

# **Emerging Technologies for Cloud Property Measurements**

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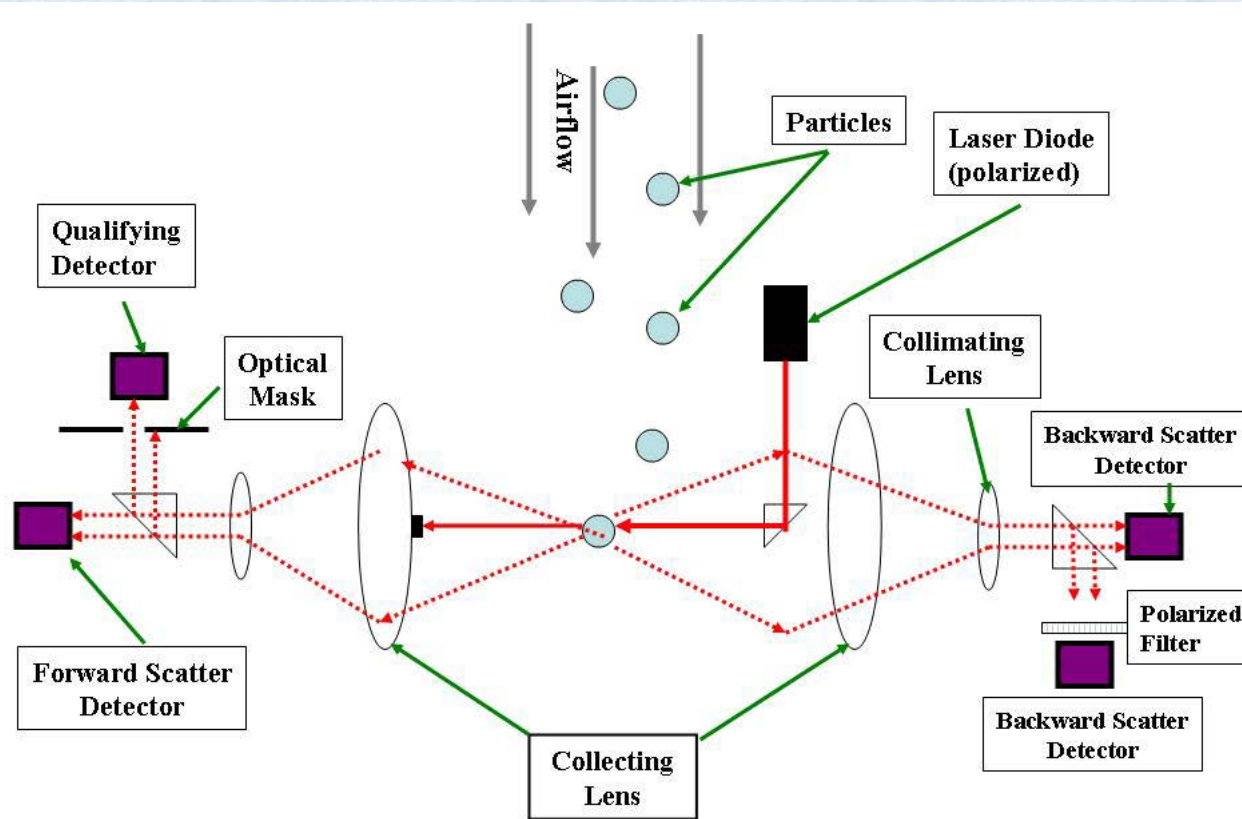
# Motivation for New Measurement Approaches

- Need for better characterization of small ice properties ( $< 50 \mu\text{m}$ ), e.g. water/ice discrimination and shape identification
- Shattering and Splashing avoidance
- Cloud detection from commercial aircraft

# Motivation for New Measurement Approaches

- **Small ice properties (< 50  $\mu\text{m}$ )**
- Shattering and Splashing avoidance
- Cloud detection from commercial aircraft

