

Interactive comment on “On the effect of water-soluble compounds removal on EC quantification by TOT analysis in aerosol samples” by A. Piazzalunga et al.

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Response to referee 2

» REFEREE: However, the results show that removal of water-soluble compounds prone to charring in fact increases the EC concentration measured in the samples. Assuming that charring of WSOC happens anyway (as it is proved in the separate experiments), it would mean that optical correction of char formation is compensated partly at the expense of soot. An alternative explanation might be that the untreated samples contain alkali metals that catalyse the premature combustion/volatilization of EC, which in turn yields lower EC values. Once removed, combustion temperature of

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soot returns to normal and can be adequately measured by the analysis protocols.

» ANSWER: We agree with the referee: we think that soluble compounds in the sample can affect EC thermal behaviour. Indeed, the removal of soluble compounds (inorganic ions, alkali metals, salts,...) was demonstrated (page 19860, lines 11-18 in the original manuscript) to affect the thermal behaviour of light absorbing components. The original text in paragraph 3.2 has been now extended as follows: “This result suggests that measurements on untreated filters can lead to an EC underestimation. One explanation might be that the untreated samples contain soluble compounds that catalyse the premature combustion of EC, which in turn yields lower EC values”. Moreover, in case of EC and PyC co-evolution, it is likely that optical correction of char formation is compensated partly at the expense of soot but more work is needed to prove this hypothesis.

» REFEREE: However, they assume that this fraction is chemically homogeneous, which may not be a case for the samples. Nevertheless the results suggest that the bulk of this fraction is not strongly light absorbing. Could it be that highly absorbing char superimposes on non-absorbing organic compounds and produce this apparently weakly absorbing material? The proof of the methods is the direct analysis of WSOC which is expected not to yield EC readings at all. Provided that WSOC behaves the same way as it does with the samples, high temperature methods indeed seem to be a better choice for unbiased EC assignment.

» ANSWER: As now reported in the revised text, the C_{He4} at 870 °C is not expected to be chemically homogeneous. The average attenuation coefficient was calculated to gather information on the optical properties of this fraction. We totally agree with the referee hypothesis; indeed, the calculations reported in original text (paragraph beginning at page 19860, line 19) were based on the assumption that highly absorbing material superimposes on non-absorbing organic compounds and produces this apparently weakly absorbing material.

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» REFEREE: An interesting by-product of the work is that sample time is recommended to be limited to 9h in heavily polluted urbanized environment in order to stay below the filter load that would prevent reliable TOT determination of EC.

» ANSWER: we recommend to carefully evaluate the expected local PM levels before planning a sampling campaign in heavily polluted areas to limit problems in EC-OC measurements.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 19851, 2011.