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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Estimated total emissions of trace gases from the Canberra wildfires of 2003: a new method using satellite measurements of aerosol optical depth and the MOZART chemical transport model" *by* C. Paton-Walsh et al.

Anonymous Referee #2

Received and published: 24 March 2010

General Comments:

The paper describes a new methodology do estimate trace gas emissions from vegetation fires by using satellite Aerosol Optical Depth (AOD) data from NASA's MODIS instrument and the chemical transport model MOZART-4. A previously established and published correlation between observed tropospheric AOD columns and correspondent carbon monoxide amounts (CO) was applied in a case study of the Canberra

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fires in 2003 to demonstrate the performance of this new approach. A whole section of the paper was dedicated to assess the uncertainties of all the method's components and underlying assumptions, which is very useful for readers who are eventually interested in using this method, however it lacks a better foundation of the decisions that led to using the final uncertainty percentages. I am in doubt if the presented method is an alternative to the conventional ways of calculating fire emissions, as it seems to be somewhat complex to reach the final estimate, after performing all the necessary corrections using a chemistry transport model, and uncertainties are not considerably reduced. I wonder if the first, simpler method that included double counting wouldn't be the better approach, given its simplicity and given the fact that the total amount of emissions lies within the uncertainty range of the final result, after all correction work? I agree with the authors that in fact for distinct fire events the method may be used as an additional tool to derive independent emission estimates, given the fires occur in regions not polluted with a variety of other emission sources (mineral dust, urban/industrial pollution, sea salt, biogenic emissions).

Specific Comments / Corrections:

p. 978, l. 5, abstract: I found the sentence on the double counting confusing in the abstract. Only later, while reading the details I understood the meaning. Consider removing or rephrasing. l. 12: "emission factor of carbon monoxide" could be more generally written as "trace gas emission factor"

p.980, MODIS AOD data description: You should state that the MODIS AOD product is AOD at 550 nm and that you used the combined land/ocean collection 5 data.

p.981 l.17: Why didn't you use the MODIS AOD "Aerosol Type" variable to identify smoke aerosols? l.26+: Suggestion: To express the AODexcess variable mathematically and resume the text above, you could call the determined background values as AODbg = 0.11, and write:

"For all AODavg > 0.2 : AODexcess = AODavg – AODbg".

ACPD

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This will make the formula on p. 982, l.10 easier to understand.

p.983, ls 7+8: Comment: At the same time youmay have a considerable AOD omission in the MODIS product, since smoke plumes may be mistaken as clouds and be thus removed from the final product. This would be a counter effect. The sum of both is most probably not zero, though. But the contrasting effect should be mentioned as well.

p.986, l2.: I got a bit lost starting from here. I understood the general idea, of why you are using a chemistry transport model, but I have the impression the details should be presented in a clearer way.

p.988, l.5: Isn't the MODIS AOD at 550nm? l. 21: Why do you think half the value can be assumed?

p.989, l.7: reference?

p.990, l. 11: Why 10%?

p.991, l.22: insert "are" after ". . ., there" l. 30ff.: From what I understood, I don't think the method can be used for estimates on a large scale. First, the effort for preparing the data for corrections and runnig a CTM seems to be too complex to make this directly feasible. Second, the presence of other emission sources than fires will jeopardize the quality of results. Should I be wrong about that I suggest clarifying in the text that these issues are not a problem and why

p.993, l.10; . . .and 347 Tg CO global total for the year 2000 from Hoelzemann (2006), see reference below p. 993, l.15: a newer version of this model with better underlying data for Australia delivers 25 Tg CO/yr for the year 2000 (Hoelzemann (2006). <http://www.mpimet.mpg.de/fileadmin/publikationen/Reports/BzE_28.pdf>

p.993: please correct "Shultz" three times: The good man's name is "Schultz".

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 977, 2010.