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Interactive comment on "Characteristics, sources, and transport of aerosols measured in spring 2008 during the aerosol, radiation, and cloud processes affecting Arctic climate (ARCPAC) project" *by* C. A. Brock et al.

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We thank Dr. Petzold for his constructive comments on the manuscript.

We agree that more discussion of the particle size distributions in the biomass burning (BB) plumes is warranted. However, as this is already a very long manuscript, we will limit the depth of the discussion. In our observations we could not often distinguish the specific origin of most smoke plumes from the large regions with wildfires (southern Russia or southeastern Siberia), making a determination of plume age difficult.

Therefore we choose not to focus on the temporal evolution of smoke properties as described in Mueller et al, 2007. On average our results are indeed consistent with those reported by Petzold et al. (2007) and Dentener et al. (2006), and we now point to these references. However, we see some interesting differences with Dr. Petzold's results, and also point these out. We have added several sentences in section 3.3.1, as follows:

"Submicron particles were present as a single mode with D(g,n)=0.19 um and a geometric standard deviation sigma(g)=1.5 (Fig. 7, Table 3). These mean values are consistent with those from various sources summarized in Table 6 and Fig. 11 of Petzold et al (2007) for BB smoke transported for ∼6 days, and with those recommended by Dentener et al. (2006) for biomass burning aerosol parameters for use in global system models. However, in ARCPAC the BB plume particles were present in a single accumulation mode (Fig. 7), while Petzold et al. reported the presence of an attenuated Aitken mode (D(g,n) <0.10 um) in BB smoke transported from Alaska and western Canada over periods >10 days to Europe. Furthermore, in ARCPAC, values of D(g,n) varied systematically with CO within the BB plumes (Fig. 8) in a manner not described in these earlier studies. This relationship between D(g,n) and CO may have occurred because mixing of concentrated BB smoke with background air resulted in partitioning of semivolatile organic matter from the condensed to the gas phase (e.g., Donahue et al., 2009), thereby decreasing particle size in diluted BB smoke."

The references to Petzold et al. (2007) and Dentener et al. (2006) have been added, the unused references removed, and the King et al. reference fixed.

Some of the figure sizes and quality were not adequate in the discussion paper, and we will improve their quality and ensure that the size of the complex, compound figures is large enough for easy reading.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 27361, 2010.