# CAS-DPOL (CAS with depolarization)

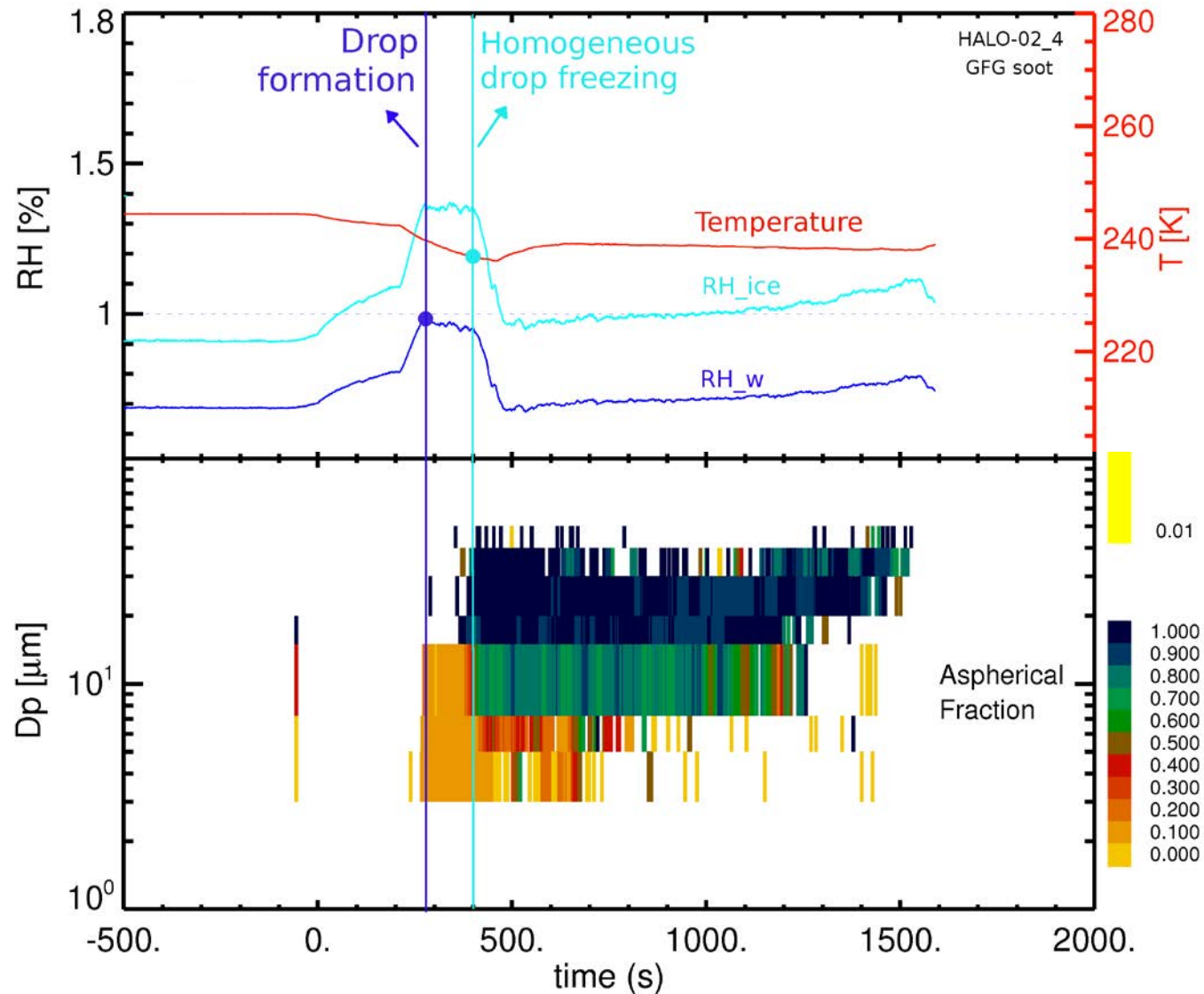


**Forward/Backscatter Sensor Optical Path Diagram**

- **Water/ice discrimination  $> 2 \mu\text{m}$  (Depolarization)**
- **Shape discrimination (forward to back scatter)**
- **Asymmetry factor estimate**

