Institute of Meteorology and Climate Research (IMK)
Atmospheric Aerosol Research (IMK-AAF)

Contact: feng.jiang@kit.edu

Brown carbon aerosol in an urban atmosphere in Karlsruhe, Germany: light absorption, chromophores, and chemical characteristics

Feng Jiang[1,2], H.Saathoff[1], J. Song[1,2], L. Gao[1,2], M. Vallon[1], T. Leisner[1,3], S Norra[2]

[1]Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology, 76344 Eggenstein–Leopoldshafen, Germany
[2]Institute of Geography and Geoecology, Karlsruhe Institute of Technology, 76131 Karlsruhe, Germany
[3]Institute of Environmental Physics, Heidelberg University, 69120 Heidelberg, Germany

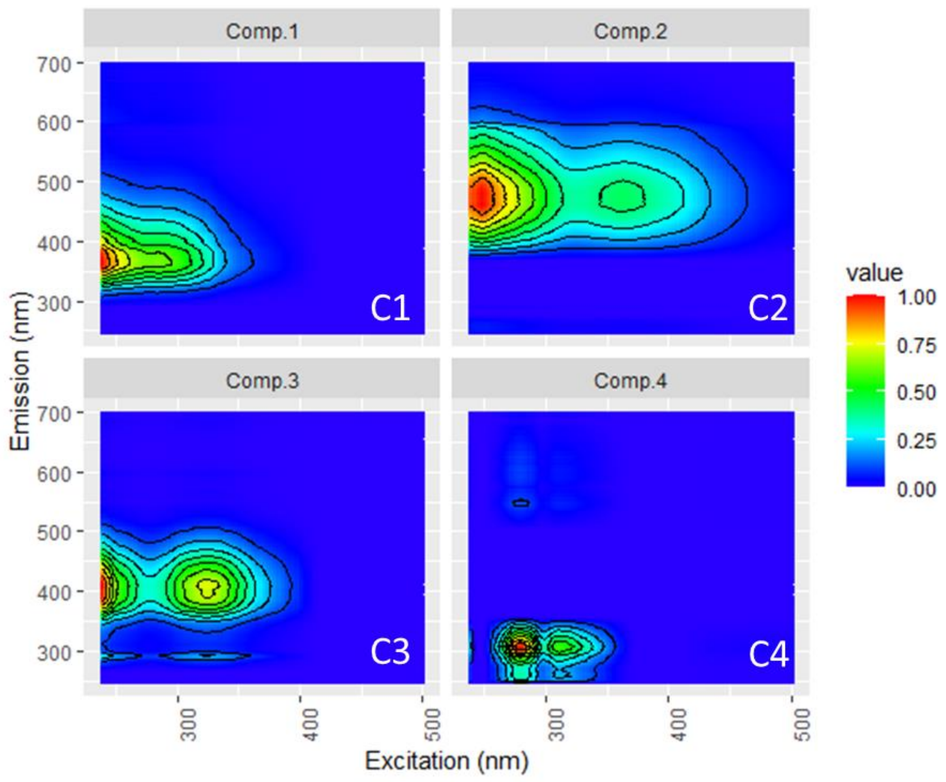
Abjectives

- Detemine light absorption, chromophores and specific molecules of brown carbon aerosol in an urban atmopshere in Karlsruhe.
- Estimate absorption contirbution from nitro-aromatic compounds and total potential brown carbon molecules.

Methods

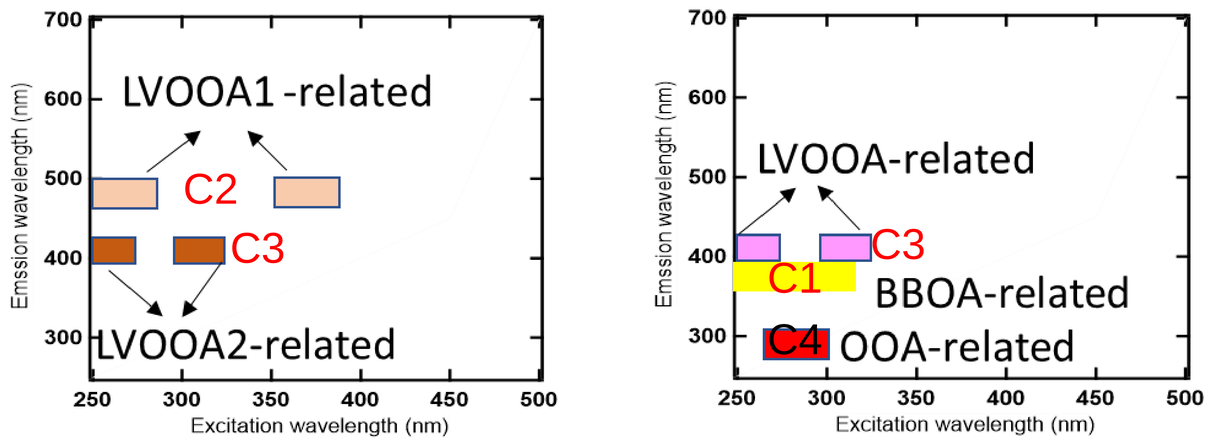
- Particle number, trace gases, and meteorological measurement.
- Light absorption and fluorescence spectra→ Aqualog (methanol filter extracts).
- Total non-refractory particles mass →HR-ToF-AMS.
- Oxgenated organic aerosol → FIGAERO-HR-TOF-CIMS.

