



**Suborbital Science  
Program**

**Sensor Program  
Element**

**Airborne Science &  
Technology Lab**  
Jeff Myers  
U.C. Santa Cruz





# Sensor Element Functions

## **Engineering Support:**

Assists with payload integrations and promotes the portability of systems by developing common platform interfaces and infrastructures

## **Sensor Operations:**

Maintains a small suite of facility sensors and support equipment for multi-disciplinary ESD use and provides flight planning for remote sensing missions.

## **Sensor Technology Development:**

Engages in airborne instrument technology development, specializing in infrared sensors and high-speed airborne data systems.



# Engineering Support

## Payload Integrations:

### Ikhana UAS:

AMS, DCS, MicroMaps

### WB-57:

NOBALT, DCS, Remote Sensing Spear Pod

### ER-2:

DCS & video

### B-200s

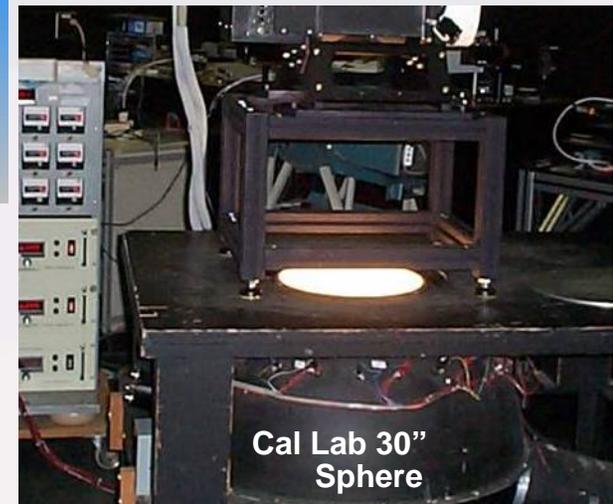
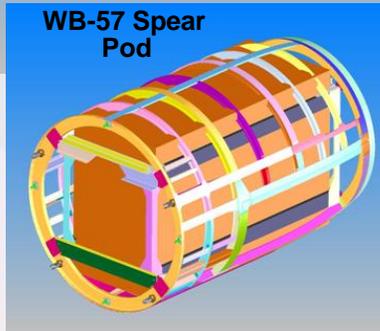
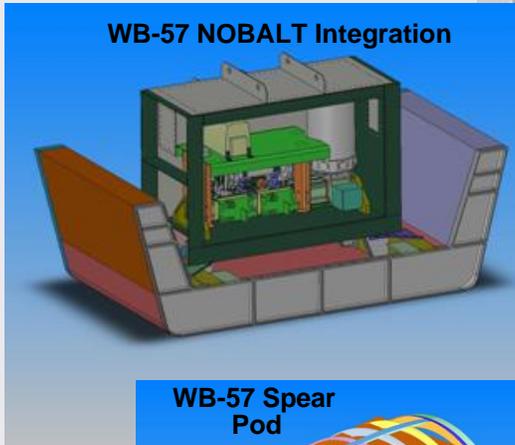
LVIS Lidar, DCS

### J-31:

CAR, POS-AV

## IR Instrument Calibration Lab

Provides NIST-traceable spectral and radiometric measurements for multiple radiometers and imaging devices



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# Operational Systems

## Sensor Systems:

UAS-Modular Sensor System (AMS)

DCS & Video Cameras

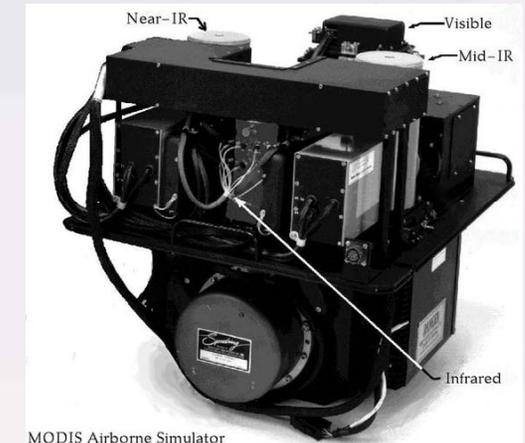
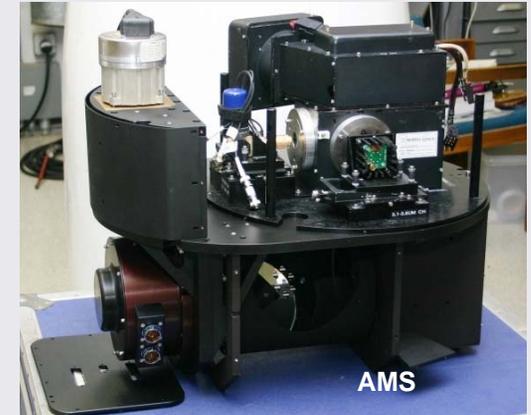
MODIS & ASTER Airborne Simulators  
(joint w/ EOS)

## Support Equipment:

POS-AV stand-alone precision  
navigation systems

Navigation Data Recorders and  
Experimenter Interface Panels

Misc. pressure housings, power  
supplies, high-altitude heaters, etc.



