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

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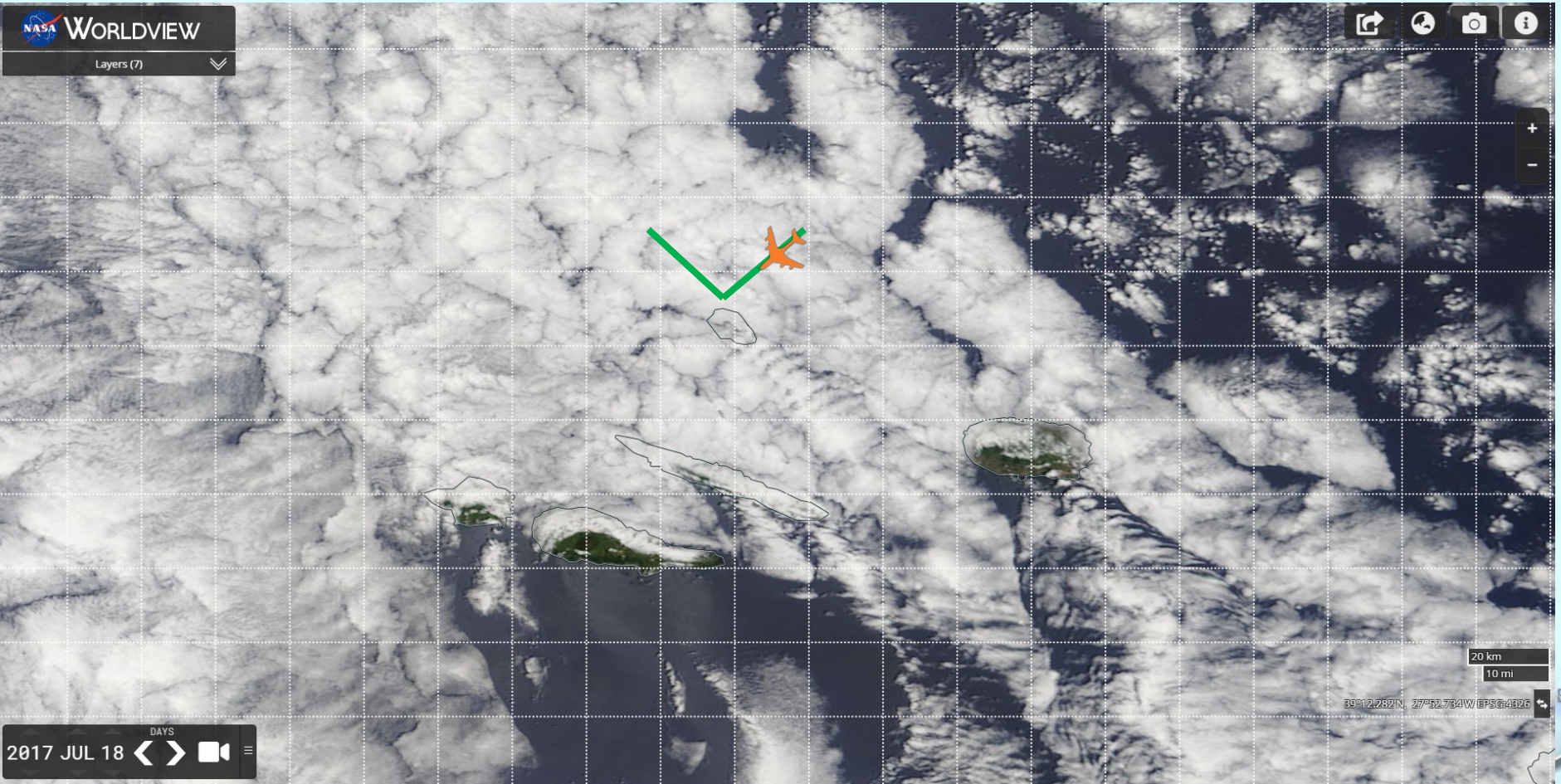

