

Interactive comment on “A review of biomass burning emissions part III: intensive optical properties of biomass burning particles” by J. S. Reid et al.

J. S. Reid et al.

Received and published: 21 October 2004

Thanks you for your kind review. Below are some responses to specific comments:

Specific comments:

On the impact of non-sphericity on optical properties: I have added a paragraph on the effect of non-sphericity on particle optical properties and refer the interested reader to Sorensen's extensive review.. For the most part, they are not significant for open biomass burning because accumulation mode particles tend to be spherical. In very intense flaming some fine mode chain aggregates can form, but they collapse into spheres very quickly. The following paragraph was added:

“As discussed briefly above and Reid et al., (2004), smoke accumulation mode parti-

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cles are spherical in nature and are typically modeled as such. Even in intense burning conditions when chain aggregates and other asymmetric particles are created, particle evolutionary processes converge to create more spherical particles in an hour or so (e.g., Martins et al., 1996; Hobbs et al., 1996). But, near the fire source particle asymmetry can have some impact on particle properties. While aerosol extinction efficiency is more or less conserved, aggregation can increase total scattering relative to absorption, increase the asymmetry parameter, and depolarize scattered light (Ku and Shim 1992; Colbeck et al., 1997). Consequently, such particles cannot be modeled as equivalent spheres (Ku and Shim 1992). The interested reader is referred to the thorough Sorensen [2001]. For the rest of this section, however, we assume a fairly justifiable spherical type model.”

Theoretical limit on single-scattering albedo: Particle extinction is composed of refraction, diffraction (interference) and absorption. In the Mie regime it is very hard to get a particle with a single-scattering albedo less than 0.3 because there is always some diffraction component. Even a perfect absorber will diffract light around it (which is why even in geometric optics Q_{ext} is equal to 2, not 1). Looking at this comment I noticed a typo in the text here (originally it says “refraction” when it should have said “diffraction” which may have caused the confusion).

Technical corrections: On the use of the “ α ” symbol: I can see how this can be confusing. However, for consistency we are holding to the IPCC notation. But, we now have added a line in the text as well a “symbols” appendix.

On a “blank” before and after a dash: We now have this typesetting convention. But, we do not have spaces for a hyphen (as in for hyphenated words such as single-scattering albedo),

Specific comments: fixed - thanks; except for page 5223 (“in” is out of place)

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 5201, 2004.