## MAS

CC-VEX (Maring)- 12 Flights (ER-2)  
Monterey Bay (Bontempi) - 1 Flight

## MASTER

Southern CA Faults (LaBrecque) - 16 Flights (B200)  
ASTER Mapping Improvements (LaBrecque) – 2 Flts (B200, ER2)  
EOS thermal data Validation (King) – 5 Flights (ER-2)

## DCS Tracking Camera

Snow Products (Maiden) - 7 Flights (Twin Otter)  
Coral Bleaching (Bontempi) - 9 Flights (Twin Otter)  
AVIRIS (Wickland) 8 Flights (Twin Otter)  
ASTER Mapping Improvements (LaBrecque) – 3 Flts  
(B200/ER2/Twin Otter)

## AMS

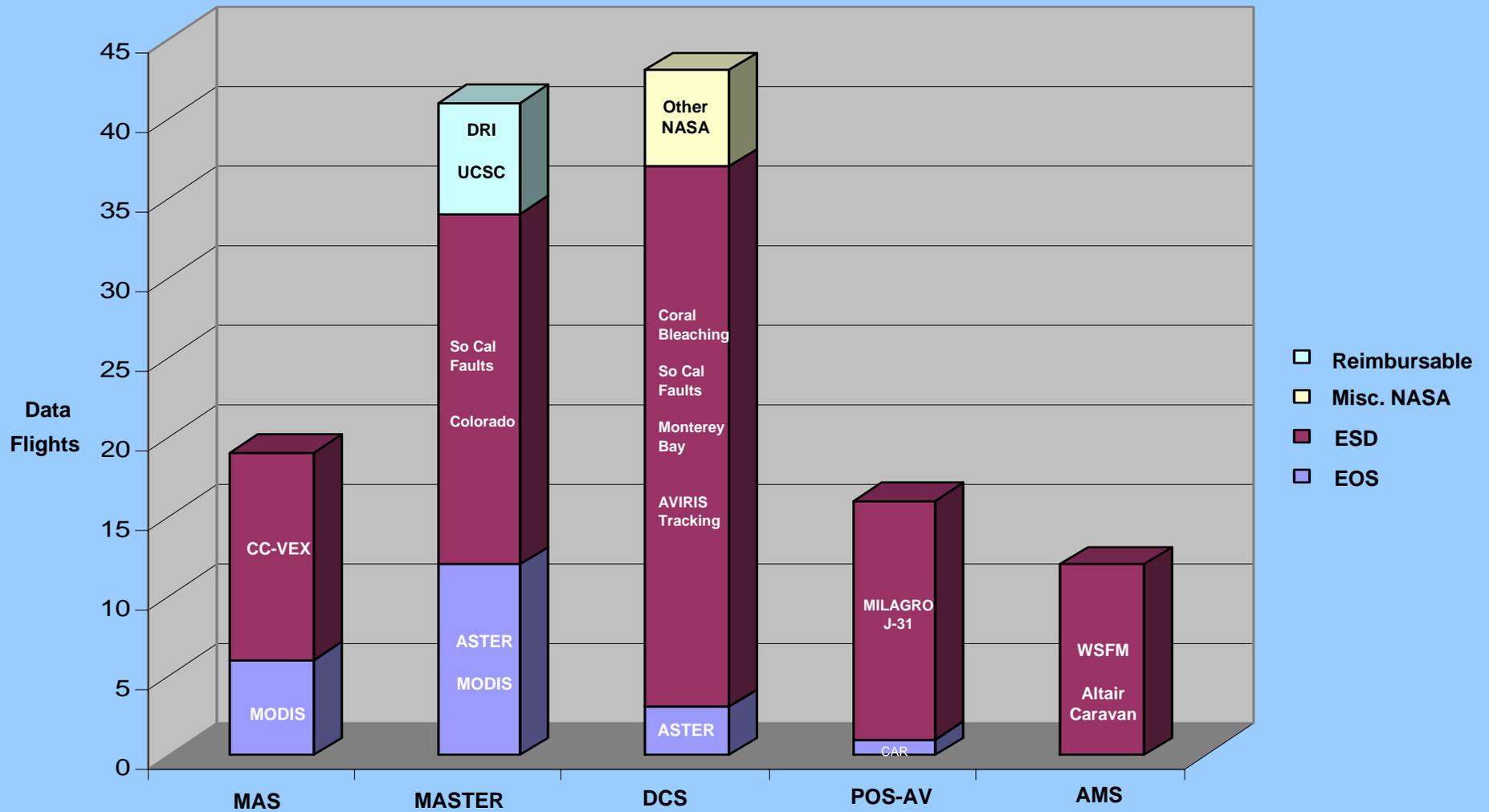
Western States Fire Mission (Ambrose) – 5 Flights (Altair UAV)  
WRAP Hunter Liggett (Ambrose) – 4 Flights (Cessna Caravan)

