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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Interpreting the Ultraviolet Aerosol Index observed with the OMI satellite instrument to understand absorption by organic aerosols: implications for atmospheric oxidation and direct radiative effects" *by* M. S. Hammer et al.

Anonymous Referee #2

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This paper uses satellite measurements and model simulations to constrain the optical properties of absorbing organic aerosol (brown carbon), and estimate changes to photo-oxidation and the aerosol direct radiative effect. The authors first show that in a model simulation with only weakly/non-absorbing organic carbon, the ultraviolet aerosol index is biased low relative to satellite measurements. Next, the authors use satellite observations to estimate the wavelength-dependent imaginary index of refraction for brown carbon. This is then used in GEOS-Chem to estimate changes to OH

production and the direct radiative effect. The paper is suitable for publication with some minor comments.

It is stated that Figures 1-3 are monthly mean UVAI. I am unclear, though, if you supplied monthly-mean aerosol fields to VLIDORT and calculated the UVAI or calculated UVAI at a higher temporal resolution (daily?) and then took the average. If the former do you expect much difference (perhaps from cloud or snow cover)?

Section 4.2 contains a good deal of information; however, I found it a little hard to follow. The first two paragraphs of Section 4.2 contain background information and could possibly be moved to the introduction. It's not clear how the effective imaginary index of refraction is determined. I think a few more sentences elaborating on the methods of estimating the imaginary index of refraction for brown carbon are needed (this could perhaps be moved to the 'methods' - Section 3, and the results remain in Section 4?). The background and methods described here (in my opinion) tend to disrupt the flow of the results.

It is difficult to tell the difference between the color of the filled circles and background colors in Figure 3 (I realize this is partly the point). A thicker edge color may help.

I believe GC-RT assumes externally mixed aerosols. As you are considering an absorbing (and hydrophilic) species, an internal mixture may lead to slightly more absorption. I doubt this would change your general point, but it may be useful to state.

Tables 1 and 5 are a little difficult to compare. Is there a way to combine them? The paragraph in the text is clearly written (and could possibly stand on its own). You could consider moving the tables and Section 2.2 to the supplement, but that's just a suggestion.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 27405, 2015.