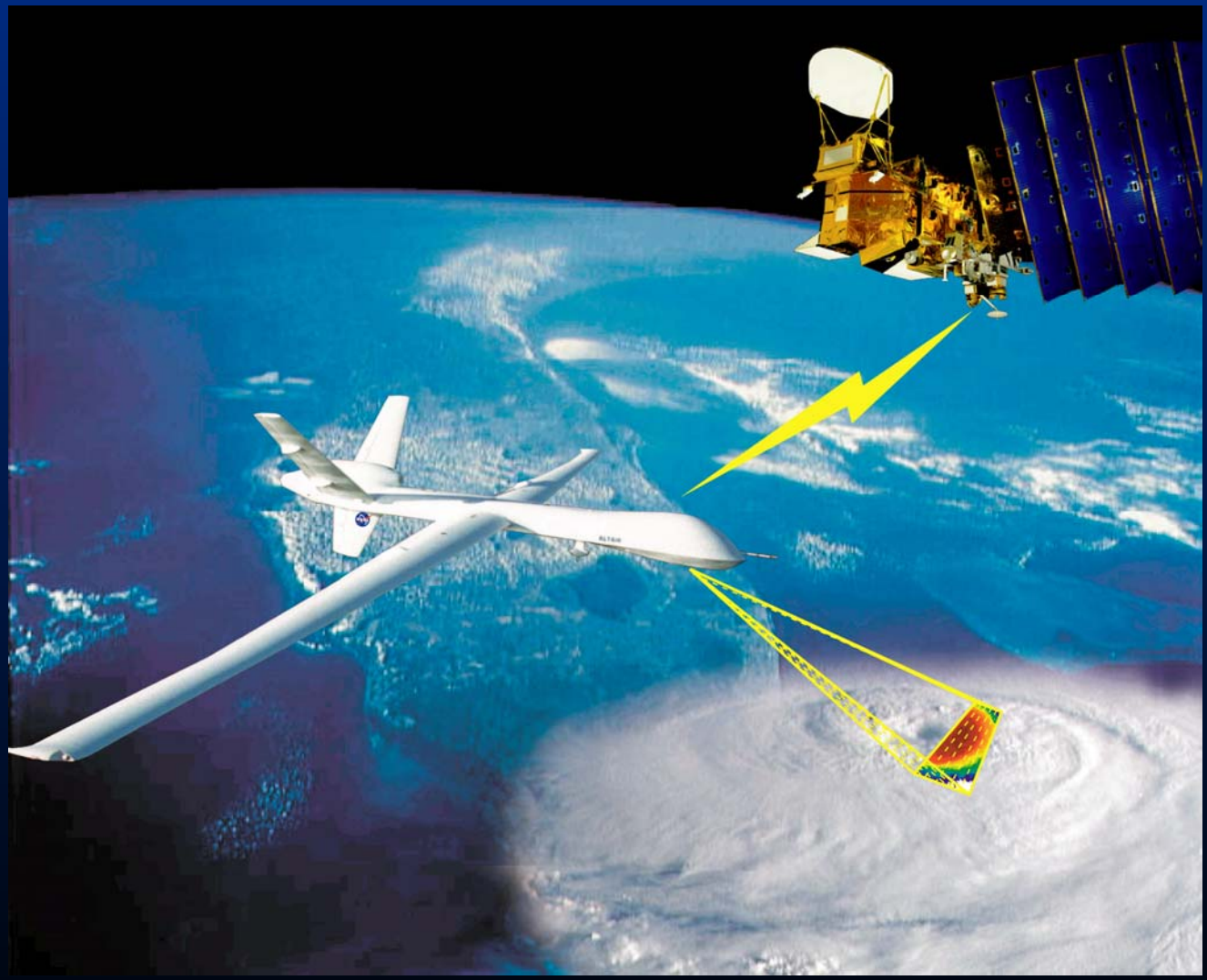
NASA Suborbital Science Program
UAV Sensor Development Activities



Ames Research Center

Jeff Myers

UAV Sensor Project:

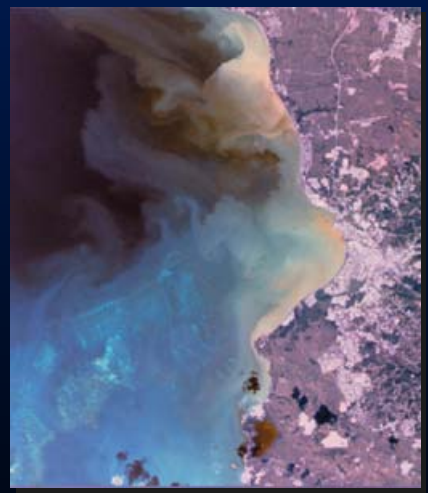
3 ESE legacy instruments rebuilt into a modular system for UAV operations

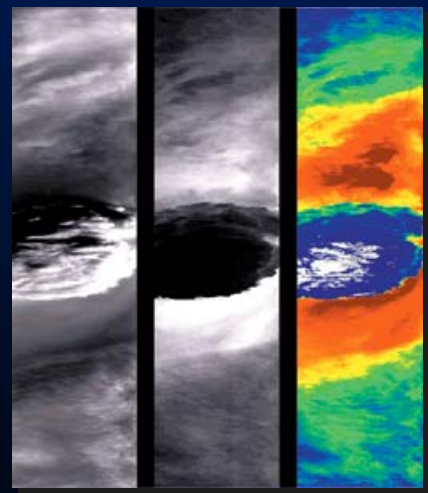
Three Science Configurations:

- Ocean Color Imager
- Atmospheric Mapping Sensor
- Wild Fire & H2O Vapor Mapper
- Operational 4Q FY04


NASA Altair


TMS, Calif. Wildfire


AOCI, Mayaguez Bay, P.R.


MAMS, Hurricane Danielle

NASA UAV Ocean Color Imager

- Conventional Aircraft or UAV-Compatible
- SeaWiFS Bands + Thermal IR for SST
- Variable Resolution (5 – 50 meters, altitude dependent)
- Highly Calibrated
- Successor to AOCI. Operational 4Q, FY04

Band	Center Wl, nm
1	412*
2	443*
3	490*
4	510*
5	555*
6	620
7	670*
8	770*
9	860*
10	1024
11	11.5um

*SeaWiFS Bands

Aircraft Platforms:

Altair or Global Hawk UAV, ER-2, WB-57, Beech B200, Cessna Caravan

50m AOCI, Mississippi Delta

UAV-OCI System Features

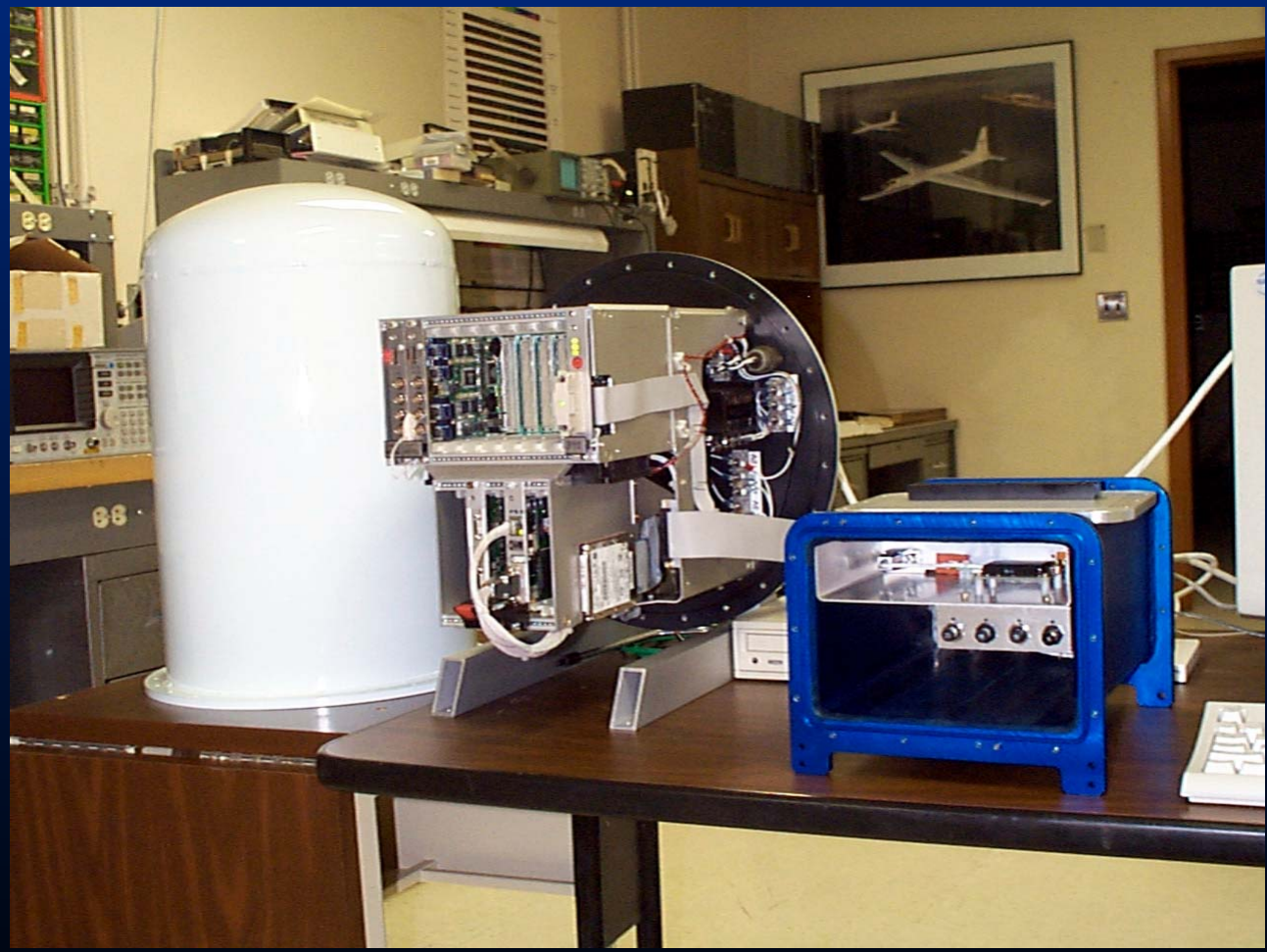
- New 16-bit digitizer
- New scanning optics module
- Sterling & TE- cooled detectors
- Pressurized electronics packaging
- Autonomous operation
- Fully network & web-enabled
- Improved Vis. and IR calibration
- Cross-platform portability