## POS-AV

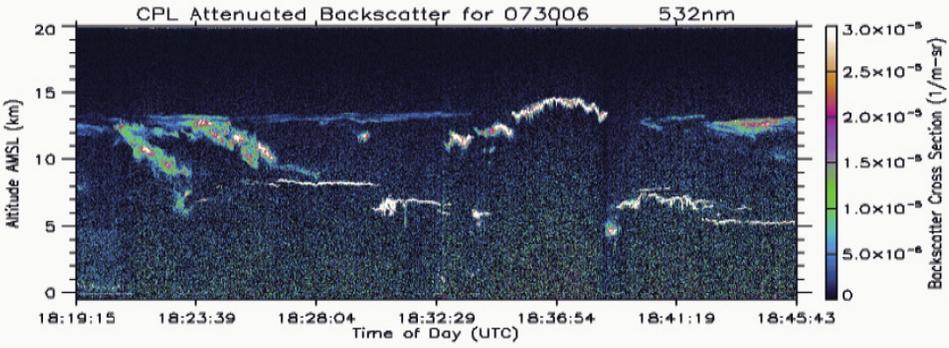
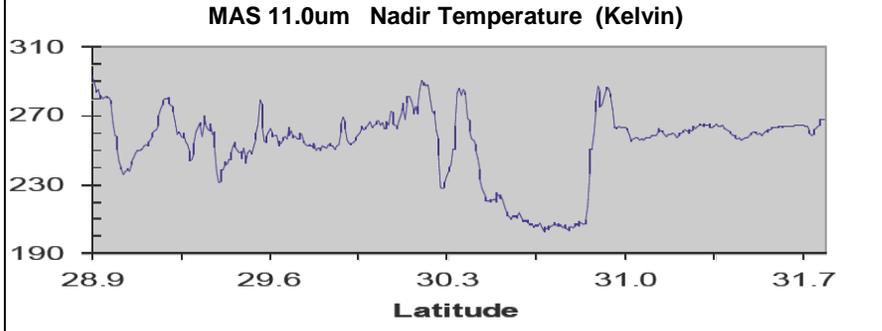
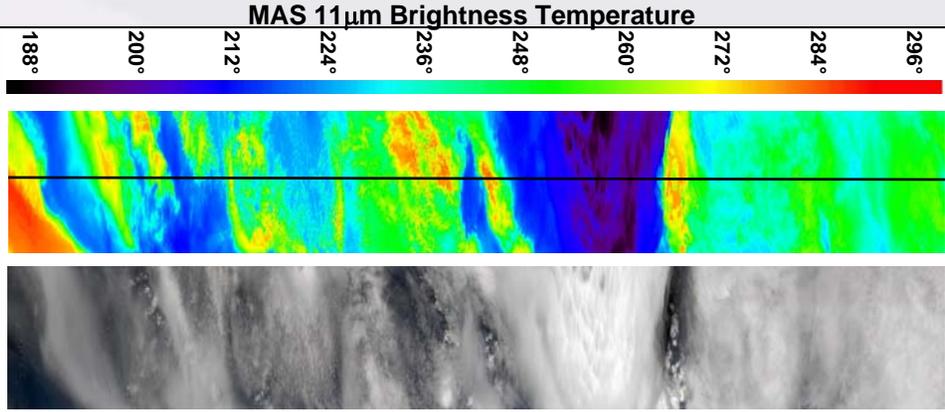
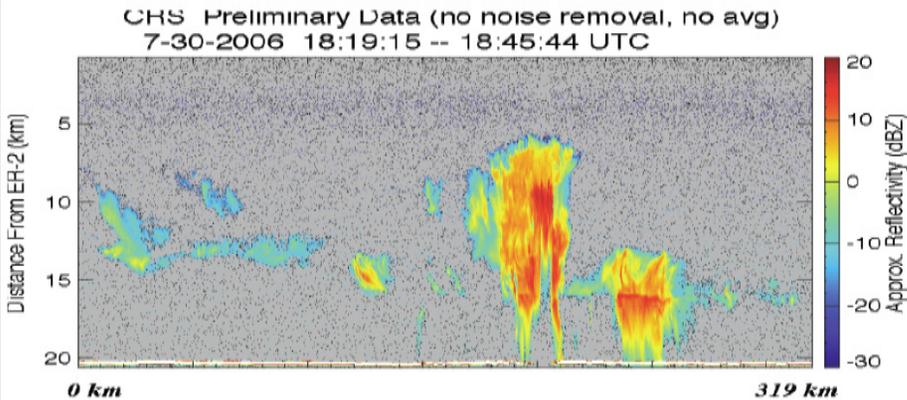
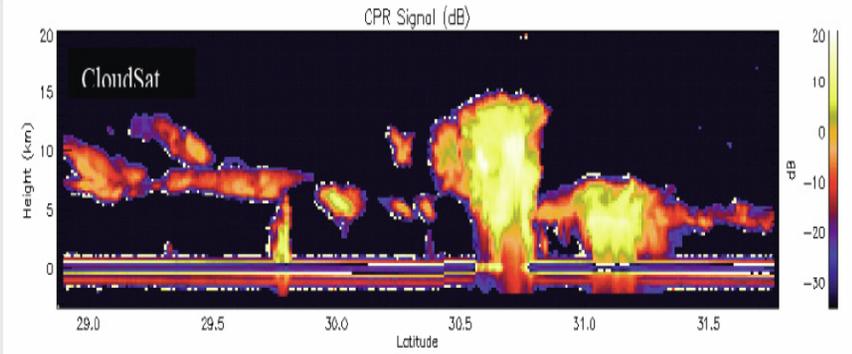
MILAGRO (Maring) – 16 Flights (J-31)



