

PECAN

NOAA P-3 Aircraft Component

Pls:

D. P. Jorgensen, NSSL

T. J. Schuur, NSSL

C. L. Ziegler, NSSL

Nick Guy, NSSL

R. M. Rauber, U. Ill.

B. F. Jewett, U. Ill.

G. M. McFarquhar, U. Ill.



P-3 Logistics

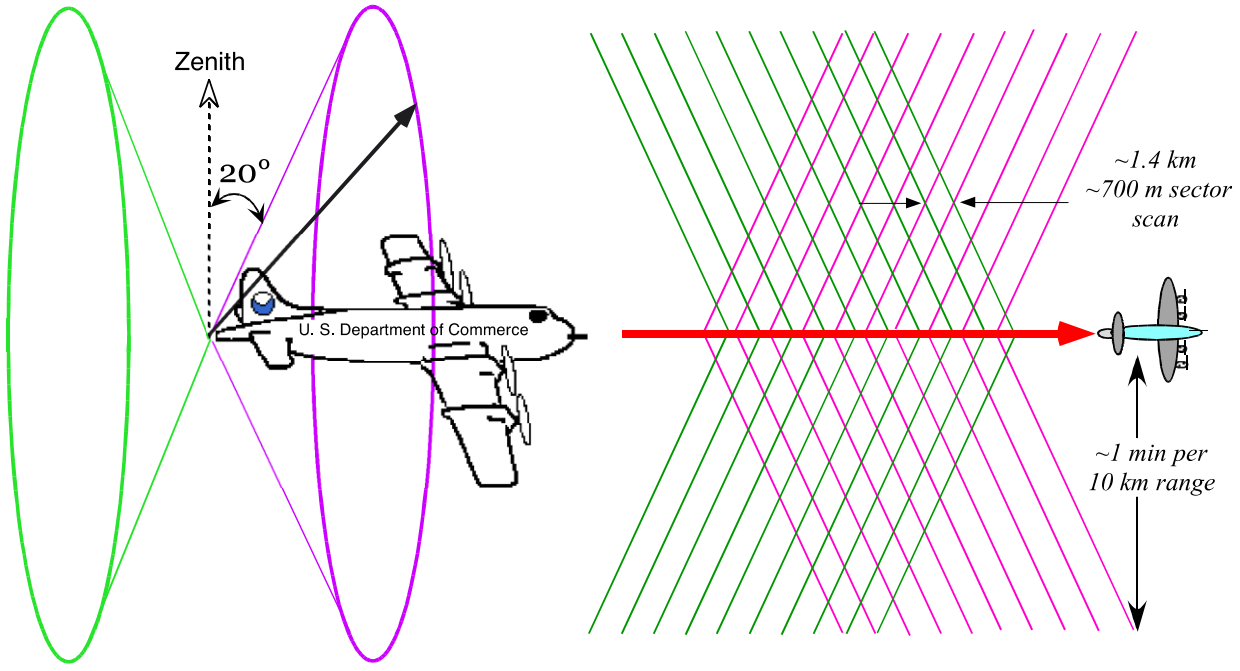
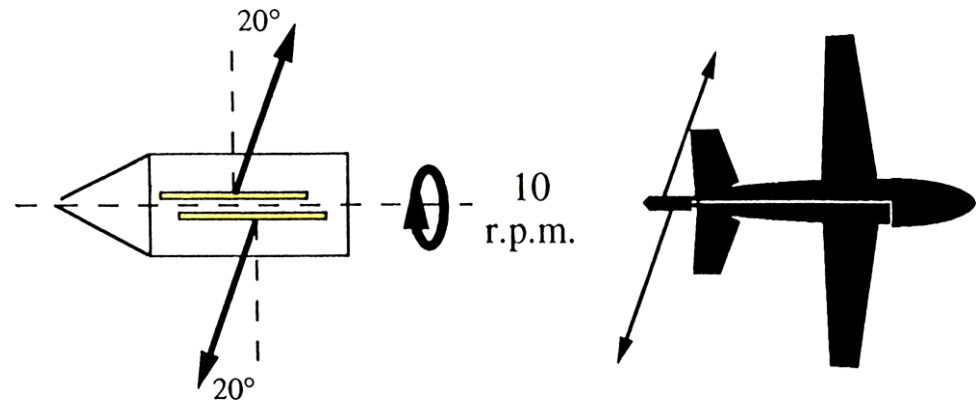
- Duration: 27 days starting ~15 June 2015
- Base of Operations: Wichita, KS (McConnell Air Force Base)
- Flight Hours: 75 (research) + ~10 ferry (~10 IOPs of 7.5 hrs each)
- Domain: PECAN Domain – first choice in conjunction with surface instruments – then look outside
- P-3 configuration: “As is” for hurricane deployments (tail Doppler radar; cloud physics probes; no dropsondes)
- Constraints:
 - One P-3 (N42RF) laid up in 2015 for wing replacement.
 - NHC has right to “recall” P-3 for *significant* landfall hurricane (e.g., Agnes 1972)

