RC2

This manuscript presents an framework integrating HOLODROPS for long-term observation, HOLODROPS-TRACK for short-term particle tracking, and ePIV (an event-camera-based particle image velocimetry system) for atmospheric research (cloud microphysics and turbulence). The attempt to overcome the limitations of traditional single-particle sampling probes using digital holography is interesting and valuable. However, due to the prototype stage of the system, significant shortcomings remain regarding data uncertainty treatment, specification consistency across instruments, and control over experimental environments. I hope the following comments will be helpful before the manuscript can meet the standards for publication.

Response: We sincerely appreciate the reviewer's constructive suggestions and have addressed the comments below.

Major comments

1. In Section 3.2, known-size glass beads were used to calibrate instrument accuracy, but sizing errors (about 10-25%) were observed in the resulting data: The authors attribute this to "turbulence and background intensity variations (noise) caused by the carrier airflow." However, real cloud conditions and outdoor atmospheric conditions exhibit far more severe turbulence and water vapor inhomogeneities than controlled laboratory setups. If the instrument exhibits a 25% sizing error under laboratory carrier airflow, it cannot be deemed "high-precision." Algorithmic noise reduction (e.g., improved background subtraction) must be implemented, or quantitative error margins (error bars) must be explicitly provided.

Response: Thank you very much for the suggestions. We have revised section 3.2 to clarify the confusion and improved the analysis of the glass beads. To disperse the particles in the air in front of the imager, the calibrated particles were placed in a vial. Then an air duster can of air was used to propel the beads. This had the negative effect of introducing residual aerosols, such as freon or dust, into the captured images, which affected the results. We also added Table 2 with the details about the glass beads. Our revision clarifies that the high-resolution bias is constant in pixels, which diagnoses it as an edge-localization offset rather than a calibration error. Because the 42.3 µm high-speed measurement is slightly low and the 49.3 µm one is very high, you can rule out a systematic scale error in the high-speed chain and pin the outlier on the injection conditions.

2. One of the core scientific contributions claimed in this manuscript is the scenario where the lightweight, high-speed ePIV system runs continuously to guide targeted deployment for the computationally intensive, data-heavy HOLODROPS-TRACK system. While the Abstract implies a seamless integrated

workflow where ePIV enables "targeted deployment" of HOLODROPS-TRACK, the Conclusion retreats to stating that "ePIV can inform users and can inform when the conditions would be ideal." This indicates a passive monitoring interface for manual user intervention rather than automated, data-driven closed-loop system triggering. The authors must clarify whether this connection is manual or automated. To prove interoperability, time-series data demonstrating ePIV detecting a flow event and subsequently triggering HOLODROPS-TRACK must be presented for a single flow phenomenon. Instead, Sections 3.4 and 3.5 show that the two instruments imaged separate, independent nebulizer flows at different times. This proves that both devices can measure similar velocities, not that ePIV dynamically informs the deployment timing of TRACK. The authors should include a software flowchart or signal triggering timeline for real-time control. If automatic triggering was not implemented, the claim must be toned down to describe the setup as "two complementary, independent measurement instruments."

Response: We thank the reviewer for raising this point and clarify that the connection between the two instruments is manual rather than automated at this stage. The ePIV system is intended for continuous, real-time monitoring, and its role is to inform an operator's decision of where to manually deploy HOLODROPS-TRACKS. We are working on the algorithm to automatically trigger the HOLODROPS-TRACKS for a collision-coalescence event. However, that is not mature enough at the time this manuscript was drafted due to funding limitations. This clarification has been added to the abstract. The distinction follows from the data handling of the two instruments. The event camera transfers data in real time over USB, making it straightforward to visualize the flow and compute velocities during acquisition. The high-speed camera, by contrast, writes to an onboard buffer that must be offloaded to a hard drive before any velocity information can be obtained. This information has been added to the text.

3. HOLODROPS-TRACK uses a 532 nm pulsed laser (Line 188), whereas ePIV utilizes a 532 nm continuous-wave (CW) laser shaped into a laser sheet (Lines 205–207). If operated simultaneously in a field deployment, the high-intensity CW laser sheet from ePIV could spill directly into the sensitive image sensor of HOLODROPS, introducing severe speckle artifacts and noise into the reconstructed holograms.

Response: HOLODROPS-TRACK uses the same CW 532 nm laser as ePIV. This has been added to the text.

Minor comments

1. Throughout the text, micrometers are frequently written as um instead of using the standard micro symbol. Meanwhile, µm is correctly used sometimes. Units should be standardized to µm across the entire manuscript.

Response: Corrected to µm. Thank you.

2. Line 303: The word "lactation" appears to be a typo for locations. Additionally, in in is duplicated.

Response: Thank you for catching that. Corrected to "location"

3. Line 306: "general articles tracking software's" should be corrected to general particle tracking software.

Response: Corrected.

4. Figure10: The individual subplots only bear duplicate headers (vx distributions and vy distributions), making visual interpretation difficult. I suggest that the author can add explicit row labels (e.g., "Front-View" / "Side-View") to the left or top of each subplot group.

Response: We updated Figure 10 as suggested.