# FY06 Sensor Utilization



# Data Collections: CCVEX



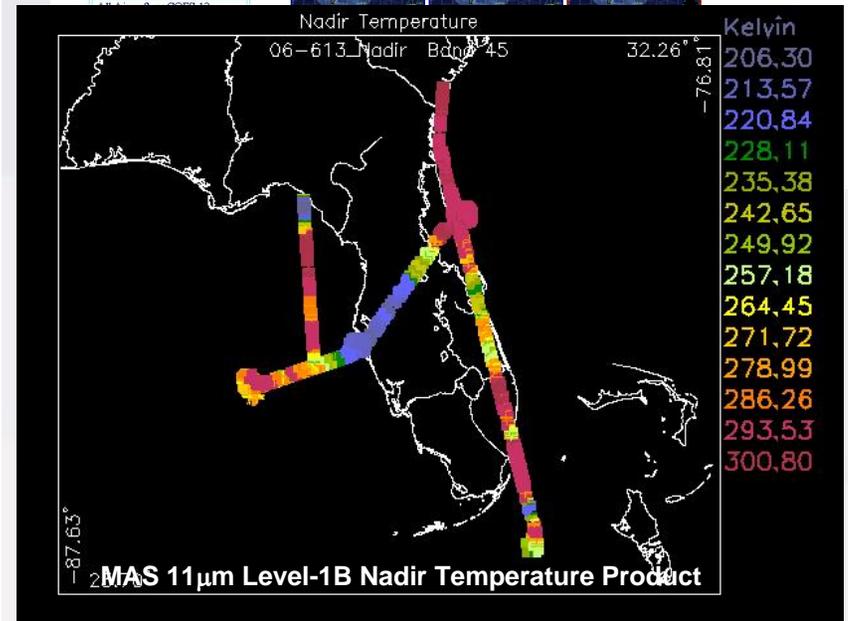
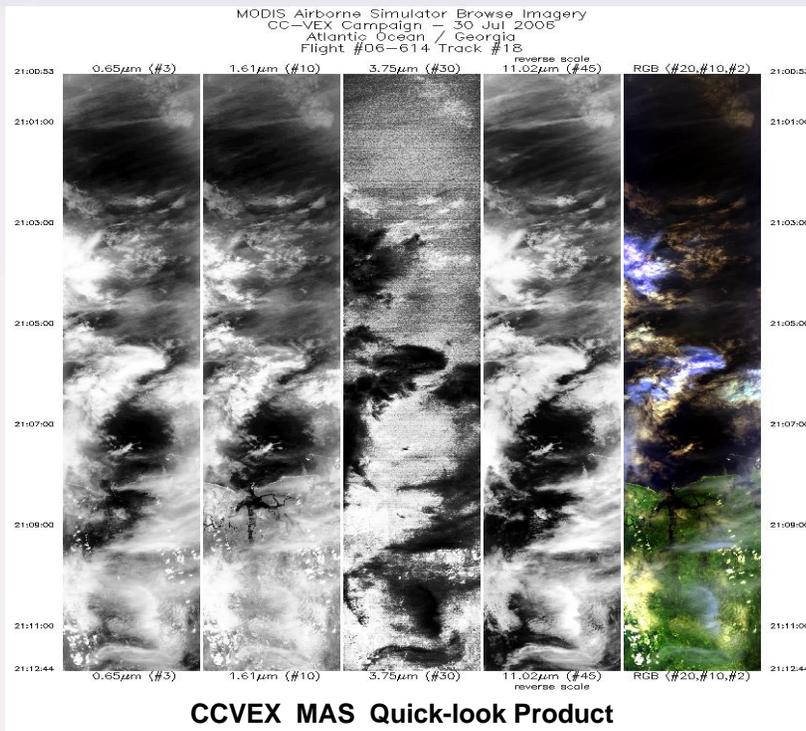
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# Science Support: CCVEX

## Daily Generation of:

- MAS Quick-Looks
- Preliminary Level 1B & L2 MODIS products
- Nadir Temperature data & plots
- ER-2 Navigation Data Products