Ocean Color Imager Progress Report

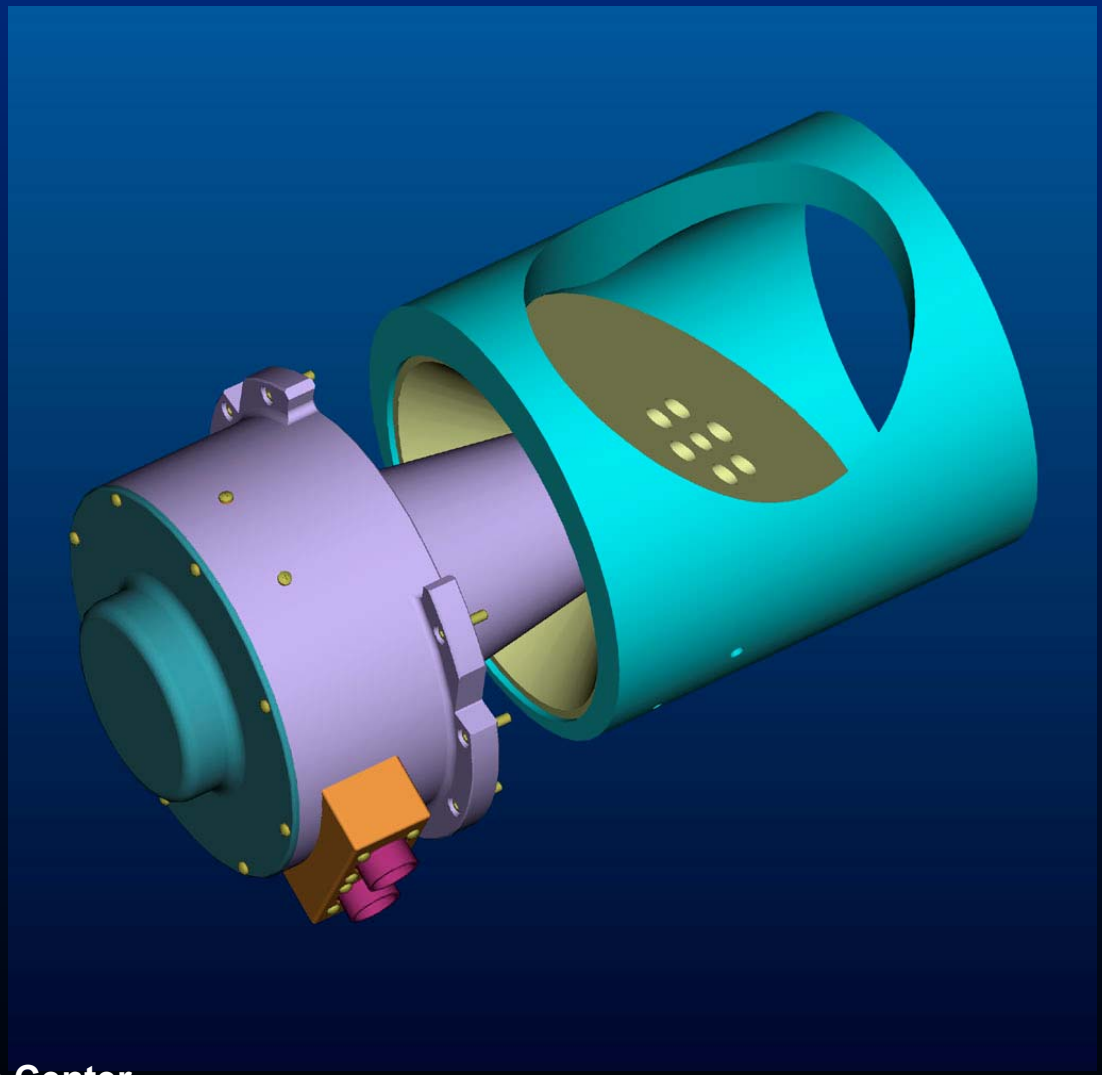
- Data capture system hardware assembled
- Electronics packaging completed
- Scanning Optics Module completed
- Spectrometer Delivered 4/1/04
- Sterling-Cooled TIR Detector Procured

