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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Water soluble aerosols and gases at a UK background site – Part 1: Controls of $PM_{2.5}$ and PM_{10} aerosol composition" *by* M. M. Twigg et al.

Anonymous Referee #1

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Though the main ions have been measured from particles for decades (e.g. with the EMEP filter method) quite limited amount of shorter time-resolution data is available and therefore the 6.5 years MARGA data series from the UK EMEP Super Site Auchencorth Moss, Scotland is most valuable and worth publishing. This paper provides greater detail in the long term temporal variation of inorganic compounds in UK background air. Secondary inorganic aerosol (especially NH4+ and NO3-) were dominating in PM2.5 and sea salt was dominating in coarse fraction, especially in winter (with higher wind speed). Sea salt processing was discussed - considerable amounts of NO3- were occasionally found in coarse fraction with depletion of Cl-. Average sea-

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sonal ion balance was always basic (excess NH4+). The data was also used to study the influence of air masses from marine and anthropogenic sources. Furthermore, the data will be valuable to study long term trends in particulate matter composition in response to climate and policy drivers.

There was a very nice and detailed description of MARGA instrumentation in this paper. However, the data quality and processing should be described as well. There are some open questions like: Is there any estimation of detection limits (or quantitation limits) or/and measurement uncertainties available? Were the zero (or under the detection limit) values replaced somehow and were there any under the detection limit concentrations? Were the instrument blanks taken into account or were they negligible when compared to the measured values? Were the inlets cleaned / replaced regularly as well as the glassware? There are always risks for artifacts when using inlets: particles may be lost in the inlet and there may be some gas-particle reactions inside the tubing, especially for NH4NO3 / NH3+ / NO3- .

p. 3717. “It is not the first time that inorganic water soluble aerosols have been found to be major contributors to the total mass in Europe (Putaud et al., 2010). Aerosol components not resolved by the MARGA include inorganic aerosols, BC, water and crustal elements such as silicate. Organic aerosol often accounts for a larger fraction of the PM10 mass at central European background sites than the missing mass at Auchencorth allows for . . .” I assume, you mean organic aerosol not resolved by MARGA instead of this: Aerosol components not resolved by the MARGA include inorganic aerosols. . .

Table 2: I do not understand, why new type SJAC improved accuracy in maintaining the cut-off (17 Feb 2009). Were blanks and external standard set-up remotely in practice and how often? Did the solutions stay clean enough for that purpose? What was the external standard used for?

Please, check that all abbreviations used are defined in the text, e.g. SPT (p. 3710),

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RH (%) and St (W m-2) in (Table 1), PILS.. Figure 2: Check lines and font sizes.

Figure 3: Text far too small (especially seasons).

Figure 5. Non-marine magnesium -1% and 0% could be replaced with < x %.

References: Check the formats. Sometimes there are commas in the author list (between authors) and sometimes not.

p. 3722: Drewer. . . Penttila should be Penttilä.

p. 3710: The performance of MARGA (e.g. tests of preconcentration colums) has been discussed also in: Makkonen et al. 2014: Semi-continuous gas and inorganic aerosol measurements at a boreal forest site: seasonal and diurnal cycles of NH3, HONO and HNO3. Boreal Env. Res. 19 (suppl. B): 311–328.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 3703, 2015.