

Interactive comment on “Molecular composition and photochemical lifetimes of brown carbon chromophores in biomass burning organic aerosol” by Lauren T. Fleming et al.

Anonymous Referee #3

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The work of Fleming et al. describes a series of measurements made on filters collected from laboratory burning. They use chemical separation followed by UV-vis absorption spectrophotometry and high-resolution mass spectrometry to identify and classify brown carbon (BrC) chromophores from different fuels. They also age the filters using two different lamps, directly measuring transmission and looking at extracts. They observe the photodegradation of BrC chromophores, leading to a persistent fraction of BrC. I recommend the changes detailed below be made to the manuscript prior to consideration for publication in ACP.

General comments

C1

The Authors noted a decrease in absorption following photolysis that leveled off. This observation of a longer-lived fraction of BrC is consistent with several measurements in the lab (e.g. Wong et al. (2017)) and real environment (e.g. Forrister et al. (2015) and Di Lorenzo et al. (2017)). The previous work is not effectively reflected in the text of the paper. For example, lines 60-62 suggest that field measurements demonstrate a short lifetime for BrC. While observations of a short-lived fraction have been made, long-lived fractions have also been observed. In addition, the results described leading up to line 406 should be discussed in the context of this literature.

More information should be provided about the solvents chosen for filter extraction. On line 139, the Authors say, “filters were extracted by solvents with a range of polarities”. Only two solvent mixtures were used, and these were used to extract different samples. A mixture of dichloromethane/acetonitrile/hexanes was used to extract samples prior to HPLC/PDA/HRMS analysis, while a mixture of methanol/acetonitrile/hexane was used to extract PTFE filters following transmission measurements. A justification should be provided for the choice of each solvent mixture. The impact of the solvent choice on the results described in lines 393-395 should also be discussed.

Specific comments

Line 70: Typo in polycyclic aromatic hydrocarbons.

Line 122-123: Wong et al. showed not just a decrease in WSOC, but also a decrease in BrC absorption.

Line 266: Should be “one fewer methoxy ring substituent”.

Line 318: Saying that PAHs are “stable during atmospheric transport” is an oversimplification. Although they may end up in pristine regions, the conditions that allow them to undergo long range transport are complex. The review from Keyte et al. (2013) and recent work from Zhou et al. (2019), along with other relevant work, should be consulted and discussed in this section.

C2

Figure 1: Suggest this figure could be relocated to the SI.

Sources Cited

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