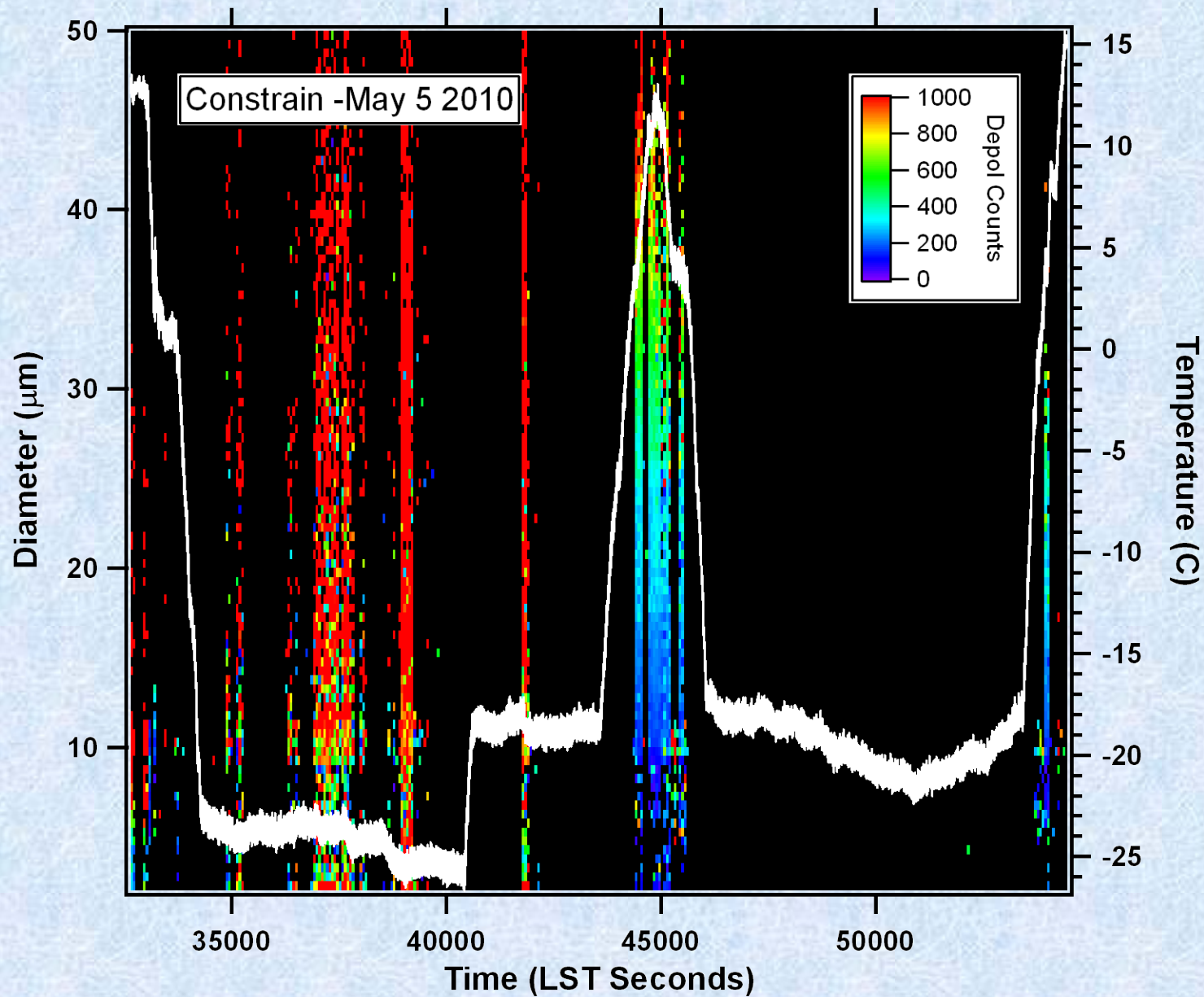
# Evaluation at the AIDA Cloud Chamber

*(Courtesy of M. Krämer, J. Meyer Jülich Institute)*



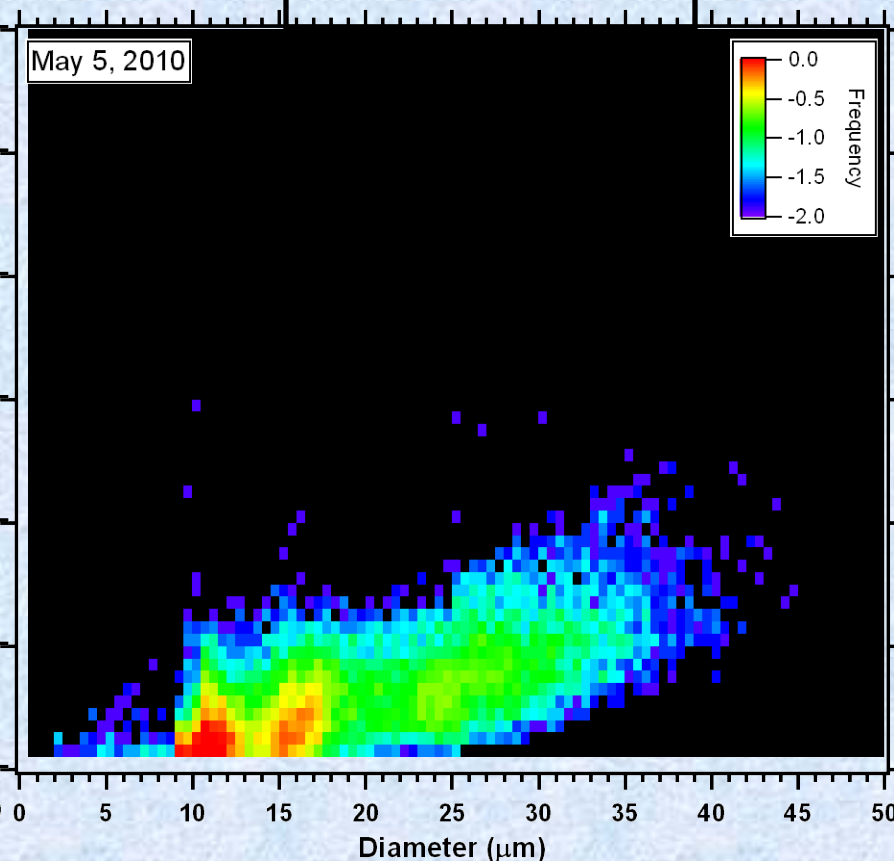
