

Interactive comment on “Brown carbon aerosol in the North American continental troposphere: sources, abundance, and radiative forcing” by J. Liu et al.

Anonymous Referee #1

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This paper shows data of biomass burning aerosols from above the USA, with the optical properties measured using two complementary techniques, optical analysis of liquid filter extracts and in situ PSAP measurements. The authors attempt to achieve closure between these and estimate the instantaneous direct radiative forcing using a radiative transfer model. This is a highly relevant field, as the exact effect that brown carbon (BrC) has on the earth's radiative budget is currently a hot topic of debate, with estimates varying by a large amount. In situ data such as this is vital to constraining models and improving our understanding.

The methods used seem to be both sound and state-of-the-art. The fact that the two

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techniques were able to agree to such an extent I regard as a highly significant achievement in its own right. The article was well put together and I'm pleased to say that I found it a joy to read. I've only a few comments, but these are of a technical nature and won't affect the conclusions. Other than that, I wholeheartedly recommend publication.

Technical comments:

P5965, L12: 'Fisherbrand' is asterisked but it is not clear why.

P5966, L8: What is meant by 'N'?

P5967, L12: The AMS uncertainty seems a little high. Is this capturing any collection efficiency uncertainty? How was the collection efficiency estimated anyway? Also, was a pressure-controlled inlet used?

P5977, L6: A recent paper by Liu et al. (doi: 10.1002/2014GL062443) found an even bigger potential range than this by invoking a Rayleigh-Debye-Gans approximation.

P5977, L8: I'm a little confused by this line of discussion. The previous sentences discuss the effect of morphology on AAE, which can cause both negative and positive discrepancies from unity, but then an 'enhancement' is discussed. The main focus of the Cappa et al. (2012) is the enhancement of bulk absorption, not AAE.

P5985, L13: For consistency with the rest of the text, use '1' rather than 'one'.

Table 3: Please be consistent in the unit notations for the denominator; having $\mu\text{g}/\text{m}^3$ rather than $\mu\text{g m}^{-3}$ looks odd next to Mm^{-1} .

Figures 8 and 9: I would not denote the 1:1 lines with 'y=x' because y and x do not refer to variables used here. I think '1:1' would suffice.

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