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Atmospheric Measurement Techniques Discussions

Interactive comment on "Multi-wavelength optical measurement to enhance thermal/optical analysis for carbonaceous aerosol" *by* L.-W. A. Chen et al.

Anonymous Referee #3

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The paper presents the implementation of a principle applied already at the optical absorption monitors to the Thermal/Optical Analysis for carbonaceous aerosols. The application of the multi-wavelength laser at a TOA carbon analyzer can provide additional information of the sample composition, such as the distinction between elemental and brown carbon content. Depending on the laser wavelength selected and the type of sample analyzed differences and similarities between reflectance and transmittance TOA can be illustrated. Overall this work provides a detailed description of the recently developed multi-wavelength laser kit which introduces the Thermal/Spectral Analysis and therefore it is suggested to accept the paper for publication after minor revisions:

Quite a few abbreviations are present in the manuscript. Maybe a list would come handy for the reader.

Lines 110-113: In the new configuration a 635nm wavelength is used which is compared to the previously used 633nm wavelength. Why wasn't the exact same wavelength used? Further, why were there 7 wavelengths selected for the new configuration and why those specific wavelengths?

Lines 145-148: While the uncertainty for FR633nm and FT633nm is $\sim$3%, the respective for FR635nm and FT635nm is 11%, the highest from all wavelengths of the retrofit when excluding the 18% of FT532nm, which as stated in lines 228-230 is attributed to a low sensitivity of the transmittance photodiode detector. Could some justification over this observed difference be provided?

Line 215: Why is EC2 used? Were also the rest of EC steps looked into?

Figure 3: Comparison of organic and elemental carbon by transmittance should be also included.

Figure S1, (a) and (b): It is not clear which lines refer to LRλ and which to LTλ.

Do all 7 wavelengths used for TSA add value or provide extra information when compared to conventional TOA, or could the same conclusions be reached by the use of 3 wavelengths (e.g. 455, 635 and 808nm)?

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 9173, 2014.