{ W.m}^{-2}$ ) than for 2005 ( $-20 \text{ W.m}^{-2}$ ) and 2006 ( $-15 \text{ W.m}^{-2}$ ). A quick look at the GFEDv3 inventory seems to be consistent with those results since it shows larger biomass burning emissions in 2007 than in 2005 and 2006. What about 2008, 2009? It would be easier to compare different years if you could plot data on the same plot. Maybe different color lines for each year with a 3 days smooth? There are also several papers in the literature referring to the transport of aerosols in the Amazonian region that could help.

3) I would remove the Figure 4. This figure comes from another paper which is cited and it doesn't add anything to your paper. We understand the difference between your approach and that used in previous studies. Your explanations on page 31525 are enough. Maybe same for Figure 6.

4) I agree with you when you say that a small SSA variation induces a large 24h-DARF variation for large AOD values (e.g.,  $\text{AOD}=5$ ). However, you showed that the mean AOD over Amazonia is about 0.2 to 0.4 during dry seasons. So, it would be more judicious to tell us about the difference in 24h-DARF at these AOD for different SSA. Are those 24h-DARF variations at these low AOD values (0.2-0.4) in range of variations that you observe with AERONET? You might need to change the x-axis range on Figure 10 as well (e.g., from 0 to 1 or 0 to 2).

5) I found the English approximative and heavy but the paper is understandable. Here after, I listed some specific comments but there is space for more improvements.

### **Specific comments:**

When several references are mentionned, put them in chronological order please.

Page 31516

- 1) Line 3: Remove "For that,"
- 2) Line 8: Replace studies by study
- 3) Line 20: ...in the estimate of...

Page 31517

- 4) Line 24: Remove "important"

Page 31518

- 5) Line 6-9: Rephrase sentence
- 6) Line 13-14: Remove "and other properties"
- 7) Line 23-24: ...with ground-based remote sensing measurements (ref) or in-site field-campaigns (ref)

Page 31519

- 8) Line 11: ...is estimated to be about...

Page 31520

- 9) Line 5: Remove "retrievals"
- 10) Line 7: These both instruments...
- 11) Line 16: MODIS measures...
- 12) Line 19: ...about cloud and aerosol optical...
- 13) Line 25: ...aerosol and cloud properties...

Page 31521

- 14) Line 2: ...shortwave flux retrievals at the TOA from Terra satellite...
- 15) Line 12-13: ...measured in background (Fcl) and polluted (Fpol) conditions.
- 16) Line 19: Can you explain why you take 0.1 as the threshold for background scenes ? Does it come from another paper ?
- 17) Line 22: Is the example showed in Figure 1, a best case scenario or it is representative of each grid cell ? Why did you choose to show this example more than another ?
- 18) Line 25: "approximation"

Page 31522

- 19) Line 13: Remove "of the"
- 20) Line 16: CERES radiance measurements

Page 31523

- 21) Line 1: Remove "For this,"

Page 31524

- 22) Line 9: ...from about -30 to -15
- 23) Line 13: ...from -30 to -15

Page 31525

- 24) Line 6: Remove "That is"
- 25) Line 6-7: Replace more negative by decrease and less negative by increase
- 26) Line 8: ...from one day to another...
- 27) Line 13-14: ...was calculated by using...
- 28) Line 22: Replace "that is, in a" by "with a"

Page 31526

- 29) Line 5-7: ...is always lower than...for this 10 year period (2000 to 2009) is -8.2...is -5.2...
- 30) Line 16: Replace less negative by larger
- 31) Line 22: Replace most certainly by very likely
- 32) Line 23: Remove "that was"
- 33) Line 26: ...between aerosol optical depths obtained by these two collections is due to the fact...

Page 31527

- 34) Line 18-19: correlation
- 35) Line 19: ...to 2009 is -0.86+-0.03 which is better than the mean...
- 36) Line 24: ...TOA flux estimates...
- 37) Line 26: Replace rely by relies
- 38) Line 27: ...those flux retrievals.

Page 31528

- 39) Line 4: ...in the calculated DARE...
- 40) Line 6: ...that accounts for...
- 41) Line 23: ...to retrieve AOD and...

Page 31529

- 42) Line 23: with 1 within 2 uncertainties ??? I dont understand what you mean here
- 43) Line 26-27: AERONET sunphotometers are at the surface and CERES-MODIS instruments are at 705 km aboard...

Page 31530

- 44) Line 10-11: In order to properly do that we compare CERES-MODIS data at the TOA with...

Page 31531

- 45) Line 4: ...are compatible with 1 and 0, respectively, within one uncertainty ??? Same as before, I dont understand.
- 46) Line 9: ...pyronanometer measurements.
- 47) Line 16: To me, a slope of 0.86 is not close to  $y=x$ . A difference of 14% is not negligible.

Page 31532

- 48) Line 8: ...significant and it shows that aerosol single scattering albedo is a critical parameter to assess DARE.
- 49) Line 13: consists

Page 31533

- 50) Line 10: ...methodology is applied.
- 51) Line 12: Reformulate the sentence: The intercomparison between...
- 52) Line 23: ...resulting in a better correlation between...

Figure 2: caption, distributions

Figure 5: What happened in 2004. Can you mention it ?