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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source apportionment and impact of long-range transport on carbonaceous aerosol particles in Central Germany during HCCT-2010" *by* Laurent Poulain et al.

Anonymous Referee #1

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Poulain and coauthors describe a measurement campaign at a forest site in central Germany in 2010 involving the investigation of sources of carbonaceous aerosols using aerosol mass spectrometer (organic and inorganic aerosol) and multi angle absorption photometer (equivalent black carbon) measurements. Particle number-size distributions and light scattering were also measured using a dual mobility particle sizer and a nephelometer, respectively. Although originally chosen as an upwind site for a cloud processing study the dataset is also well suited to source apportionment of local and transported carbonaceous aerosols, which is the focus of this work. Good

mass closure was obtained for AMS+MAAP data relative to expected mass concentrations derived using size distribution data and composition-dependent density values. AMS mass concentrations were observed to agree well with supporting on-line measurements (Monitor for AeRosol and Gases in Ambient Air, MARGA) and off-line size-resolved filter analysis (ion chromatography/UV-Vis and OC/EC analysis). Organic aerosol as measured by the AMS was apportioned using PMF/ME-2 constrained with reference mass spectra for hydrocarbon-like organic aerosol (HOA) and biomass burning organic aerosol (BBOA). Five factors were derived: HOA, BBOA and three oxidized organic aerosol factors: semivolatile (SV-OOA), less oxidized (LO-OOA) and more oxidized (MO-OOA). eBC was found to be predominantly associated with long-range transport through multiple linear regression analysis, which is somewhat unexpected, and this observation is supported by the size-dependence of eBC during different air mass periods. Under marine air masses, locally emitted carbonaceous aerosol sources become more important in terms of fractional composition, however continental air masses from the East result in the worst local air quality at the site. Overall, I find the manuscript to be well written and the quantification and apportionment procedures are rigorous and comprehensive. The dependence of aerosol composition on air mass origin is established well and the findings reported here are a useful reference point for central European background sites. I only have a few minor comments.

How do the size distribution shapes for the impactor off-line analysis (Figure 2) agree with the AMS size distributions for nitrate/sulfate/ammonium/OC(or OA)?

Figure 2 caption define NCE and FCE here also

Figure 2: different colour for sodium needed here

Replace size cutting with size cut-off throughout the text

Line 230: The temperature dependence could also be related to less evaporation or oxidation of locally produced vehicle exhaust HOA. Is there more local wind stagnation at lower temperatures? This could also boost the contribution of local vehicle emissions.

Figure 8: add the regression statistics

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