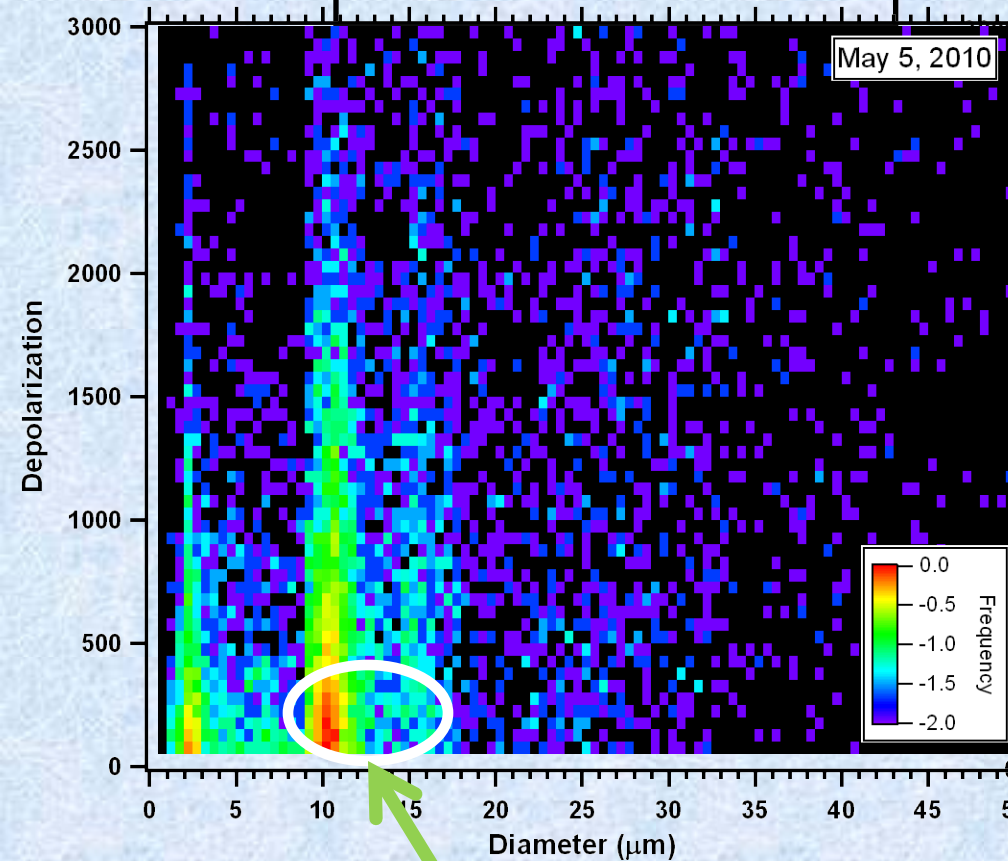
# Flight data: BAE 146 Constrain Campaign

(*Courtesy U. Manchester, K. Bower, J. Dorsey, M. Gallagher*)



