

***Interactive comment on* “Trends, composition, and sources of carbonaceous aerosol in the last 18 years at the Birkenes Observatory, Northern Europe” by Karl Espen Yttri et al.**

Anonymous Referee #2

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The present study investigates the carbonaceous composition of PM_{2.5} and PM₁₀ obtained at the Birkenes Observatory (GAW - EMEP) from 2001 to 2018. The data series is unique in Europe and has invaluable scientific interest. The treatment and interpretation of the data is adequate and the results and conclusions obtained are very relevant.

The results demonstrated a long-term change in the chemical composition of the aerosol at the background site of Birkenes and therefore also in the sources contribution to PM.

Authors applied PMF receptor model to the 2016–2018 chemical dataset identifying

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6 carbonaceous aerosol sources. They demonstrated a decrease of traffic and industry OC/EC emissions, while the abatement of OC/EC from biomass burning has been slightly less successful. Moreover, results emphasize the importance of biogenic sources (BSOA and PBAP) at Birkenes site. The results demonstrated a decrease in OC / EC emissions from traffic and industry affecting the Birkenes site. This decrease is not as obvious for OC / EC from biomass burning, indicating a less successful abatement strategy. The results also emphasize the importance of biogenic sources (BSOA and PBAP) at the Birkenes site.

Authors concluded the need of investigating trends in levoglucosan and biomass burning in Europe, given the further importance residential wood burning as a major source of air pollution in Europe. The need of measuring monoterpene and sesquiterpene oxidation products for improving the SOA apportionment is also highlighted. These data can be essential to improve the model outputs.

Minor correction. The data regarding the decreasing EC fractions in PM_{2.5} (-4.0% yr⁻¹) and PM₁₀ (-4.7% yr⁻¹) in the abstract differs from the data in the main text (Line 380: whereas it decreased for the EC fraction (-3.9 – -4.5% yr⁻¹)).

Line 58. I think OC and EC are not regularly measured in Air Quality Monitoring networks, with the exception of EMEP/GAW and aerosol in.situ ACTRIS sites.

Method section

2.2.1. What is the difference between the old and the new Birkenes Observatory? When was the new observatory installed? Please add some comments on 2.1.

2.2.2 - Lines 187-188- It should be noted here that the “novel” positive matrix factorization for BC data is based on the methodology devised by Platt et al, in preparation. Is there any other reference to this method available (eg conference proceedings...)?

2.4. It should be noted here that the PMF was applied to the 2016-2018 dataset. Line 210: was OC in PM_{2.5-10} calculated by difference (OC_{PM10} – OC_{PM2.5})? Was EC

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inPM25 equal (or similar) to EC in PM10?

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