## CCVEX Web Page Construction



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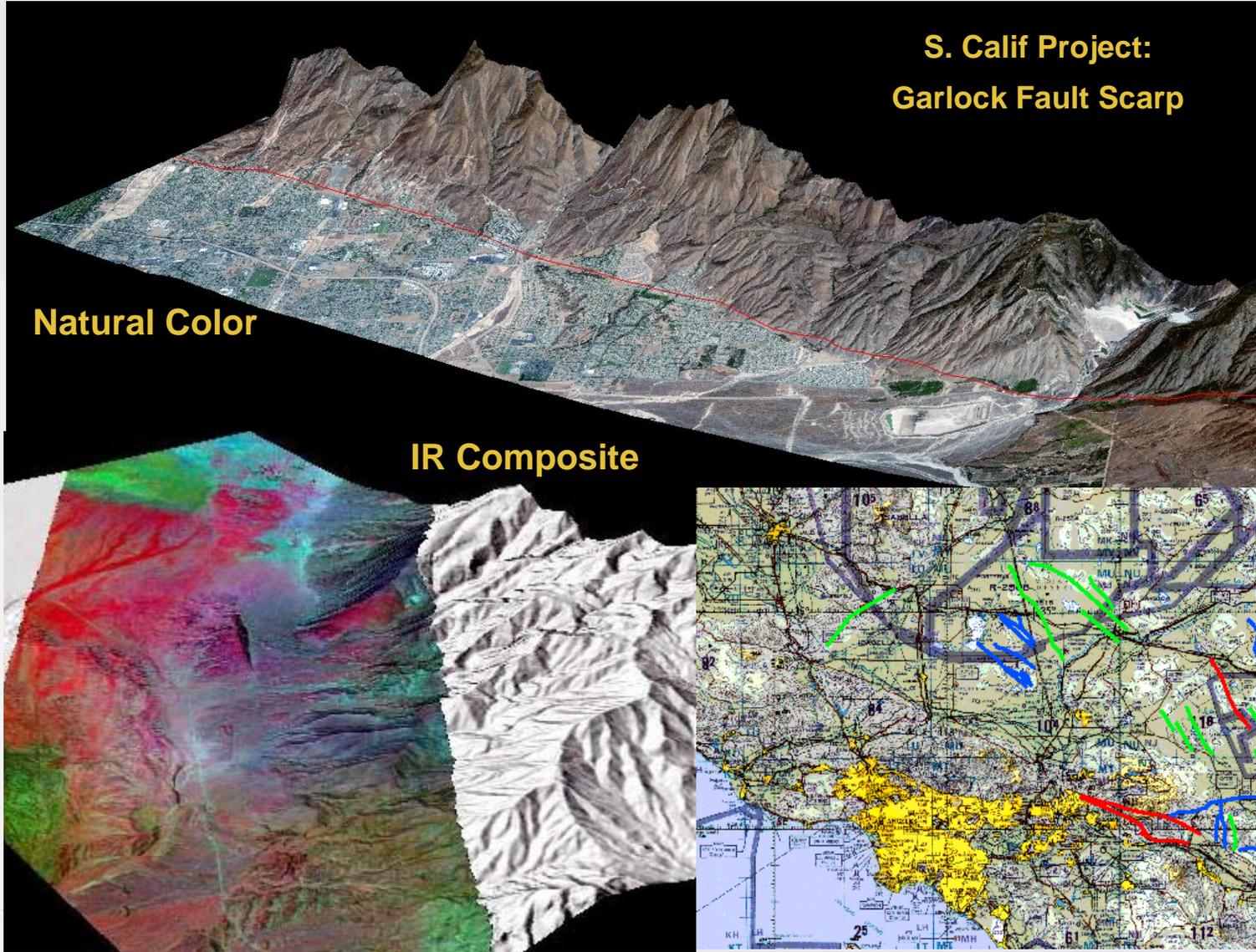
# DATA Collections: MASTER POS-AV

## S. Calif Project: Garlock Fault Scarp

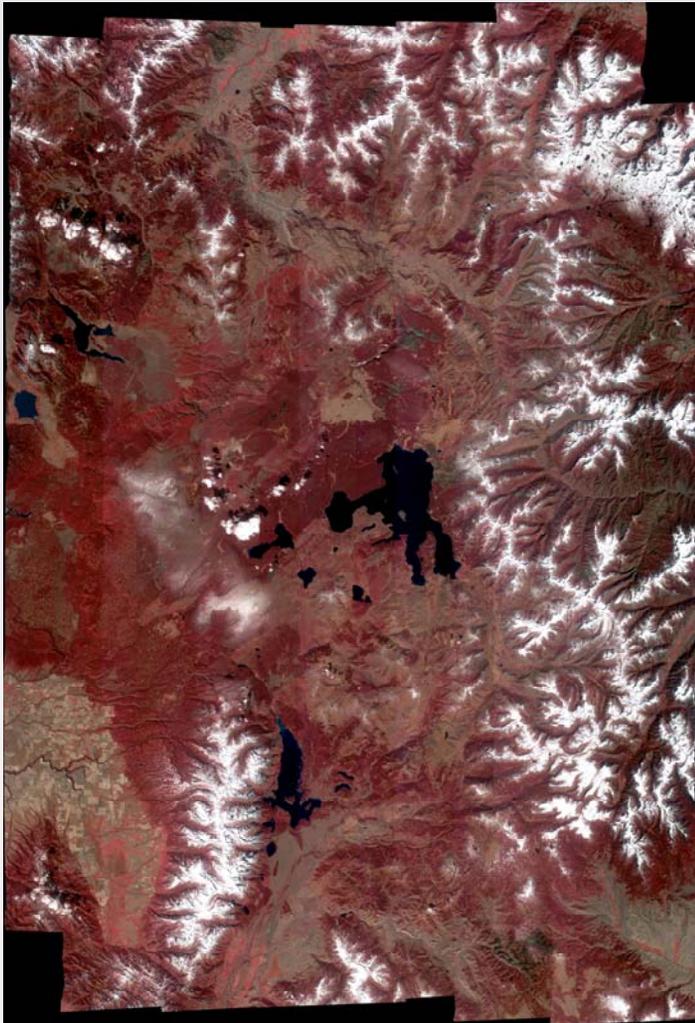
Natural Color

IR Composite

B200 Flight Lines  
(Day/Night Repeat-  
Pass Coverage)

