

Interactive comment on “Organic Aerosol source apportionment in London 2013 with ME-2: exploring the solution space with annual and seasonal analysis” by Ernesto Reyes-Villegas et al

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Response to comments of referee # 4

Comment 1 from Referee.

Line 20 – “detected in the combined March-December dataset.”

author’s response

Phrase has been edited as suggested.

author’s changes in manuscript

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detected in the combined March-December dataset.

Comment 2 from Referee.

Lines 47-49 – add Takahama et al., Organic Functional Groups in Aerosol Particles from Burning and Non-burning Forest Emissions at a High-Elevation Mountain Site, Atmos. Chem. Phys., 11, 6367–6386, 2011.

author's response

The citation has been added to the manuscript.

author's changes in manuscript

In particular, the Aerosol Chemical Speciation Monitor (ACSM), which has been recently developed (Ng et al., 2011), has been used to carry out long-term measurements of non-refractory submicron aerosols around the world, for instance an industrial-residential area in Atlanta, Georgia (Budisulistiorini et al., 2013), a high-elevation mountain in Canada (Takahama et al., 2011), at background locations in South Africa, (Vakkari et al., 2014) and Spain (Minguillón et al., 2015a; Ripoll et al., 2015), a semi-rural site in Paris (Petit et al., 2015) and at an urban background site in Switzerland (Canonaco et al., 2015).

Comment 3 from Referee.

Line 110 – what is the difference between PM and aerosols?

author's response

PM refers specifically to solid and liquid particles and aerosols are these liquid and solid particles in a gas (usually air). There are not main differences between these two terms and PM is used when the particle size is taken into consideration. The intention with this paragraph was to show different studies carried out at the North Kensington site and the particle size is important to mention to compare different studies. The paragraph has been rewritten to compare the different studies based on the particle

size.

author's changes in manuscript

Different studies have been carried out at this site such as analysis of elemental and organic carbon concentrations in offline measurements of particulate matter with a diameter less than 10 micrometres (PM10) (Jones and Harrison, 2005), PM10 and NO_x association with wind speed (Jones et al., 2010), properties of nanoparticles (Dall'Osto et al., 2011), PM10 and PM2.5 (Liu and Harrison, 2011) and in aerosol chemical composition (Beccaceci et al., 2015) in the atmosphere. The first long-term study of the behaviour of non-refractory inorganic and organic aerosols (PM1) at the North Kensington site was carried out analysing cToF-AMS data collected from January 2012 to January 2013 (Young et al., 2015a) where source apportionment analysis was carried out applying unconstrained PMF runs, with five sources identified: HOA, COA, solid fuel OA (SFOA), SVOOA and LVOOA.

Comment 6 from Referee.

Line 317 – I don't see BBOA, HOA or COA in Figure 4a.

author's response

Figure 4.a shows only SVOOA and LVOOA values. The caption on the plot has been modified. The clouds of dots show the f₄₄:f₄₃ and f₄₄:f₆₀ values for the OA measurements (the adding of these clouds was required for another referee).

Comment 7 from Referee. Lines 318-319 - How do the connecting lines display variability? Are they intended to make the differences between the cluster of LVOOA and the wider spread of SVOOA points more obvious?

author's response

Yes, this is has been explained with more detail in the manuscript.

author's changes in manuscript

Figure 4.a shows that LVOOA, while having different values between solutions, is found in distinct areas of the plot (connecting lines are used to make the SVOOA variability clearer), whereas SVOOA shows values of f44 vs f43 with high variability.

Comment 8 from Referee.

Lines 328-329 – could cloud processing also contribute to the higher 44 and lower 60?
author's response

Yes, paragraph has been edited in the manuscript.

author's changes in manuscript

BBOA evolution has been frequently observed with high f44 and low f60 values due to due to aging, oxidation and cloud processing (Huffman et al., 2009; Cubison et al., 2011). Thus, it was possible to obtain a variety of BBOA for the different seasons of the year, ranging from a fresh BBOA with a high f60 during autumn to a more oxidised BBOA with a low f60 during summer.

Comment 11 from Referee.

Lines 359 – 363 – you use “possible to observe” in a couple of places in this paragraph. I suggest re-writing those segments.

author's response

The paragraph has been edited on the manuscript.

author's changes in manuscript

Figure 5 shows the WD/WE ratios, where it is possible to observe $\text{NO}_x/\Delta\text{CO}$ ratios of 1.25, 1.35 and 1.136 for March-Dec, summer and autumn, respectively, suggesting diesel with a higher contribution during WD compared to petrol. These findings are confirmed by the CO/HOA ratios, which for the same periods of time, are lower than one (0.8, 0.45 and 0.9) suggesting a lower contribution of petrol during weekdays compared

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to diesel. In spring, there are no considerable changes to the WD/WE ratios, although a higher contribution of petrol is shown during WD with values of 1.28 for CO/HOA and low diesel contribution.

Comment 13 from Referee.

Line 375 –How do you derive PM1? It is a large unstated assumption if you mean that the ACSM measures PM1. It will measure a larger fraction of the PM1, but it is not a PM1 measurement. author's response

PM1 composition is mainly conformed by OA, SO4, NO3, NH4 and BC, these components were mentioned on the manuscript. Also, Fig. 6 has been updated.

author's changes in manuscript

Considering that PM1 is composed mainly of OA, SO4, NO3, NH4 and BC, it is possible to analyse the PM1 composition during PM2.5 high concentrations (Fig. 6.b).

Comment 14 from Referee.

Line 379 – Another unsubstantiated claim. Explain how you come to the conclusion that secondary aerosols are the main contributors to PM2.5 from particles smaller than the upper limit of the ACSM. Which components of Figure 6 do you consider secondary and which do you consider primary? author's response

BBOA, HOA COA and BC are considered primary while SVOOA, LVOOA, NO3, NH4 and SO4 are considered secondary. The text and figure in the manuscript have been modified.

author's changes in manuscript

Defining BBOA, HOA COA and BC as primary and SVOOA, LVOOA, NO3, NH4 and SO4 as secondary aerosols, the main PM1 contributors to PM2.5 concentrations are secondary aerosols with a total contribution of 61% (Fig. 6.c).

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All the minor comments such as typos were accepted and modified.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-465, 2016.

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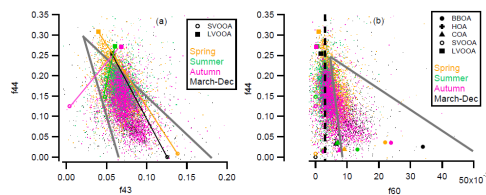


Figure 4: f_{44} vs f_{43} (a) and f_{44} vs f_{60} (b) plots for different periods of time.

Fig. 1. Figure 4

C7

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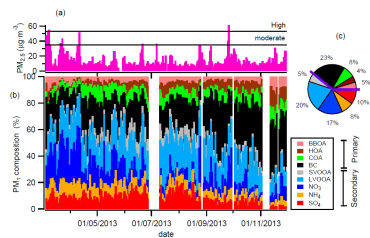


Figure 6: Daily PM_{2.5} concentrations (a) daily (b) and total PM₁ composition (c), purple line in Fig. 6.c separates secondary and primary aerosols.

Fig. 2. Figure 6