New Microphysical Insights from Analysis of Centimeter-Resolution Holographic Data during ACE-ENA

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**HOLODEC (Holographic Detector for Clouds)**

A joint development between Michigan Technological University, Mainz University, and NCAR

**Conventional**

1 particle in beam at a time

**Holodec**

13 cc $\sim 10^3$ droplets

30-60 m

Raymond Shaw, MTU
Comparison between

• Cloud passes on the same day

• Cloud passes at different altitudes (segments)
Mixing diagrams vs altitude

- X axis: Normalized droplet number concentration
- Y axis: Normalized mean volume diameter
- Many holograms show droplet growth $d^3/d_o^3 >> 1$ (condensation / collisions)

Takeaway
Homogeneous mixing near cloud base.
Progresses to Inhomogeneous mixing near middle and cloud top
Each altitude has 3 legs

- Parallel to the wind
- Turn
- Perpendicular to the wind
Variation at constant altitude

- Parallel leg: Homogenous mixing (HM)
- Turn: Homogeneous mixing (HM)
- Perpendicular leg: Inhomogeneous mixing (IM)
- P2 did not show the same behavior

**Takeaway**

Averaging over a single altitude may not show what is going on at smaller scales
• HOLODEC allows centimeter-scale cloud measurements.

• Cloud base shows homogenous mixing while middle and cloud top show inhomogeneous mixing.

• Averaging over a single altitude may not show what is going on at smaller scales

Thank you!