Atmospheric Measurement Techniques Discussions

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Comment on amt-2021-26

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Community comment on "A phase separation inlet for droplets, ice residuals, and interstitial aerosol particles" by Libby Koolik et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-26-CC1, 2021

The manuscript ” A phase separation inlet for droplets, ice residuals and interstitial aerosol particles” by Koolik et al presents a new device to study mixed phase clouds with special focus on separation of ice crystals from supercooled droplets. It combines well known components as pumped counterflow virtual impactor PCVI in two version together with newly designed cooled evaporation chamber to enhance separation of ice phase from liquid phase.

The concept is sound and the whole manuscript should be seen more as a proof of concept than detail and precise characterisation. Certain shortcomings and future work need are mentioned in conclusions.

The manuscript deserves publication in AMT as this is an important contribution to improve our instrumental portfolio to study mixed-phase clouds, although, mentioning this again, it should be clearly stated in the manuscript that this is a proof of concept with initial set of test, but proper detail cauterization and has to be done in future. At current version manuscript does not provide sufficient evidence that that proposed mixed-phase cloud probe can be used for quantitatively based observations.

General comments

In introduction or later in results part I would like to see comprehensive discussion on possible sampling artefacts. Statement on L112-113 that there is no possible break up just because modelling says so is not sufficient. For example, can the effect of scavenging of interstitial particles by ice crystals and droplets by estimated?

How relevant are latex PSL spheres used for calibration with respect to different aerodynamic behaviour of ice crystals?

There are earlier studies showing (e.g. Fig 4 in Kupiszewski, 2016) that in various environments there are smaller ice crystals and INP particles than is the lower cut size of sizing OPC and cut off selection size of PCVI. Using instrument with lower cut off on both, residual and interstitial (PF) flow line is necessary to provide relevant quantitative characterization of the instrument.

Also lower size cut off of the initial separation around 10 um does not cover full size of spectra of hydrometeors (e.g. Patade, 2015)and this should be discussed in the manuscript how SPIDER can be possibly modified or combined with additional instrumentation to provide relevant information on how big fraction of population it actually sample.

References

Kupizsewski et al, JGR 2016, https://doi.org/10.1002/2016JD024894

Patade et al, JGR 2015, https://doi.org/10.1002/2015JD023375