

SPEC_{inc}

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SPEC is Supporting Four Cloud Particle Probes.
Combined the four probes cover the size range from
1 μm to several cm.

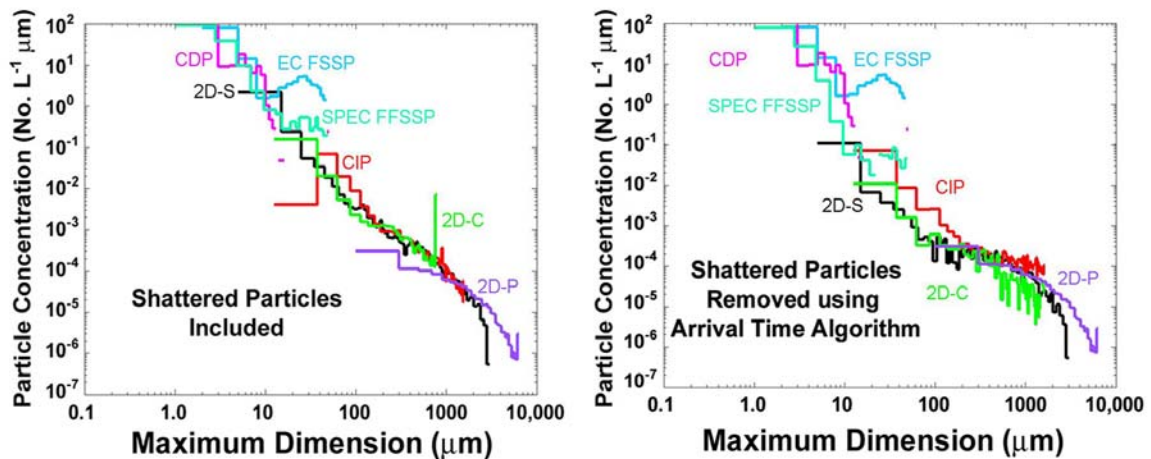
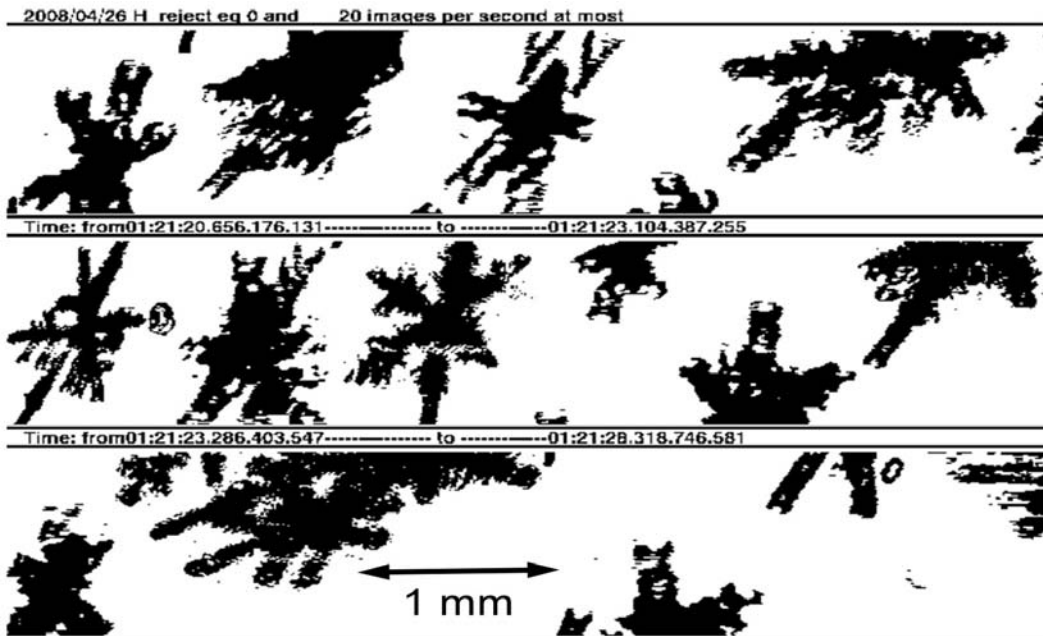
- 1. 2D-S (Stereo) Optical Array Cloud Particle Imaging Probe: 10 μm to 3mm**
- 2. Fast Cloud Droplet Probe (FCDP): 1 to 50 μm**
- 3. High Volume Precipitation Spectrometer (HVPS) Imaging Probe: 150 μm to 10 cm**
- 4. Cloud Particle Imager (CPI): High Resolution digital images of cloud particles with 2.3 μm pixel resolution and 256 gray levels.**

