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Atmospheric Chemistry and Physics Discussions

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.

Anonymous Referee #2

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This manuscript is a well written and important contribution which helps improve our understanding on widely used thermo-optical methods. The main advantage of the approach is that it establishes a sort of closure of EC readings of untreated and water-extracted filter samples as well as the extracts themselves. What one would normally expect from such an exercise is that untreated samples would yield higher EC readings due to the extensive charring and incomplete optical correction than water-extracted extracted ones, and the difference between the two readings would be by and large covered with the apparent EC obtained upon thermal-optical analysis of the extract itself. However, the results show that removal of water-soluble compounds prone to charring in fact increases the EC concentration measured in the samples. Assuming

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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 soot returns to normal and can be adequately measured by the analysis protocols. It is meaningful that the authors calculate apparent attenuation coefficient for the most critical EC4 fraction. 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. 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.

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