

Interactive comment on “Seasonal and diurnal variations of particulate nitrate and organic matter in the Central European atmospheric aerosol” by L. Poulain et al.

Anonymous Referee #4

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The paper presents observations of the aerosol composition as measured at Melpitz, Germany in three intensive observation periods in 2008 and 2009. Aerosol composition was measured with a high resolution AMS for the non refractory PM1 and MAAP for soot in PM1. Meteorological parameters and O₃, NO_x, and SO₂ were measured in all three campaigns. Additionally photolysis rates and OH, and H₂SO₄ were measured during the summer campaign. The observed aerosol composition is discussed with respect to different seasonal influences. In particular the observations of organics and nitrate are discussed in more detail and determining factors for aerosol composition are presented. While the overall topic of the paper is within the scope of ACP, the manuscript has several weaknesses and needs major revision before it can be

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considered for publication.

Major points:

1. The authors focus their discussion on organics and nitrate when it seems from the data coverage that they should be best able to derive determining factors of aerosol sulphate. In the summer campaign in addition to NO_x, ozone and SO₂ also H₂SO₄ and OH were measured, providing an ideal data set to compare measured ammonium sulphate concentrations with predictions based on gas phase observations.
2. It is not clear why the authors consider low volatile OA (or rather high f₄₄) to be of regional origin and how they differentiate between regional photochemical effects on OA and long range transport aging effects. The data analysis is based on two major fragments (m/z 44 and m/z 43) only, without exploiting the high resolution possibilities of the AMS. Also from figures 2 and S2 it is shown that f₄₄ is correlated with ozone in all seasons. The possible effects of ozone chemistry on f₄₄ would have to be pointed out more clearly than is currently the case. Different individual ions present at nominal m/z 43 and 44 should be considered for this data analysis. The authors present OM/OC ratios, so the high resolution analysis must have been performed.
3. The presented framework for calculating determining factors of ammonium nitrate (AN) formation is an oversimplification of the real situation. While this may be justified by the typical lack of consideration of AN in regional models, the limitations of the approach should be clearly pointed out. If hygroscopicity data for the aerosol are available, the authors should consider testing their assumption on deliquescence RH with observations. The part on N₂O₅ and HONO impacts on particulate AN do not go beyond speculation and should be substantiated or left out.

Specific:

The title of the manuscript announces to deal with the Central European atmospheric aerosol which would imply a more general data coverage. The title should be changed

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to state it is measurements from one location in Central Europe.

P11614 L19 and elsewhere in the MS: the impression is given that measurements were performed throughout the year, instead three intensive periods were covered, this should be clarified. P11617 L10: check grammar P11618 L20: Isn't isotopically labelled SO₂ used in this approach?

P11620 L16 and elsewhere: data are given to two digits after comma, is this justified by measurement accuracy?

P11621 L 21: the numbers in the figure caption of figure 1 would imply that the aerosol is not fully neutralized in Summer and Autumn and excess ammonium is measured in Winter.

P11623 discussion of figure3: it might be interesting to focus on the 25th and 27th of May for which the f₄₄ and OM/OC are high during low OH. Could the impact of OH versus O₃ chemistry on OA composition be explored in these situations or was the high f₄₄ caused by other factors?

P11623 L 24: r₂ is presented for summer values only here, this should be mentioned.

P11624 L 25: Why is f₄₃ not considered anticorrelated for winter?

P11625 L 3: it has not been shown that the season strongly influences the nitrate concentration, rather it is shown that nitrate varies strongly with different seasons.

Throughout the manuscript there are a couple grammar issues that the authors should sort out.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 11611, 2011.