

Interactive comment on “Iodine emissions from the sea ice of the Weddell Sea” by H. M. Atkinson et al.

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This is a very interesting report containing an impressive range of measurements of iodine species off the coast of Antarctica which have potentially important consequences with regard to the role which iodine chemistry plays in such an environment. After reading the paper, I have a few questions/comments and so would be grateful if the authors could find the time to address them.

1. In section 2.1 (page 6 – line 5), it is stated that microscopy confirmed the presence of algae in the ice samples. Were any reasonably high resolution images taken of the algae? Such an image would be very interesting to see in the paper i.e. in Figure 2. Was the algal species identified as one known to participate in iodine biogeochemistry?

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2. In section 3.5, it is stated that ‘in general, production was observed. . .’ – specifically, how many times was this the case? Also, the phrase ‘in line with classical aerosol growth’ is pretty vague – what was meant by this? Can the authors rule out any contribution to the particle data from sea salt nano-aerosol released as a result of ice/snow/frost flower disruption caused by the ship’s passage?

3. Table 3 – data for the particle measurements are not given.

4. Figure 10 – there are 2 important points which I would put to the authors for consideration of more discussion in the paper;

(i) The caption for Fig. 10 states that the figure shows new particle formation as the ship breaks through the ice. I disagree with this statement and would say that it only shows particle growth (probably from condensation of vapours) from the background level starting about 20 minutes from when particle measurements were begun. The ‘background’ level of around $1\text{e}+4$ per cc of particles at approx. 10 nm size indicated in this plot is very large for particles of this size. For newly formed particles, such a concentration would be typical of significantly smaller clusters/particles (1 – 3 nm) nucleated from background vapours (e.g. Fig. 5 in Manninen et al., ACP, 10, 7907-7927, 2010).

(ii) The reported growth rate of 20 – 40 nm per hour is particularly high compared with typical growth rates reported in unpolluted environments. Even at the ‘classic’ seaweed-rich site of Mace Head, Ireland, where photolysis of iodine vapours results in rapid new particle formation events, typical reported growth rates for particles of equivalent size to this present study are only of the order of 5 – 10 nm per hour (see the bottom panel of Fig. 6 in Manninen et al., 2010).

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