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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "On the attribution of black and brown carbon light absorption using the Ångström exponent" *by* D. A. Lack and J. M. Langridge

**Anonymous Referee #2**

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Overview

This paper attempts to address the timely and relevant issue of solar absorption by atmospheric particles containing organic carbon in addition to black carbon, which recent literature has shown could have significant impacts on the global climate system. In my opinion this paper falls short of providing sufficiently new information to merit publication without significant revisions.

Recently published methods have followed similar pathways to attribute absorption to black and brown carbon (and dust), they have however differed in the use of Angstrom

exponents used to perform the attribution – the basic strength of this paper is that it provides context for the total range of optical properties used in other studies and attempts to constrain the uncertainties introduced by those methods. In addition, the authors include a single experimental study to provide a point of comparison for their results.

The weaknesses however are that this paper does not consider dust as a significant absorbing quantity, and considers absorption at only two wavelengths – thereby ignoring the wavelength dependence of the Absorption exponent itself. I also find the use of a single forest-fire type event to be insufficient here – at the very least the authors need to also consider the converse case – an event without significant brown carbon absorption.

In my opinion to merit publication, the Authors need to expand the scope of their paper significantly – perhaps either by performing a comparative analysis of brown and black carbon attribution obtained by using already published methodologies, or by including a few other case studies pertaining to scenarios not considered here.

Minor Comments

The paper suffers from containing a large number of acronyms and values in the text and thus is not reader-friendly. The authors may want to consider moving this information and presenting it in tabular format – for example the information on pages 15501 and 15502.

As far as I could tell, the authors acknowledge that particle size does influence optical extinction but do not examine the effect on attribution, relying solely on absorption. As recent papers (Russell et al 2010, Bahadur et al 2012, and Cazorla et al 2013) utilize both the absorption and scattering components of extinction, the authors could perhaps examine that element in their included case study.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 15493, 2013.