The Four Cloud Particle Probes will all be installed on the Wingtip Pylons of the DC-8. Data will be recorded and displayed on an integrated LED flat panel display located at Station 850 left.



SPEC 2D-S and FCDP probes

- The 2D-S probe is actually is two independent, identical cloud particle probes in one housing, called the 'H' (horizontal) and 'V' (vertical) channels
- Each of the H and V channels of the 2D-S probe has 128-photodiode arrays that produce black and white images of particles with 10 μm resolution at TAS up to 200 m s^{-1}
- FCDP records individual particle statistics, including arrival time, transit time signal and qualifier pulse heights
- Both 2D-S and FCDP reduce shattering of ice particles using improved probe tip design and particle inter-arrival time algorithms.



2D-S images and Particle size distributions from several cloud particle probes flown on the Canadian Convair 580 in precipitating dendrites below cloud base during ISDAC. Left panel shows measurements with shattered particles included and right panel with shattered particles removed using arrival time algorithm. EC FSSP = Environment Canada FSSP. CDP = DMT CDP. SPEC FFSSP = SPEC Fast FSSP. CIP = DMT CIP. 2DC = EC 2DC. 2DP = EC 2DC.

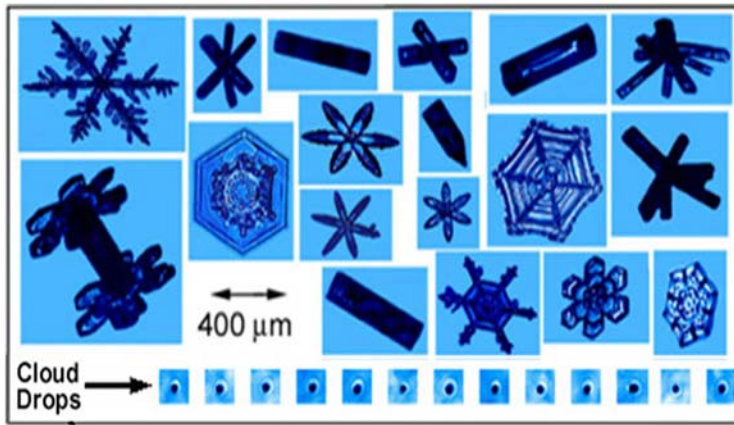


Photograph of SPEC HVPS probe installed in the PMS canister embedded in the tip tank of the SPEC Learjet.

- **HVPS is hermetically sealed and has probe tips designed to reduce shattering.**
- **Images particles from 150 μm to 2 cm.**

