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Atmospheric Measurement Techniques Discussions

Interactive comment on "Ice particle sampling from aircraft – influence of the probing position on the ice water content" *by* Armin Afchine et al.

Anonymous Referee #2

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General Comments:

Measurements of ice water content at different aircraft mounting locations are potentially of interest, since much of current knowledge is based on potential flow or CFD models. It's a start, but this paper needs major revisions before it is publishable. The presentation is confusing, and much of the introductory material (including objectives) lacks focus and clarity. Also, the paper seems incomplete without additional work that is needed to quantify and scale each fuselage position for different aircraft. My specific suggestions are below.

Specific Comments:

1) There is very awkward English used throughout. Please avail yourself of an English

editing service.

2) Abstract line 3-8: Please clearly explain that you are comparing upper fuselage vs wing measurements on one business-jet aircraft from one experiment, and separate comparisons on specialized high-altitude aircraft from different experiments. The various aircraft wing and cockpit geometries are very different, and not everyone will know that HALO is a Gulfstream G-V, or what the Geophysica and WB57F are.

3) Abstract line 20: A "factor of 2.5" doesn't sound like good agreement, and may be misleading as actually the vast majority of your data points are much better than that. I recommend finding a better way of quantifying the data comparisons (see also point 17).

4) Page 2, line 1-2: Or "solid measurements" could also be made with an instrument mounted in a wingpod with extending inlet.

5) line 18: You can and should discuss the width of the shadow zone for each aircraft, based on the King (1984) modified Stokes parameter. Granted this is an estimate, but it will give an idea of the expected variance for different aircraft fuselage sizes and stations (distance back) on the aircraft. Ice crystal sizes and can be converted to aerodynamic diameters and modified Stokes parameter for typical crystal sizes and shapes.

6) lines 20-25: As in the Abstract, what measurements are being compared on which aircraft is confusing. You can't necessarily generalize from one aircraft to another. Please be specific.

7) Page 3, line 24: Every inlet will influence the airflow somewhat. So, switch "not influence" to "minimally influence".

8) Page 4, Section 2.1.2: Not sure that all this detail is required; you could just specify the uncertainty/detection limits for each instrument and reference papers for more information.

9) lines 18-23: If you are going into all this detail, a figure would be helpful. Or the section could be cut.

10) Lines 31-32: Only if the flow rate is not controlled, which it can be in some flow configurations.

11) Page 5, line 1: This seems backwards, since you are solving for IWC.

12) Line 8; too much detail; not sure why all this is worthy of note for this paper.

13) Line 21, insert “for particle measurements” after “flow around wings”, as obviously the airflow is critical for other things (like lift).

14) Page 6: line 13-14: A philosophical point: it’s already known that the top of the fuselage is a bad place to sample clouds, so why were all these instruments mounted here? Are they primarily to measure gas-phase composition, with cloud measurements just for this study?

15) Specify the distances from fuselage and fuselage station (distance back) for each inlet position.

16) Page 8: line 13-14: but HAI is actually closer to fuselage, right? How much?

17) Line 15: Actually it seems only a small fraction of measurements differ by 2.5. This should be reworded for quantitatively, and to make it clear that actually most data that fall within smaller ratios. And many of these are at small IWCs, and likely influenced by higher uncertainties at low values (due to subtracting a relatively large clear air signal, and possibly calibration uncertainties). This should be discussed. Likewise with the factor of 10 later on. Also, are the data from different instruments synced precisely?...as this can also increase scatter.

18) It would also be nice to know if the different instruments have been successfully compared in the lab, a wind tunnel or in past aircraft campaigns.

19) Page 9: Again, we need to know how far out and back each inlet is.

20) Lines 10-11: The Geophysica is also a narrower aircraft. Cannot compare directly with the G-V without scaling somehow.

21) Lines 15-16: Page 10: lines 8 on: This is interesting, but it should be clarified that at very large sizes, particle trajectories are straight and little enhancement or shadowing is expected (ie, high S values for King, 1984). It appears this is outside the range of what you sampled, although it’s difficult to know since S values aren’t calculated.

22) Page 12: Lines 7-8: This is simplistic and dangerously misleading, since there is still a shadow zone on the side and bottom of the fuselage–it’s just more narrow than on the top. It also will vary with fuselage diameter and distance behind the nose. Again, precise inlet locations are needed.

23) Need to reference prior work. Lines 15-16: Twohy and Rogers (J. Atmos. Ocean. Tech, 1993) also reported deviations in measured cloud properties for different aircraft mounting locations. Lines 18-20: Davis et al (JGR, 2007) also compared IWC measurements on the WB57F.

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