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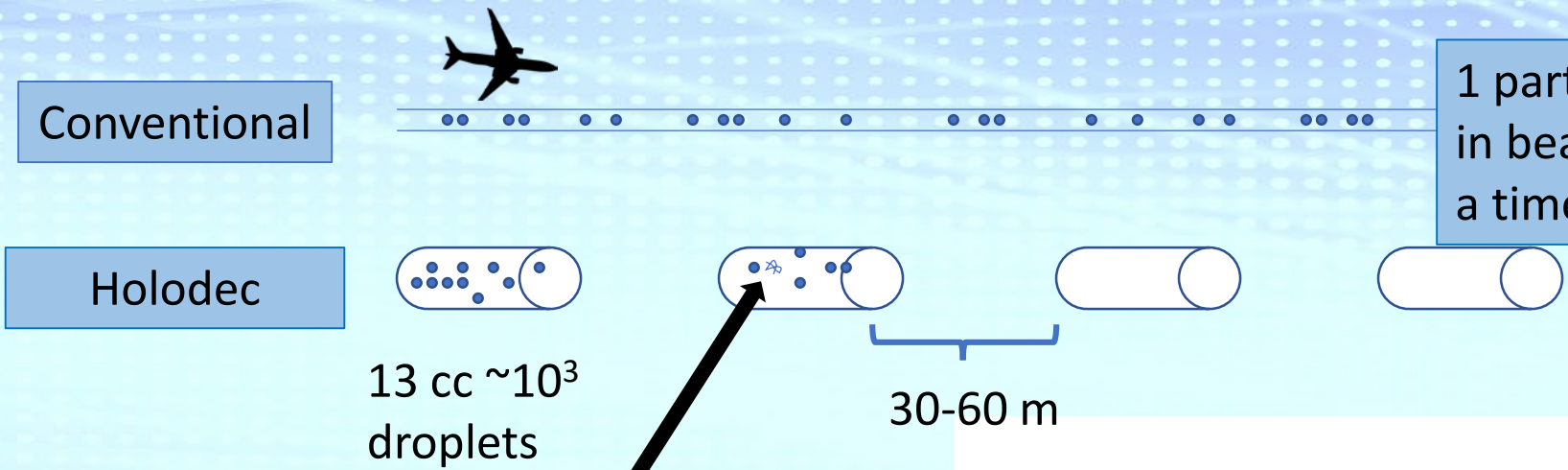
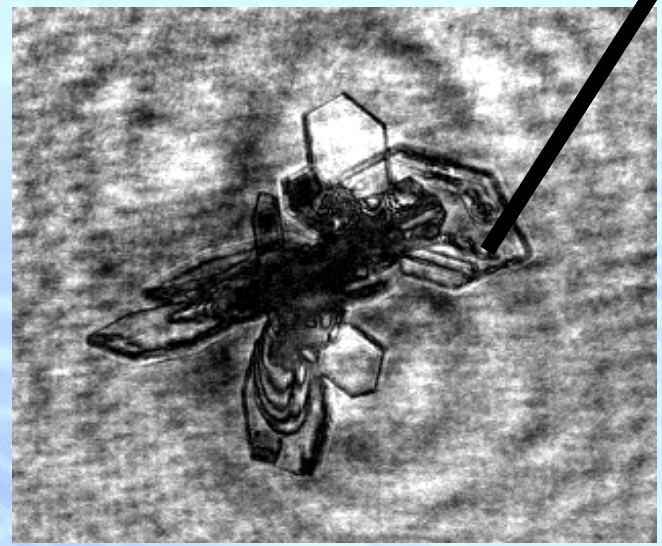
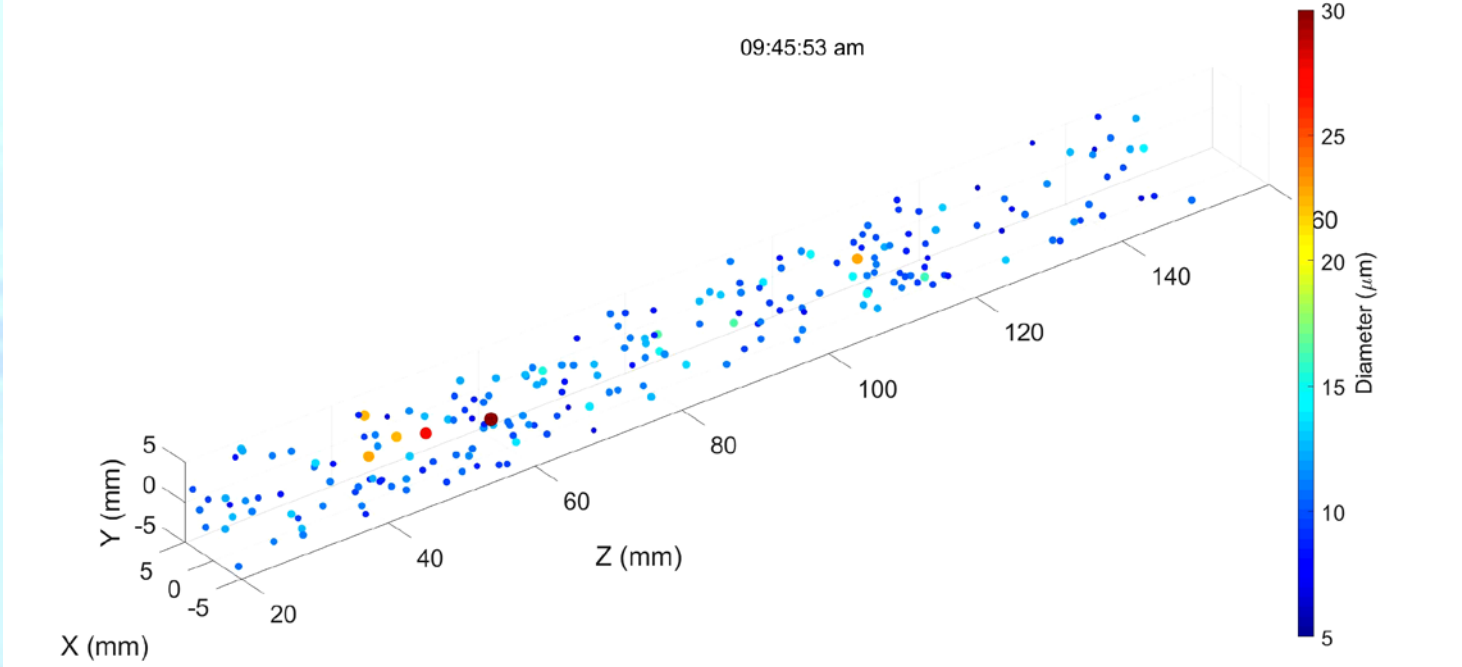
HOLODEC (Holographic Detector for Clouds)