P-3 Operational Constraints

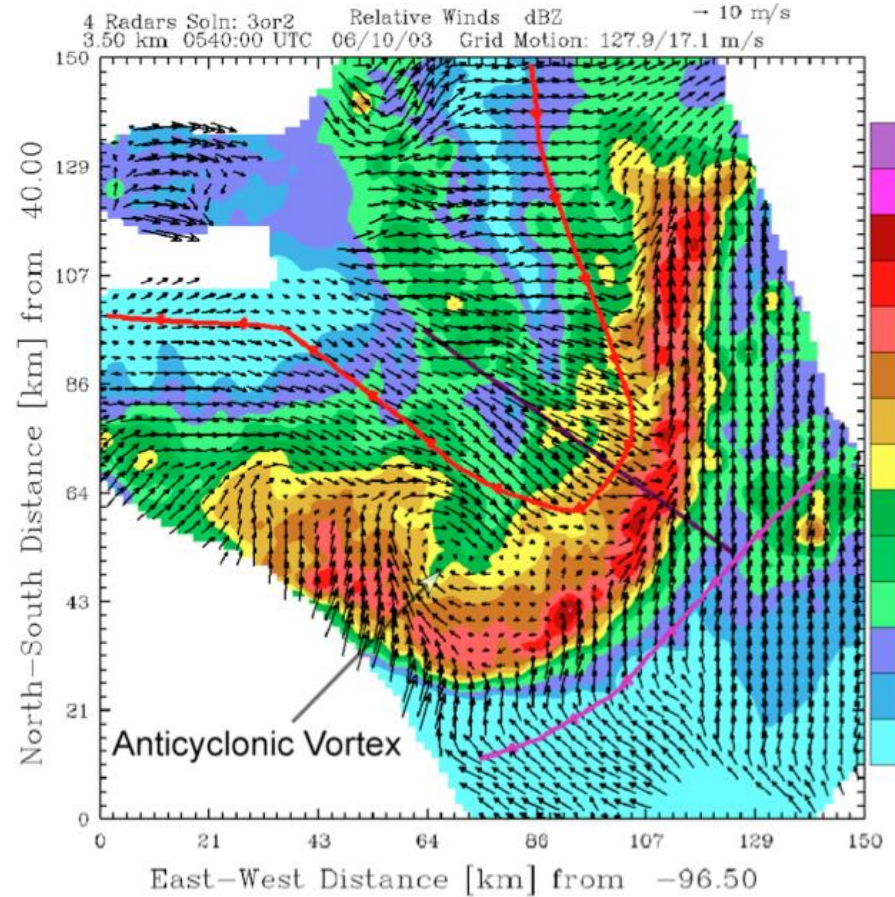
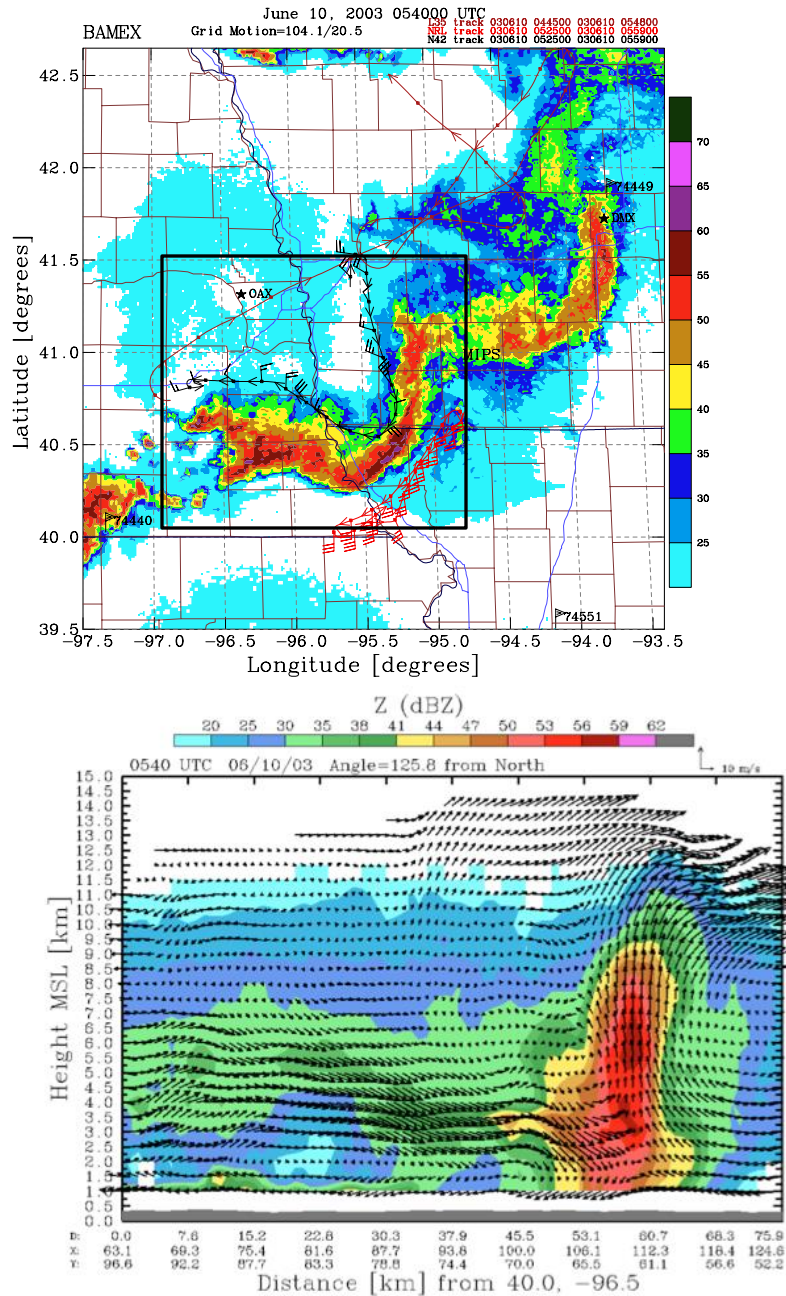
- 7 “up” days mandates a “down” day
- 3 consecutive max missions mandates a “down” day
- 50 hr inspection mandates a “no-fly” day, which is an “up” day
- ~24 hr notice of an “up or down” day. If “up” specify approximate takeoff time
- ~3 hrs before takeoff specify tentative flight plan
- ~1.0 hrs before takeoff “go” decision affirmed (aircraft fueled) – once fueled *must go*
- 16 hour crew duty day (3 hr preflight + 1 hr post flight) – 3 hr max TO delay before end of max mission impacted
- Fuel for max mission (9 hrs) – *must* fly for 6 before landing getting down to landing weight

NOAA P-3 Airborne Doppler Radar

wavelength	3.12 cm (X-band)
PRF	3200/2400 s ⁻¹
R _{max}	38 km
V _{max}	±51 m s ⁻¹
H beam width	1.35°
V beam width	1.90°



Quad-Doppler Example: BAMEX



P-3 Cloud Physics Probes

Cloud Combination Probe (CCP): Cloud Imager + Cloud Droplet Probes

- Aerosol particle and cloud hydrometeor size from 2 to 50 μm
- Precipitation size distributions from 25 μm to 1550 μm
- Liquid water content from 0.05 to 3 g/m^3



Cloud and Aerosol Spectrometer (CAS):