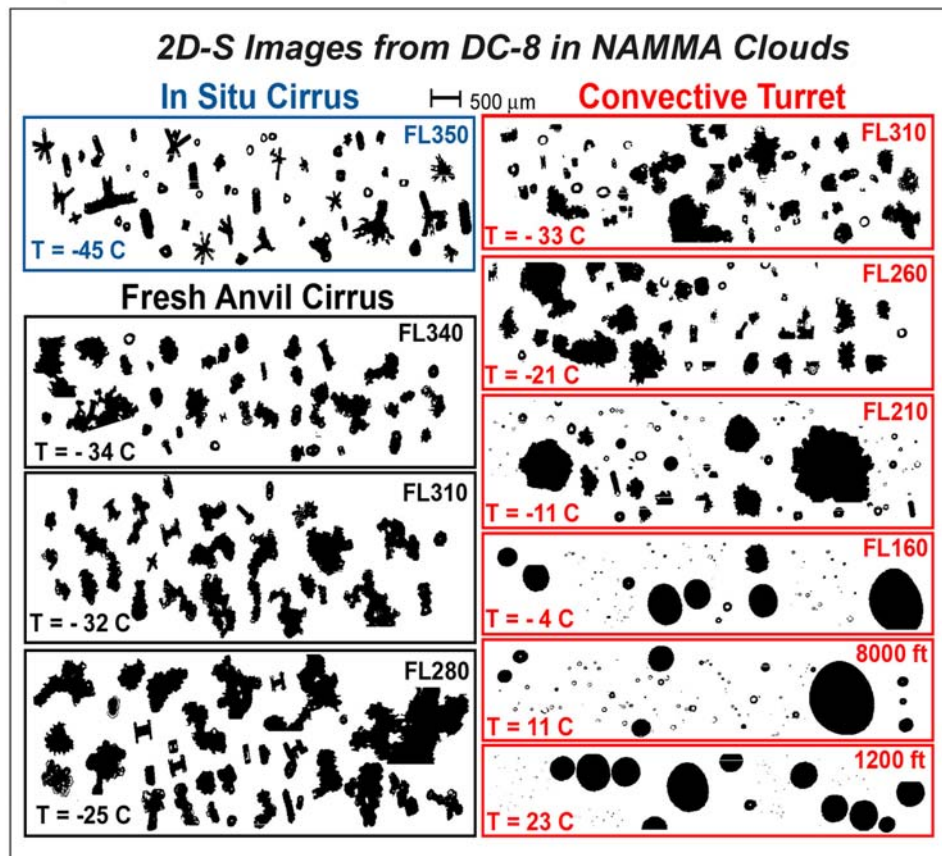
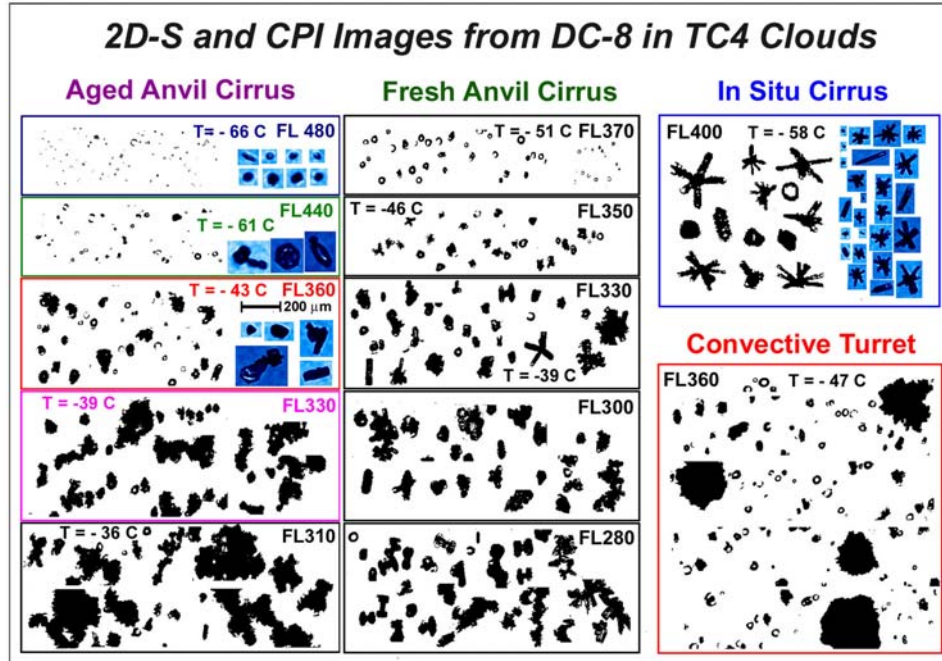


- CPI provides high-resolution images (2.3 μm pixel resolution with 256 gray levels) of ice particles and water drops.