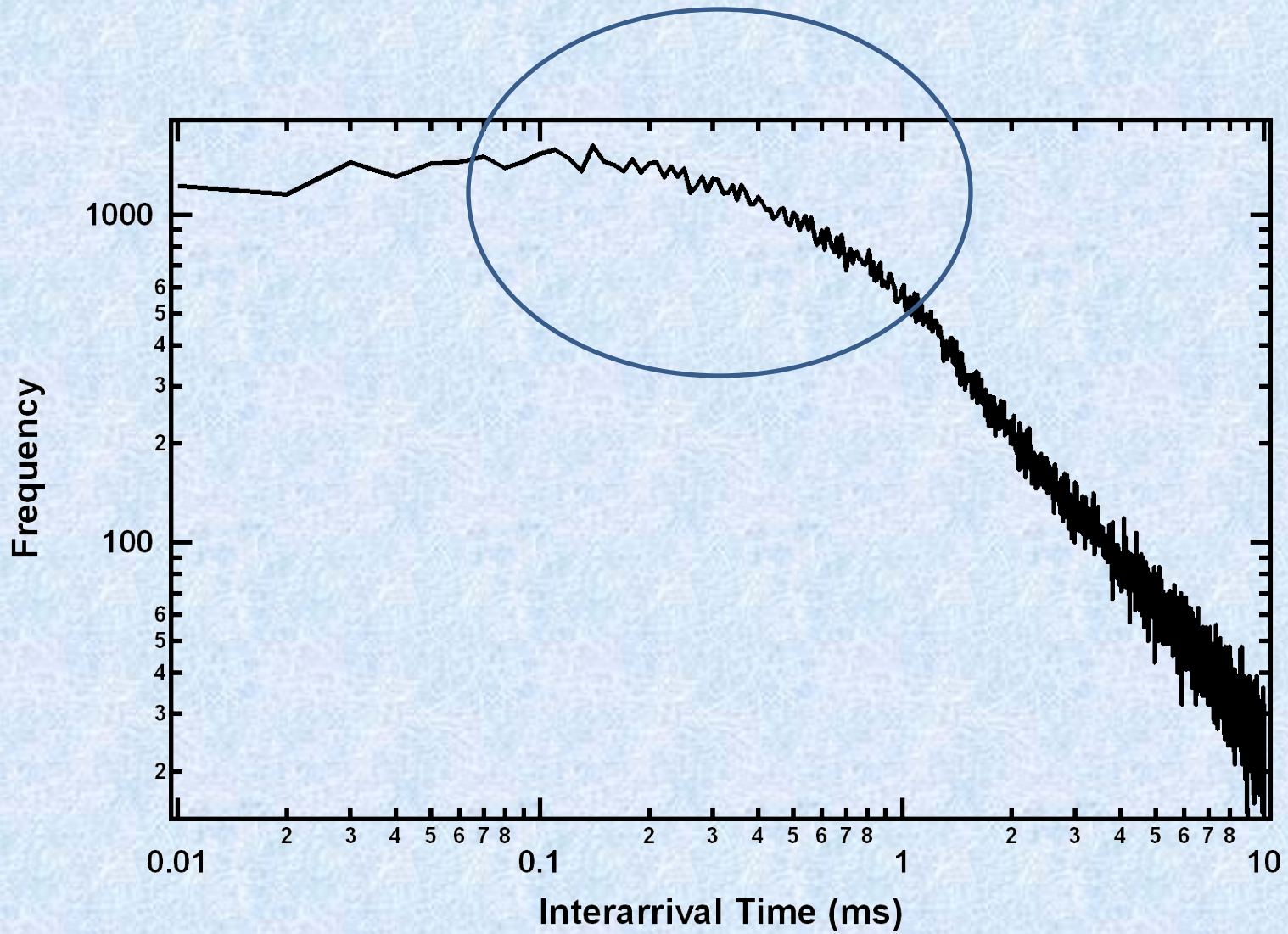
**-26° C**  
**Mixed Phase**

**3-12° C**  
**All Water**



**Water Droplets**

**Particle by Particle Interarrival time Analysis shows no sign of shattered particles**



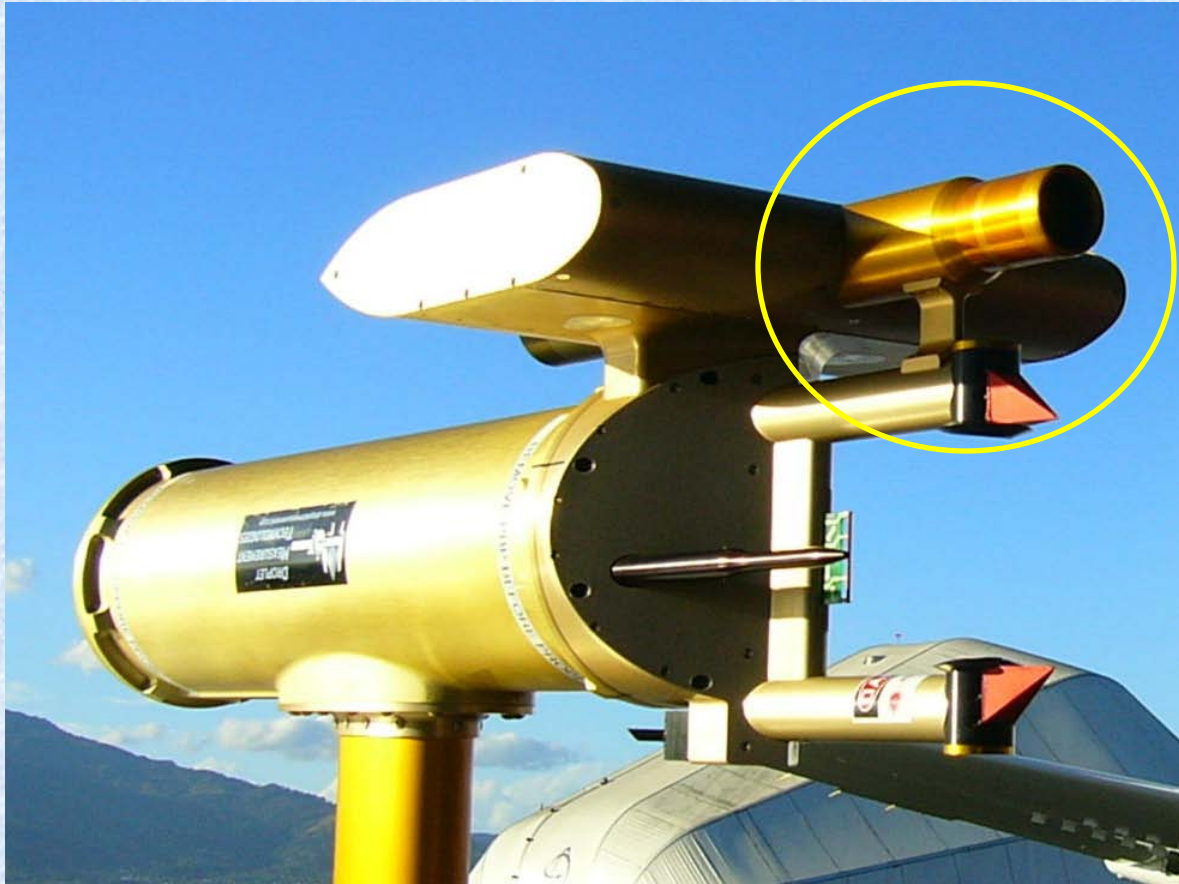


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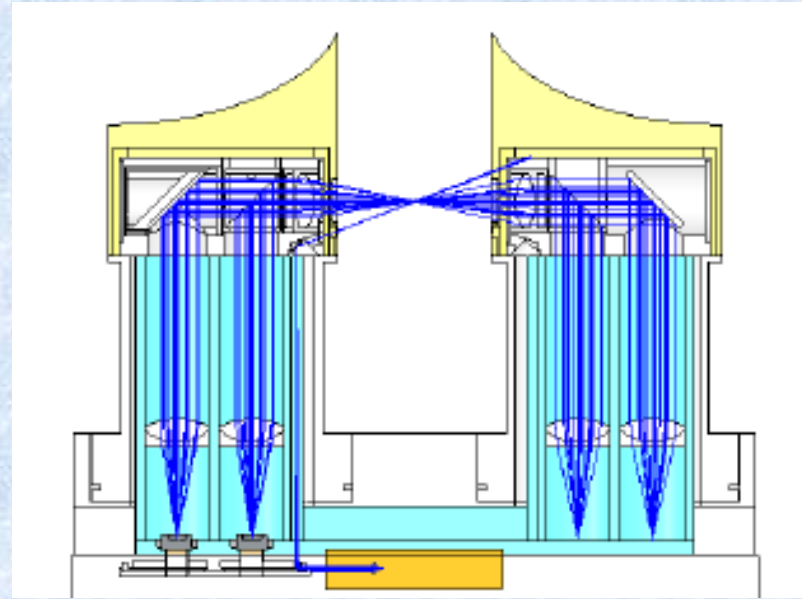
- Small ice properties ( $< 50 \mu\text{m}$ ), water/ice discrimination
- **Shattering and Splashing avoidance**
- Cloud detection from commercial aircraft

# Cloud Aerosol Spectrometer (CAS-DPOL)

## Potential For Shattering Artifacts



# CPSD (Cloud Particle Spectrometer with Depolarization)



The CPSD and CDP will be on display at the DMT exhibition booth

Marquee (Chapiteau):

