

We thank Brice Loose for taking the time to review our manuscript and for his positive comments. We address each comment below. Throughout, our response is in green, the reviewer comments are in black, deletions from the manuscript are in red, and insertions to the manuscript are in blue.

We also added the data sheet for the photodiodes to the SI, which we mistakenly omitted in the first instance, updated the affiliations, added a link to the final version of the supplementary information, and fixed some typos.

### Response to Brice Loose (reviewer 2)

Overview: The manuscript “The Roland von Glasow Air-Sea-Ice Chamber (RvG-ASIC): an experimental facility for studying ocean/sea-ice/atmosphere interactions” by M. Thomas and co-authors describes the experimental sea ice chamber at the University of East Anglia. The manuscript provides a thorough overview of the design and capabilities of the Chamber and its attendant infrastructure. A series of experimental test runs have been carried out to benchmark the chamber behavior against mass balance, 1D models and to interrogate the internal consistency of instruments, including the techniques for measuring ice thickness. The manuscript is well-written and clearly laid out and, in my opinion, does an excellent job of featuring the Chamber and providing future users with valuable metrics they can use to design their experiments and test their results. It is clear that the facility is well-equipped for gas measurements as well as radiation studies – both very exciting and relevant phenomena to polar and sea ice research. The benchmark tests and presentation of data are all clear and easy to understand. My only comments have to do with the content and descriptions in Section 2 – the Facility Description. I suggest publication after some moderate revisions to Section 2, to help the reader to conceptualize the facility as it exists.

I suggest the authors consider using the passive voice in the description of Section 2 paragraphs where the active voice has been used. Some sentences begin with phrases such as “We use” or “Our version” or “We set up”. In general, I am a fan of using the active voice, but in this case, I think it creates the impression of impermanence or haphazard decisions, when in fact, it is clear that both the design and implementation choices are well-thought out. For example on Line 141, instead of “We use a weather station”, the section could begin with “Weather inside the Chamber is measured with a W600-UMB. . .”

We have amended the text in several places to remove the active voice from section 2.

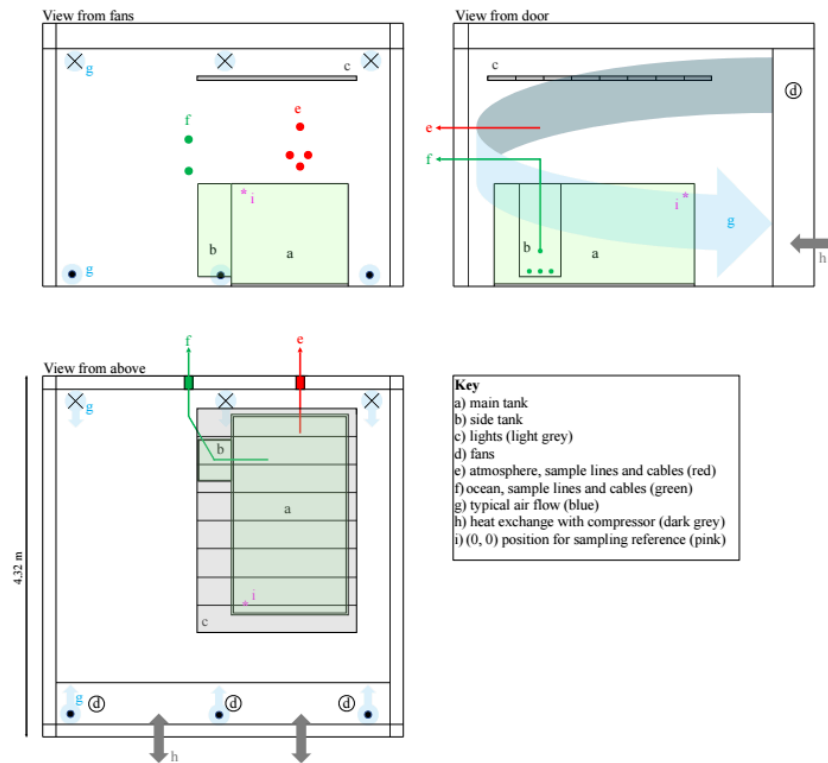
et al. (2012) for pure NaCl. ~~We deploy a~~ A sonar (Aquascat 1000R) ~~to measure~~ measures the position of the waterline at the start of the experiment and the position of the base of the sea ice throughout the experiment. We use the GSW toolbox to