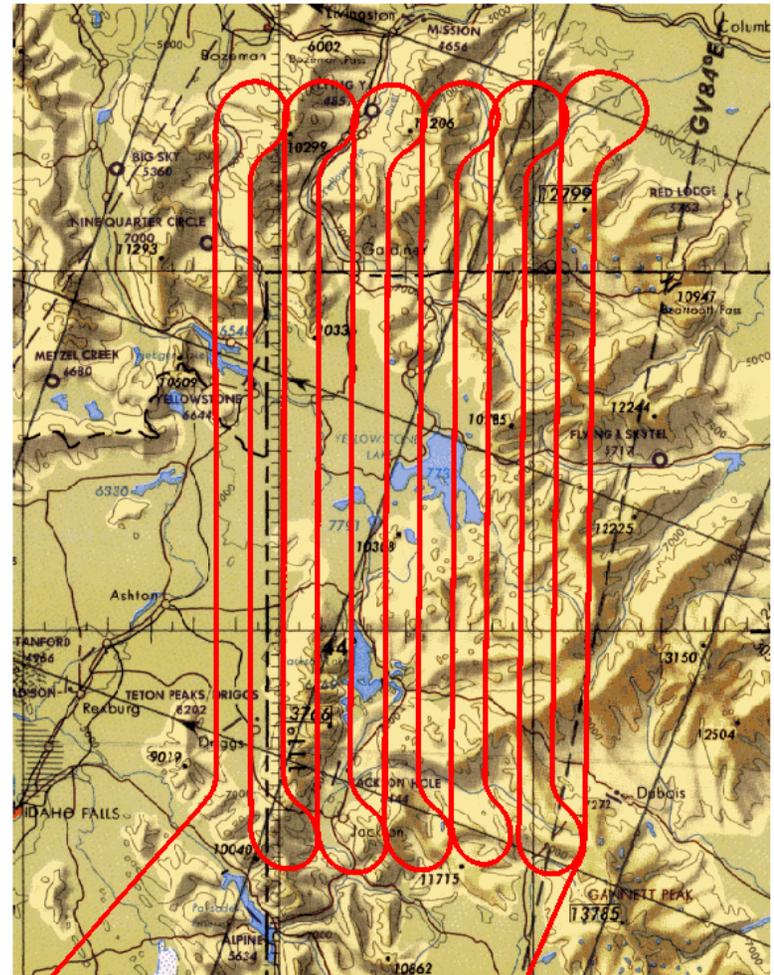


# MASTER Data Collections: Yellowstone



MASTER 12 Flight Line Ortho Mosaic

## ER-2 Flight Lines

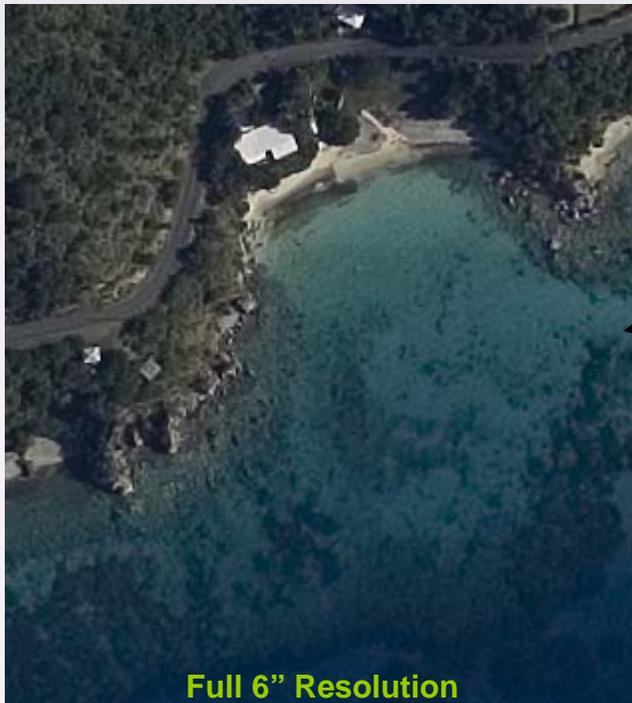


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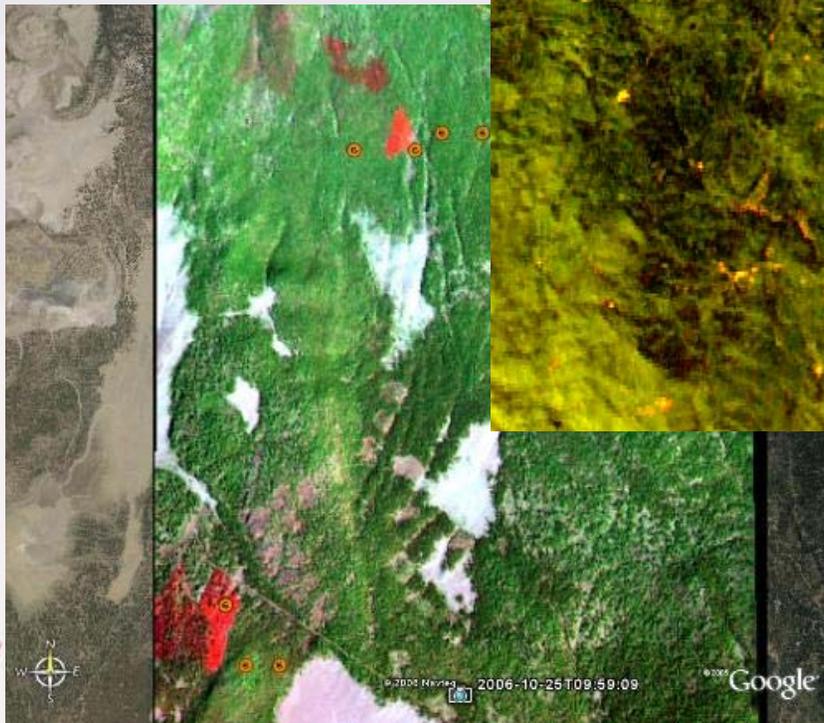
# Data Collections: DCS Tracking Camera