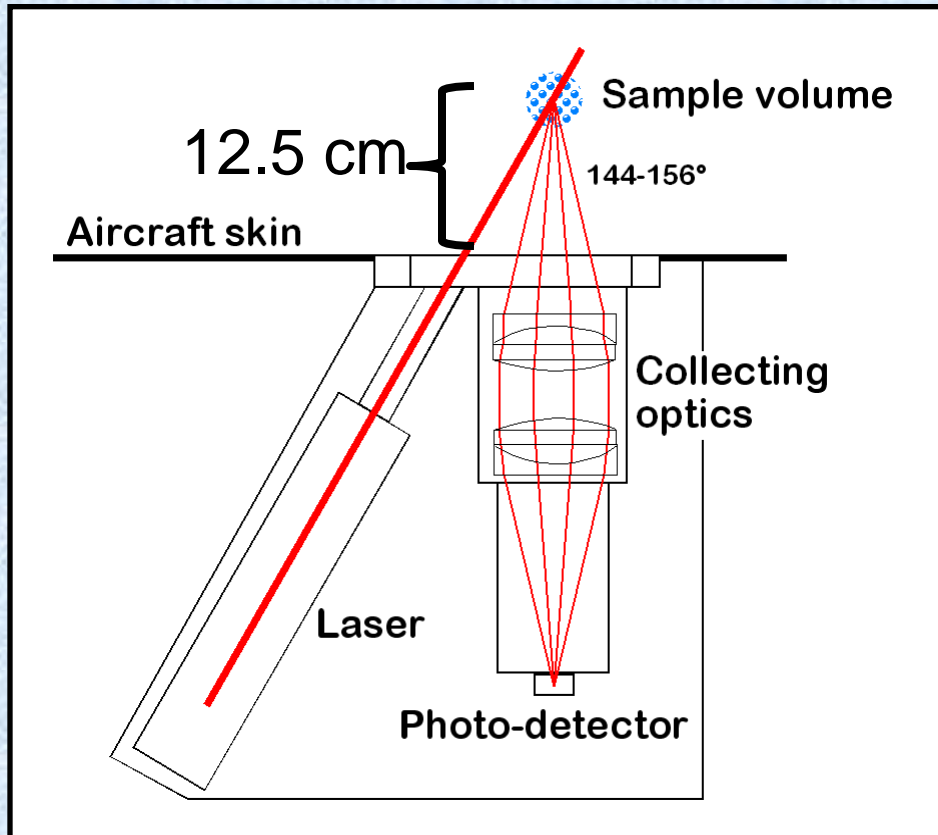


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# BCP (Backscatter Cloud Probe)

Application: Basic statistics on cloud structure measured from commercial airliners.

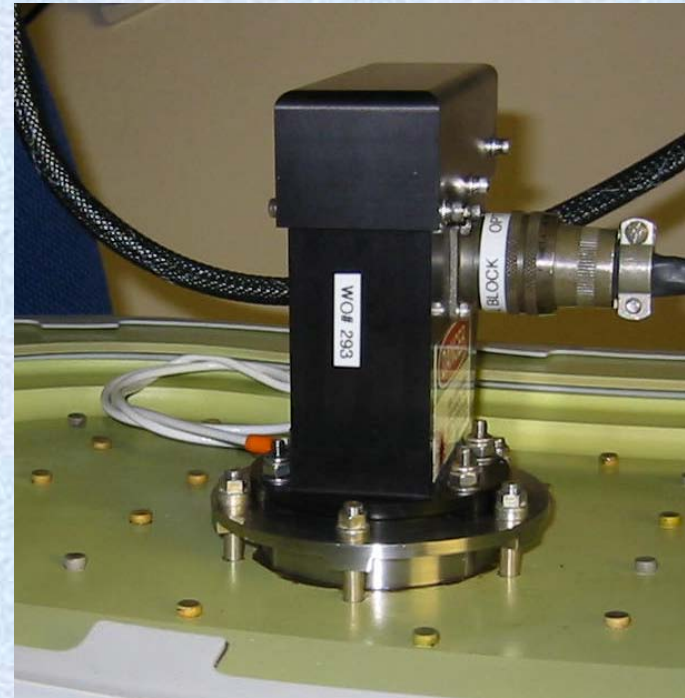


- Particles pass through open laser beam
- Scattered light in the 144-156 cone is collected by photo-detector
- Signal is amplified, digitised and sized into 10 size bins, size range 5-75 $\mu$ m diameter

