Atmos. Meas. Tech. Discuss., 2, C224–C226, 2009
www.atmos-meas-tech-discuss.net/2/C224/2009/

Atmospheric Measurement Techniques Discussions

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

Ph.D. Fugal

fugal@ucar.edu

Received and published: 28 May 2009

Response to Anonymous Reviewer Comments

We appreciate the anonymous reviewer's comments and have revised the paper accordingly, as detailed below. Page and line numbers refer to the Discussions paper, for consistency with the reviewer comments.

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

Response: We've added a few sentences to extend the discussion as suggested.

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

Response: We have added a discussion of phase discrimination to the end of Section 4.

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.

Response: We've added a comment pointing out that HOLODEC can measure many particles coincident in it's sample volume. We also refer readers to Fugal, Schulz and Shaw 2009 for a discussion of what occurs when particles appear in front of and/or near each other. (See the following point and the second paragraph of Section 2.3.)

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

Response: This is an important point and we have added a paragraph describing the sample volume as a function of particle size, and how we handle it in this paper. (See second paragraph of Section 2.3.)

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.

Response: We have added a comment to the last paragraph in Section 2.2 giving an argument for why we believe most breakup events are the result of measurement artifacts rather than observations of naturally occurring events. It is of course possible that

AMTD
2, C224–C226, 2009

some natural events are observed and misclassified, and this will remain a challenge for the future.

section 2.3 – See response to point 4 above.

p665/9-10 – We have defined the effective concentration and compared it to the background concentration (see first paragraph of Section 2.2).

p665/20 – Yes it would be possible, but in the interest of space we have not included a figure like this in the present paper. While we don't show particle size as a function of position along the optical axis, Figures 8 and 9 show what fraction of detected particles are shattered for various sizes (difference between blue solid, and blue-dashed lines).

p667/9-17 – We have clarified this by adding a sentence (see second to last paragraph of Section 2.3).

p669/3-14 - We have added a parenthetical remark noting that the observed liquid water contents in segments (c) and (d) could be ambiguous.

p669/19 – We have added "orientation" as suggested.

p670/3-4 – The reviewer is correct, and we have revised accordingly.

p670/7 – We've added a comment that the droxtals from the light scattering library were randomly oriented and thus we are assuming a random orientation in this estimate of a correction to FSSP sizing of small ice particles.

p673/26 – We have revised the wording as suggested.

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