Dear editor,
We believe we fully addressed the referees concerns as described below:

1) The presentation of some of the figures needs to be improved and the style of the figures should be consistent throughout the paper. Some are not as clear as most figures in this journal. For example: The new Figure 2 has no x-axes. Some of the ranges should be reduced to show the variability (i.e., TOC could range from 600 to 1300 instead). The axes labels should have units in a standard format (i.e., µg instead of microgramme written out; m-2 and s-1 need to be superscripted). There are grey boxes around some of the panels and the boxes don't seem to be centered on the graphs. Additionally, I think the individual markers need to be darker because they are hard to see on the boxes. It seems like Figures 2, 5, and 6 were made by a different program and have a different style than Figures 3 and 5. I think they should all have consistent formatting.

We reformatted Figure 2 as requested and in compliance with the formatting of the other figures.

2) Although the authors have included a schematic of the setup used for measurements, there are still important missing details. For instance, the dimensions of the tank are not provided. While the authors argue that the plunging jet does not interact with the tank's sidewalls and bottom, I am skeptical that the free-floating bubbles on the surface do not interact with the walls to some extent. It would be helpful if the authors could provide a photo of the system with the jet on to demonstrate the coverage of bubbles on the surface and their proximity to the walls before bursting. This information is also crucial for calculating fluxes from the chamber. According to the revised version, the authors assume that the entire water surface in the chamber generates particles, which contradicts their assertion that bubbles do not interact with the chamber walls. It is likely that less than 100% of the water surface acts as a particle source, and additional photos could assist the authors in estimating tank fluxes more accurately. In addition, it would be beneficial to provide information about the depth of the headspace, which would enable a comparison with the typical height reached by the jet and film droplets generated upon bubble bursting. This would help confirm whether only a few droplets were impacting the chamber roof, thereby affecting the measurement process.

We now provide the dimensions of as many items as we can of the system so the reviewer (and reader) can duplicate it. Of course free floating bubbles eventually meet the tank's walls, but the jet does not reach the tank's bottom (as we stated).

The text was modified as follows:

"Sea spray was continuously generated with a plunging jet system, as described in detail in Sellegri et al. (2023) and previously used in Schwier et al. 2015 and 2017, Trueblood et al. 2021, Freney et al. 2021 and Sellegri et al. 2021. The **10 L tank was operated with a 10 cm seawater depth, so jet and film drops did not interact with the tank's top locate 15 cm above the seawater level**. Given the jets total flowrate of 1.2 LPM, this relatively small seawater volume results in low residence time (4 min), so preventing changes in biology or sedimentation of large species that occur in larger chambers (Dall'Osto et al. 2022). The small dimensions of our system also correspond to a short residence time of air in the headspace (12s), preventing potential gas-phase reactions with lab air. **E**ight plunging jets **were created by flushing seawater through 1 micrometer orifices that were** equally spaced along **a ¼" stainless steal tube, located at 5 cm below the tank's top in the** chamber diagonal**. Jets** penetrate the seawater volume at a depth of 7 cm, and therefore do not interact with the chamber **bottom**. **Free floating bubbles could occasionally meet the tank's wall as they floated away from the center of the tank. For this reason and others such as the continuous jets vs intermittent wave breaking process, fluxes derived from our experiments, similarly to all controlled lab experiments, are necessarily different from the ones obtained from the natural wave breaking in the open ocean**. **Natural conditions were however mimicked as much as was possible."**

We do not believe providing a photo of the system would be of much value, as the bubble lifetimes (and so the "whitecap" surface coverage) do change significantly as a function of seawater biology and temperature, so a photo would be representative of only one experiment.
Moreover, the fraction of the tank's surface covered by bubbles is not taken into account in our flux calculation, neither it is assumed to be 100% . Instead, we use the flow of air entrained in the seawater, an easier parameter than the surface covered by bubbles, (related to whitecap coverage) to scale our flux to equivalent windspeed condition in the natural world. Indeed air entrainement flowrate is easier to accurately measure than whitecap coverage, and it can easily be prognosticated in models. The tank's surface is only used together with the flushing flowrate, to derive a number of sea spray particles produced across the seawater surface per unit of time, as a function of air entrained.

