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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Increased absorption by giant aerosol particles over the Gangetic–Himalayan region" *by* V. S. Manoharan et al.

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This manuscript provides important corroborating evidence of the contribution of coarse (supermicron) aerosol particles to absorption in the atmosphere.

The presentation is quite clear, with judicious selection of figures that effectively illustrate the message of the manuscript.

The attribution of the absorption to biomass combustion has important implications for use of remote sensing to distinguish between contributions of carbonaceous and mineral dust to column aerosol absorption. Such a distinction was heavily relied on in



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Interactive Discussion

Discussion Paper

the bounding black carbon paper by Bond et al. JGR, 2013. The implications of this work for bounding the contribution of black carbon to direct radiative forcing should be discussed in this manuscript. The authors might also discuss the Bahadur et al. PNAS (2012) and Chung et al. PNAS (2012).

Bahadur et al., (2013) Solar absorption by elemental and brown carbon determined from spectral observations. Proc. Natl. Acad. Sci. U.S.A., www.pnas.org/cgi/doi/10.1073/pnas.1205910109.

Bond, T. C., et al. (2013), Bounding the role of black carbon in the climate system: A scientific assessment, J. Geophys. Res. Atmos., 118, doi:10.1002/jgrd.50171.

Chung, C. E., V. Ramanathan, and D. Decremer (2012), Observationally constrained estimates of carbonaceous aerosol radiative forcing, Proc. Natl. Acad. Sci. U.S.A., 109(29), doi:10.1073/pnas.1203707109.

Minor comments

1. Abstract, lines 3-4. Not true. Most climate models treat some absorption by organic aerosol, particularly at ultraviolet wavelengths, though it is much weaker on a per gram basis than black carbon. See Kirchstetter et al., JGR, 2004, and Feng et al., ACP, 2013.

2. Page 19838, Lines 26, remove “regional”, and page 19839, line 1, insert “in this region” after “processes”.

3. Page 19841, lines 19-20. The sentence “This, in turn, implies that the ASI10 $\mu$m spectrum is becoming much less dependent on the wavelength” says the same thing as the previous sentence, and should be deleted.

4. Page 19841, lines 24-25. What is the basis for the conclusion “this distinct feature indicates the presence of larger particles”? It is one possible conclusion, but composition can also influence the spectral signature of absorption. For example, brown carbon indicates more scattering at shorter wavelengths. Other evidence is needed



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before such a conclusion can be drawn. At best you can say that the feature is consistent with the presence of larger particles. You should wait until you've also shown the spectral signature of scattering before drawing this conclusion.

5. Page 19845, first paragraph. Also compare total atmospheric heating by aerosols for the two size ranges (i.e., the difference between forcing at TOA and surface).

6. Page 19845, point 1. D10 microns is all particles with diameters less than 10 microns, so it includes contributions from submicron particles too, so you should not imply D10 microns is large partlcles. If you want to discuss large particles, discuss the difference between D10 and D1.

7. Page 19845, point 2. Please use "small" rather than "low" when talking about negative values.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 19837, 2013.