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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fossil and non-fossil source contributions to atmospheric carbonaceous aerosols during extreme spring grassland fires in Eastern Europe" *by* V. Ulevicius et al.

Anonymous Referee #3

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The paper of Ulevicius et al. describes the event of grassland fires observed in Preila, Lithuania. They investigated the evolution and chemical composition of particles during the fires and the impact of biomass/grass burning. Authors measured the chemical composition of PM1 by aerosol chemical speciation monitor (ACSM) and the source apportionment for OA was performed by utilizing positive matrix factorization (PMF). Carbonaceous species were separated into fossil and non-fossil primary and secondary components by combining ACSM PMF-results with radiocarbon measurements. Additionally, satellite data was used to indicate the burning areas and biomass burning

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tracers, i.e. levoglucosan, was determined from filter samples. The results of this paper showed that the dominant factor in PM1 was non-fossil organic carbon consisting of primary and secondary fractions. Primary and secondary fossil organic carbon had smaller portions in PM1. Regarding elemental carbon, non-fossil fraction was higher than fossil fraction.

This paper is relevant and interesting as it combines different methods to investigate the impact of biomass burning emissions by using aerosol mass spectrometry, statistical analysis and radiocarbon determination. This paper addresses relevant scientific questions, however, it presents relatively narrow portion of the data provided by the instruments available. Therefore the main issue of this paper is the lack of results, and relevant discussion, related to the general characteristics of biomass burning particles. Overall, this paper is well written and the structure of the paper is clear and easy to follow. I think this paper merits publication after major revision.

General comments

As mentioned above, the largest deficiency of this paper is the lack of results. Methods used in the paper are described in detail (more than ten pages), however, relative to that the results of the paper are presented in less than five pages. I suggest to extend the result section with more careful investigation of present results and by adding some new findings. For example size distribution data could be discussed as well as 7-wavelenght aethalometer data to investigate biomass burning BC. Also a more careful comparison between grassland fire events and other periods is needed for particle chemical composition and the concentrations of various chemical species.

Specific comments

1. Methods: page 26320; Add a collection time for the high volume filters

2. Methods: page 26320: Methods: Page 26321, line 7; change “collection coefficient” to “collection efficiency” for consistency

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3. Methods: Page 26321: How did you calculate the transport efficiency of the sampling line?

4. Methods: Page 26321: What was the variation for the collection efficiency (0.52)? How did you determined instrument particle counting efficiency (line 10)? Is it transport efficiency*ASCM collection efficiency? Make this transport/collection/counting efficiency section clearer.

5. Methods; PMF analysis: page 26321; Why did you average ACSM data from 28 minutes to 1 hour? Explain if it improves the performance of PMF.

6. Methods: 7-wavelenght aethalometer; why did you show results only for BC (880 nm)? There is a method (e.g. Sandradewi et al., 2008) to calculate biomass burning contribution of BC by using other wavelengths. I suggest adding data from other wavelengths as well.

7. Methods: page 26328: line 19; remove “recently”

8. Methods: page 26329: lines 26-29; add reference for SILAM (e.g. Sofiev et al., 2006)

9. Results, page 26331: lines 3-8; Explain the change in the chemical composition/concentrations during the burning period. If OA contribution increased, what decreased? How much concentrations increased during the burning events?

10. Results: page 26334; lines 9-15; regarding the SMPS results, why don’t you present (and discuss) some size distributions to show if there was an impact of biomass burning particles on size distributions (number and volume)?

11. Figure 3; Why concentrations between 5 and 14 March only? Why didn’t you show them for the whole measurement period (one month)? If the filter measurement did not cover the whole period, explain it. Change the y-axes so that the change in OC and EC concentrations can be seen.

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12. Figure 5; This figure is very difficult to read. Fonts are too small and there is too much information placed in one figure. Separate legends according to a), b), c) and d) and put them to corresponding figures. SOA and POA are missing from legends. Place e), f) and g) to separate figure.

References

J. Sandradewi, A.S.H. Prevot , E. Weingartner, R. Schmidhauser, M. Gysel, U. Baltensperger. A study of wood burning and traffic aerosols in an Alpine valley using a multi-wavelength Aethalometer, Atmospheric Environment 42 (2008) 101–112

Sofiev, M., Siljamo, P., Valkama, I., Ilvonen, M., Kukkonen, J., 2006. A dispersion modelling system SILAM and its evaluation against ETEX data. Atmospheric Environment 40, 674–685.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 26315, 2015.