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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Sensitivity studies on the photolysis rates calculation in Amazonian atmospheric chemistry – Part I: The impact of the direct radiative effect of biomass burning aerosol particles" *by* L. M. M. Albuquerque et al.

**Anonymous Referee #2**

Received and published: 9 November 2005

This paper examines the importance of biomass burning aerosols on the photochemistry of the boundary layer, specifically on photolysis rates and on surface ozone concentrations. Agreement of model and measurements is obtained (for both radiation and O3 concentrations) only if measured aerosol optical properties are included. The manuscript is clearly written, persuasive, and without any apparent conceptual flaws. It should be published after consideration of a few minor comments.

1. Several previously published studies have looked at similar issues in different con-

texts. Some were already mentioned by Referee#1. Two others are: Greenberg, J. P., A. B. Guenther, S. Madronich, W. Baugh, P. Ginoux, A. Druilhet, R. Delmas, and C. Delon, Biogenic volatile organic compound emissions in central Africa during the Experiment for the Regional Sources and Sinks of Oxidants (EXPRESSO) biomass burning season, J. Geophys. Res., 104, 30659-30671, 1999. and Castro, T., S. Madronich, S. Rivale, A. Muhlia, and B. Mar, The influence of aerosols on photochemical smog in Mexico City, Atmos. Environ., 35, 1765-1772, 2001. Both indicate slower surface photochemistry (including less O3 production) due to either biomass burning plumes (Greenberg et al.) or urban pollution (Castro et al.).

2. Characterization of OZIPR as a 1-dimensional model could be misunderstood. It suggests that multiple vertical layers are considered, which is not the case. However, it is also mentioned that "aged materials" are entrained from above. Some more description of this would be useful. For example, how is the exchange rate calculated? Which materials? and how are those concentrations established?

3. It would be interesting to see some sensitivity studies of the model-measurement agreement for PAR and surface O3. Specifically, how well must aerosol optical properties be known? If the single scattering albedo in the 300-400nm range were changed from the value used (˜0.93) to, say, 0.8 or 1.0, would agreement still be there? A related question is whether surface measurements (of radiation and O3 concentrations) are sufficient to constrain also the impacts at other altitudes. Or are free tropospheric j-values (and O3 chemistry) more sensitive to the exact choice of the single scattering albedo?

4. Figure 8(a) caption: dotted line is presumably WITH aerosols, and solid WITHOUT. Panel (b): should clarify what is being plotted on vertical axis.

5. Technical suggestions: / p3327 line 2: "has" -> "have" / /lines 10, 12: citation should be in parentheses and not preceeded by a comma (see lines 27 and 29 for correct examples) /line 16: remove "it" / p9328 line 10: "Most" -> "Some" (Most atmospheric



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models do have a diurnal cycle of photolysis rates. A few models, especially those designed for long term simulations use dirunally averaged j-values. The authors are correct that in those models the diurnal variability of aerosol optical depth is not considered.) /line 12: "at" -> "by" /line 21: "coefficient" -> "coefficients" / p9329 line 2 "from" -> "over" / p9330 line 1: "build" -> "built" /line4: delete "actinic radiation F(lambda)" because Eq. 1 uses, not obtains, F. /line7: insert "and" after comma. /line 11, at end of line, add "the" /lines 15-17: move citations to just after "atmosphere" so that it is clear that these refer to the extraterrestrial flux, rather than passage through the atmosphere. /line 19: should not be necessary to go to wavelengths shorter than 290 nm for the troposphere. / p9331 line 1: "representative" -> "known" / p9332 line 11: delete "a" / p9333 line 9: what is C10H16? alpha-pinene? /line 15: "is" -> "are" /line 16: insert "as" after "processes" / p9335: line 4: delete "process" /line 5: delete "the" /line9: "produce" -> "produces" / p9337: line 4 "absent" -> "absence" / Figures: The symbol for single scattering albedo does not show properly in my pdf version

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 9325, 2005.