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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Iodine-mediated coastal particle formation: an overview of the Reactive Halogens in the Marine Boundary Layer (RHaMBLe) Roscoff coastal study" *by* G. McFiggans et al.

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We'd like to thank the referee for taking the time to read the paper which is admittedly rather long. The referee immediately correctly identifies the intention of the manuscript, but appears to have significant concerns about the balance of the material as presented.

The intention was to present a paper that not only introduced and summarised the measurements made during the RHaMBLe Roscoff deployment, but also could stand



alone as a coherent piece of the scientific literature. In retrospect, much of the material describing the instrumentation could have been omitted and this has been done in the revised manuscript.

However, it is not completely possible for the paper to simply provide a roadmap to the individual measurement papers, since not all measurements are presented elsewhere. The basic chemical climatology, meteorological overview and airmass classification are only presented here - and an overview paper is the correct place for them. Certain of the measurements are insufficiently novel or too limited in scope for individual papers, so their inclusion is also required in the current manuscript (for example the spectral radiometry and MAX-DOAS slant column densities).

Moreover, it is only in an overview paper that the results from multiple methodologies and measurement techniques can be brought together. This is done in assembling the results from multiple techniques such as for nitrogen species measurements in section 6.1 and the inorganic iodine observations in section 6.3.2. This could not be done in any of the individual papers. Furthermore, the discussions that are reliant on such results syntheses can only be had in an overview paper. Thus all the discussions in section 7 are reliant on multiple techniques and combinations of analyses.

However, in response to the referee's concerns we have significantly reduced the description of all the techniques in section 4 and in section 6 have only kept discussions of the measurement results where they have been discussed in comparison with or to shed light on other measurements or where they are not reported in other papers. This has not amounted to a great deal of reduction in presentation of the results, but we do not see a means to further reduce this.

To address the specific concerns and minor details, the following modifications have been made:

i) The campaign was indeed driven out of scientific curiosity. It was suspected that Roscoff exhibited the characteristics that would make iodine-mediated particle forma-

tion likely, but no preliminary studies had been possible to demonstrate this. The primary objectives have been slightly rephrased, but these were exactly as written in the proposal for funding. We apologise if the referee does not find them compelling.

ii) p26423, line 2 "that were" deleted

iii) p26423, line 3 "throughout September 2006" added

iv) p26423, line 12 this is precisely why the phrase is chosen. "Apparent particle emission" accounts for the fact that the particles are formed by secondary processes below the measurement height rather than being directly emitted as primary particles.

v) p26423, line 17-19

(a) There is absolutely no means by which we can unequivocally show that the particles are growing by the condensation of anthropogenically-formed material without direct measurement. Since we did not deploy an aerosol mass spectrometer during RHaMBLe, we cannot state for certain what the material is that was responsible for ther growth. In any case, even with such an instrument, there is always ambiguity between anthropogenic and biogenic material. However, since the conditions were semi-polluted, it is probable that condensable material was present from the oxidation of man-made emissions (e.g. HNO3, H2SO4, both of which will condense in the presence of agricultural NH3 emissions). We therefore contend that "probable" is the most appropriate word to use here.

(b) Without a cloud condensation nucleus counter, we cannot precisely state the supersaturations at which particles of a given size of undetermined composition will activate into cloud droplets. However, we do know that 100 nm diameter NaCl and (NH4)2SO4 particles will activate at 0.102% and 0.135% supersaturation respectively, we also know from a range of field measurements that ambient marine particles will activate at 0.12% from the 2007 RHaMBLe cruise (modified from Good et al., ACPD, 22659–22692, 2009) or around 0.15%, unpublished data from MAP project. Supersaturations



below 0.3 or 0.5% are perfectly reasonable and we contend that "reasonable" is about the best constraint we can put on this parameter given the lack of CCN measurements.

vi) p26423, line 24 The strict definition of an aerosol is the particle population in its carrier gas. It is therefore strictly correct to distinguish between the particle and the gas in an aerosol.

vii) 26428, line 25 "area of hard-standing" is probably too colloquial and it indicates a sturdy solid foundation upon which to mount the sea containers. This has been changed. viii) p26428-9 - the month of September has been stated for the experimental duration. Since the start of the measurement period varied from 29th August to 4th September depending on instrument, the statement of "the month of September" is appropriate.

We cannot identify where the page numbers are given in the citation list inappropriately - unless the referee is referring to the page numbers inserted by the publication office.

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