

Interactive comment on “Estimates of fire emissions from an active deforestation region in the southern Amazon based on satellite data and biogeochemical modelling” by G. R. van der Werf et al.

Anonymous Referee #1

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General comments

The emission estimates from tropical forest fires are highly uncertain. This paper presents a meaningful work for the assessment of tropical deforestation fires. The authors developed an emission model at relatively high spatial and temporal resolutions, based on Morton et al. who merged the active fire information with land cover change estimates for deforestation. The work conducted in this paper could substantially contribute to improve the estimation of the fire emissions. As described by the authors, processes not included in this stage (e.g., logging) could be a next step. However, the

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effect of such processes on the fire emission estimates is not sufficiently discussed in the text. The major concern is that their estimates of deforestation fire emissions might be affected by the logging and understory fires significantly. If the authors provide more detail information on their methods and interpretation of the results, this paper could be improved.

Specific comments

1 Introduction

You described the bookkeeping methods and inverse modeling in the 3rd paragraph, and then, jumped to the introduction of your model in the 4th paragraph, although you mentioned that current estimates are only available at coarse spatial resolution with large uncertainty in the abstract. Various methods used to estimate the terrestrial carbon fluxes have been compared and discussed in House et al. (2003) and Ito et al. (2008). These studies have shown that large model differences exist in the Amazon forest. Some discussion with the relevant papers would be appropriate.

House, J. I., Prentice, I. C., Ramankutty, N., et al.: Reconciling apparent inconsistencies in estimates of terrestrial CO₂ sources and sinks, *Tellus, Ser. B*, 55, 345-363, 2003.

Ito, A., J. E. Penner, M. J. Prather, et al.: Can we reconcile differences in estimates of carbon fluxes from land-use change and forestry for the 1990s?, *Atmos. Chem. Phys.*, 8, 3291-3310, 2008.

2.3.1 Deforestation fires and post-clearing land use

The INPE deforestation map is a fundamental data set for this study, but the INPE (2007) reference does not help the reader to understand it. You should summarize the data set and cite a specific paper.

Brazilian emission inventory includes the cerrado in the deforestation. What is the definition of forest in the INPE deforestation map? How did you adjust your model to

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be consistent with that?

How did you discriminate the deforestation fires from the logging in the satellite-derived map when you converted the PRODES data to 250m resolution? You stated that the logging process was not included, but the reader might take that the logging was included in the deforestation fires. If the selective logging is treated as the deforestation fires, you may overestimate the fire emissions at relatively high spatial and temporal resolutions significantly, although the reductions in forest biomass from selective logging before deforestation might be small on average. It would be worth adding a few sentences to discuss how this assumption might be expected to affect the estimates presented here. Quantitative discussion would be helpful.

Where is Sect. 2.2.5?

Why did you describe the secondary transition in this section?

2.3.2 Cropland expansion

What is the definition of previously-forested areas (INPE, 2007)? How did you identify these areas?

What is the definition of non-forest areas (Morton et al., 2008b)? How did you identify these areas?

2.3.2 Management fires in pasture or cerrado

Which land cover map was used to classify the land into the pasture or cerrado?

2.5 Land cover

How did you summarize the land cover into 6 land cover classes? What is the definition of each class?

3 Results and 4 Discussion

Although the Landsat-based estimates of deforested area may be the best available

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data, you have made assumptions in the areas affected by fires. You should have the subsections for the areas affected by fires in results and discussion. It is interesting to compare the areas affected by fires for deforestation and conversion of pasture or Cerrado to cropland with the MODIS burned area product used for maintenance fires and other products.

Comparison of fuel consumption with measurements (e.g., Balch et al., 2008) would be appreciated.

4.4 Uncertainties

Active fire products at 1 km spatial resolution may include some understory fires, but the discussions on the understory fires are not given in this paper, although the paper by Balch et al. (2008) is cited to compare the biomass. The understory fires might be used to determine the transition type (early trajectory) and duration of the transition. The understory fires might have already consumed part of the woody debris in the tree covered areas. The understory fires in closed-canopy tropical forests might cause substantial carbon emissions. It would be worth adding a paragraph to discuss how these might be expected to change the estimates presented here. Quantitative discussion would be helpful.

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