PARAFAC Components



- C1 (<250/375) was higher intensity in biomass burnin aerosols[1].
- C2 (251/475) and C3 (<250/400) could be Humic-like substances[2].
- C4 (281/304) could be protein-like organic matter[2].

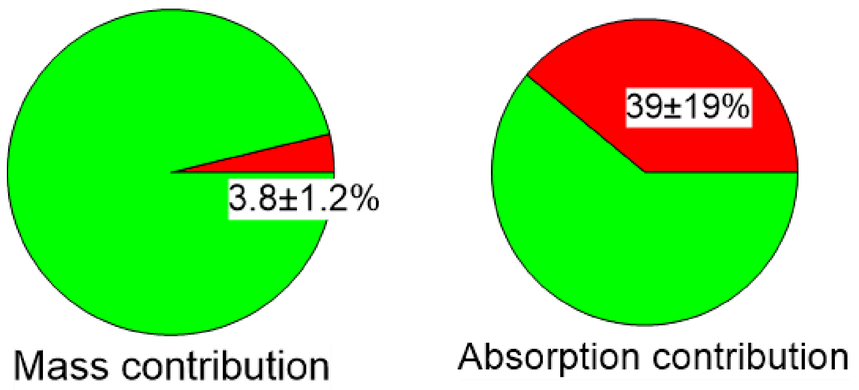
Correlation of EEM components with AMS factors



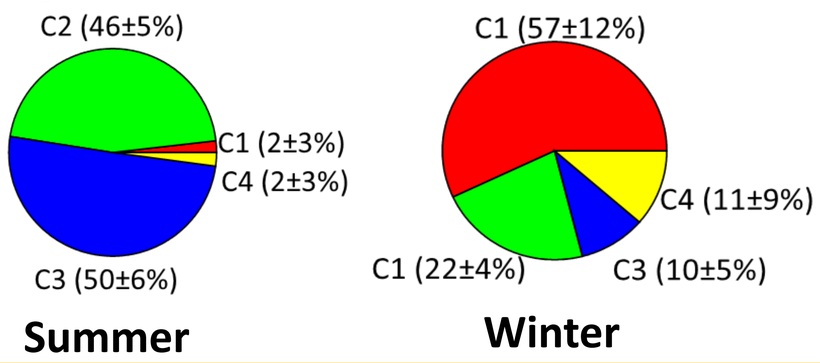
Summer **Winter**

- C2 is related with LVOOA1 (0.9); C3 is related with LVOOA2 (0.7).
- C1 is related with BBOA (0.8); C3 is related with LV-OOA (0.5); C4 is related with OOA (0.5 and 0.7).

Potential brown carbon molecules contributions:



Chromophore Contributions



- Humic like substances (C2 and C3) dominated in summer with 96±6%.
- Biomass burning components (C1) dominated in winter with 57±12%.

Conclusion & Implications

✓ ***HULIS and OOA components dominated in summer with 96±6% and biomass burning component dominated in winter with 57±12%.***

✓ ***338 potential brown carbon accounts for 3.8±1.2% of organic mass, but it can explain 39±19% of absorption in 365 nm, assuming average MAE as 7 m^2 g^{-1}.***

Reference

1.Tang. et al.ACP, 2020 20(4): 2513-2532. 2. Chen, et al.EST, 2016, 50(19): 10351-10360.

Acknowledge

Technical support from IMK-AAF and financial support by China Scholarship Council for Feng Jiang, Junwei Song and Linyu Gao are gratefully acknowledge.