

Manuscript Changes Itemised

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List of edits

- added "during the Pallas Cloud Experiment - 2022" on Line 2 for RC1
- "These measurements are intended to expand on the previous campaign since they form an extended dataset with the uncertainties already evaluated by previous experimental work" added to the abstract for RC1.
- added a paragraph in the introduction to clarify the purpose of these measurements for RC1.
- L10 - climate models changed to earth system models for RC1.
- L11 - added references to polar clouds specifically for RC1.
- Added a clarification of the intended use of the dataset at the end of the introduction for RC1.
- Rephrased L11 slightly for RC1.
- UCASS explanation expanded on for RC1 on L22.
- Changed methods section heading for RC1
- Fixed corrupted references.
- Updated caption of Fig. 3 to state that it was a representative profile.
- Explained why the data are in the time domain for RC1
- Collapsed all subsections into master sections.
- Added in depth discussion of the data retrievals for RC1.
- Altered the start of the flight information section with more information about the cloudy conditions for RC1.
- flight information and constraints was renamed to flight information and conditions for RC1.
- "one of a number of algorithms" now expanded upon on L87 for RC1.
- data analysis and data qa sections split apart for RC1.
- cross reference for exact ucass flight constraints on L95 added for RC1.
- Expanded the apparatus section for RC1.
- L101 rephrased for RC1.
- Added paragraph discussing co-location error at the end of data QA for RC1.
- Clarified that Fig. 5 and 6 are using altitude above sea level for RC1.
- Paragraph added to the summary with the intended uses of the data for RC1.
- date now added to citation on L74.
- QA now spelled out in section title for RC1.
- References to warm cloud changed to liquid cloud for RC2.
- added information on ice crystal encounter chances for RC2.
- explanation of data levels given for RC2.
- space added after degrees symbol on L68.
- spacing in units fixed for RC2
- full stop added to end of sentence
- Senserion changed to Sensirion
- Bosh changed to Bosch.
- n/a defined in caption of Table 2.
- changed in-situ to in situ.
- Added to the end of the apparatus section to give more information about the temperature sensor housing.
- fixed DOI links for RC3
- Citations to Brus et al 2025 now fixed.
- changed figures 5 and 6 to include error

- added to the discussion of figures 5 and 6
- added equations for the error in the plots.

Response to RC1

General Comments

- The UAV profiles were all up to a set altitude of 2 km above ground level which was the legal limit. The cloud tops were beneath this limit for all but two of these profiles. The flight information section did contain this. Overall, instead of a separate section, the discussion of the cloudy conditions has been expanded upon in this section.
- the flight information and constraints section was renamed to "flight information and conditions"
- information, however it has been made more plain
- The "Data analysis and qa" section was amended to explain all the derived cloud properties in the dataset.

Specific Comments

- added "during the Pallas Cloud Experiment - 2022" on Line 2
- "These measurements are intended to expand on the previous campaign since they form an extended dataset with the uncertainties already evaluated by previous experimental work" added to this line.
- I have added a paragraph in the introduction to explain the difference between this and my previous work. It's worth stating that I am actually the same author as Girdwood et al 2022, I have just changed my name since then.
- climate models changed to earth system models on L10.
- Specific references to polar clouds added.
- I added a clarification of the intended use case of the dataset at the end of the introduction since it made more sense to put it here after I introduce the SUA, instrument, location, etc.
- rephrased L11 to clarify
- UCASS explanation moved to L22 and more citations of previous use given. The UCASS is described in detail later in the paper, this is now cross referenced.
- Altered the section headings to remove method section and move its subsections up a level, since there is already a more specific flight information section.
- The abbreviation was actually a corrupted reference which is now fixed.
- The flight in Fig. 3 was very characteristic, and the caption has been updated to reflect this. Any attempt at plotting multiple profiles resulted in an unreadable plot, though I am colourblind so this probably does not help.
- The spatial resolution of the data depends on the ground speed and ascent speed of the aircraft. This changed throughout the campaign as a result of changes in wind speed. The dataset is in the time domain in order to comply with the data standards for the rest of the campaign outlined in Brus et al 2025. The manuscript has been amended to reflect this.
- "one of a number of algorithms" is now expanded upon in the data analysis section, which now has a relevant cross reference.
- data analysis and quality assurance sections split apart.
- the constraining conditions for the UCASS being referred to here are the AoA and airspeed limits, which are discussed in the flight information section. This has now been cross referenced and expanded upon.
- The reason for the choice of these limits was engineering constraints with the UCASS, which was previously stated in the flight information and apparatus sections.
- Expanded the apparatus section to include information on UCASS uncertainty.
- Line 101 was rephrased
- Added paragraph discussing co-location error at the end of data QA.
- The altitude is above sea level, this was clarified in the text. There is no minimum altitude, just the take off altitude.
- Figures 5 and 6 have been altered to include the error for other reviewers comments.
- I added references to the exact equations used to calculate corrected airspeed.
- The take off site was the same each time, and the profiles were very similar and only changed in orientation with different wind directions. This was added to the text already in response to a different comment.
- A paragraph was added to the summary with the intended uses of the data.