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





Raymond Shaw, MTU



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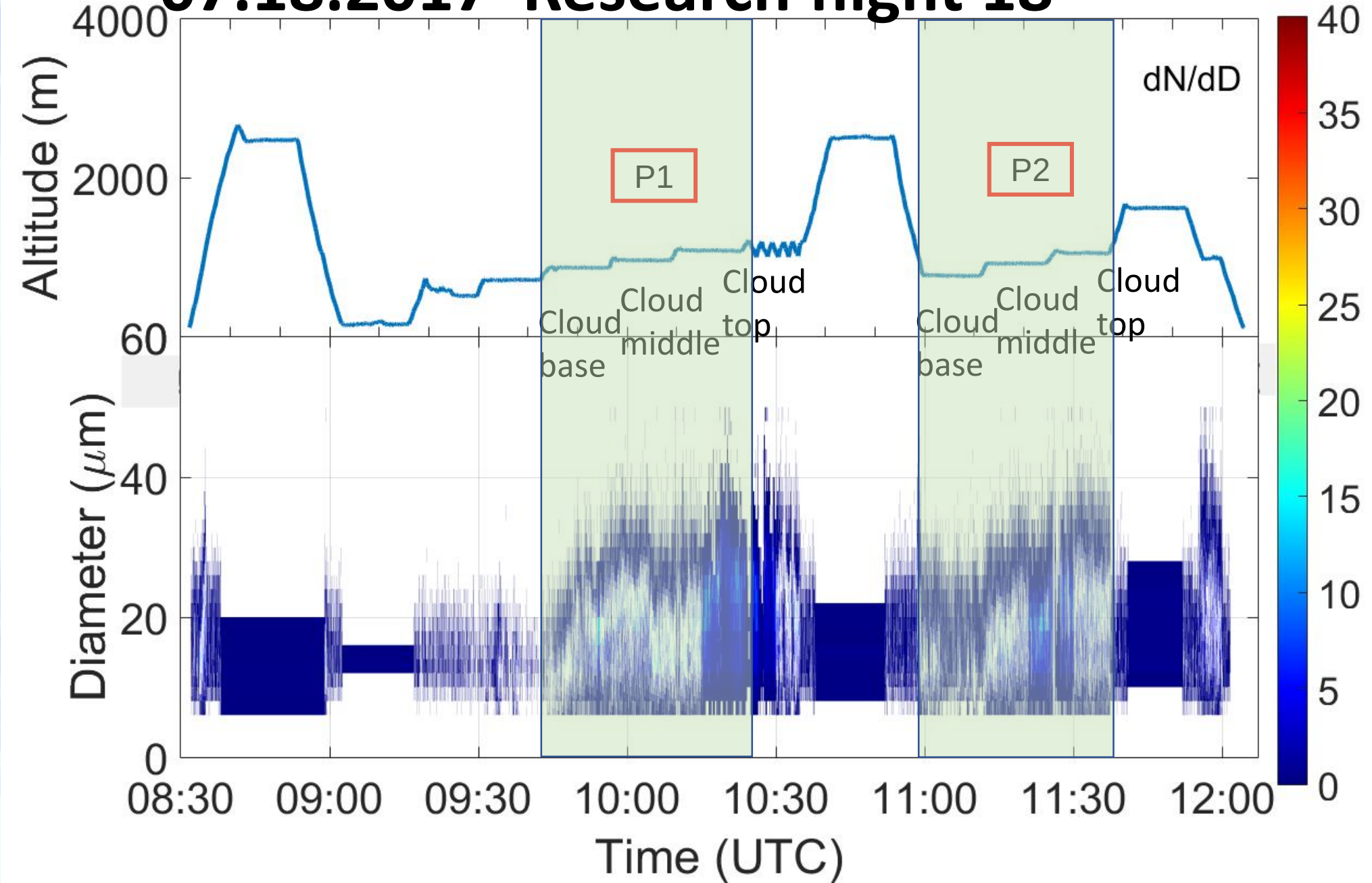
Comparison between

