Objectives
-Operational experience at cruise speed and altitude with:
  -eye-safe Lidar
  -high moisture environment
  -large backscatter variations
  -variety of clouds, clear-air and very clean air
  -cloud entry and exit
-Evaluate range of detection for light to moderate turbulence
-Validate Lidar wind shear measurement capability
-Validate atmosphere backscatter design model
-Demonstrate clear-air turbulence (CAT) detection and prediction

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Rod Bogue (Co-I);
(AS&M) Chris Ashburn

CTI: Philip Gatt (Co-I),
Sara Tucker & Dale Bruns

NASA LaRC: Gary Grew,
Phil Brockman
Wayne Gerdes;
(Swales) Carroll Rowland
Doppler Radar/Lidar Turbulence Measurement

General Principle

- Energy scattered off of naturally-occurring moisture or aerosols
- Relative wind induces a Doppler frequency shift in the backscattered light; this frequency shift is detected by the sensor

- Doppler Turbulence Sensor
- Lidar Pulse Envelope (50-100 meters)
- Radar Pulse Envelope (~300 meters)
- Lidar “Pencil” Beam Width 10-20 cm
- Radar Beam Spread 3.5°

Explanations:

- Pulse transmitted
- Updraft
- Downdraft
- Beam
Atmospheric Aerosol Backscatter for Clear Air: Previous Database and CAMEX-4 ACLAIM Database

- Ground database collected 1995-96 in continental US
- High altitude 50% profile derived from 1.06m GLOBE measurements

**2.096 um Backscatter Database**

- Extinction & Turbulence Corrected
  US, Northern with out Clouds
  Resolution = 92.5 m

**2 µm Backscatter Coefficient**

- Ground Based 90%
- Ground Based 50%
- Ground Based 10%
- ACLAIM 90%
- ACLAIM 50%
- ACLAIM 10%
ACCLAIM vs Dropsonde Radial Velocity
September 10, 2001 Comparison

ACCLAIM Data
9/10/01, 40° Elev.

Wind speed, m/sec

ACCLAIM (16:08:38) • ER-2 dropsonde (15:48)
Lidar Atmospheric Sensing Experiment (LASE) vs ACLAIM
September 10, 2001 Comparison
CAMEX-4 Analyses Status

• CAMEX-4 flights very helpful to AvSP Turbulence Lidar effort
• ACLAIM forward-looking velocity and backscatter initial analysis done
• Quick look qualitative comparison of LASE and ACLAIM very promising
• ACLAIM up-slope line-of-sight data analysis underway for vertical windshear
• ACLAIM CAMEX-4 data and experience very helpful for evaluation of beam quality, data acquisition and archiving procedures, and 2-micron lidar doppler behavior in convectively-induced turbulence
• ACLAIM up-slope line-of-sight configuration could support a wind shear measurement inter-comparison between rawinsondes, ICATS climb winds, and both DC-8 and ER-2 dropsonde wind profiles on a future mission