

## ***Interactive comment on “Cloud particle size distributions measured with an airborne digital in-line holographic instrument” by J. P. Fugal and R. A. Shaw***

### **Anonymous Referee #2**

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This paper describes the routine construction of size distributions from in-line holograms and compares them with those obtained from other cloud probes. The authors show size distributions from a range of flights in different microphysical conditions. They demonstrate that this approach to measuring ice particle size distributions is practical and has many advantages.

I believe that the paper is publishable. I have a few suggestions that I think would be interesting additions to the paper.

1. Extend the discussion to include comments about fig.3 indicating that because there is a non-uniform and symmetric distribution of number density along the optical axis

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then shattering of ice particles on the inlet appears to be the only explanation for this.

2. A discussion about whether the holodec can be used for phase discrimination would be welcome. What sizes would this be possible for? Perhaps this can be tested with the theoretical forward modeling and hologram reconstruction tests mentioned in the text.

3. It would also be good to discuss how holographic reconstruction also removes/reduces the problem of coincidence that hampers particle measurement when trying to increase sample volume and introduce instruments with open path sample volumes.

4. It would be useful to summarise the holodec sample volume as a function of particle size so that readers can compare against other instrumentation.

5. p665/18 What is the cause of this breakup? This could be used as evidence that particles naturally break up and give rise to numerous small particles that are closely located in space.

section 2.3 - mention sample volume as function of size.

p665/9-10 - What concentration is this filtering equivalent to?

p665/20 - Fig3. Is it possible to reproduce this figure for different particle sizes or ranges of sizes?

p667/9-17 - Are the forward and reconstruction methods independent?

p669/3-14 - Be aware that there is a residual liquid water content signal even in pure ice cloud (Korolev et al 1998b)

p669/19 - ...different shapes AND ORIENTATIONS yield...

p670/3-4 - Only after averaging over all orientations. Some orientations will scatter more light to the detector than others

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p670/7 - ...shape AND ORIENTATION of small ice crystals...

p673/26 - ...particle size AND SHAPE...

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Interactive comment on Atmos. Meas. Tech. Discuss., 2, 659, 2009.

**AMTD**

2, C50–C52, 2009

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