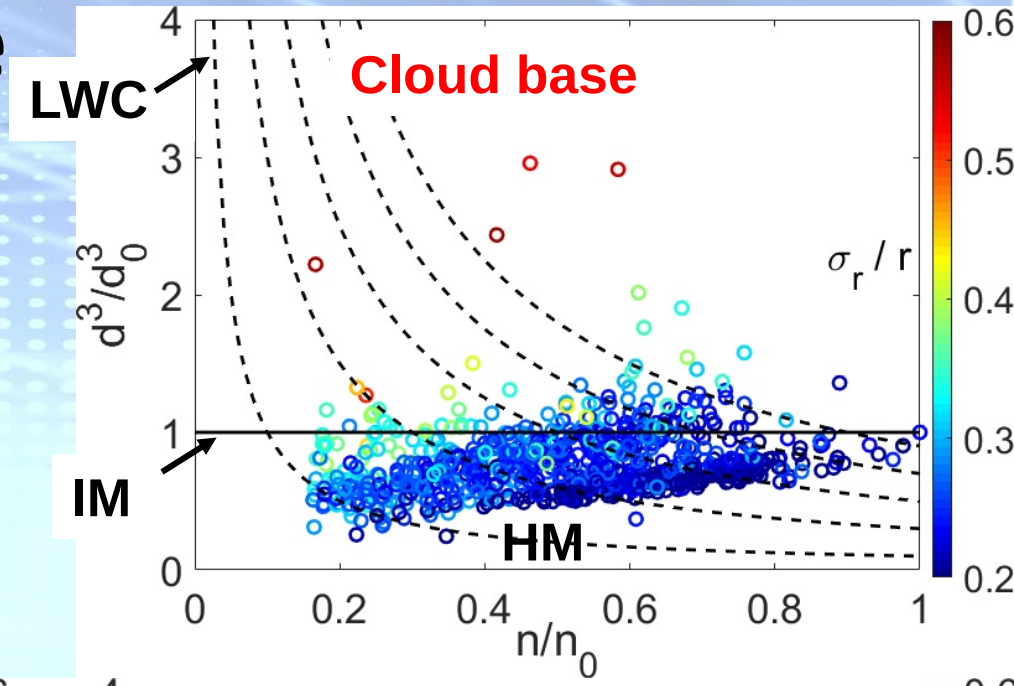
- Cloud passes on the same day
- Cloud passes at different altitudes (segments)



Mixing diagrams vs altitude

- X axis: Normalized droplet number concentration
- Y axis: Normalized mean volume diameter
- Many holograms show droplet growth

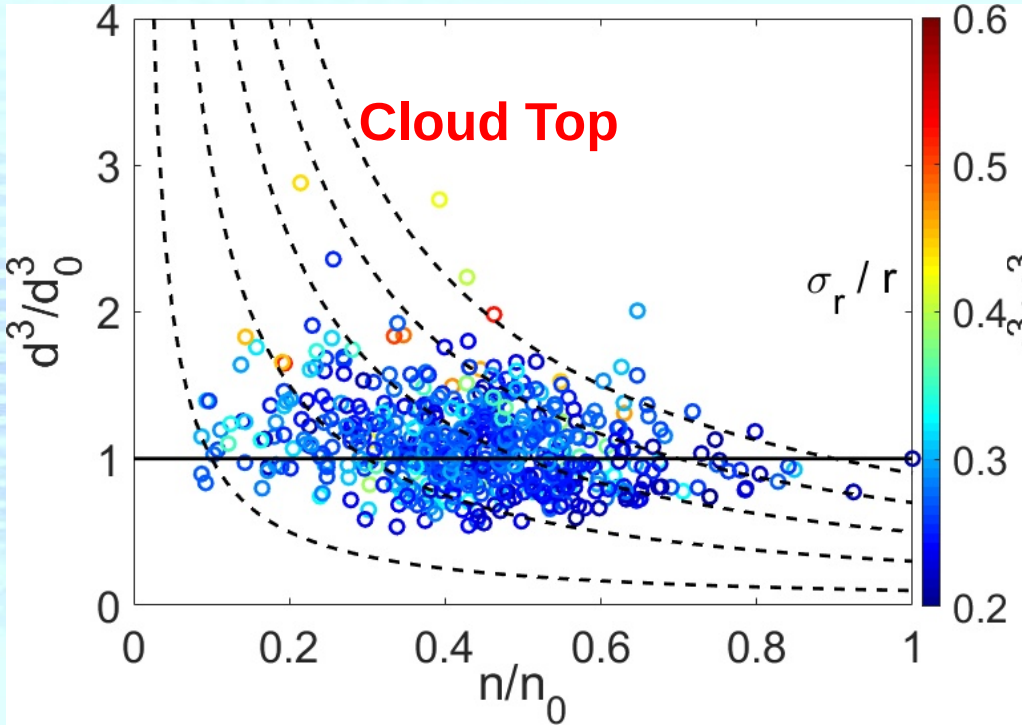
d^3/d_o^3 >> 1 (condensation / collisions)

