

Interactive comment on “On the isolation of OC and EC and the optimal strategy of radiocarbon-based source apportionment of carbonaceous aerosols” by Y. L. Zhang et al.

Anonymous Referee #1

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This paper focuses on the separation of TC into OC and EC for ^{14}C analysis with minimal artifacts. It is a contribution to a long list of papers concerned with OC EC measurements, the associated difficulties and possible solutions. The unique feature here is that the exhaust gas from a Sunset Labs OCEC analyzer is collected for subsequent radiocarbon analysis. The main interest is in the accurate separation of EC, which is difficult owing to EC being a small fraction of TC making it highly sensitive to the OC EC split and artifacts, positive and negative, during the OC thermal evolution. Overall, the authors do a very good job of explaining the difficulties with this task and laying out their method and I have no suggestions on changes in this regard. The paper could be more concise, but in my view it makes a valuable contribution to the general

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measurement of OCEC via thermal desorption.

Throughout the paper, however, I found one aspect odd; often it was implicitly assumed that there is a real and definitive distinction between OC and EC, whereas it is just an operationally defined delineation based on some property that does not abruptly segregate OC and EC, but instead varies continuously.

For example, the background section of this paper begins by making very definitive statements contrasting OC and EC, then stating that this delineation is really just an operational definition. The logic seems inconsistent.

The authors define OC and EC as: “weakly refractory and light polycyclic or polyacidic hydrocarbons (organic carbon, OC) and strongly refractory and highly polymerized carbon (elemental carbon, EC),”

This may be true for some (possibly large) fraction of each, but is there really a clear separation based on this definition, or instead is it a continuum in variation of certain properties, such as volatility, light absorption, etc. Since later in the introduction the split between OC and EC being operationally defined is discussed, some of the statements in the introduction (and throughout the paper) seem incorrect (pg 17660). Eg 1: “Particulate EC derives from incomplete combustion of fossil fuels and biomass, whereas OC originates from either primary emissions or secondary organic carbon (SOC) formation (Poschl, 2005). Eg 2: “Since OC and EC play decisive but different roles in the global climate and on human health, assessing their respective source strengths is needed for a better understanding of their influences as well as for efficient abatement strategies”. Eg 3: “Since both fractions are influenced by very different sources (Szidat et al., 2009)”. There are more of these throughout the paper. I think qualifying these types of statements, something to the effect; Eg 2 the majority of the EC and OC play decisive but different. . .

As noted by the authors, how one defines OC and EC is based on a method, hopefully a method agreed upon by the scientific community and adhered to by all. The authors

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make this point on page 17661 lines 1-5.

Thus, I suggest these types of statements made in the introduction need to be qualified based on the idea that TC is a complex mix having a continuum of properties, and OC and EC are subsets based on a method. The point is the authors here work hard on not subjecting the aerosol collected on filters to processes that bias the results based on how they have generally decided to define OC and EC. This idea should guide the discussion throughout the paper where details of how to adhere to this separation with minimal artifacts are presented.

Specific Comments: Pg 17670, why does removing WSOC reduce charging on all filters. 1) Is it because the water wash step removes a substantial amount of the overall OC on the filter (ie, what is the WSOC/OC ratios of these filters, or 2) WSOC is must susceptible to charring?

Page 17678 line 6-8. Not sure the statement that TC will not provide source information is really necessary, it seems obvious.

Page 17680 line 16 type artefacts

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 17657, 2012.