**Coral Reef AVIRIS  
Twin Otter Missions  
Puerto Rico (natural color)**

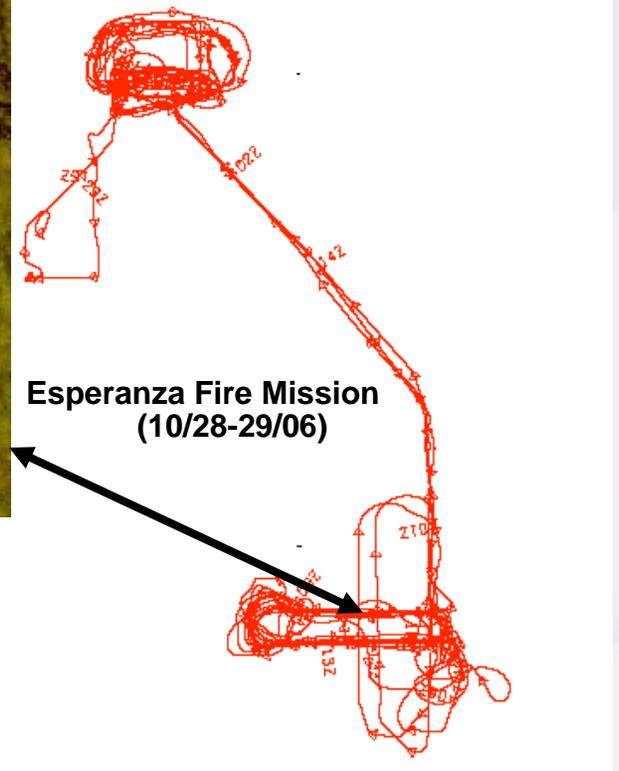
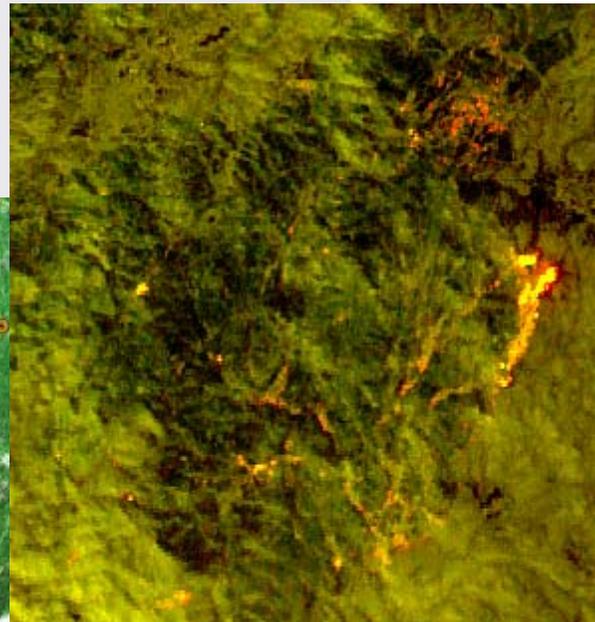


# UAS-AMS: Western State Fire Missions

- Demonstrated extensive real-time onboard data processing
- Payload Sat-Com (3 Mbs down X 9.6 Kbs up)
- CDE & Google Earth Internet Image Distribution
- Joint SSP & REASON-CAN



Real-time Data Display: Yosemite Area  
10/25/06



Esperanza Fire Mission  
(10/28-29/06)

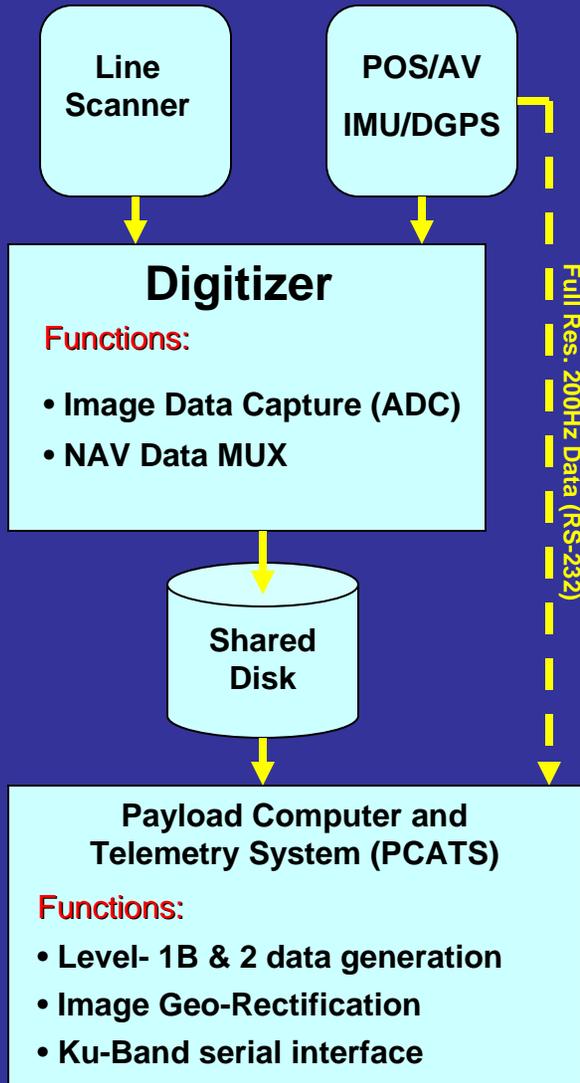
07-001-03 28-29 OCTOBER 2006 ALTAIR AMS-L (2.5MRAD)  
CONFORMAL PROJECTION: SP1 = 33.9 SP2 = 34.9 CM = -117.1 ROTATED BY 0.0  
S TO 16+26+00 UT SCALE 1:1.13E+06 TIME TICK EVERY 6.00 MINUTES



