



Comment on acp-2021-175

Anonymous Referee #2

Referee comment on "Measurement report: Long-emission-wavelength chromophores dominate the light absorption of brown carbon in aerosols over Bangkok: impact from biomass burning" by Jiao Tang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-175-RC2>, 2021

In this manuscript, the authors present a comprehensive study of water- and methanol-soluble chromophores and fluorophores in brown carbon (BrC) from aerosol samples collected year-round in Bangkok, using absorption and excitation-emission matrix (EEM) spectroscopies and numerical methods, including both parallel factor analysis (PMA) and positive matrix factorization (PMF). The selection and preparation of samples and the spectral and factor analyses are all well designed and carefully executed. The observations of chromophores and fluorophores together provide insights into the origin and fate of BrC in the atmosphere. For example, the PMA analysis of EEM observations indicates that atmospheric aging shifts the wavelengths of emission from fluorophores, as primary species react and secondary species form. The PMF analysis indicates that components most associated with absorption at 365 nm are largely emitted from biomass burning. These components are also characterized by long emission wavelengths, suggesting that the constituent molecules incorporate extended conjugated systems or charge-transfer interactions. With these and other impactful implications, the manuscript is suitable for publication in ACP. I have only technical and minor comments for the authors to consider.

Line 31 - Please reword "these inferences exhibited a refutation".

Line 80 - Here and throughout the use of chromophore versus fluorophore is sometimes ambiguous. I would argue the claim in this sentence is not true, since many previous studies have explored the relationship between chromophores (i.e., the species that give a material its color) and BrC. If chromophores were to be replaced with fluorophores, or "fluorescent chromophores" as in line 94, the claim is not so problematic.

Line 112 - Include units of electrical resistivity.

Line 113 - Replace "GFFs" with "QFFs".

Line 213 - Please consider rephrasing the sentence beginning with "Although one exceptional component was detected..." The meaning is not clear to me.

Line 335 - Mention the range of measured pH values.

Line 341 - I am surprised by how much more absorptive the WSOC is than the MSOC. Can comparisons also be made for specific periods dominated by biomass burning emissions, identified using the PMF analysis or even simply the MODIS active fire spots? I would expect MSOC to be significantly more absorptive than WSOC during these periods.

Line 343 - On a similar note, here or in Section 2.1, please clarify how MSOC was prepared. Was it extracted from nascent filters or filters already extracted with water? If the latter, "MSOC" is perhaps inaccurate since many methanol-soluble compounds will have already been extracted into water, and it could be more precise to refer to MSOC as water-insoluble BrC throughout.

Line 383 - I think it is important to mention this point, that not all chromophores in BrC are fluorophores, in the introduction.

Line 420 - Perhaps discuss Figures S15-16 here as corroborating evidence for the importance of biomass burning.