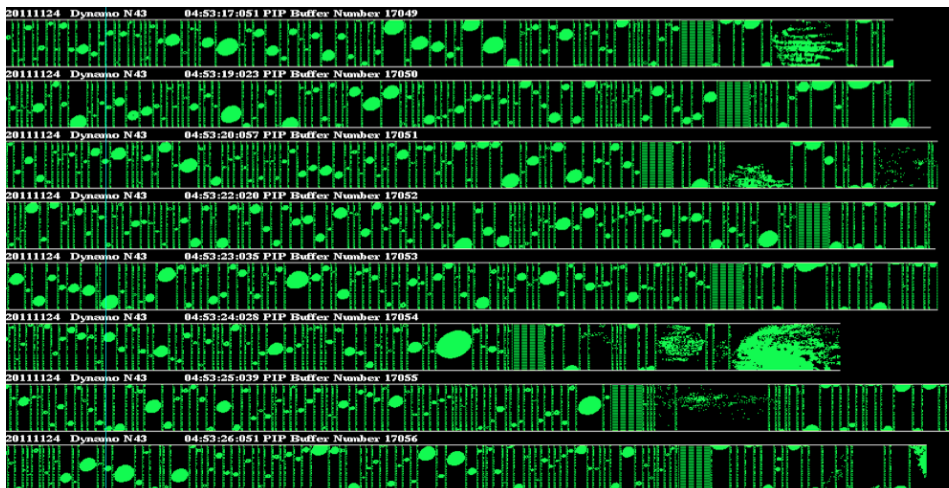
- Forward and Back Scatter
- Size range: 0.51 μm to 50 μm

Precipitation Imaging Probe (PIP):

- Optical spectrometer measures the size and shape of particles from 100 to 6200 μm

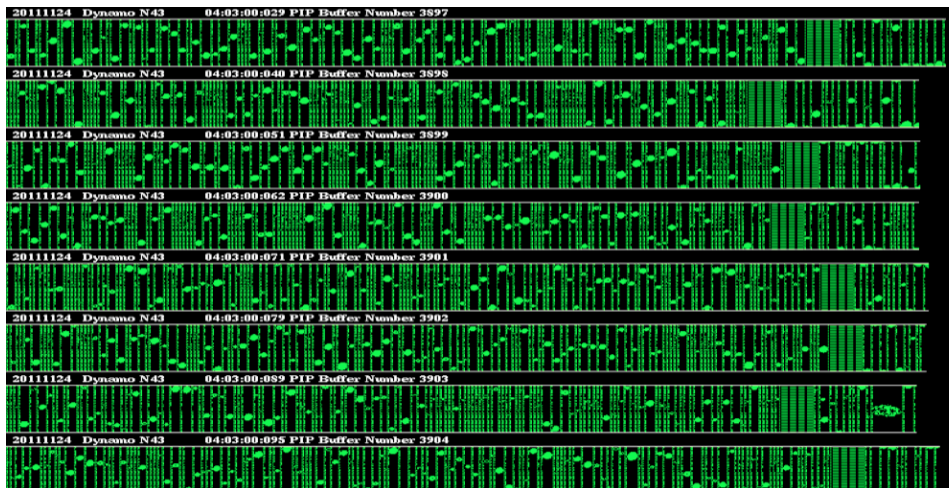
Probe Image Data

2D-C



Observable sizes: 25 μm – 6.2 mm; 25 μm res.

