



národní
úložiště
šedé
literatury

Ambient Organic Aerosol Origin at Rural Background Site in the Czech Republic.

Lhotka, Radek
2021

Dostupný z <http://www.nusl.cz/ntk/nusl-448661>

Dílo je chráněno podle autorského zákona č. 121/2000 Sb.

Tento dokument byl stažen z Národního úložiště šedé literatury (NUŠL).

Datum stažení: 09.04.2024

Další dokumenty můžete najít prostřednictvím vyhledávacího rozhraní [nusl.cz](http://www.nusl.cz).

Ambient Organic Aerosol Origin at Rural Background Site in the Czech Republic

Student: Mgr. Radek Lhotka

Supervisor: Ing. Jaroslav Schwarz, CSc.

*Supervising Experts: RNDr. Petra Pokorná, Ph.D.,
Ing. Petr. Vodička, Ph.D.*

Introduction

Atmospheric aerosol (AA) are ubiquitous particles in the atmosphere that influence Earth's climatic system, environmental interactions, and human health.¹ AA is emitted directly from primary sources or formed in the atmosphere via the oxidation of gas-phase precursors with subsequent partitioning resulting in low-volatility products into the particle phase.² Among AA, great interest is dedicated to organic aerosol (OA) since it can represent from 20 to 90% of the total submicron mass.³

Methods

The variability of OA sources and their origin during four measurement campaigns were studied at the rural background station National Atmospheric Observatory Košetice (NAOK) in the Czech Republic. Ambient aerosol measurements of non-refractory PM₁ (NR-PM₁) were performed using a Compact Time-of-Flight Aerosol Mass Spectrometer (C-ToF-AMS⁴) from 8th January to 14th October 2019 with a 5-min time resolution. The C-ToF-AMS measurements were supplemented with 1-min equivalent black carbon (eBC) data by an aethalometer (Model AE33, Magee Scientific, Berkeley, CA), and 1-h NO and NO₂ data by a TAPI (Model T200, Teledyne). 30-min averages of NR-PM₁ were calculated from the 5-min data. A Positive Matrix Factorization (PMF) with multi-linear engine (ME-2) was applied to separate OA into different factors in terms of their mass spectra and time series. The Source Finder (SoFi,⁵) was used to run PMF and ME-2.

Results and discussion

During three seasons (winter, spring, and autumn), five OA factors/sources were identified namely hydrocarbon-like OA (HOA), biomass burning OA (BBOA), coal combustion OA (CCOA) and more and less oxidized OA (MO-OOA and LO-OOA). Four OA factors/sources were identified for the summer, HOA, BBOA, MO-OOA, and LO-OOA. Three of these factors represent primary sources (HOA, BBOA, and CCOA), the other two represent secondary/oxidized factors. The largest share of primary factors (29% of total OA concentrations) was found in winter, the lowest (20%) in summer. Since the aged primary OA becomes part of OOA and therefore, the percentage of primary factors cannot be directly related to the share of these emission sources in the overall immission budget. The concentrations of individual factors correlated with eBC as well as with the inorganic species measured by AMS (especially with sulfate and ammonia). However, the correlations with NO and NO₂ were relatively weak, probably due to another (industrial) source of this pollutant.

Acknowledgment

This work was supported by MEYS of the Czech Republic under grant ACTRIS-CZ-LM2015037, ACTRIS-CZ LM2018122 and ACTRIS-CZ RI (CZ.02.1.01/0.0/0.0/16_013/0001315), and by the GACR under grant P209/19/06110Y.

References

1. Zhao, B.; Wang, S.; Donahue, N. M.; Jathar, S. H.; Huang, X.; Wu, W.; Robinson, A. L. *Scient. Rep.* **2016**, *6*(1), 1–10.
2. Kroll, J. H.; Seinfeld, J. H. *Atmos. Environ.* **2007**, *42*(16), 3593–3624.
3. Zhang, Q. I.; Jimenez, J. L.; Worsnop, D. R.; Canagaratna, M. *Environ. Science & Tech.* **2007**, *41*(9), 3213–3219.
4. Drewnick, F.; Hings, S. S.; DeCarlo, P.; Jayne, J. T.; Gonin, M.; Fuhrer, K.; Worsnop, D. R. *Aerosol Sci. Tech.* **2005**, *39*, 637–658.
5. Canonaco, F.; Crippa, M.; Slowik, J. G.; Baltensperger, U.; Prévôt, A. S. *Atmos. Meas. Tech.* **2013**, *6*, 3649–3661.