

Response to RC3

We thank Referee 3 for the very helpful and valuable comments. We will take all the comments into consideration and revise our manuscript. Our responses to the Referee's comments are shown below. The Referee's comments and our replies are numbered and shown in blue and black, respectively.

This manuscript “Technical note: High-resolution analyses of concentrations and sizes of black carbon particles deposited on northwest Greenland over the past 350 years – Part 1. Continuous flow analysis of the SIGMA-D ice core using a Wide-Range Single-Particle Soot Photometer and a high-efficiency nebulizer“ submitted by Goto-Azuma et al. describes an improved CFA system by coupling single-particle soot photometer and a high-efficiency nebulizer. This technique is suitable to perform high-resolution measurements of black carbon (BC) regarding concentration, as well as size distribution up to 4 μm . The authors applied this technique to analyze the BC particles in an ice core retrieved at the SIGMA-D site from the northwest Greenland. This manuscript is accompanied by a following part focusing on the 350-year BC record of the SIGMA-D ice core. This work has advanced the conventional CFA system, especially concerning to the size distribution of BC that has been less considered before. Therefore, this specific merit deserves a publication in an esteemed journal such as ACP.

RC3-1 I suggest that the authors might discuss the innovative content (e.g., size distribution of BC particles) in more details, and simply the other parts that have been considered thoroughly in previous papers, or to include the other parts in the supplementary material. Accordingly, the introduction should be revised for a concise review of previous works, but focus more on its novelties.

AC3-1 Thank you for the constructive comments. We will revise the manuscript to address them accordingly.

Other comments:

RC3-2 Lines 304-314: The authors claim that a combination of the standard SP2 and a high efficiency nebulizer, and a combination of the standard SP2 and a traditional ultrasonic nebulizer would lead to underestimation of the averaged mass concentration by 12% and 17%, respectively.

However, I don't know if the authors analyzed BC concentration using these two conventional methods. Please provide more details to reach this conclusion.

AC3-2 Our apologies for the confusing explanation. We did not analyze the BC concentration using conventional methods. Instead, we estimated the underestimations based on the measurable size ranges for conventional methods. We will revise the manuscript to make this clear.

RC3-3 Line 29: Please take a check on the resolution value of 10-40 mm.

AC3-3 The resolution values depend on the definition of 'resolution.' We presented two types of resolutions, 10 mm and 40 mm. However, this was not clear in the abstract. Since we cannot explain the details in the abstract, we will delete '(resolution: 10-40 mm)' from the abstract to avoid any confusion. Instead, we will explain this more clearly in the text.

RC3-4 Line 58: The words "have become possible" should be deleted.

AC3-4 Thank you for pointing out the typo. We will delete the words.

RC3-5 Lines 117-118: What's the meaning for saying the depth resolution value of 0.3 ± 0.1 mm?

AC3-5 This is the depth resolution of the laser positioning sensor, which has been published by Dallmayr et al. (2016). However, as pointed out by Referees 1 and 3, this sentence was very confusing. We will revise the manuscript to avoid confusion.

RC3-6 Lines 186-187: Please explain in more details how to calculate the reproducibility.

AC3-6 We repeated measurements of the same samples. We will revise the manuscript and explain how we calculated the reproducibility.

RC3-7 Line 224: " $\pm 0:05\%$ " \rightarrow " $\pm 0.05\%$ "

AC3-7 We were not aware of this typo. Thank you for pointing it out. We will correct it.

RC3-8 Line 238: “± 0:08%”→“± 0.08%”

AC3-8 We were not aware of this typo. Thank you for pointing it out. We will correct it.