~~We use chains of digital thermometers to measure temperature~~ Temperature,  $\theta$ , profiles through the ocean and sea ice are measured using chains of digital thermometers (Table 1). These have a resolution of  $\frac{1}{16}$  °C and are calibrated against  $\theta$  measured

~~We use a weather station (WS600-UMB) to measure the~~ The temperature, wind speed, and relative humidity of our atmosphere are measured using a weather station (WS600-UMB). Two Los Gatos Research (LGR) greenhouse gas analysers measure CO<sub>2</sub>,

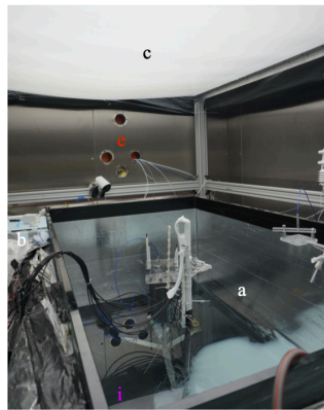
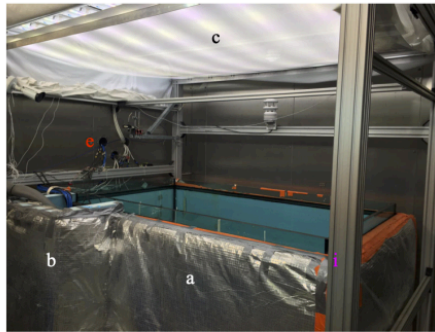
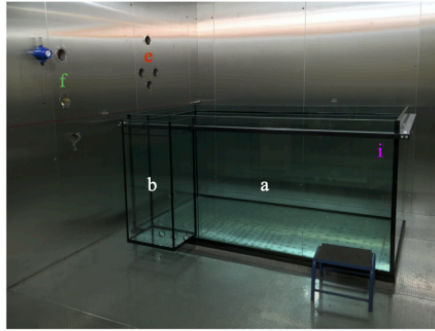
Specific comments: Suggest combining Figures 1 and 3 to make a single unifying diagram of the Schematic in a 3 x 2 panel configuration. Photos could be paired with the diagram that comes closest to revealing that perspective. Common features in the schematic could be annotated in the photos. For the schematics, I would encourage more use of shading to distinguish the tank from the cold room (as was done in ‘view from above’) and different line thicknesses to help reveal tank and chamber outlines. Clearly indicate what is the chamber – this refers to the cold room and all its contents? It might be helpful to include some fan icons and tighten up the arrows and other graphic elements.

We have amended the schematic following these useful comments. See below:



**Figure 3.** To scale schematic diagram of the coldroom. The three panels show orthogonal views from different vantage points. Crosses and dots indicate air flow away from and towards the viewer, respectively. The lights, shown in grey, are made up of eight sets of visible, UV-A, and UV-B triplets. The main and side tanks are pale green.

After some thought and a few attempts, we chose not to merge figures 1 and 3. Our main reason was that the photos in figure 1 do not correspond to the panels in figure 3, and we felt combining the figures might therefore cause some confusion. A secondary consideration was that, in a combined figure, it is difficult to show the three photos and the schematic as large as we would like. We have added labels to figure 1 (see below) that correspond to figure 3.



**Figure 1.** The tank just after installation (top), with all the main features in place (middle), and set up for experiments with visible lighting (bottom). The labels are consistent with Figure 3, indicating: a) the main tank, b) the side tank, c) the lights, e) atmosphere sample lines and cables, f) ocean sample lines and cables, and i) the (0, 0) position of our sampling coordinate system.

Please see our response to the next comment for our clarification on what the ‘chamber’ actually is.

Line 199: Do “cold room” and “chamber” refer to the same physical enclosure? I had some difficulty understanding what was referred to by “chamber” as opposed to “tank” and “cold room”. It might be helpful to explicitly define what is encompassed by the word “chamber” in the text and in the combo of Figures 1 and 3.

This is a good point. We have added the following text, in a prominent position at the end of Section 2, to clarify what we mean by the ‘chamber’.

We use ‘chamber’ to describe the experimental system. When the tank is exposed to the entire coldroom, as for all the experiments presented here, the coldroom is the chamber.