Digitizer Module

With Pressure Housings and Motor Controller

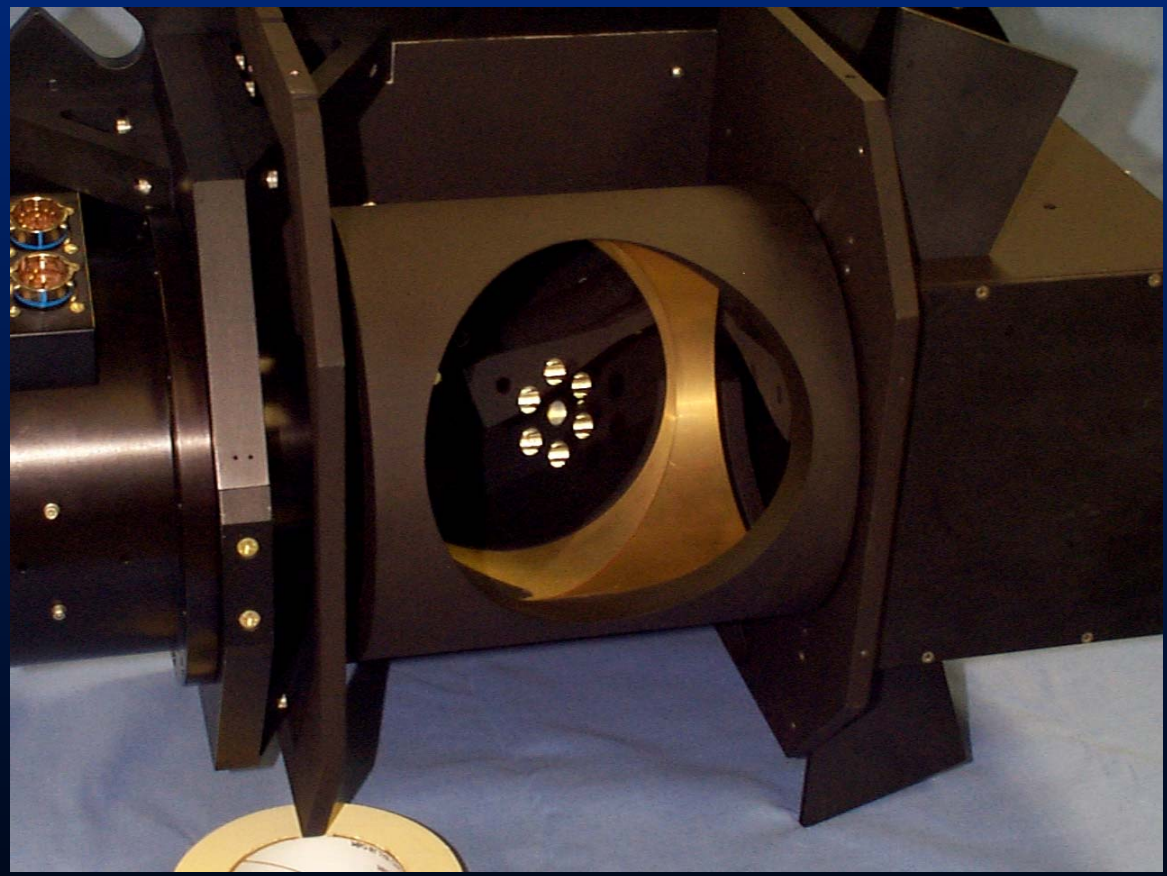


Scan Motor/Mirror Module Design



Motor/Mirror Module

Installed in scanning optics module

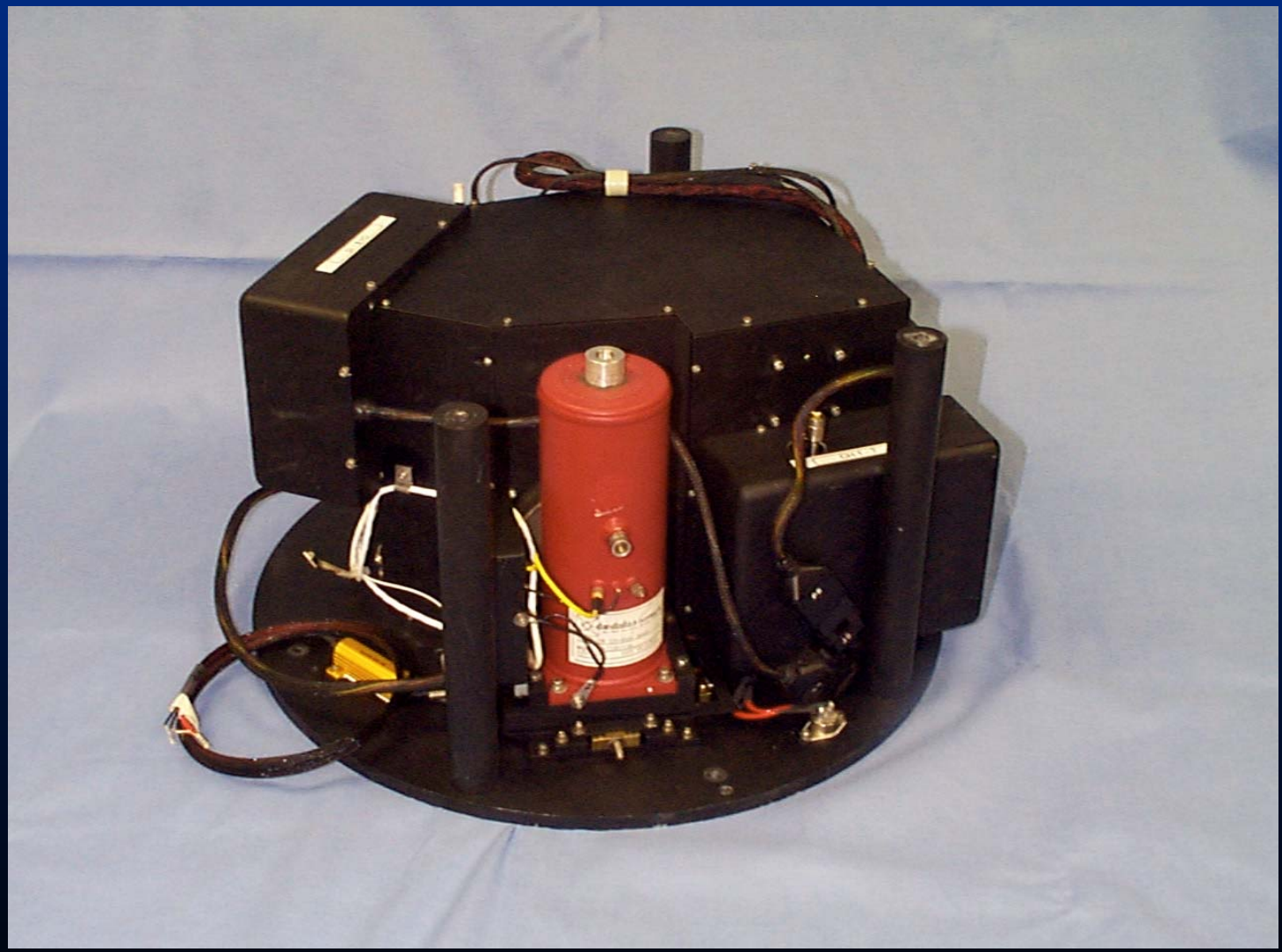


Modular UAV Sensor System

Scanning Optics Module

OCI Spectrometer

(TIR Sterling Cooler not installed)



Spatial Resolution Comparison:

AOCI and Simulated SeaWIFS

50m (AOCI from ER-2)

1Km (AOCI Re-sampled to SeaWiFS Pixel Size)

San Diego / Pt. Loma, CA (2/25/92)

Mississippi Delta

AOCI (50 Meter Res.)

SeaWiFS simulation
(1000 Meter Res.)

Ames Research Center

Mayaguez Bay and Rio Grande de Anasco River Outfall, Puerto Rico

11/17/91 12/5/93

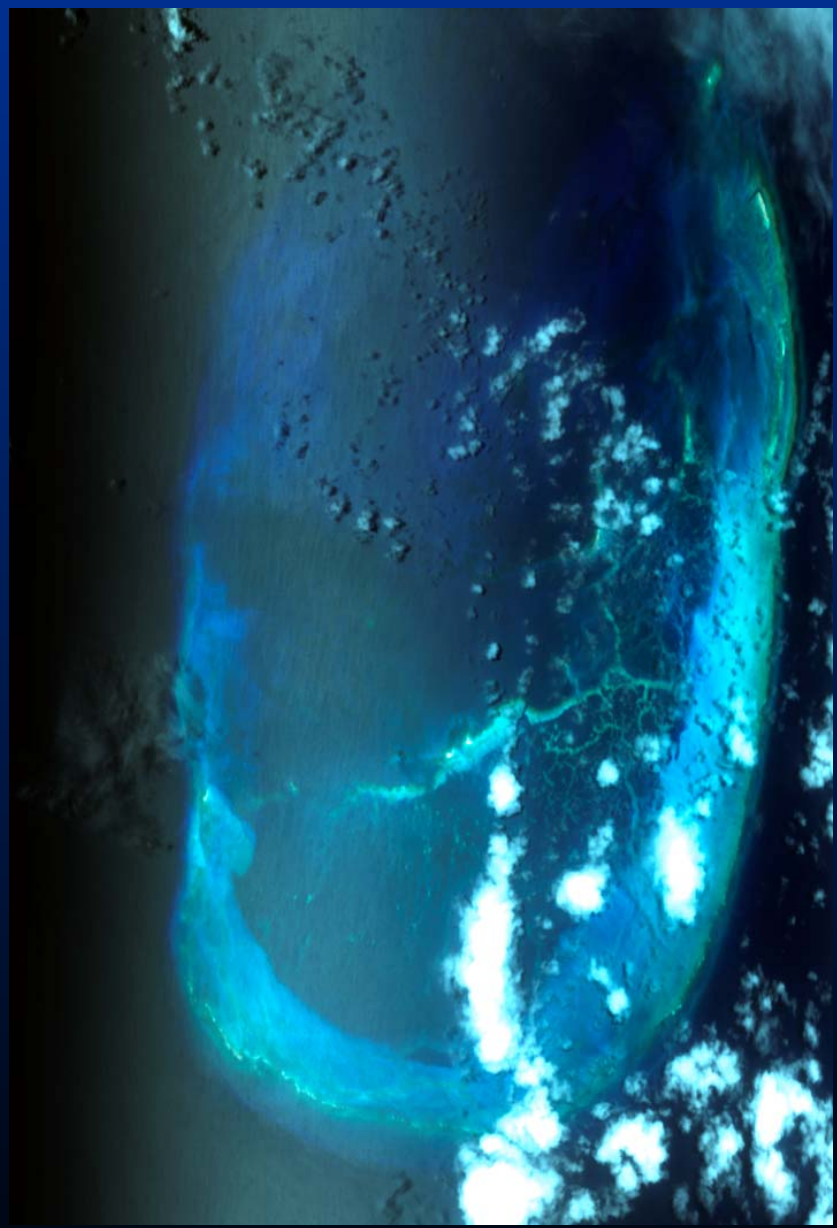
Airborne Ocean Color Imager

(50 m. resolution, Natural Color. From ER-2 Aircraft at 65,000 ft)

NASA Ames Research Center

MAS, Kane'ohe Bay, Oahu, Hawaii, April 2000, Flight 00-082

Ames Research Center R (0.66μm) G (0.55μm) B (0.47μm)



