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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-term real-time chemical characterization of submicron aerosols at Montsec (Southern Pyrenees, 1570 m a.s.l.)" *by* A. Ripoll et al.

Anonymous Referee #1

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This paper presents real-time measurements of PM1 inorganic and organic species from a continental background site in the Western Mediterranean Basin over a 10 month period. Variability in PM1 components was attributed to boundary layer changes, air mass origin and meteorological conditions at the local, regional and continental scales. Only organic aerosol, which was composed mostly of oxygenated organic aerosol, exhibited marked diurnal cycles suggested to be associated with biogenic aerosol formation in the summer. In winter, both organic and inorganic aerosols show diurnal variations influenced by boundary layer dynamics.

This is a relevant paper for ACP and would be of interest to ACP readers. The paper

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Discussion Paper

is well written, with clear study objectives, logically presented and articulated conclusions. I have a number of minor revisions and comments that are recommended before acceptance to ACP.

My comments are as follows:

Introduction, p. 28812, L1-7 - should indicate that the ACSM is built upon the same technology as the AMS, to make it clear that they are not completely separate methods.

p. 28812 L 27 – 'elevated emissions of anthropogenic emissions occur' – what is meant by this? Emissions in this region have increased over time and over what time period?

p. 28813, L14-20 and Section 2.4 – It would be helpful for the reader to know the directions from which these influences are from without having to go to Supplementary, especially if unfamiliar with this region. The authors may want to consider putting Fig. S1 into the main manuscript. In addition, although the authors do refer to Ripoll et al. (2014b) in Section 2.1 for a site description, it would be helpful to have at least a brief description here especially in the context of the types of airmasses and frequency intercepted at this site.

p. 28814, L 15-17 – this sentence is unclear. Could fix by putting (the Relative Ionization Efficiency (RIE)) all in brackets. Or reword.

p. 28814 L 23 – Does having only 1 IE calibration limit the evaluation of the accuracy of this instrument? Please indicate uncertainties in the ACSM measurements. 62 minute time resolution is a strange sampling interval - Is this the time resolution used in the analyses?

p. 28816, L 22 – please describe what 'conventional real-time monitors are'? Thermos? Are they trace level instruments for a background site like this one.

p. 28817, L9 change arithmetical to arithmetic

Fig S2 – please add a bottom x axis label – I presume this is UTC? In the manuscript

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please provide the conversion from UTC to local time.

Fig S3, figure caption, last line needs a rewrite.

p. 28818, L9-11, Please define summer and winter periods in the text. Why were these exact dates chosen?

p. 28819, L 24 – within the uncertainties of what?

Fig 2 –I find it difficult to determine the average concentrations in the stacked bar chart – fractional contributions are even difficult to pull out numbers, although it is stated in the text. One must refer to the supplementary to get the numbers. Can these be stated in the Figure or the text?

p. 28820, L 7-12 – the summer maximum of PM components (except nitrate) is stated here to be due to photochemistry, but how does this reconcile with earlier statements (p. 28818, L17-23) that attribute seasonal PM1 mass concentrations principally to variations in the PBL? I see that seasonal differences must be due to both physical and chemical processes that change as a function of season.

p. 28821, L 28-29 – Is there any evidence to support this hypothesis? For example, are there m/z markers from the ACSM indicate biogenic influence, perhaps during specific 'biogenic events' even though PMF was not able to pull out a biogenic factor. Are the increases in OA related to wind direction and transport patterns from areas dominanted by biogenics? In which direction are the biogenic sources predominantly located? What time does the boundary layer reach the site in summer – is the increase in OA reflective of this?

Fig 4 – the blue colours showing nitrate and NOx are difficult to discern from each other.

p. 28822, L10, Please clarify how SOA formation is compared to another site in a meaningful way using the difference between day minus night. Over what time period? How is dilution accounted for? L 13 – higher SOA in Mediterranean environments

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compared to what?

p. 28822, L15 – do you mean Boreal forested areas?, Don't know what Boral areas are.

Fig 5 – Meteorological situations in the caption need to be identified (acronyms and descriptions in the text need to be defined) as in Fig 3. Also very difficult to discern between the EU and the WREG background colours; please adjust colours.

p. 28823, L7-9, In both winter and summer the site is in the FT all night and through convection (less in winter) the boundary layer eventually reaches site elevation (except Oct-Jan). However, how do these mechanisms explain the diurnal behaviour in winter, but not in summer? Are mountain breezes not prevalent during the summer?

p. 28823, L25-38 – If the comparison here is with the Atlantic data, the plots do show increased background concentrations of PM1 components, but I don't see how the mid-day increments are lower; please clarify. The amplitudes appear greater. This whole paragraph is confusing when using the words 'In contrast' and 'On the other hand' – must be very careful to explicitly say what is being compared. Also it is impossible to look at daily variations in Fig 5 eg. 17-19 Feb 2012 – reader can determine this kind of variation on such a plot.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 28809, 2014.