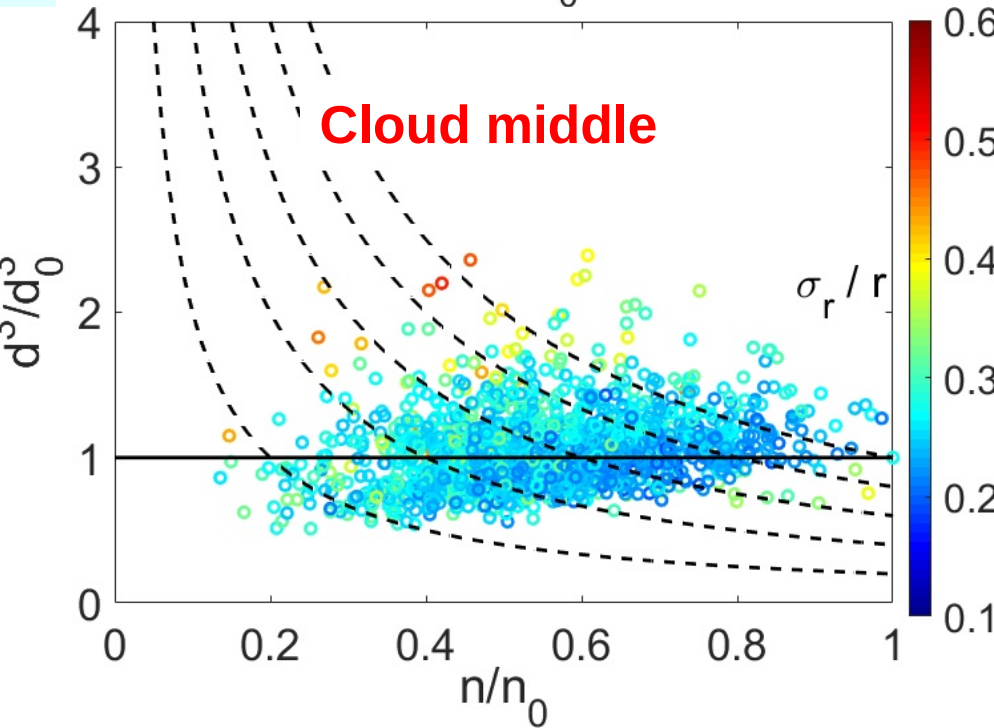


Takeaway

Homogeneous mixing near cloud base.

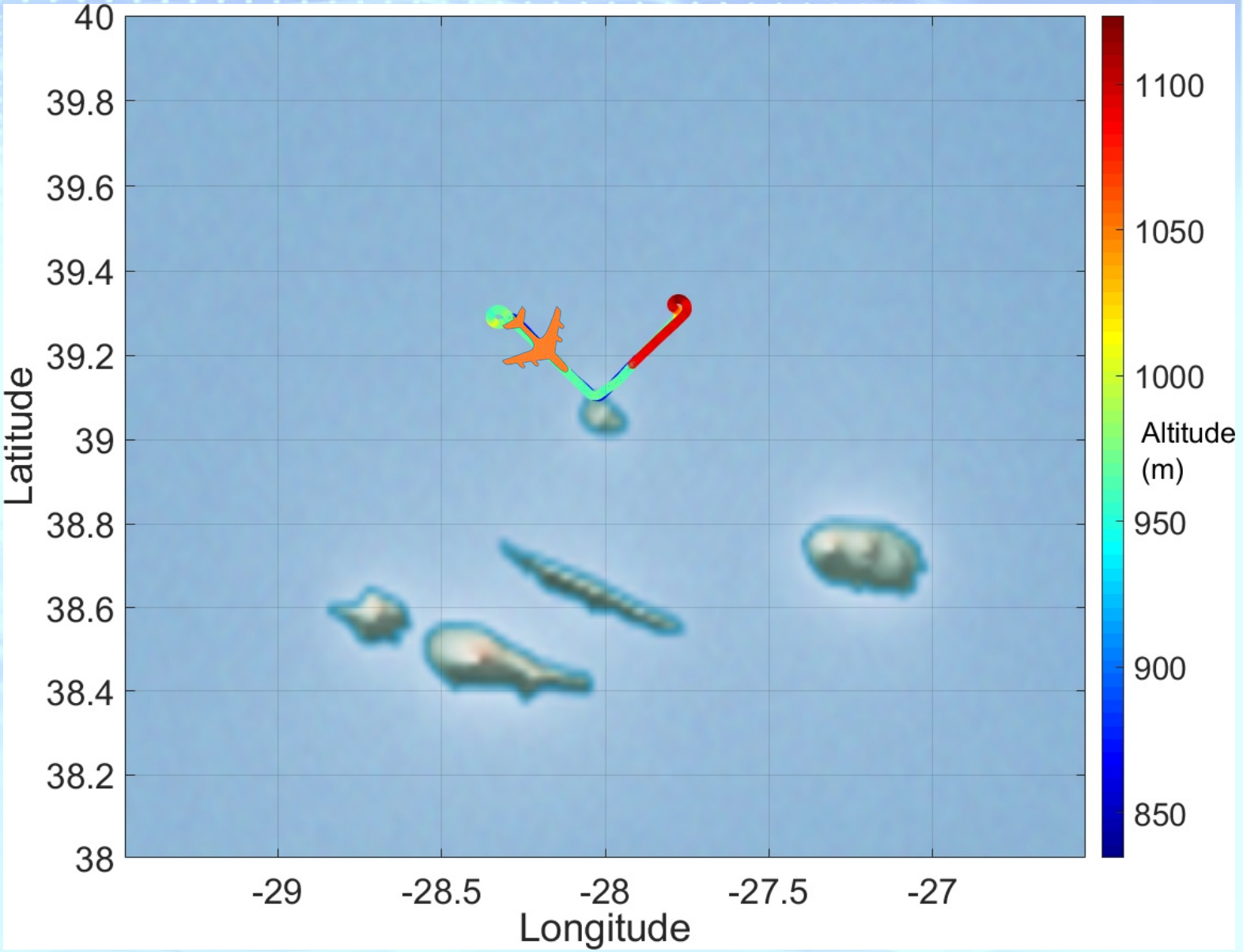
Progresses to Inhomogeneous mixing near middle and cloud top





