

## ***Interactive comment on “The Pasadena Aerosol Characterization Observatory (PACO): chemical and physical analysis of the Western Los Angeles Basin aerosol” by S. P. Hersey et al.***

**Anonymous Referee #2**

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This manuscript gives an overview of the 5-month-long Pasadena Aerosol Characterization Observatory Study occurred in the summer of 2009. Measurement results on aerosol physics, composition, and hygroscopicity are presented. One focus of the work is characterizing the organic fraction of aerosols based on data from complementary instruments including an Aerodyne compact ToF-AMS system, a PILS-TOC system, and an offline high-resolution ESI-MS. This manuscript fits well within the scope of ACP and contains rich information important to understanding the characteristics, sources, and processes of aerosols in the western LA Basin. I therefore recommend acceptance for publication after the authors attend to following comments.

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The presence of amines was speculated based on ion balance analysis that indicates an excess of particulate  $\text{NH}_4^+$  in aerosols during the hot, dry regime III condition. However, another possible reason for the seemingly surplus of  $\text{NH}_4^+$  is the incomplete counting of anions. Organic acids are not quantified separately by the AMS and therefore not included in the anion budget. But it is possible that  $\text{NH}_4^+$  is associated with organic anions. Were the PILS samples analyzed for small organic acids? It will be interesting to see if there are indications of enhanced organic anion concentrations during periods with excess  $\text{NH}_4^+$ . Besides, even if sulfate and nitrate indeed dominate the anion budget for this study, I am not convinced that the observation of excess  $\text{NH}_4^+$  needs to be attributed to the presence of amines. Most amines are bases with a positively charged nitrogen center. Amine tends to behave similarly to ammonia and its protonated form requires an anion to balance the charge. Given that aminium salts are likely nonrefractory, AMS will be able to detect their anions. It will be useful to check if the RIE of  $\text{NH}_4^+$  changed during this study. This can be done using the  $\text{NH}_4\text{NO}_3$  data if more than one IE calibrations were performed during this study.

The behaviors of the SV-OOA factor are quite interesting. It correlates well with DMA particle number concentration and  $\text{O}_3$  but not so with nitrate and chloride. Instead, LV-OOA correlates better with nitrate and chloride than SV-OOA does. Since the naming of SV-OOA and LV-OOA suggest their volatilities, it will be helpful that the authors discuss this inconsistency. In addition, it is said in page 5889 (line 7-8) that SV-OOA is considered to be mainly SOA with 1-2 hr of age. It is however unclear how the 1-2 hr determined.

Another major comment I have is regarding the PMF analysis. Given the length of the study, three distinct meteorological regimes were encountered and organic aerosol compositions appear to be significantly different among these regimes. It is therefore a question whether it is appropriate to perform PMF on the whole data set. Above all, an underlying assumption of bilinear modeling is that the OA factors have constant mass spectra during the specified time period. This assumption should hold even less true

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for a situation when OA compositions are obviously different among periods. It might be worthwhile to perform PMF analysis to segregated time periods classified according to the three regimes and make discussions accordingly.

Detailed comments:

It is said that sulfate observed in this study was primarily the result of marine sources. It is curious whether it was mainly from biogenic (e.g., DMS) or from anthropogenic (e.g., SO<sub>2</sub> from ship emissions) precursors.

P5869, lines 15-16, are the k values corresponding to the organic fraction only or to the bulk aerosol?

P5888, line 19-20 in discussion of diurnal trends, it will be useful to show the diurnal plots either in the main text or as supplementary.

page 5896, Line 20, O/C ratio is higher by how much during Regime II?

page 5896, Line 22-24, it states "Afternoons during regime II and III are characterized by the appearance of a fine organic mode, suggesting that SOA may be responsible for growth of fine particles." Didn't secondary inorganic species contribute to particle growth too?

Page 5898, line 24, it is concluded that the observed less inhibition of aerosol hygroscopicity by organics in LA was potentially owing to less surface-active behavior. Was surface tension measured during this study or are there other measurement data to support this assumption?

Two green colors for LV- and SV-OOA in Fig 1 cannot be clearly distinguished.

The axis labels for several figures are too small to read in print out version, particularly those for the bar graph in Fig. 6 and Fig. A6, A7.

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