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Atmospheric Measurement Techniques Discussions

Interactive comment on "Consistency of long-term elemental carbon trends from thermal and optical measurements in the IMPROVE network" *by* L.-W. A. Chen et al.

Anonymous Referee #3

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The manuscript deals with the potential interruption of the internal consistency of long-term series of Elemental Carbon concentrations when upgrades in the analytical procedure (IMPROVE_A thermal protocol) and hardware occur.

Here are my major comments:

1) To prove the consistency of long-term EC series, the authors make use of the attenuation (R) claimed as a robust parameter, unaffected by the upgrade. They compare the relationship between EC and attenuation over a period of several years pre- and post-upgrade. Minor changes, in term of slope and/or intercept, are observed as proof of

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consistency in the database. In general, the relationship between EC and attenuation is linear; however, when analysed over a whole year or a period of several years (i.e. the case of this ms), it shows a significant scatter around the regression curve. And this is due to seasonal variability of the EC-attenuation relationship which indeed depends on the EC sources, aging and mixing state and on the scattering components. Therefore, changes in the regression potentially introduced by the upgrade (post-upgrade regression) are not easily detectable in a annual- or multiannual-based analysis because of the original (pre-upgrade regression) significant scatter. In conclusion, the reviewer considers a annual-based analysis not fit for the purpose and strongly recommends for a monthly based-analysis and comparison.

2) Logically the selected approach would only hold in case the attenuation (R) remained unaffected by the 2005 upgrade. But the authors themselves indicate –in sections 1 and 3– that the 2005 update introduces changes in the laser intensity and sensitivities. Is then the approach still valid?

3) First sentence of the Introduction: Elemental Carbon (EC) also known as black carbon or light-absorbing carbon (. . .). BC and LAC are, definitely, not synonymous of EC. This part of the sentence should be removed or rigorous and correct definitions for EC, BC and LAC should be given in the ms.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 3837, 2012.