Dear authors,

Thank you for this new version of the manuscript and for the replies to my questions. In my opinion, this revised version is easier to follow, particularly due to the numerous explanations added to your methodology. I also appreciate the inclusion of the Monte Carlo simulation, which provides a statistical understanding of the search radius, and the use of bootstrapping to evaluate the relevance of particles' compositions during the campaign.

One overall aspect I still find difficult to understand is how the center of the search radius is chosen. From L212: "the software identifies the image with the highest number of ice crystals for each measurement cycle and tags the ice crystal positions in the images as the center of an area exceeding a size threshold of 30 pixels with a brightness threshold of 30 of 256 on a scale stretching from the darkest to the brightest recorded signal (Schrod et al., 2016)" I understand that the center is determined based on the 30 adjacent pixels. However, in the schematic for your simulation in Fig. 4, the center (red cross) is clearly positioned in an area that is not surrounded by 30 pixels above the brightness threshold of 30. Then, in Fig. 5, it seems that the center of the search radius corresponds to the center of the ice crystal. I find these descriptions contradictory and would appreciate further clarification, especially that the center of search radius is a key step for your method.

Specific comments

-L155: "However, even after thorough cleaning a small amount of ice formation can regularly be observed at temperatures at or below -30°C, constituting the background concentration and defining the limit of detection, which is in the order of 0.1 L-1 of atmospheric air for a collection volume of 100 L." It appears that ice formation on silicon wafer only appears at -30°C, so is the background concentration is only for particles that nucleate ice at this temperature or below?

-L234: "can be caused" here you employ a modal verb which suggests that condensation is only a possible explanation for the higher particle counts observed with FRIDGE compared to SEM. Is there any evidence or analysis that could strengthen this claim? In other words, is it not possible to determine with greater certainty whether condensation is indeed the cause?

-L259: "mechanical movement" can you add an explanation?

-Fig. 3b: There are 3 pictures (top left, bottom left and bottom right) with each calibration marks and 1 picture (top right) of the entire calibration system incorporation the 3 marks? Please add explanation.

-Fig.4: Did you think about integrating the pixel size of this schematic? Looking at the radius of the inner circle (25 µm) and the area around, I don't see how there could be 30 adjacent pixels with brightness above the threshold in that area. Perhaps you can increase the size of ice crystal?

-L297: "The direction of shift is randomly chosen; the distance is randomly sampled from a mirrored normal distribution with a standard deviation of some typical uncertainty assumptions." Could you further explain what you mean by typical uncertainty assumption?

-L304: "(total number of 20000 / 50000 / 100000 particles on the wafer with different INP fractions of 0.0005 / 0.001 / 0.002)" Please discuss this further and add references.

-L305:" In this case the standard deviation of the position uncertainty of 25 µm was assumed." Why did you choose this one?

-Fig 5: I am having difficulty understanding how the probability of INP correctly identified (thin black line) is equal to 1 for the smallest search radii, but at the same time the fraction of INP missed is increasing as search radii are decreasing.

-Fig.4: Why don't you integrate the pixel size of this schematic? Looking at the radius of the inner circle (25 um) and the area around, I don't believe there are 30 adjacent pixels with brightness above the threshold in that area.

-L395: "From the statistical calculation in Tab. S1 with a 95% confidence level, a limit of approximately 10 particles per group can be derived to make a reliable quantitative statement, for groups with less particles the uncertainties become large" do you mean that since the 95% confidence level for less than 10 particles spans reaches 0 as lower limit, it is not possible to make a reliable quantitative statement?

Technical corrections

-Fig.3: "polar coordinatesystem" change to "polar coordinate system"

-Fig 3: in the cation is mentioned "d10" but not in the figure.

-Fig 3: please add in the caption that white circle is an ice crystal.

-Fig. 4: "die" replace by "due"

-Fig. 4: "For this plot" there are several plots here, which one are you referring to?

-L.280: "orange" it is yellow, no?

-L361: "Based on the modeling, we would consider a value of around 100,000 particles on the wafer to be a good starting point, as the proportion of incorrectly identified particles increases significantly with higher particle numbers." Consider changing "good starting point" as this can be understand that 100, 000 particles minimum are suitable, while higher number of particles increases uncertainty.