

Interactive comment on “Geochemistry of PM₁₀ over Europe during the EMEP intensive measurement periods in summer 2012 and winter 2013” by Andrés Alastuey et al.

Anonymous Referee #3

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This manuscript presents and discusses the composition of PM₁₀ during intensive measurement periods in summer 2012 and winter 2013 for 20 rural background sites across Europe. The emphasis is placed on the mineral dust component, but data for several metals and metalloids are also given. Most of the data were obtained by particle-induced X-ray emission (PIXE). The study clearly shows that PIXE can provide a very valuable contribution in atmospheric aerosol research. The impact on mineral dust, which was often attributed to Saharan dust, on the PM₁₀ aerosol and the spatial variation and seasonality therein are well discussed.

As discussed in detail below, the manuscript is on a few occasions unclear and it has some other weaknesses. There are also some problems with the references. Revision

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is needed before this manuscript can be published in ACP.

Specific comments:

1. There are several gratuitous statements within the text with regard to the mineral dust and the non-crustal and non-sea-salt elements, which are not backed up by appropriate references. This is for example the case for the statement in line 66 on the composition of natural mineral dust and in lines 73-74 on the anthropogenic sources of mineral dust, for the attribution of the nssK to aluminosilicates (or to clays, as indicated in line 331) and to biomass combustion in lines 317-318, for the attribution of SO₂ to combustion processes in line 456 and for the attribution of part of the nss-sulphate to marine biogenic and volcanic emissions in line 457. Also, which combustion processes do the authors have in mind as source of SO₂? Other examples of occasions with lacking references are given below.
2. Lines 48 and 587: Se is mentioned here (respectively in the Introduction and in the Conclusions) and concentration data for this element are given in Tables S3 and S4. However, this element is not discussed at all in the main part of the text. I suggest that it be discussed.
3. Line 61: "Engelstaedter et al., 2006" is not in the Reference list. On the other hand, there is "Engelstaedter et al., 2009" in that list to which no reference is made within the text.
4. Lines 107 and 153: "Lucarelli et al., 2010" is not in the Reference list. On the other hand, there is "Lucarelli et al., 2011" in that list to which no reference is made within the text.
5. Lines 168-169: It is somewhat unclear for which elements the concentrations were close to the analytical detection limit; besides, in which technique were those elements close to the detection limit, in PIXE or in IC-AES/MS or in both techniques?
6. Line 188: A literature reference is needed for the Na/Cl ratio of 0.56 in sea water.

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7. Lines 280 and 285: A literature reference is needed for the attribution of (part of the) Al, Si and Fe to a clay-dominated source and to illite.
8. Lines 292-296: Literature references are needed for these statements on Ca.
9. Lines 308-309: A literature reference is needed for this statement on nssMg.
10. Line 381: There is something missing in between "during" and "account".
11. Line 452: What is the basis for attributing part of the K₂O to biomass burning? It is known that KCl is a form of K that is present in pyrogenic particles.
12. Line 519: As has besides coal combustion other sources that are of similar or even higher importance, such as Pb production and especially Cu-Ni production (Nriagu and Pacyna, 1988).
13. Line 573: It is unclear what MSY and MSC denote.
14. Figure 12: It is unclear what SW, SC and CE denote.
15. Technical and other minor corrections:
 - line 59: the "-1" of "year-1" should be in superscript.
 - line 92: the "-2" of "m-2" should be in superscript.
 - line 97: subscripts and superscripts are needed for "SO₄²⁻, NO₃⁻, NH₄⁺".
 - line 141: replace "additionally to" by "addition for".
 - line 157: replace "andboth" by "and both".
 - line 168: replace "S₂in" by "S₂ in".
 - line 259: replace "10%PM₁₀" by "10% of PM₁₀".
 - line 334: replace "SDE in" by "SDEs in".
 - line 382: replace "μgPM₁₀" by "μg PM₁₀".

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- line 430: replace "see Fig.s" by "see Figs."
- line 440: replace "but whereas" by "whereas".
- line 471: replace "contribution of" by "contributions of".
- line 476: replace "indicate a low" by "indicating a low".
- line 483: replace "Concentrations" by "The concentrations".
- line 496: replace "with Nickel" by "with nickel".
- line 515: replace "see Fig.s" by "see Figs."
- line 519: replace ".As shown" by ". As shown".
- line 530: replace "see Fig.s" by "see Figs."
- titles of journal articles in the Reference list should be in lower case instead of in Title Case (e.g., for Aluko and Noll, 2006).
- for authors with two initials in the Reference list, there should be a space between the two initials (e.g., in lines 624, 637, 680).
- line 614: replace "L. C. L. C." by "L. C."
- line 640: replace "Health 2012;" by "Health,".
- line 648: replace "J Geophys Res 114" by "J. Geophys. Res., 114".
- line 681 replace "U S A 108:" by "U S A, 108, ".
- line 684: replace "andGanor" by "and Ganor".
- line 691: replace "B 318, (2014)" by ", B 318,".
- line 692: replace "B 363" by ", B 363".
- line 695: replace "Environ Health Perspect 2011;" by "Environ. Health Perspect.,".

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- line 732: replace "Rev Geophys 40:1002" by "Rev. Geophys., 40, 1002".
- Table 1: it is unclear what the "P" in the Filter column denotes; presumably "Partisol"; in any case, it should be indicated what it denotes.
- Caption of Figure 8: replace "proportional to the concentrations" by "proportional to the concentrations and percentages".

Reference

J. O. Nriagu and J. M. Pacyna, Quantitative assessment of worldwide contamination of air, water and soils by trace metals, *Nature*, 333, 134-139, 1988.

For the Supplementary Information:

- Heading of Tables S3 and S4: the "-3" of "m-3" should be in superscript.
- Caption of Figure S1: it is unclear what MSY denotes.
- Caption of Figure S4: replace "proportional to the concentrations" by "proportional to the concentrations and percentages".

Interactive comment on *Atmos. Chem. Phys. Discuss.*, doi:10.5194/acp-2016-42, 2016.