MAS, French Frigate Shoals, Hawaii, 18 April 2000, Flight 00-086

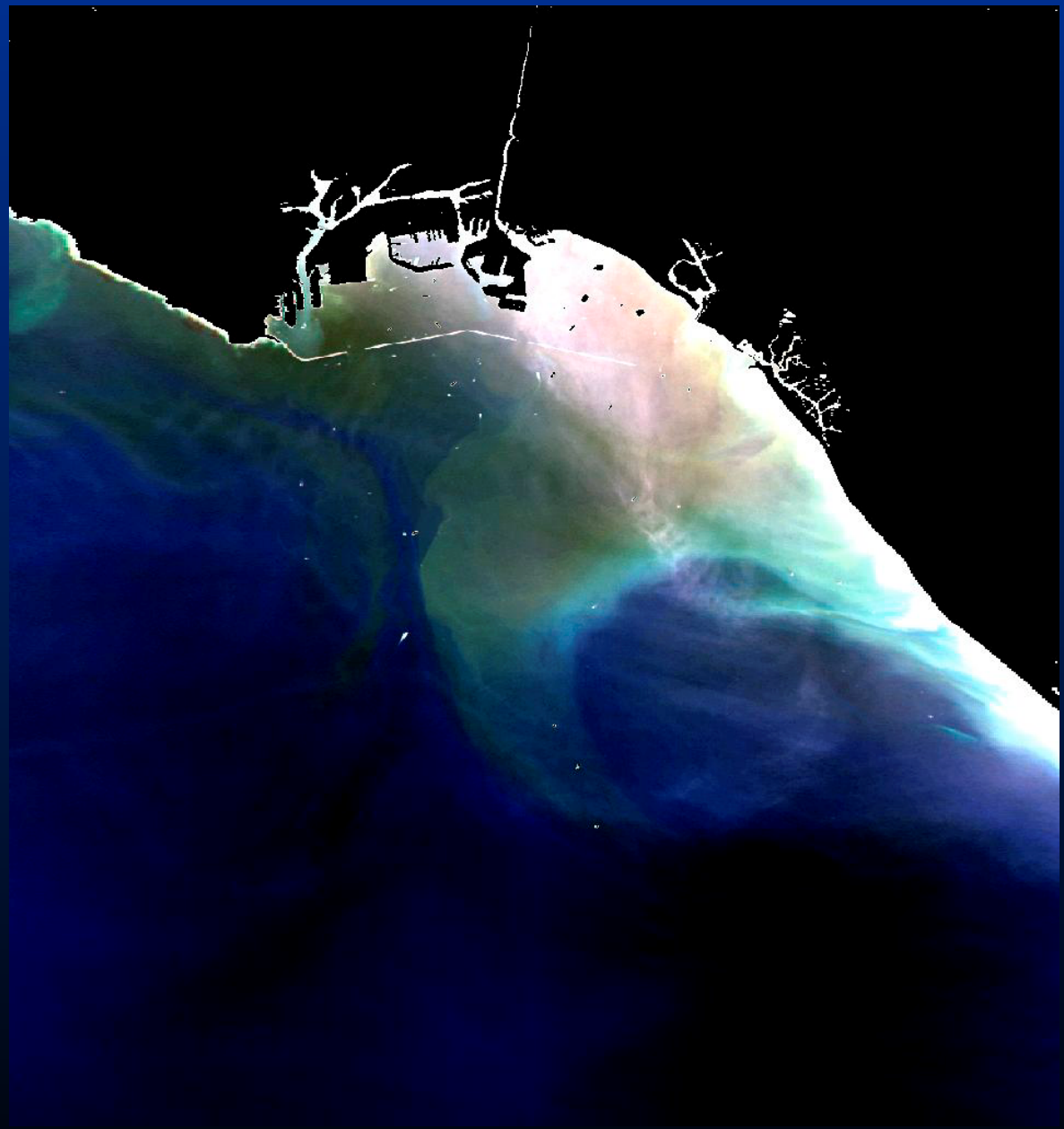
Ames Research Center R (0.66μm) G (0.55μm) B (0.47μm)

Los Angeles River Outfall and Long Beach Harbor

AOCI from ER-2 at 65,000’

Resolution: 50 meters

2/25/92

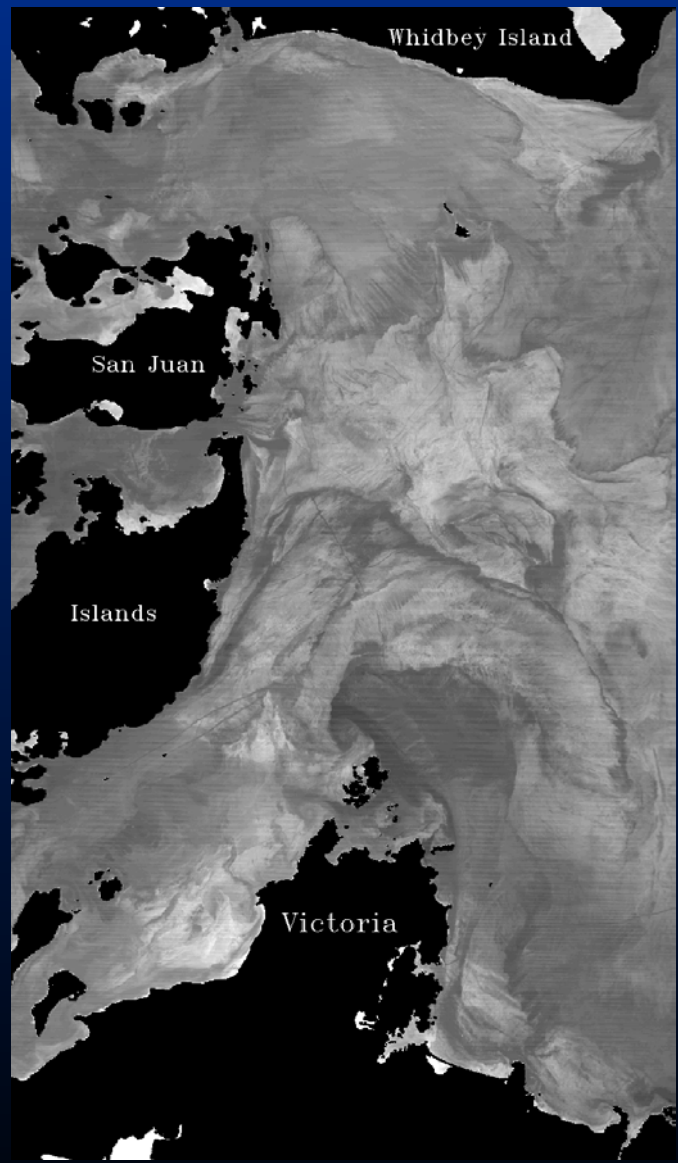


Enhanced Natural Color (B5-3-2)

Victoria Sound, B.C.

AOCI from ER-2
at 65,000'
Resolution: 50
meters
7/20/94

Natural Color (B5-3-2)

