**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Direct and semi-direct radiative forcing of smoke aerosols over clouds" *by* E. M. Wilcox

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General comments

This study shows a useful methodology to estimate the direct and semi-direct radiative effect of biomass burning aerosols using remote sensing techniques, which can be used under other aerosol environments. Nonetheless, the estimates of radiative forcing based on OMI Aerosol Index may completely be not robust. This parameter may be interpreted as a proxy of absorbing aerosol presence, but given its uncertainties can not be used to distinguish clearly situations with aerosols. To this aim, other parameter, like the POLDER aerosol optical depth, may be used as recommended by the other referee. Other possibility is to increase the OMI AI reference, guarantying absorbing aerosol conditions and including the AI uncertainties (for example, AI>2). Besides the

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author should include an error estimation more detailed, analyzing how the AI uncertainties affect the direct and semi-direct radiative forcing estimations. On the other hand, normally the radiative forcing is defined by the difference between conditions with and without atmospheric aerosols. Although in this work only the radiative effect of absorbing aerosols is estimated, including the aerosol scattering effects in the clear estimation of solar fluxes (AIïĆč0) may introduce significant errors in the estimation of radiative forcing.

Technical corrections

- A short description of the region analyzed in terms of cloud albedo, LWP and OMI AI would be useful to complete the study. For example, the table 2 could be replaced by plots of frequency of occurrence of these parameters. - A figure showing the semi-direct radiative forcing, like figure 3, would support the discussion of the semi-direct effect. Furthermore, a plot comparing the direct and semi-direct effect would help readers. - The aerosol optical depth is a spectral magnitude, so author must include the wavelength at which AOD is given (figure 4 and section 3). Furthermore this information should be includes in the definition of aerosol forcing efficiency (section 3). Please, include the error of these latter values in the manuscript. - Some details along the manuscript should be checked: the units of the AOD in the figure 5.b (this magnitude is dimensionless like the OMI AI, so the units of AI must be changed in table 1), the figure 1 was not referenced in the text.

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