

## ***Interactive comment on “Mediterranean nascent sea spray organic aerosol and relationships with seawater biogeochemistry” by Evelyn Freney et al.***

**Anonymous Referee #2**

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### **General comments**

The manuscript “Mediterranean nascent sea spray organic aerosol and relationships with seawater biogeochemistry” by Freney et al. presents aerosol composition data collected aboard a 5 week voyage in the Mediterranean Sea in the late-spring - early summer of 2017. The project continuously pumped bulk-seawater from 5m below the surface into a sea-spray generator which uses a plunging jet system to produce primary aerosol. Aerosols generated in the apparatus were then sampled continuously with a range of aerosol instrumentation – of which this paper focuses on the chemical composition measurements: the ToF-ACSM and filter-methods. Surface sea-water was also measured in parallel for phytoplankton cell count, chlorophyll-a, POC. Spo-

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radic sampling of the sea surface microlayer was also performed manually, with DOC analysis undertaken on these samples.

Positive Matrix Factorisation was applied to the ACSM mass spectra which identified four significant factors making up the non-refractory organic aerosol (OA) include primary OA, oxidized OA, methanesulfonic acid type OA and mixed OA. Interesting correlations were found between these factors and phytoplankton cell abundance, as well as the POC concentrations. No relationship was observed with chlorophyll-a, but this was likely because of only minimal variance in this parameter throughout the voyage.

The manuscript is well written and provides an interesting dataset to help further understand the organic fraction of primary aerosol generated from bubble bursting. The authors thoroughly assess their data and generally speaking, identify well the limitations of the dataset, however a few conclusions in the discussion are a bit overstated. One of the main limitations of the paper is the model parameterisation section, which leaves much to be desired in terms of convincing the reader that these are robust and significant relationships.

Overall, I would recommend this paper be accepted after minor revisions.

### **Specific scientific comments**

- Line 80 requires a reference
- Line 176 – where did the waste-water from rinsing go? Was there any chance it could contaminate or disturb the microlayer before sampling?
- Line 193 – what speed was the air flowing across the water?
- Section 2.4

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- what are the models, manufacturers and setup parameters of the ACSM, DMPS, CPC and impactor?
  - What was the diameter and material of the sampling line? Did you characterise the sample losses?
  - Tof-ACSM - did you use a standard or capture vaporizer?
  - Table 1 – what is the uncertainty on these? Is it 2 standard deviations, 95
  - Section 3.1 – could the discrepancy between the ACSM and filter measurement be more simply explained by the differences in upper diameter limits between the two measurement techniques (i.e. ACSM is 500 nm, presumably the filter is 1um)?
  - I would like to see a graph of the size distributions, even in the supplementary information.
  - Line 336 – please include the reference for the “reference mass spectra”
  - Figure 4 – what are the 3 different pie graphs? Please label or include in the caption.
  - Figure 5 and its conclusions – the error bars on this figure are very difficult to read, please consider offsetting them or altering the presentation here. Looking at this figure, complete with the error bars, I find it difficult to come to the conclusions the authors have about there being a diurnal cycle present at all. There is variability from hour to hour, but given the size of the standard deviation, none of this is significant enough to conclude any diurnal cycle.
  - While I commend the authors on their efforts to parameterise the production of organic aerosol from POC concentrations, I would like to see the actual underlying data supporting this from your study – i.e. the figures showing POC vs the
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fractions of OA, and how your models actually fit the data. I wouldn't put a lot of confidence in the equations without seeing the data, and even then, the Pearson coefficients are reasonably low so trusting and implementing this may be a stretch.

#### Technical comments

- Line 98 – name of vessel should be italicised. Does it need the “?”?
- Line 196 – “different” should be “various”
- Line 312 – remove space after “1.2 g cm<sup>-3</sup>”
- Line 313 – missing close parenthesis in sentence.
- Figure 3 caption - please check units
- Line 326 – remove full-stop before “(Fig S7)”.
- Line 428 – remove semicolon in “Fig; 6”