Each altitude has 3 legs

- Parallel to the wind
- Turn
- Perpendicular to the wind

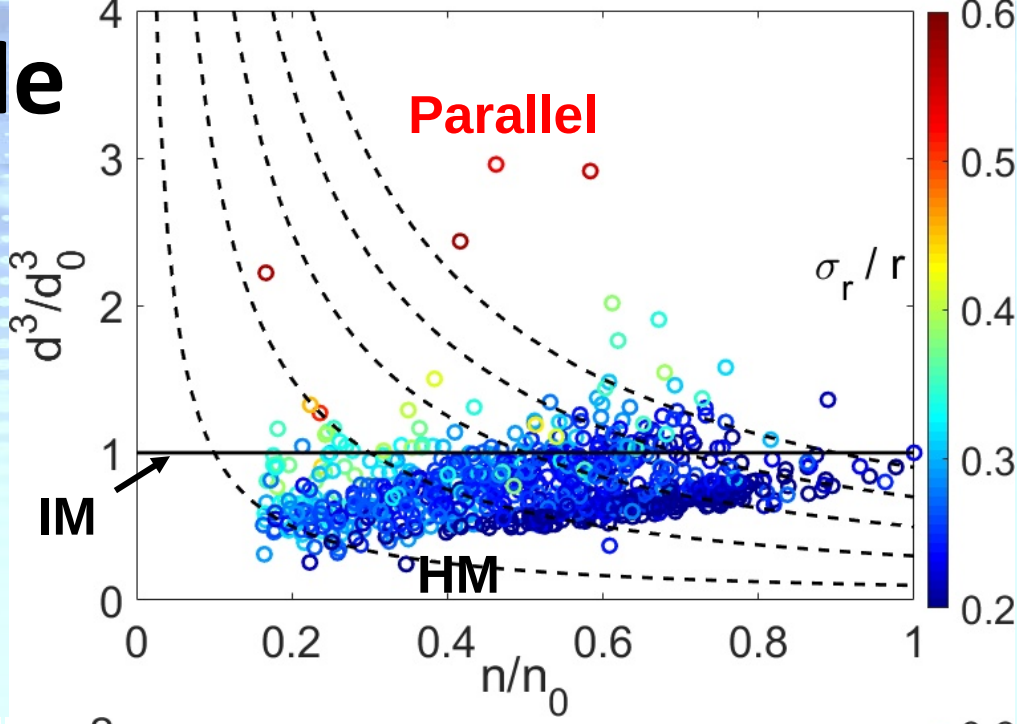


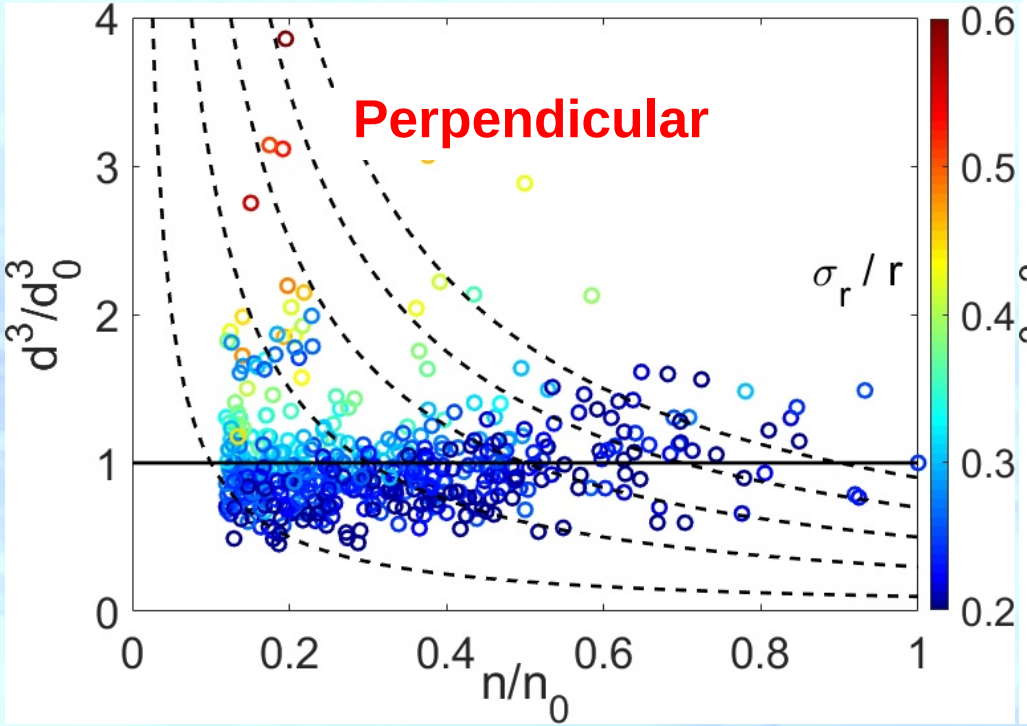
Variation at constant altitude

