Atmos. Chem. Phys. Discuss., 9, C5246–C5249, 2009
www.atmos-chem-phys-discuss.net/9/C5246/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Regional-scale correlation between CO_2 fire emissions, burned areas, and mid-tropospheric CO_2 daily variations over southern Africa" *by* A. Chédin et al.

Anonymous Referee #1

Received and published: 25 September 2009

GENERAL COMMENTS

The paper presents some interesting results but a few issues need to be addressed before it is publishable:

Firstly, what is the novelty of this research? page 4 lines 20-25 the authors state here that the relationship between DTE and fire emissions has already been demonstrated by Randerson et al 2006 and Chedin 2005, 2008. How then does this paper add any more information?

To me the most interesting result is that the DTE shows more burning early in the season than any of the active fire or burned area products, and that this might actually

be true (that the fire products would miss the early burns). - but you need to be able to explain why this is only apparent in some regions.

Secondly the structure is hard to follow. The authors have a methods section (section 2) but then continue straight into reporting results without a clear results section. Similarly, at the end of the paper in the modelling section a whole lot more methods are reported. This needs to be clarified before the paper will be readable.

Finally, the manuscript needs to be carefully checked for correct English grammar. For example, Page 12 line 1: "The DTE observation periods is 10 years apart with GFEDv2" should read (I think): "The DTE observation period is 10 years earlier than GFEDv2"

SPECIFIC COMMENTS

The abstract should be re-written to make the research sound more interesting.

Start with "The usefulness of using the difference in morning and evening CO2 in the mid-troposphere as an index of fire emissions is investigated for southern Africa. This "Daily Tropospheric Excess" is compared with other datasets that have been used to estimate burned area and fire emissions (L3JRC and GFEDv2) and shows similar seasonal and annual patterns....

page 4 lines 20-25. You state here that the relationship between DTE and fire emissions has already been demonstrated by Randerson et al 2006 and Chedin 2005, 2008. How then does this paper add any more information?

page 5 line 5 people usually burn more in the afternoon also.... see Gareth Robert's recent paper in biogeosciences.

methodology: be more clear about which analyses you do... this will make the results easier to follow. I would suggest a new section titled: "Analyses" containing a tabulated list of the various things investigated (eg 1: we compared DTE values with other fire products to test how good a proxy it is of fire activity. 2: we tested whether annual

ACPD

9, C5246–C5249, 2009

DTE values could pick up changes in fire emissions related to inter-annual variability in climate and fire. 3: we investigated how well DTE measurements reflect seasonal patterns of fire in southern Africa. 4. We developed a 3-D model to test whether the hypothesized mechanism of atmospheric transport can be reproduced in a general circulation model.

It does not appear that you did any statistical tests to see whether these patterns were significant. If you did, then you should also detail them in the analysis section.

The authors mention in page 12 line 8 that the burned area data used to compare with the DTE are themselves prone to error (in fact, accuracy assessment show that the best of them (the modis burned area product, which the authors did NOT use) only identified 75 % of the fires. Can they think of any other, less error-prone, way of testing the usefulness of the DTE?

page 12 lines 15-20: I dont think many fire ecologists or managers would dispute that most of the burning in Southern Africa occurs in June and July.

Section 4.1: This explanation should be in the methods surely??. Also, it does not provide all the information required. Where do you get your fire data from? Are these active fire data? In which case, perhaps it is justifiable. If the fires are also modelled then it is highly suspect to make them all the same size

The discussion only focuses on the results of the modelling exercise. Why did you report all the information on annual and seasonal patterns if you do not discuss them?

Conclusions - if your hypothesis that the burned area data do not catch the early fires is true, then why would the DTE only show an earlier start of the fire season in two of the 10 regions? which regions are these? What is the major vegetation in these regions?

I do not find figure 4 very informative

Figure 5. Report mean annual rainfall for region for each year to give an indication of how comparable the two year-pairs are.

ACPD

9, C5246–C5249, 2009

In figure 9 label the classes with the actual DTE intervals.... using a class is unnecessary and makes it difficult to interpret.

Why report both figure 9 and figure 10 ? Surely just one of these graphs will suffice?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 18621, 2009.