

Interactive comment on “The micro-orifice uniform deposit impactor-droplet freezing technique (MOUDI-DFT) for measuring concentrations of ice nucleating particles as a function of size: improvements and initial validation” by R. H. Mason et al.

Anonymous Referee #2

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The manuscript reports on investigations of the non - uniformity of size - dependent aerosol deposit in a rotating MOUDI. Non – uniformity was studied at three different optical resolutions of a microscope. In the second part, the paper discusses ice nucleation experiments done on selected areas of some of the MOUDI stages using a droplet freezing technique (DFT). It introduces a method to correct ice nucleating particle concentrations for the aerosol non - uniformity found in the first part. The MOUDI

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– DFT results are compared to measurements done simultaneously with a continuous flow diffusion chamber. The comparison shows reasonable agreement of the two different techniques at the chosen conditions. The manuscript presents a detailed investigation and an improvement of the recently introduced MOUDI-DFT technique for measuring ice nucleating particle concentrations as a function of size. It is well written, the study is put into context and relevant earlier work is referred to. The manuscript is of interest to the readers of Atmospheric Measurement Techniques. I recommend it for publication after the few following comments have been addressed.

General Remarks:

Similar to the 1st referee's comment, it is not clear to me from the manuscript if Fig. 4-6 are averages over all analyzed glass cover slips and if so, what the variation between the slips is.

In addition, have you looked into the effect on the normalized particle concentration of the 0.5 mm uncertainty in centering the microscope viewing area and the hydrophobic glass cover slip to the deposit center? Your results show that there are non-uniformities at the 0.1mm scale, hence they might as well exist in the y-direction (perpendicular to the line through the center).

The comparison to the CFDC measurements are a good first step to validate the MOUDI-DFT method. However, only two data points with some uncertainty in both instrument's measurements is not enough to proof the accuracy of the new method. Thus, as promised by the authors, further comparison studies are necessary in the future.

Are the results expected to be affected by different aerosol types?

Specific Remarks:

Page 2227

Line 7: Please clarify at this point already if size is (aerodynamic, geometric, mobility)

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diameter or radius?

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Line 3: What are the standard deviations of temperature and SSw of the CFDC during each of the two experiments?

Line 4: If it cannot be ruled out that dust was a major component of the samples, the factor 3 should be treated as an uncertainty in the CFDC data.

Line 22: Are representative particle size distribution measurements available for this location which could be used to validate or constrain this factor?

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Line 24: Does $\nu_{0.25-0.10\text{mm}}$ vary with the number of sections used in the described calculations? Have you looked into that and could comment on it?

Technical corrections:

Page 2226

Line 7: change 'can be' to 'is'

Page 2231

Line 19: Replace 'video images (...) were' by 'video recording (...) was' or 'image recording (...) was', depending on what has been done

Page 2232

Line 7-8: insert a minus sign before '1°C'.

Page 2237

Line 11: replace 'under prediction' by 'underprediction'

Page 2238

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Line 22: change 'three SDs' to 'three standard deviations (SDs)'s

Page 2261

Line 6: delete 'in' before 'found'

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 2223, 2015.

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