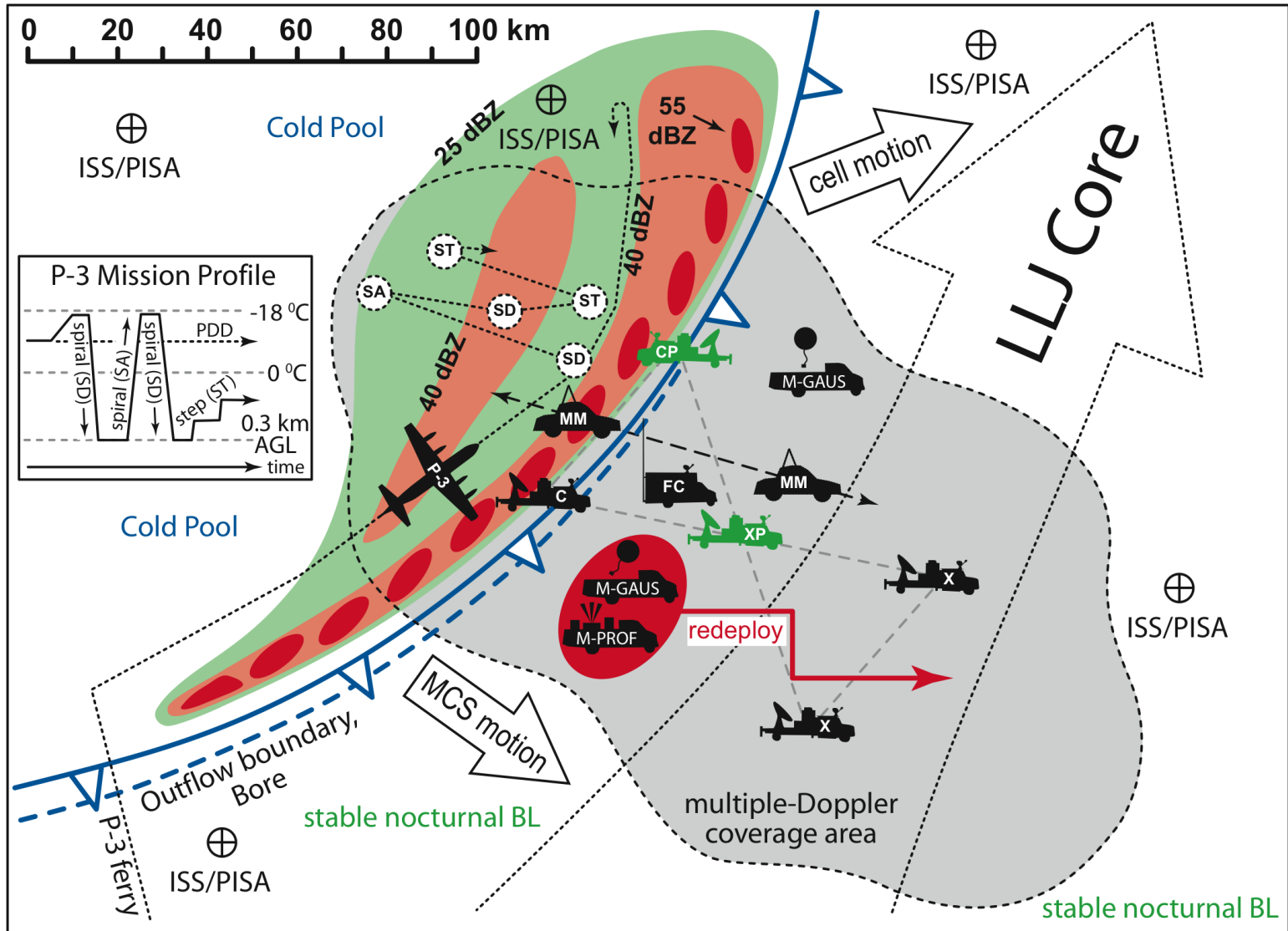
2D-P



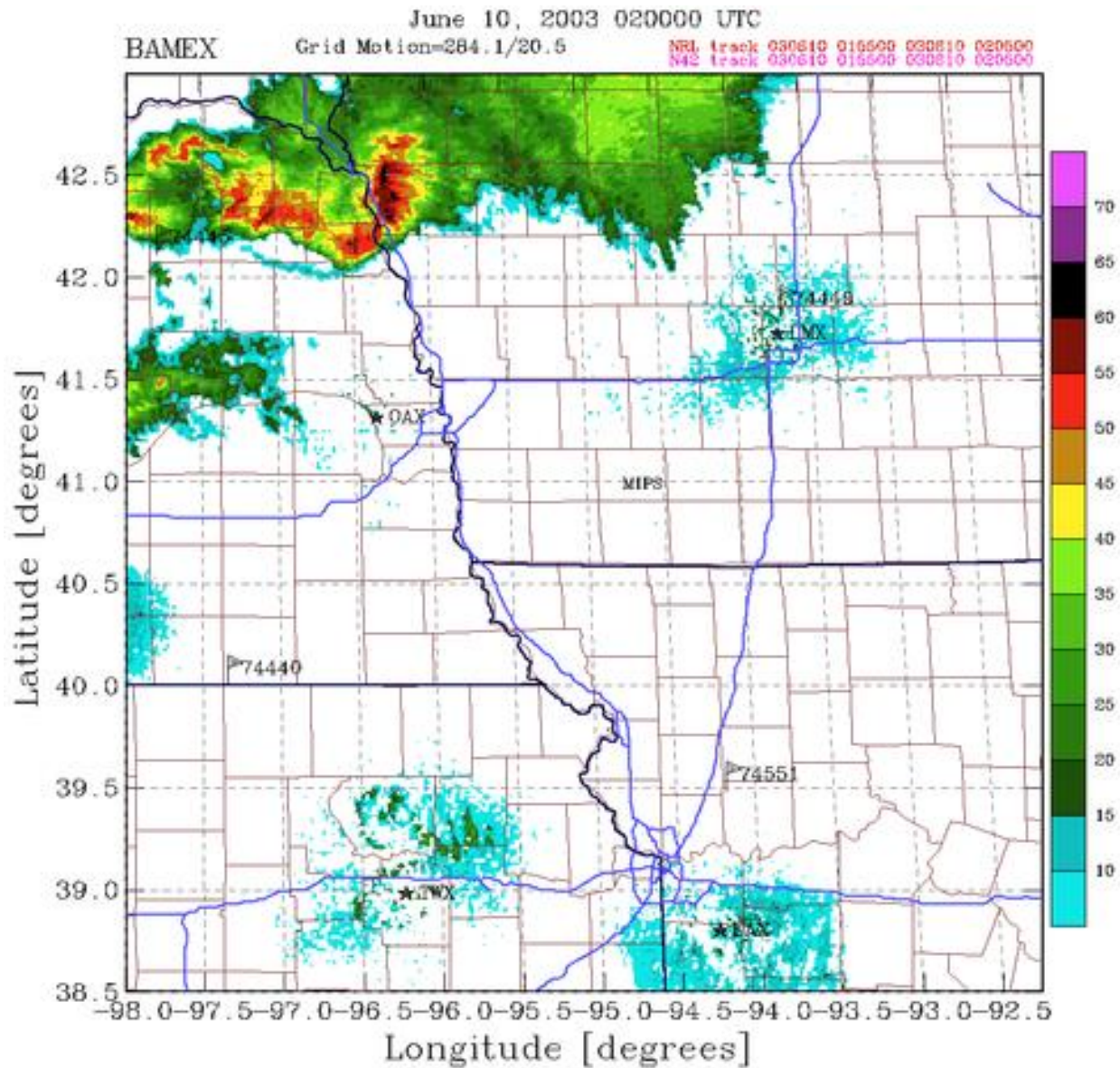
Observable sizes: 100 μm – 6.2 mm; 100 μm res.

Other possible probes? (McFarquar)

