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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sources and light absorption of water-soluble brown carbon aerosols in the outflow from northern China" *by* E. N. Kirillova et al.

Anonymous Referee #2

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The MS is an interesting contribution to the field of water soluble carbon and brown carbon and merits publication. There are a few points, however, that should be addressed before publication. The points are given in their order of occurrence in the text.

The statement about the greater contribution of fossil fuel combustion to WC-BrC (p. 19627, lines 22-23) needs more background info. BrC is usually thought to originate mainly from biomass fires, which are definitely non-fossil?

carbon analysis:

a) please discuss possible losses of OC from filters during the carbonate removal step

(acid digestion, drying at 60°C); see also Jankowski et al. 2008, Atmos. Environ. 42, 8055-8064

b) please clarify: "the total carbon method was used on the TOT instrument to isolate the entire TOC for subsequent carbon analysis" (p. 19629, lines 24-25,p. 19639, line 1). If a filter containing total carbon (i.e. organic _and_ elemental carbon) is heated to 870°C in the presence of O2, elemental carbon, too, will be combusted, so the gas stream exiting the Sunset analyzer will contain CO2 both from organic and elemental carbon, and not only from TOC.

c) both for TOC and WSOC: the description "filter areas corresponding to ... μg TOC / WSOC ..." is unclear. Are these parts of filters containing total aerosol samples (PM2.5, etc.) or was WSOC first extracted and then put on filter segments?

There is some confusion about the nomenclature: WSOC and WS-BrC seem to be used interchangeably. Not all WSOC is BrC, although most WSOC might also have some absorption in the UV. BrC, however, also absorbs in the visible part of the spectrum, though of course not as efficiently as in the blue and UV regions.

Angstrom exponent (p. 19633): in this MS, the AAE is obtained from spectrophotometer measurements only in the wavelength range 330 - 400 nm. It is well known that there is a change in AAE over the whole spectral range e.g. from UV to near IR. The AAE obtained for the WSOC in this study are compared to literature values, which were obtained for different wavelength ranges, so a direct comparison is not possible.

"Bleaching" of WS-BrC: without further experimental evidence or theoretical arguments, a lower MAC in some samples should not be explained by bleaching. Different sources emit carbonaceous aerosols with different MAC, and the aerosol arriving at Jeju Island may have more sources than only the Beijing winter aerosol. Aging processes may also change MAC of the aerosol (and WSOC) by admixture of non-absorbing material, which is different from a reduction of MAC of the original aerosol.

In order to make the MS more accessible to readers, the main findings should be included again in a quantitative way in the "conclusion" section.

minor points:

please avoid use of acronyms without prior explanation (e.g. BT, page 19628, line 19)

add list of analytes to " the filter samples .... were analyzed for concentrations (of what?), ... (p. 19628, lines 23-25)

missing word: p. 19637, line 8: insert "fuel" between "Fossil" and "combustion"

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 19625, 2013.