3) Similarly, there are still important details missing regarding the air entrainment measurements. Simply stating that the authors followed the same procedure as Salter et al. (2014) is insufficient. Upon reviewing that publication, it became clear that it did not provide enough information to replicate their work. For instance, the diameter of the tube used to enclose their plunging jet was not mentioned.
This is now mentioned

Additionally, while Salter et al. used a single plunging jet, the current study employed multiple parallel jets. It is crucial to clarify whether all the jets were enclosed simultaneously and if air entrainment was measured accordingly.
The air entrainment measurements experiment were performed on a single jet as Salter et al. (2014) did. Now specified.

The authors should provide details such as the diameter of the tube used, the depth to which it penetrated the water surface, the method used to measure airflow into the tube, and the number of measurements conducted (assuming an average was taken).

Text was added to describe the air entrainment measurement set-up:

“The set-up used to measure (F_{ent}) **reproduced one of the 8 plunging jets set in a separate, larger tank, with the same distance to seawater and seawater depth than the main experimental set-up. For the air entrainment measurements, the jet was enclosed in a ½” vertical plunging tubing (at 1 cm depth) connected to a TSI flowmeter. The seawater flowrate was varied from 150 to 400 ml min^{-1} and the relationship between seawater flowrate and entrainment air flowrate was fitted to obtain a calibration curve of our set-up.”** Air entrainment flowrate calibrations were performed at moderate temperatures around 20 °C **and also at lower temperatures that showed undetectable influence of the seawater temperature on the air entrainment flowrate**.”

In addition, the authors state on line 75 that "The combination of viscosity, density and surface tension changes may also affect the volume of air entrained in the seawater and the total volume and number of bubbles formed." This implies that seawater temperature may impact air entrainment. As such, the authors should also state the water temperature that their air entrainment measurements were made at and how this impacts their flux calculations.

We actually made new air entrainment measurements experiments in which the seawater temperature was varied and did not detect any effect. Therefore we withdraw the above mentioned sentence "The combination of viscosity, density and surface tension changes may also affect the volume of air entrained in the seawater and the total volume and number of bubbles formed” and added the following text:
“Air entrainment flowrate calibrations were performed at moderate temperatures close to 20 °C **and also at lower temperatures that showed undetectable influence of the seawater temperature (across the range 2°C-16°C) on the air entrainment flowrate**.”

Minor comments.
In Figure 1a) It should be "microgram"
Done

In Figure 1e) The units are missing.
Done

Line 20 - This would read better as "We observed a significant increase in sea spray total concentration at temperatures below 8 °C. Specifically, at 2 °C, there was an average 4-fold increase compared to the initial concentration at ambient temperatures."
Done

Line 23 - Should read "Moreover, the temperature dependence varied based on the type of water mass and its biogeochemical properties."
Done

Line 25 - Would read better as "The temperature dependence of the sea spray flux was found to be inversely proportional to the abundance of the cyanobacterium Synechococcus in seawater. This relationship allows for parameterizing the temperature dependence of sea

spray emission fluxes based on Synechococcus, which can be utilized in future modeling exercises.
Done

Line 59 - Would read better as "Laboratory experiments using a plunging-jet sea spray generator provide a means to investigate the temperature dependence of sea-spray number flux (in contrast to sea spray mass flux) across various ranges of sea-spray size and temperature.
Done

Line 383 - Would read better as "We have observed a substantial increase in SSA flux as seawater temperature decreases. This finding aligns with previous observations from laboratory-based experiments using synthetic and natural seawaters (Hultin et al. 2011; Zabori et al. 2012; Salter et al. 2014; Christiansen et al. 2019). However, it contradicts the seawater temperature dependence of SSA fluxes inferred from ambient concentrations (Jaegle et al. 2011; Grythe et al. 2014).
Done

Line 409 - This sentence should be revised to make it clear that a previous campaign is being referred to ("SELL21").
We rephrased. We do refer to the present study.
"For example, Christiansen et al. (2019) report a baseline TOC content in SIGMA sea salt <0.003% by mass, which corresponds to a significant amount of organic carbon of around 1.2 mg L^{-1} in a 35 g L^{-1} that is of the same order of magnitude as the amount of TOC in rich frontal waters of the present study (Fig 2a)."

Line 420 - Would read better as "As a result, this phenomenon is expected to impact the seasonal fluctuations of sea-spray particles originating from cold surface waters, particularly in regions like the Southern Ocean.
Done

Line 431 - Would read better as "Based on our findings, it appears that higher seawater temperatures and increased abundance of Synechococcus would result in reduced sea spray fluxes at low temperatures. The combined effect of these factors could be additive or even synergistic, potentially amplifying the impact compared to each individual effect alone."
Done