Technical

- date now added to citation on L74.
- L94 QA now spelled out.
- L109 the manuscript is reformatted following publication anyway and the spacing of section titles is changed when the two column format is implemented.
- SHT and BME are just the names of the sensors, and AG is a broken reference which is now fixed.

Response to RC2

General Comments

- Warm cloud changed to liquid cloud. There were no ice crystals in this cloud but there were supercooled droplets which froze on impact with the airframe. The manuscript has been changed to reflect this.
- Droplets and ice crystals are discriminated against by size fraction separation. The scattering geometry of the UCASS means any ice encountered during the flights will have a scattering cross section beyond the range of detection. In addition, the probability of encountering an ice crystal during measurements at this time of year is negligible. The manuscript was changed to state this with the relevant references in the flight information section.
- A section on data analysis was added for reviewer #1 and I think this also covers your comment here :)
- A paragraph at the end of the summary was added to explain the intended uses of the dataset.
- The data levels are consistent with the rest of the papers in this ESSD special edition for the PACE22 campaign. An explanation of this and the relevant reference was added to the manuscript.

- I have added standard error to the effective radius plot in addition to a discussion in the manuscript.

Specific Comments (response in order)

- broken reference which is now fixed
- broken reference which is now fixed
- L68 spacing now fixed
- half space now added
- Year number added
- full stop added to end of sentence
- This sentence was reworded for a different reviewer :)
- spacing corrected
- Senserion changed to Sensirion
- bosh changed to bosch
- attitude is an aviation term which refers to the angular position of an airframe in space, which is what i meant in this instance.
- n/a defined in caption of Table 2.
- changed in-situ to in situ

Response to RC3

General Comments

- The purpose of the previous campaign was to validate the technique used to gather these data. During the 2020 experiment, we flew the aircraft – instrument combination in a number of configurations with a number of flight paths to experiment with how is best to gather these data. The introduction was expanded as part of another reviewers comments and I think that this is now clearer :)
- The data analysis and data QA sections were split apart, and the data analysis was greatly expanded upon, I hope that this is now clear.
- description of temperature sensor and housing added to the end of the apparatus section. Condensation on the sensor is an expansive issue with in-cloud temperature measurements and sparks a lot of debate in conventional aircraft measurement spaces. Solving this issue here is considered beyond the scope of this paper.
- Links are now fixed.

Specific comments (in order)

- Date is now added for clarification.
- The introduction was expanded upon with links to previous campaigns.
- a broken reference which is now fixed
- I'm not 100% sure what you mean by this, though the description of the UCASS was greatly expanded upon for another reviewer which I think might address this comment.
- the only difference between the two UCASS variants is the size range, there is no difference in data quality.
- unfortunately there was no satellite data. However I have added a more detailed description of the cloudy conditions and type of cloud encountered.
- Yes. I discussed this in detail in Girdwood et al 2020, 2022. Rotor wash is not an issue here because this is a fixed wing SUA and it does not fly through its own wake at any point. I have altered the manuscript to state this.
- you're right, this is an issue. I have recently worked on an upgrade to the UCASS which includes a hot wire airspeed sensor which does not have this issue, but it was unfortunately not ready in time for these experiments. The associated error with the corrected airspeed is now mentioned in the text, and the affected profiles can be found in table 2.
- Fixed the citation.