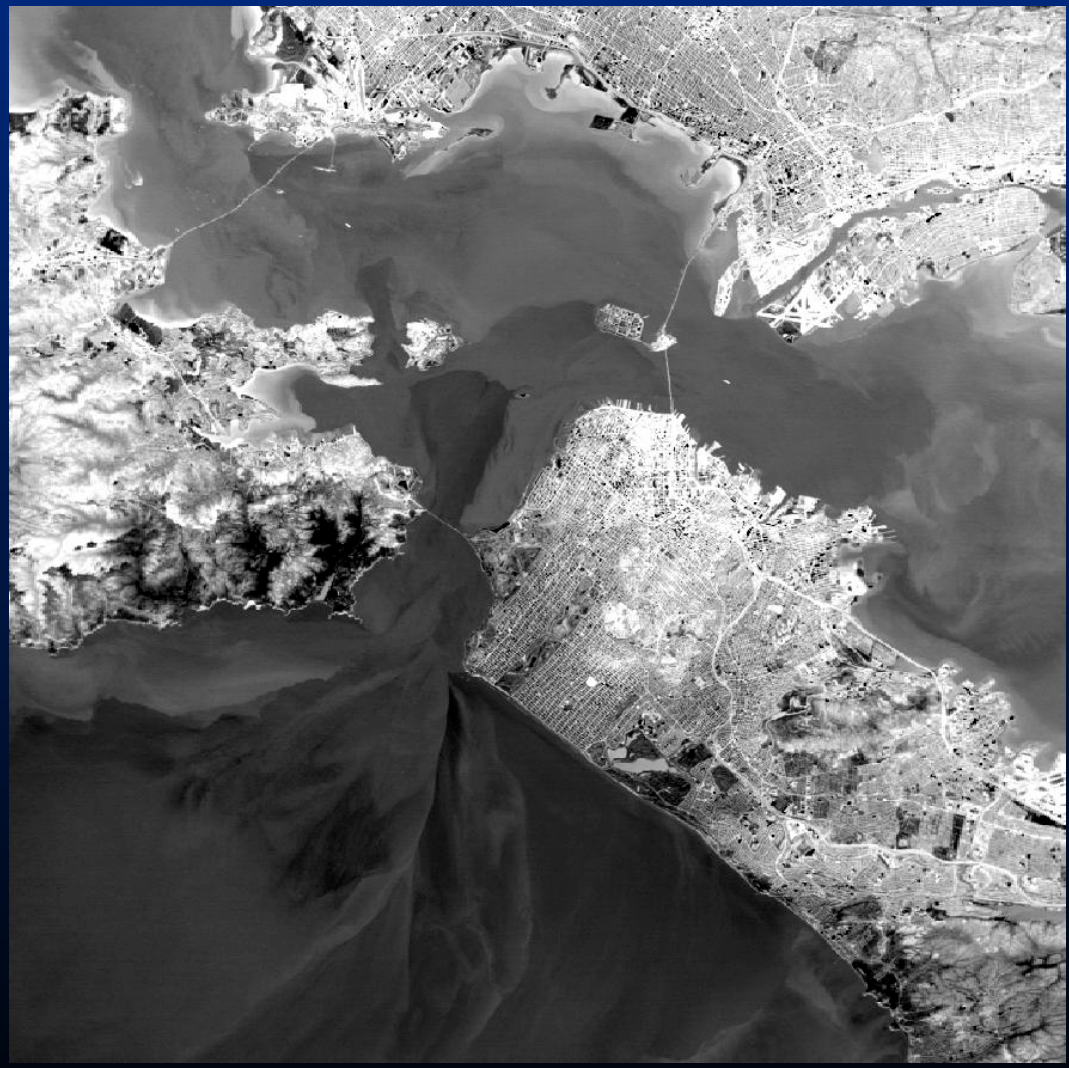


Thermal IR (B 12)

NASA Ames Research Center

San Francisco Bay SST (MAS/ER-2)

3/27/04 11um 50m resolution



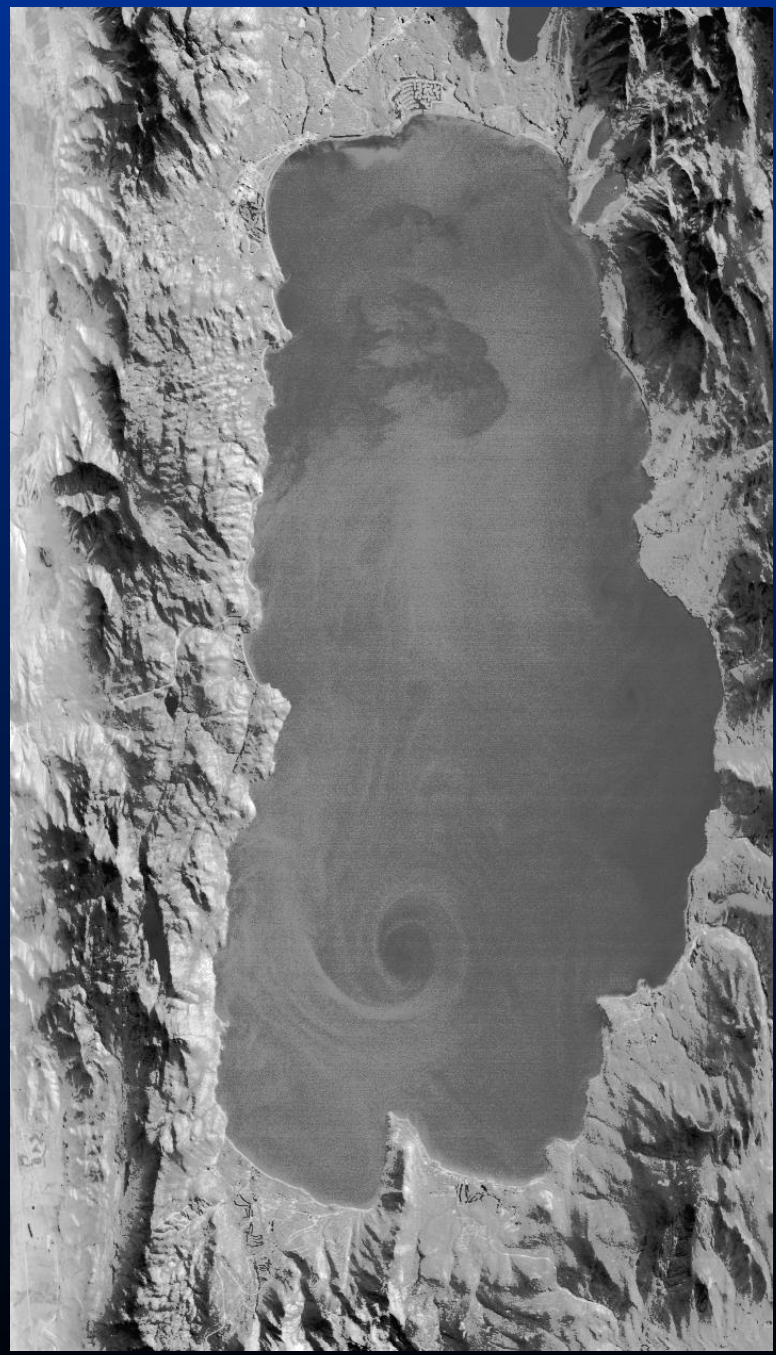
Ames Research Center

Lake Tahoe MAS

Thermal IR

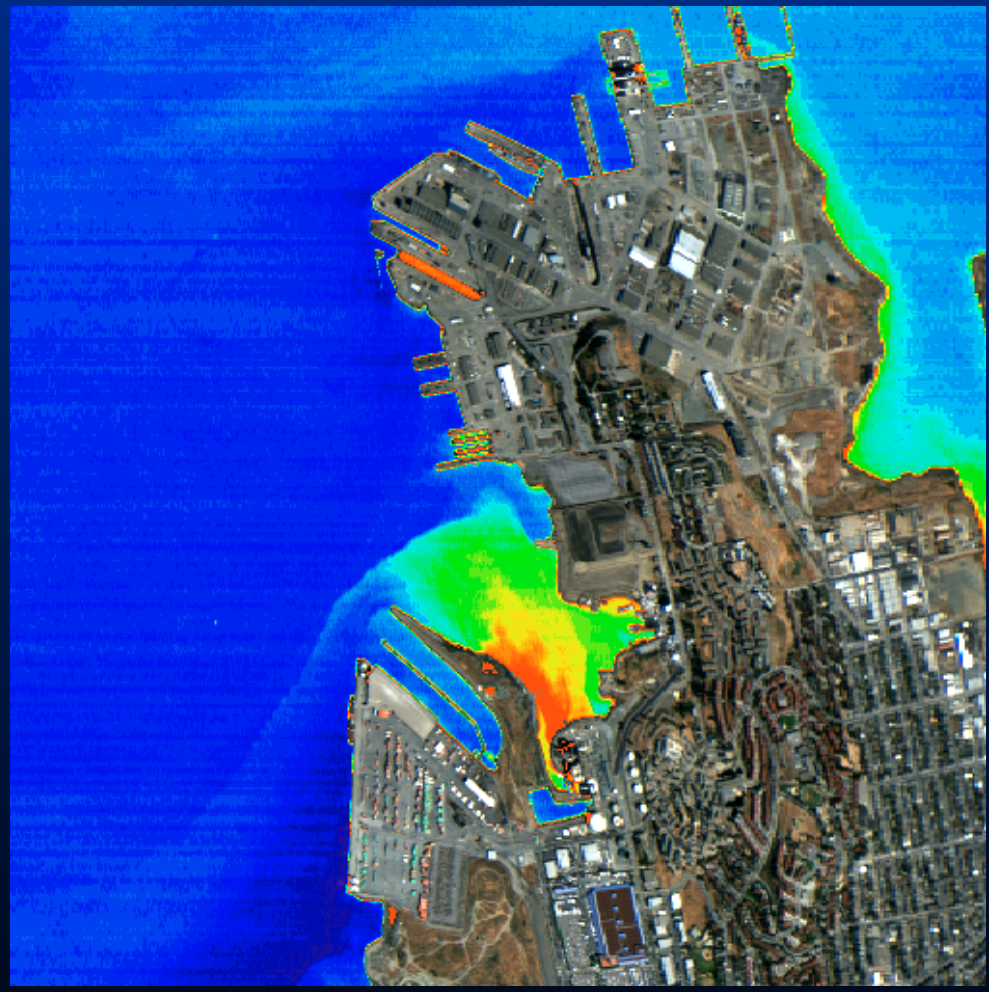
ER-2, 50 meter resolution

10/03



Ames Research Center

Thermal Plume from PG&E Power Plant, San Francisco Bay, c. 1985



Thermal IR (water) + Natural Color (land)