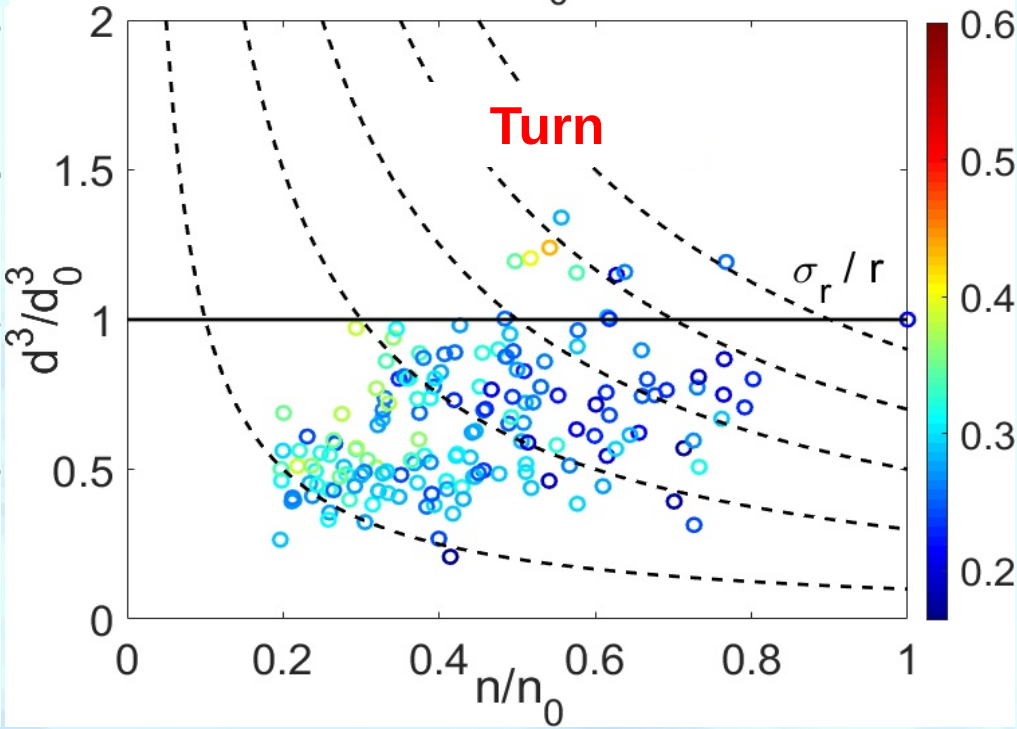
- Parallel leg: Homogenous mixing (HM)
- Turn: Homogeneous mixing (HM)
- Perpendicular leg: Inhomogeneous mixing (IM)
- P2 did not show the same behavior

