

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-676

Anonymous Referee #1

Referee comment on "Technical note: Chemical composition and source identification of fluorescent components in atmospheric water-soluble brown carbon by excitation–emission matrix spectroscopy with parallel factor analysis – potential limitations and applications" by Tao Cao et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-676-RC2>, 2022

The excitation-emission matrix (EEM) fluorescence spectroscopy is a highly sensitive analytical technique for the identification of the chemical characteristics and sources of atmospheric chromophores. However, some explanation may be inaccurate because the identification of fluorescent components is mainly based on aquatic DOM. This study investigated the EEM spectra of different types of strong light-absorbing organic compounds and water-soluble organic matter in different aerosol samples, soil dust, and purified fulvic and humic acids and some novelty findings were obtained. For example, aromatic compounds containing nitro groups, which show strong absorption and are the major component of atmospheric brown carbon, exhibited no significant fluorescence. In addition, the fluorescent component 1 (235, 270/330 nm) is generally considered as protein-like groups, however the results of this study suggested that it is mainly composed of aromatic acids, phenolic compounds, and their derivatives, with only traces of amino acids in ambient WSOM. In all, this manuscript is well-written and the major data and their interpretation are scientifically sound. I have some suggestions for changes that should be made before the manuscript is published, to wit:

The comments and suggestions that need to be addressed:
(L=Line)

- Abstract: the abstract should include quantitative information on the point that are made.
- Line 28. "by .." should be changed to "supplemented by an parallel factor (PARAFAC) modeling".
- Line 35. The "fluorescent component 1" is confused. I suggest to add "PARAFAC-derived" to define it.
- Line 41: The "fluorescent component 3" refer to C3?
- Line 98. What are "various properties"? The reference here is not appropriate, because it only focused on fluorescence properties of aerosol chromophores. I suggest the authors provide more relevant references.
- Line 110. Please add "peaks" after "fluorescence".
- Section 2.3: Please provide how Raman and Rayleigh scattering was removed from

EEM.

- Line 155. Please give a detailed definition of "IFEs".
- Line 163-165. I want to know if all the samples were investigated with the PARAFAC modeling?
- Line 190-194. I suggest the authors provide some references to support this point.
- Line 220: Please remove the "and aquatic DOM" from sentence.
- Line 277. Please add some references to support the similarities to EEM of BB and CC WSOM.
- Line 310. To support the opinion in L311-312 "Although the fluorescence intensities varied with different sites and seasons, the EEM spectra of WSOM were very similar", I suggested the authors to add more examples for the EEM fluorescence spectra of aerosols from different sites and seasons.
- Line 304-315: What is the purpose of the EEM spectrum being divided into five regions in Figure 2, and also have a discussion about them.
- Also in Line 311-312: "Although the fluorescence intensities varied with different sites and seasons, the EEM spectra of WSOM were very similar". It may be more appropriate to replace "EEM spectra" with "shape of the EEM spectra".
- Line 319-320: "To better explain the various fluorophores in different atmospheric WSOM samples, the EEM spectra were resolved with the EEM-PARAFAC tool". This sentence is repeated with the meaning expressed above, suggest deleting this sentence.
- Line 326-328: It is written: "In general, these fluorescent components have been interpreted based on the knowledge of fluorescence characteristics of aquatic DOM.". However, in Line 329-332, the reference you cited was atmospheric WSOC.
- Line 334. Please add the "terrestrial" after "aquatic".
- Line 351-354: the reference is missing.
- Line 387-390. Similar questions above. Can these two samples be representative? I suggest the authors summarize more samples in detail.
- Line 388: Please explain the "HULIS-1" used here. HULIS-1 of what?
- Line 389: It may be more appropriate to replace "component 2" with corresponding compound.
- Line 485-487. The conclusion on contributions of fluorophores within CZ WSOM was wrong.