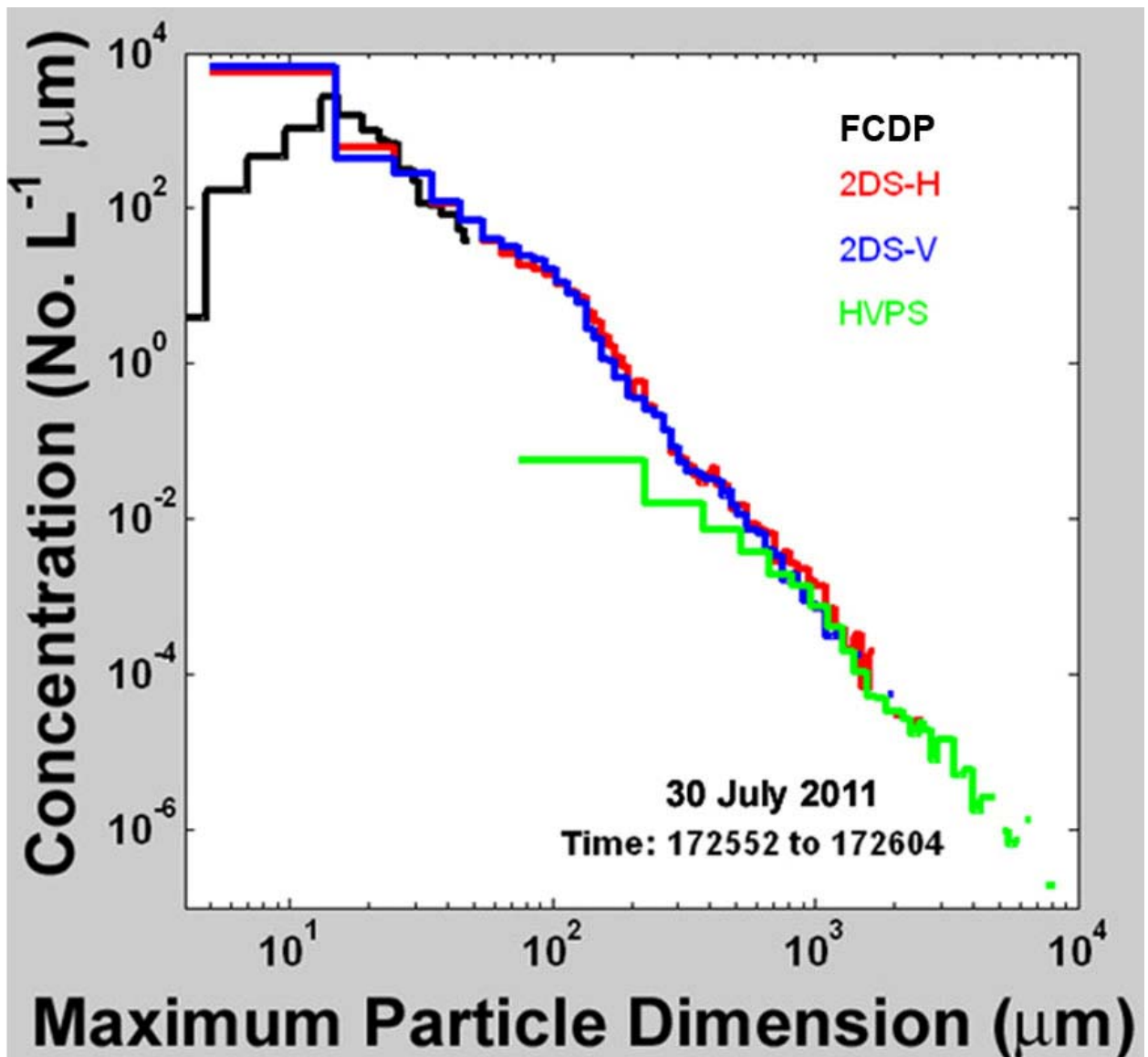


- Images can be automatically sorted into crystal habits.

SPEC CPI and sample images of ice particles and cloud drops (from King et al.



Examples of vertical profiles of 2D-S and CPI images from TC4 and NAMMA



Example from the NSF ICE-T project showing excellent overlap of particle size distributions from three of the four SPEC probes that will be installed on the DC-8 for SEAC4RS.

References

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