Takeaway

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

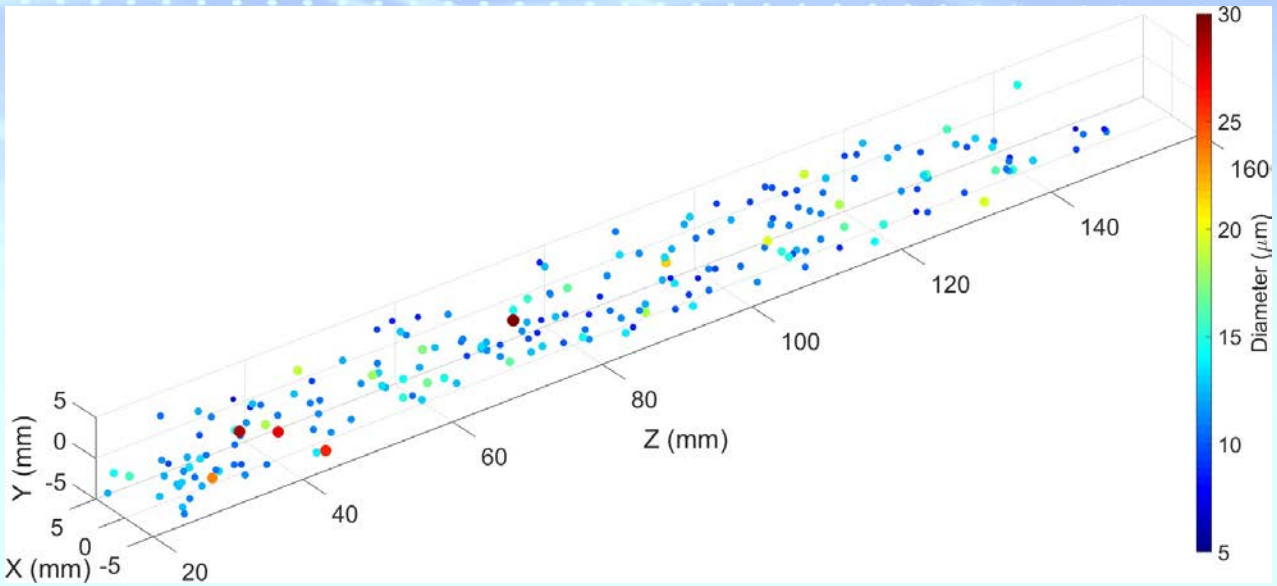






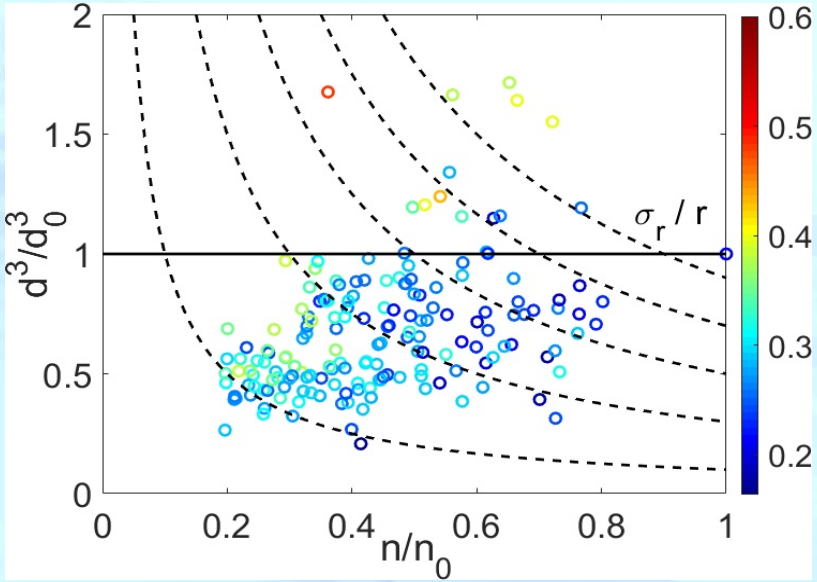
Summary

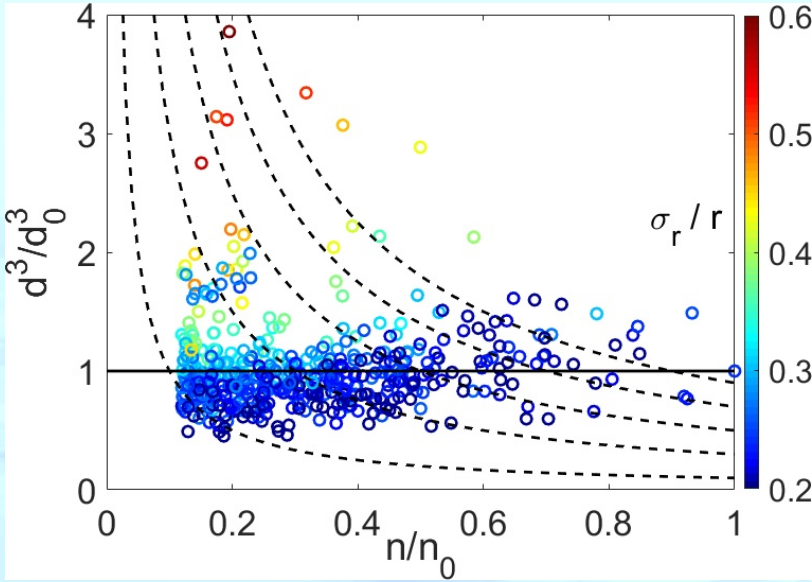
- **HOLODEC allows centimeter-scale cloud measurements.**



- **Cloud base shows homogenous mixing while middle and cloud top show in-homogeneous mixing.**

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





Thank you!