Developed by DMT for European Union IAGOS project

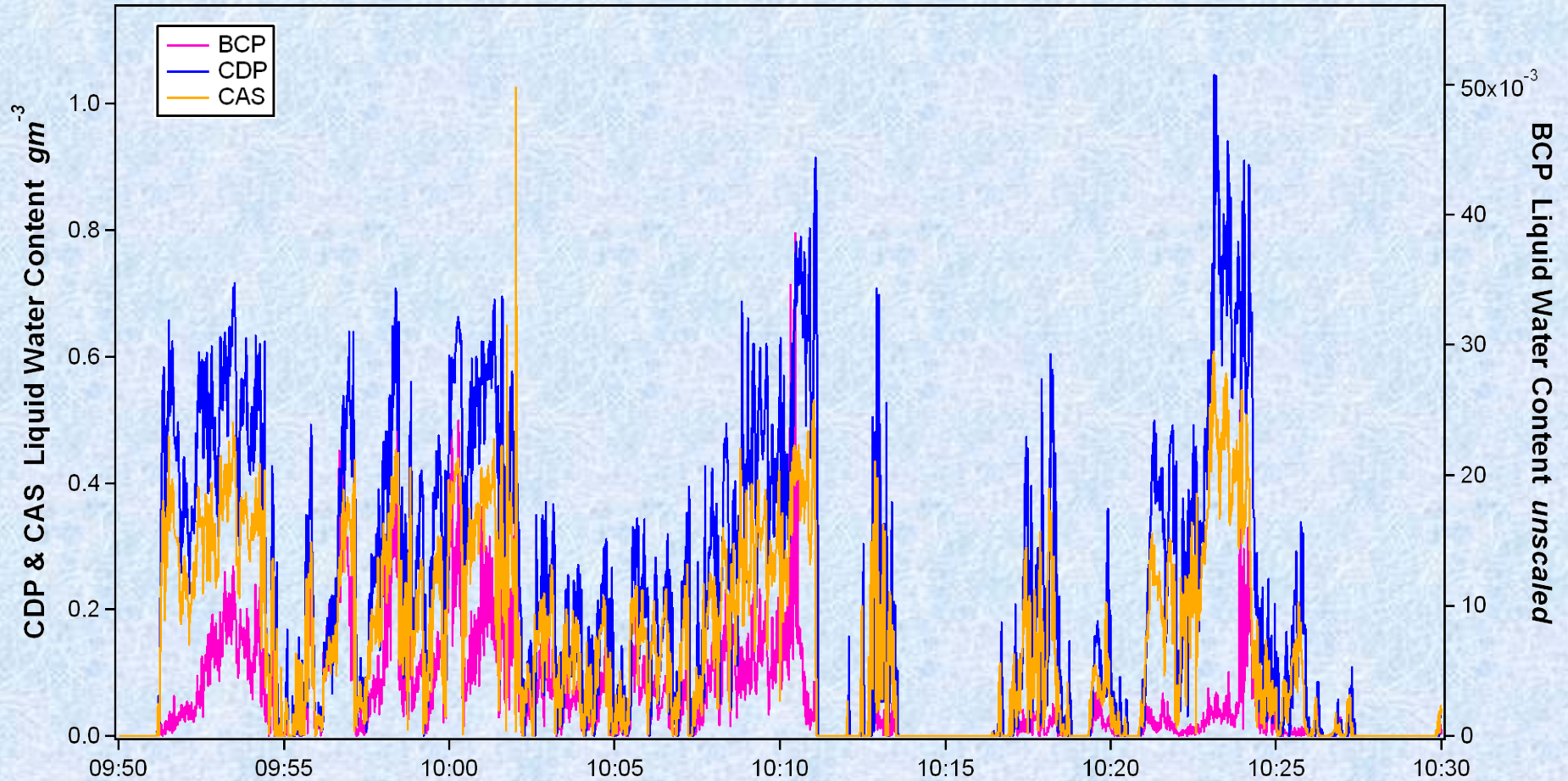


- Laser is non-eyesafe so cannot be operated on ground
- Operated through Weight-on-Wheels signal and interlock switch



# Flight data: BAE 146 Constrain Campaign

*(Courtesy U. Manchester, K. Beswick, M. Gallagher)*



The BCP and a poster with further detail can be seen at the IAGOS exhibition

**Terminal B1:**





An aerial photograph showing a vast expanse of white, fluffy clouds over a deep blue ocean. The clouds are scattered and vary in density, creating a textured appearance against the smooth surface of the water. The perspective is from a high altitude, looking down on the clouds and the sea.

Thank  
You