NASA C-130, NS001 TMS (Bands 8 + 3-2-1)
Resolution: 7 meters

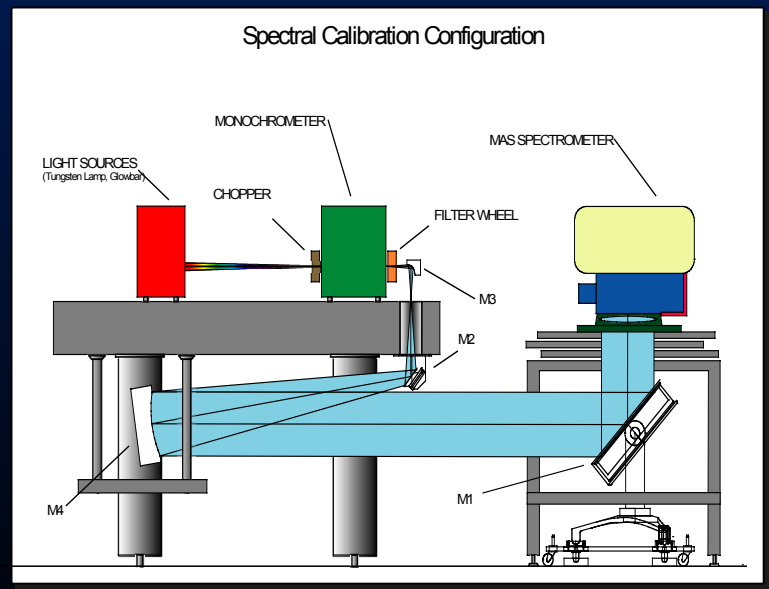
ASF Calibration Laboratory

Mission Statement:

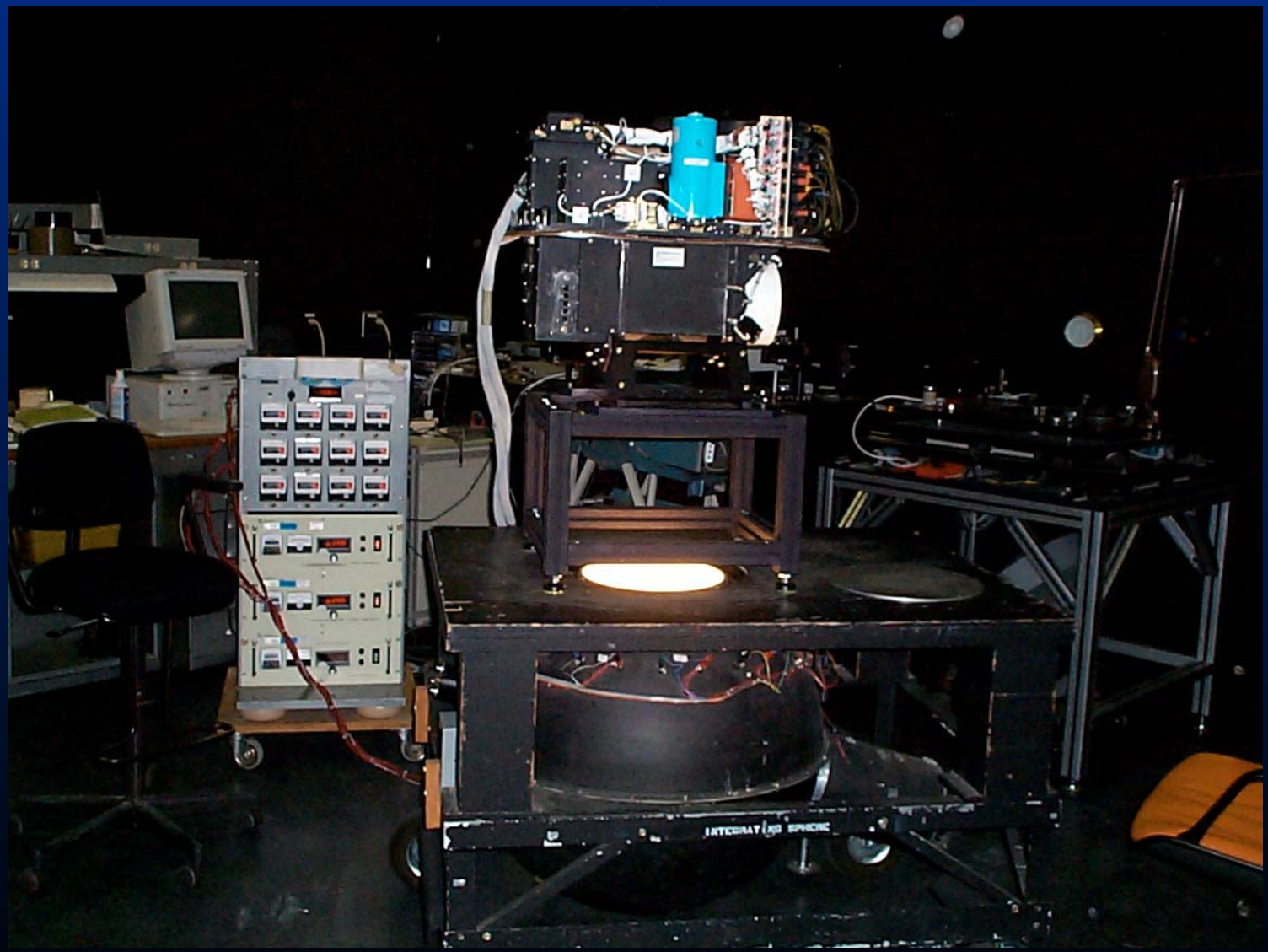
Precision Characterization of Airborne Sensor Systems & Optical Alignment Services

Capabilities:

- Spectral Response Measurements (350nm - 15um range)
- Radiometric Calibration (Vis - TIR)
- Spatial Characterization
- Environmental Simulation
- NIST Traceability and Oversight by the EOS Calibration Scientist



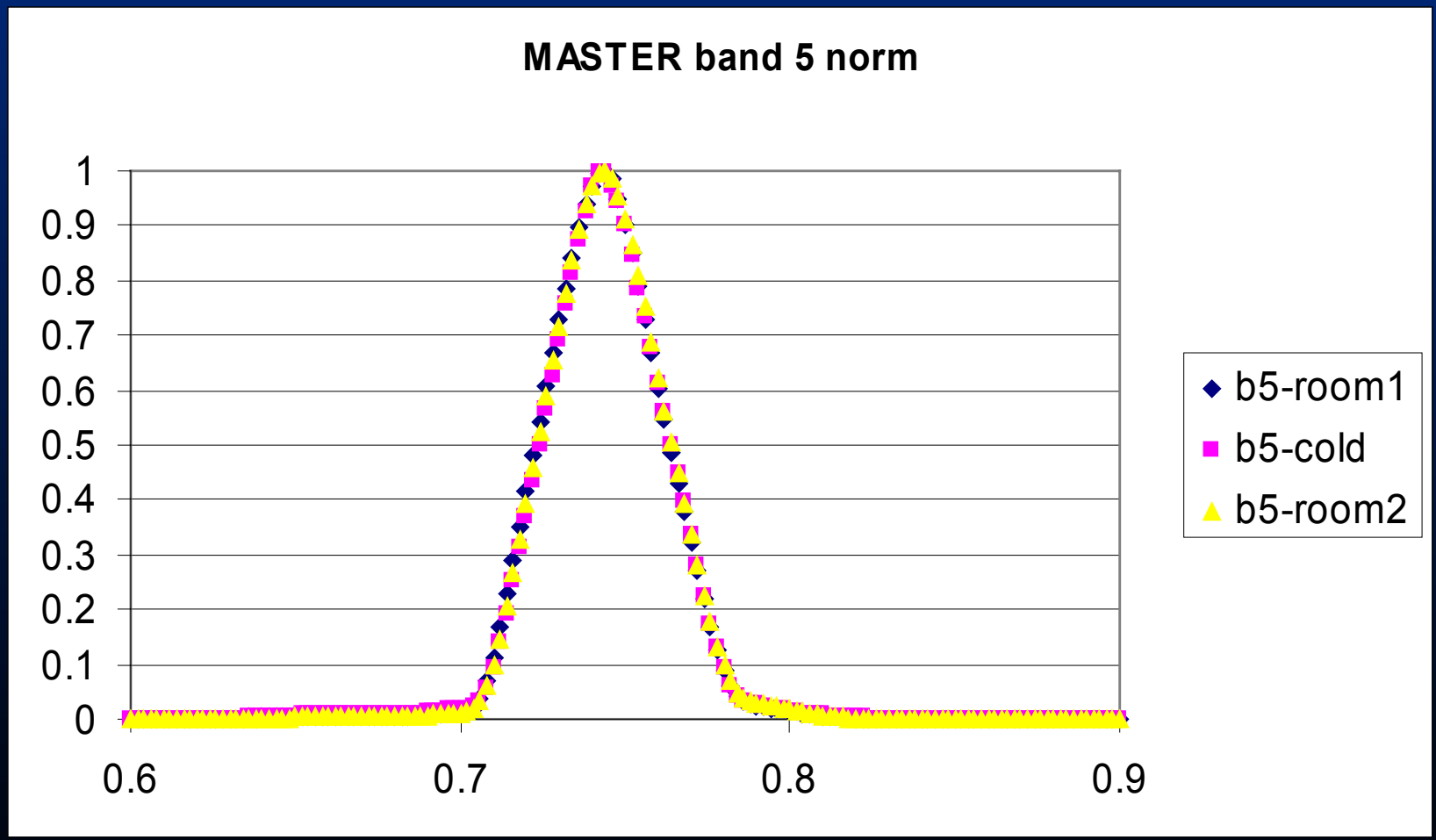
30” Integrating Sphere
(with MAS Instrument)