Flight Strategies



BAMEX Flight Strategy



Microphysics Spirals

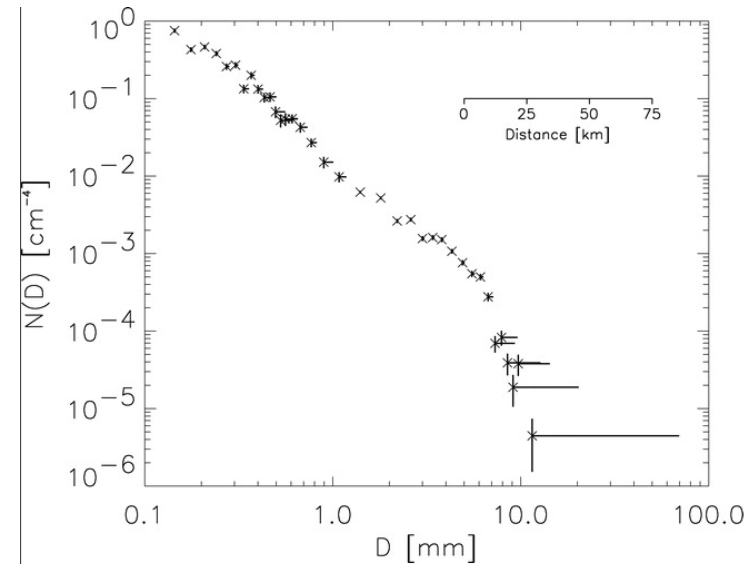
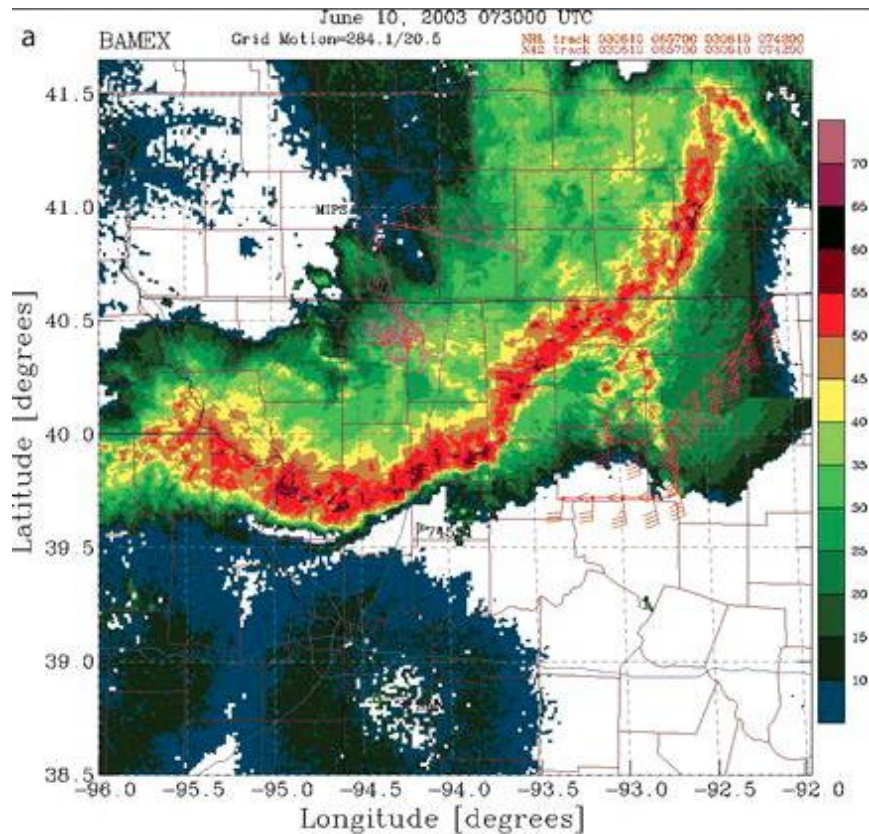


Fig. A1. The $N(D)$ measured by 2DC ($D < 1.2$ mm) and 2DP ($D > 1.2$ mm) at 2145:00–2145:10 UTC 2 Jun 2003 at T^* of -1.1°C . Vertical error bars represent uncertainty in $N(D)$, where lines run between $N(D)$ calculated using $N \pm N^{1/2}$, where N is the number of particles measured in each size bin over the 10-s period. Horizontal bars represent the distance that NOAA P-3 would have had to travel to get 10% uncertainty in $N(D)$, that is to sample 100 particles in the given size bin (horizontal axis corresponding to distance embedded in the upper right part of the figure).

McFarquhar, G. M., M. S. Timlin, R. M. Rauber, B. F. Jewett, J. A. Grim, D. P. Jorgensen, 2007: Vertical Variability of Cloud Hydrometeors in the Stratiform Region of Mesoscale Convective Systems and Bow Echoes. *Mon. Wea. Rev.*, **135**, 3405–3428.

Staffing Issues

- On the P-3
 - Chief Scientist & Assist. Chief Scientist
 - Radar Scientist
 - Cloud Physics Scientist
 - Observers (3-4)
- At the Ops Center in Hays
 - PI for next day decision (“UP” or “DOWN”)
 - Coordinator during mission (real-time comms)

Other Issues

- Crew required training (online)
- Base access – Foreign Nationals?
- Mobile radar & PISA positions displayed on the P-3?
- P-3 tracks to the field vehicles?