

Review for Sands et al. (2024)

Article title:

Satellite-observed relationships between land cover, burned area and atmospheric composition over the southern Amazon.

In this article, Sands et al. investigate the link between land surface changes, particularly in South America's rainforests, and atmospheric species of biogenic and pyrogenic sources. It focuses on the following atmospheric species: Isoprene, methanol, formaldehyde HCHO, carbon monoxide CO, and nitrogen dioxide NO₂. The land variables studied are land cover type and Leaf Area Index LAI. Different satellite instruments and other data sources are used in the study. For instance, land cover type, Leaf Area Index LAI, and Aerosol Optical Depth AOD are (from MODIS, Aqua and/or Terra); burned area (from GFED4 inventory), Isoprene (from CrIS, Suomi-NPP), Methanol (from IASI, Metop-B), Formaldehyde HCHO and Nitrogen Dioxide NO₂ (from OMI, EOS Aura), and carbon monoxide CO (from Mopitt, Terra). The period covered is within 2000-2020, however, some of the data are only available since 2001, 2005, 2008, and 2012; and some of them are unavailable after 2016, 2018, and 2019.

Overall the study is well conducted. The analysis is conducted on different layers, temporal (seasonal and yearly analyses), spatial, and per land cover type and leaf coverage. Statistical methods were also used to draw clearer conclusions as needed. This study is suitable for the journal. No major changes are needed, only minor improvements that will make it flow better to the reader. The analysis presented in this study is useful for the improvement of Earth System Models.

Specific comments:

- Metop-B was launched in 2013, this means that the IASI data you got from 2008 until 2012 are from Metop-A?
- It is better to add a *data availability* section at the end of the article, (after the code availability for instance), in which you list the data you used with the corresponding links or sources where we can download them, if possible.
- In the caption of Fig. 5, try to be consistent with the caption of Fig. 4 when mentioning the shaded area in grey.
- It would help if the statistical methods are explained in more details, with equations for instance.
- Add more results in the abstract, to highlight the main findings of the study. The results mentioned in the conclusions for instance, they can be rewritten in a more concise way in the abstract.

Minor Comments per line:

- Line 14-15: put a comma before and after these words "such as deforestation"
- Line 18: Maybe cite some of the "particular development stages"
- Line 21: the sentence seems like it is chopped "uncertainties in its magnitude remain.". Re-write or continue the sentence.

- Line 26: for every atmospheric species you write the chemical formula, you add here for isoprene (C₅H₈) for instance. Like you do for methanol.
- Line 56: you wrote particular matter instead of particulate matter, also you can add (PM₁₀ and/or PM_{2.5})
- Line 105: You mention that the data product has been quality assessed (Fu et al., 2019; Wells et al. 2020, 2022). Can you add a sentence to tell us the result of these assessments?
- Line 108: you add here the altitude of the Metop-B satellite, just like you did for OMI, EOS Aura.
- Line 110: add (*EOS*) after *Earth Observing System*.
- Line 178: change -average to average without the “-” in the beginning.
- Line 255: mention the lifetimes of other species when you compare the lifetime of CO to them. You do this later in the article, but it is helpful to have the lifetimes of other species mentioned earlier.
- Line 389: consider moving Fig. 9 and Fig. 10 closer to the text where you refer to them. Especially Fig. 10. Or maybe, you can merge them into one figure so it is easier for the reader to read the text, then look at the plots.