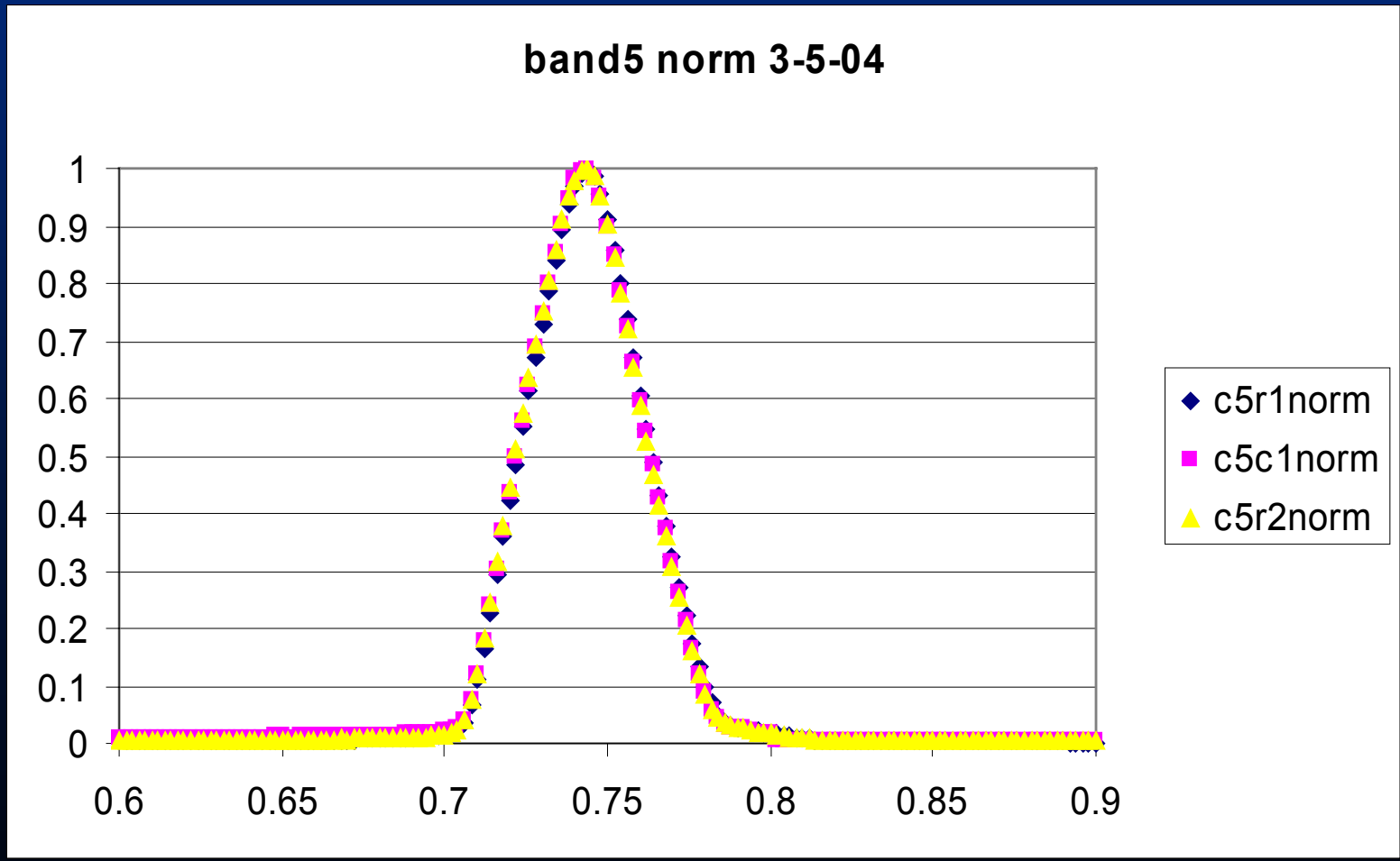
ASF Environmental Test Chamber

- -50C to +50C Range
- N2 Atmosphere
- 16” Optical Window (Quartz or IR)
- Interfaced to Collimator and Radiometric Sources

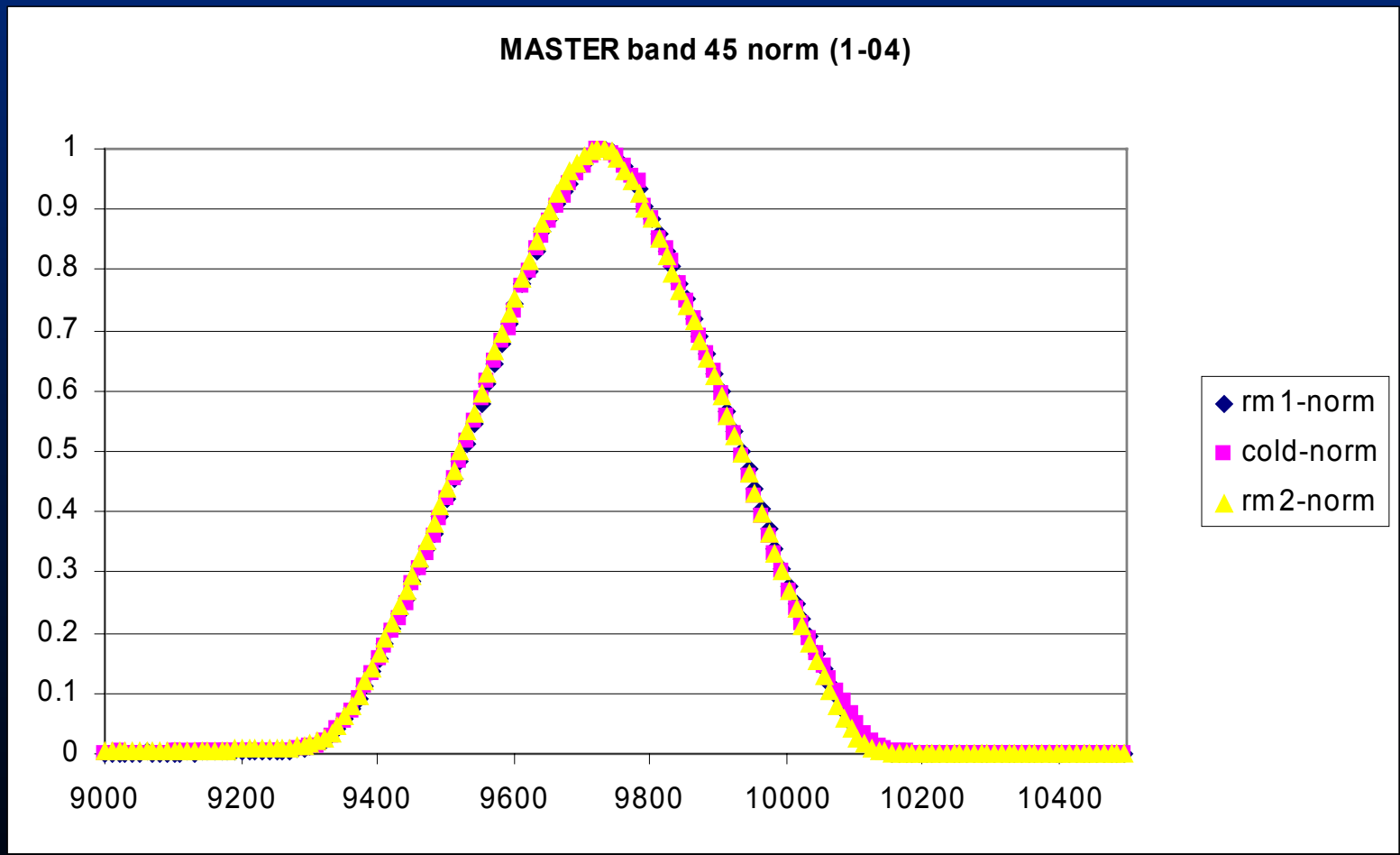
MASTER Spectral Stability Experiment (Two Hr. Cold-Soak at -20C, 12/03)



