We would like to thank the reviewer 1 for the thorough and constructive feedback on our dataset and manuscript. We appreciate the time and effort taken to evaluate the data quality and presentation, and we are pleased that the dataset is recognized as a valuable resource for cloud microphysics and meteorological research. Below can be found responses to reviewers' comments as RC - reviewer comment and AA – authors answer.

Reviewer 1: The presented document by Doulgeris et al. (2025) introduces a comprehensive and well-structured dataset of in-situ cloud microphysics measurements collected during the Pallas Cloud Experiment (PaCE) 2022.

The authors provide a clear and detailed overview of the instruments used, including the Cloud Aerosol Spectrometer (CAS), the Forward Scattering Spectrometer Probe (FSSP-100), the Cloud Droplet Analyzer (CDA), and the holographic ICEMET sensor. Particularly noteworthy is the transparent description of instrument characteristics and their respective limitations, such as measurement losses due to icing and alignment issues.

The methodology of data collection and processing, along with accompanying meteorological measurements, is comprehensively described and easy to follow. A central aspect of the document is the detailed quality control, clearly identifying potential sources of error and providing suitable solutions and recommendations for data use, particularly concerning the CAS data due to its fixed orientation.

Issues:

RC1. The metadata of the individual instruments could be further expanded (e.g., serial number, calibration values, calibration dates, first installation date, etc.).

AA1 We agree with the suggestion to expand the metadata for the individual instruments. In the revised version of the dataset and manuscript, we have added updated metadata files, including serial numbers, calibration dates, calibration values (where available) and installation dates.

RC2. To make the dataset more transparent and easier to interpret for future analyses, I suggest introducing a QA flag. This would support the well-documented quality controls and help reduce potential misinterpretations, particularly with regard to CAS and wind direction. One example: 2.November 11:56 – 15:04 Is this gap caused by icing?

AA2:

We appreciate the recommendation to include a QA flag to improve transparency and facilitate future data interpretation. For this reason, we introduce a QA flag system across the datasets, which is described in detail in Section 3 of the revised manuscript. The QA flag identifies questionable or missing data due to known issues such as icing, probe misalignment, or power interruptions. Specifically, the data gap on 2 November from 11:56 to 15:04 has been flagged, and we believe this event is very likely related to probe icing. To systematically identify probe freezing events, we closely examined the droplet number concentration (Nc) time series from the CAS probe across the entire dataset. Freezing cases were typically indicated by a sudden drop in Nc, often preceded by a brief spike. This behavior results from the progressive narrowing of the probe inlet due to ice accumulation, which reduces the actual Probe Area Sampled (PAS). Since the PAS is assumed to be constant during data processing, this reduction causes an overestimation of Nc just before the blockage, followed by an abrupt drop when the inlet becomes significantly obstructed. This pattern in Nc was a consistent and reliable indicator of icing-related measurement errors and has been used as a key criterion for QA flag assignment.

RC3. The meteorological data from the individual devices differ — for example, the ICE-MET temperature and wind direction are not the same as those in the CDA dataset. Does the CDA dataset include parameters from its internal weather station? This should be clearly stated in the manuscript, as well as in the metadata and the dataset itself.

AA3 Thank you for pointing out the differences in meteorological parameters (e.g., temperature and wind direction) between ICE-MET and CDA datasets. CDA dataset *does not* contain meteorological data from its own internal weather station. The meteorological parameters included in the CDA dataset originate from the ICE-MET system. This discrepancy in values may be due to an earlier data merging step or incorrect referencing during data preparation. We rechecked and corrected this inconsistency to ensure that the meteorological data source is clearly and accurately indicated in both the manuscript and the metadata.

RC4 The ICE-MET dataset contains noticeable LWC outliers that could affect the data when grouped temporally. It is caused by values in the upper bins. Eg. 22. October 3:05 UTC Bin 187
Is there an explanation for that —is it already precipitation?

AA4 We thank the reviewer for pointing this out. We have investigated the outliers in the upper size bins, such as the case on 22 October at 03:05 UTC (Bin 187). Based on image analysis and shape metrics (Heywood roundness), these particles are likely large ice crystals, specifically hexagonal plates that appear nearly round in shape. Because of their round appearance, they pass the current roundness-based liquid water filtering and are included in the LWC calculation, although they are not droplets.

These events typically occur during mixed-phase cloud conditions, where both small liquid droplets and larger ice particles coexist. In this case, smaller droplets were present in the same frames, confirming a mixed-phase cloud.

While we considered applying a stricter roundness threshold (e.g., 1.1 instead of 1.2) to filter out more of these large crystals, doing so would unintentionally remove a large number of valid small droplets due to resolution limitations. Therefore, instead of changing the filter globally, we have flagged such outliers in the QA column and added a clear explanation in the metadata and documentation.

To support this classification, we conducted a broader inspection and identified specific periods where ice particles (based on >100 µm effective diameter) were observed. These periods are now flagged in the updated dataset as *possible ice crystals*. The flagged intervals include:

- 22 Oct, 19:30 – 11:42
- 6 Nov, 06:53 – 23:44
- 7 Nov, 22:20 – 23:52 (incl. one large droplet at 23:24:24)
- 12 Nov, 11:18 – 13:53
- 24 Nov, 20:31 – 28 Nov, 23:22
- 29 Nov, 17:37 – 17:54
- 8 Dec, 18:25
- 18 Dec, 14:51 – 17:18
- 21 Dec, 18:48 – 19:00
- 21 Dec, 22:10 – 22:14

- 22 Dec, 01:27
- 26 Dec, 02:49 – 07:59
- 29 Dec, 18:04 – 31 Dec, 03:24
- 31 Dec, 04:23 – 04:31

Additionally, we note in the documentation that example images of these flagged particles can be provided upon request by contacting the corresponding author.

We emphasize that these outliers do not represent true liquid water but result from misclassified large ice particles. Users interested in bulk liquid cloud properties can use the QA flags to exclude these values accordingly.

Reviewer 1 Nevertheless, the dataset presented constitutes an extremely valuable resource for researchers in the fields of cloud physics, climate research, and meteorology. The careful documentation and provision of data, including uncertainties and boundary conditions, enhance reliability and facilitate their use in future studies.

We thank for the helpful feedback and believe that the improvements have significantly enhanced the quality and value of the dataset.