Author Response to RC #1

We would like to thank RC #1 for the constructive comments and address his questions below. The answers are written in blue.

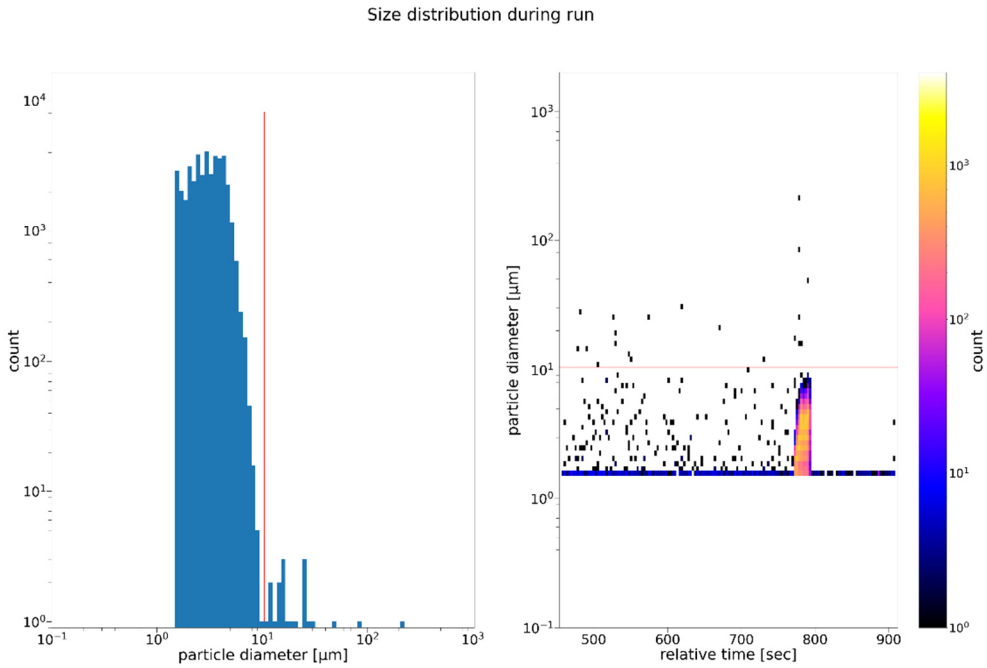
1. Fig. 3: The particle size distribution of a single run. What is the total duration of one run?

Depending on the flow and pressure settings one run usually takes 5 – 6 min. To make this clearer a sentence was added in chapter 2.1 in lines 88ff:

"One cycle of these three modes is called a run and takes about 5 to 6 minutes, depending on the duration of the flush, the expansion and refill flow, the minimum pressure, as well as ambient conditions."

2. Section 5.3: Influence of Large Aerosol Particles. If large aerosol particles are present, will a two-mode size distribution be observed? Assuming a field campaign with a strong dust plume (coarse mode particle number concentration exceeding 40 # cm^{-3}), will the two-mode ice threshold finder function effectively?

From our observations so far, the ice threshold finder will remain effective in these cases. The example plot below shows a run with an aerosol concentration of particles larger than 1.5 µm, with over 600 particles per litre. Even with a high aerosol concentration, the size distribution is still dominated by droplet formation during expansion. A theoretical problem could arise if the particles had a sharp upper size limit above the ice threshold, which could lead to the minimum shifting to higher diameters in the size distribution. However, this has never been observed. Additionally, if the concentration of 'ice-sized' particles during flush exceeds 50% of the INP concentration during expansion, a warning is raised. In this case, the INP concentration could be biased by the aerosols (see Section 4.3.2 Large aerosol particles during flush mode). In reality, it is difficult for large aerosols to enter the chamber as the tubing of the PINE-inlet has multiple curves, leading to a loss of large aerosols. In many cases the PINE is connected to a PM10 inlet.



3. Should quality control (Sect. 4.3) be performed before using the ice threshold finder (Sect. 4.2)?

Even though the quality control is the last step in the data processing, it is performed on different data levels. E.g., the tests on the instrument data are performed on Level 0 data, tests regarding the ice threshold are performed on Level 1 data. As the data is only flagged and no data is removed, it doesn't make a difference at which step of the processing the quality control is applied. To emphasis this a remark was added in the introduction of the quality control (l. 306ff):

"It should be noted, that no data is removed during the quality control. It lies within the responsibilities of the data user to handle the flagged data."