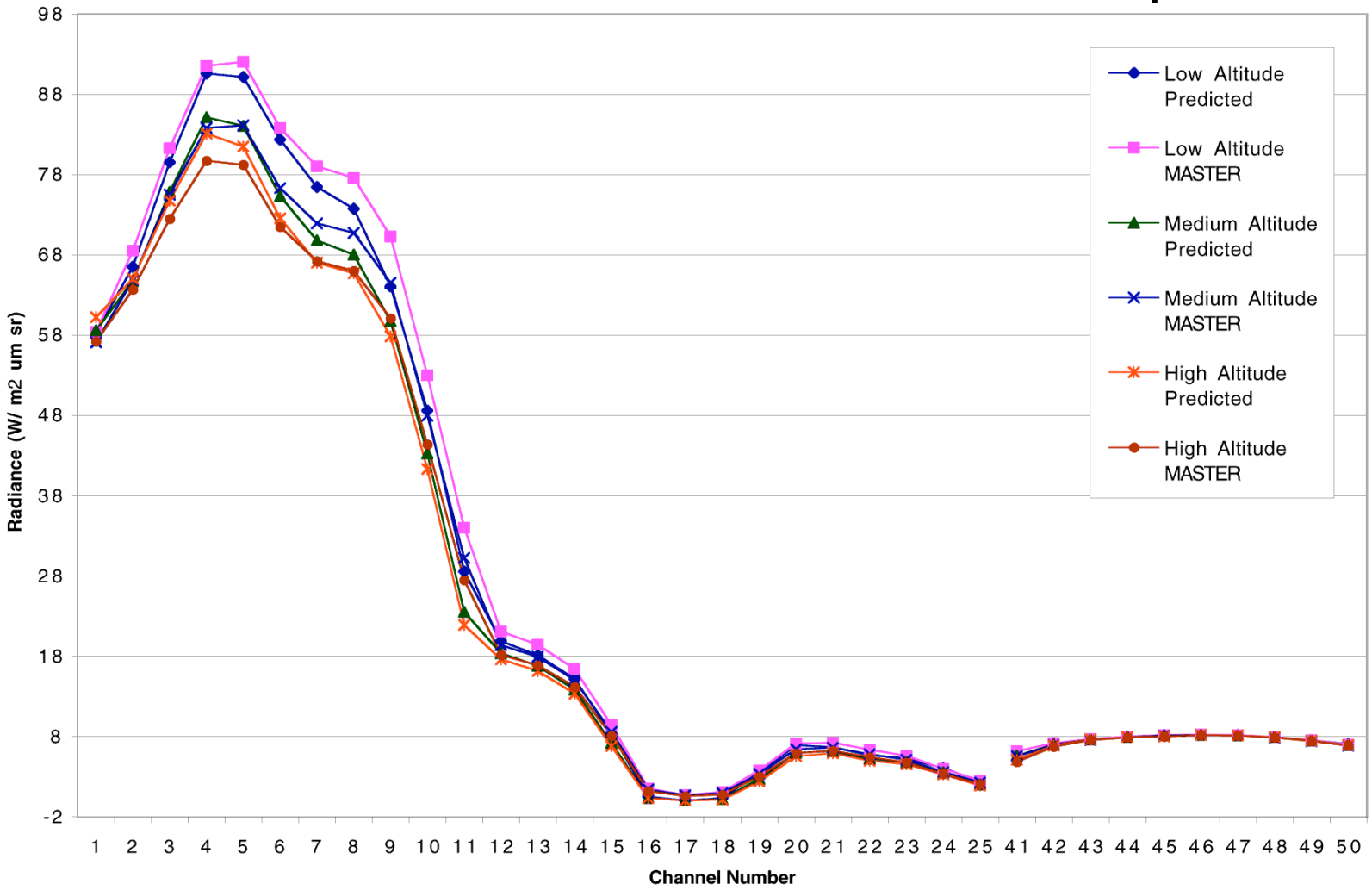
MAS Spectral Stability Experiment (Two Hr. Cold-Soak at -20C, 3/04)



MAS Spectral Stability Experiment (Two Hr. Cold-Soak at -20C, 3/04)

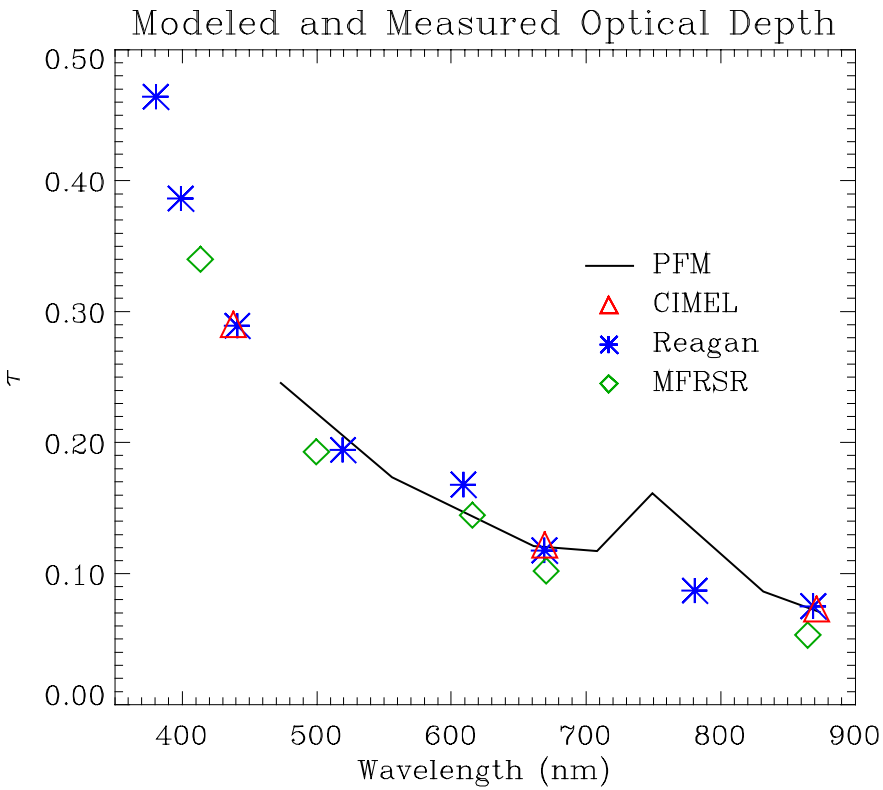


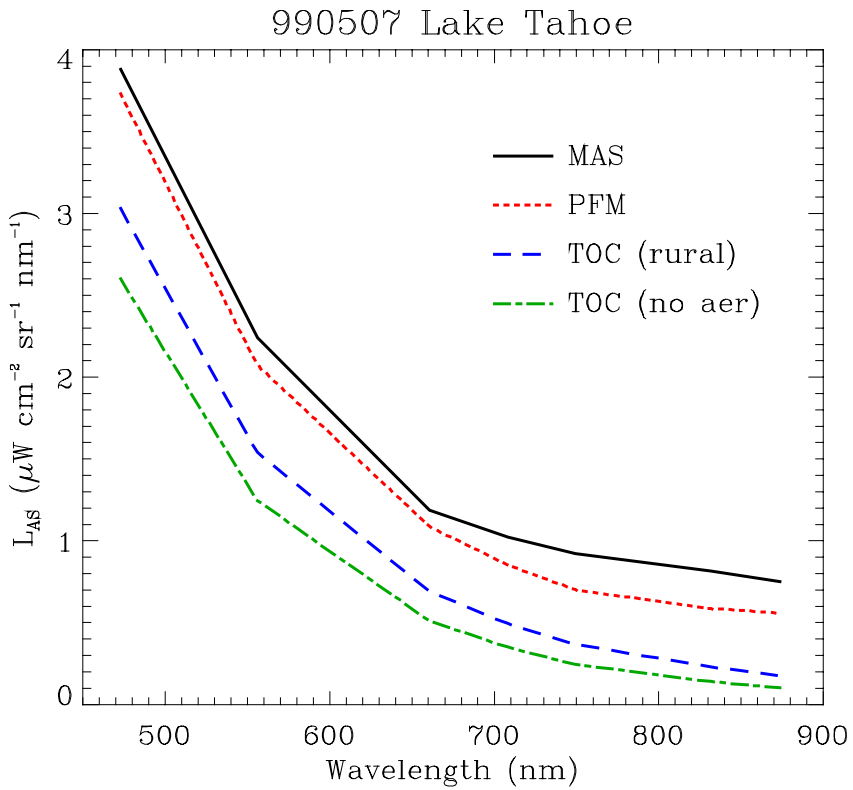
12/98 MASTER Calibration Validation Experiment



(Thome, Univ. of Arizona, Hook, JPL)

MAS Dark Target Cal/Val





PFM: Phase Function Model

TOC: Traditional Optical Closure

J. Vanden Bosch, NASA DFRC Airborne Science Program

Airborne Sensor Facility

Mission Statement:

- Develop and Operate Prototype Remote Sensing Instruments
- Collect Imagery for NASA Earth Science Research Programs
- Coordinate & Manage Non-NASA Platforms for ESE

Component Labs For:

- Sensor Engineering, Integration & Operations
- Data Processing and Archiving
- NIST-Traceable Sensor Calibration

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