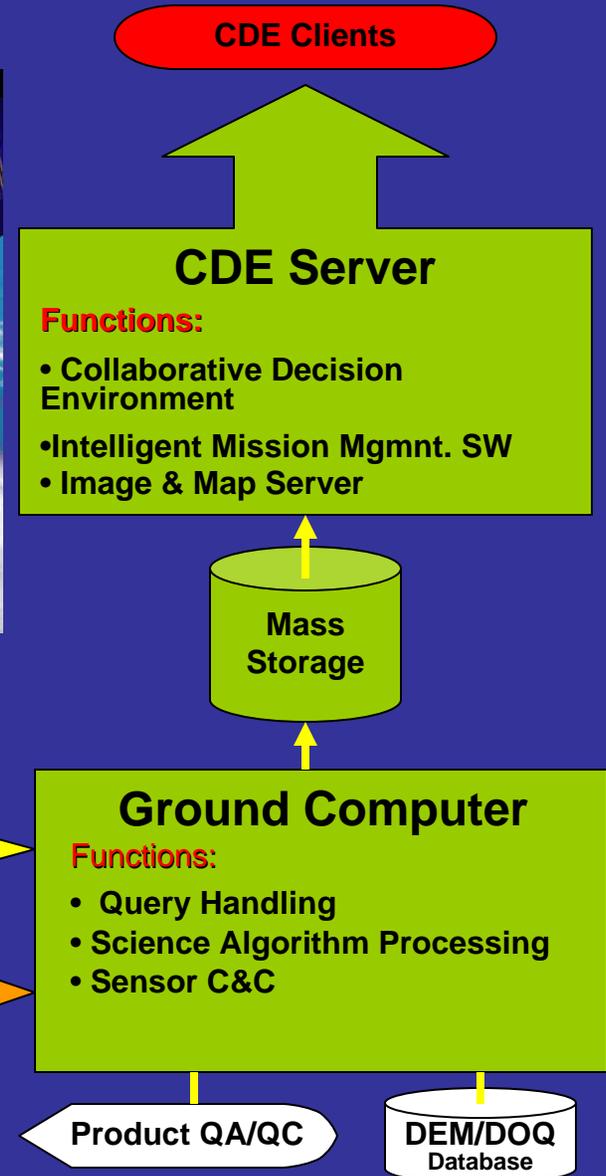
# Sensor Web Implementation

(Western States Fire Mission, 10/06)

## Airborne Element



## Ground Element



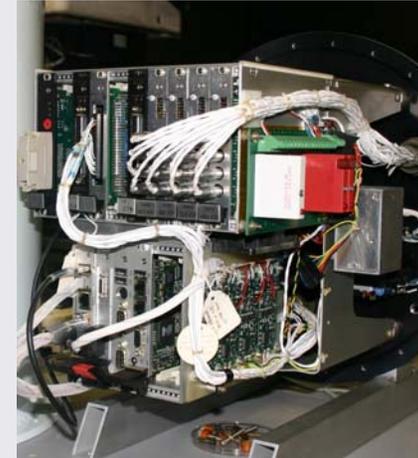
# Sensor Technology Development

## Ongoing Projects:

- UAS Autonomous Modular Sensor System
- PCATS High-speed telemetry interface computer
- New Navigation Data Recorder
- Upgraded tracking cameras (DCS, Video)
- Expanded Suborbital Web Portal

## HQ Solicitations Supported:

- ROSES: AURA validation UAS payload
- ROSES: IPY UAS payload development
- ESTO-IIP: Ongoing evaluation of suborbital support requirements



AMS and PCATS Data Systems



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# '07 Upcoming Data Collections

**MAS: CLASIC (ER-2)**

**MAS: TC-4 (ER-2)**

**MASTER: So. Calif. Seismic Surveys (DoE B-200)**

**AMS & PCATS: Western States Fire Missions (Ikhana)  
: Ocean Color Imager test flights (Caravan or  
Twin Otter)**

**DCS: Misc. AVIRIS & MASTER Missions (various aircraft)**



# New Suborbital Program Web Portal

Contains Information on:

- Program overview
- Platforms
- Instrumentation & Integrations
- New Technology
- Missions

Online Flight Request Tool

Eventually to include:

- Real-Time Display of Mission data
- Internet portal for connectivity with payloads
- Interface to IMM/CDE and “Sensor Web” environments

NASA National Aeronautics and Space Administration

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Science Mission Directorate

- PROGRAM

+ FLIGHT REQUEST

+ IMPLEMENTATION

+ POINTS OF CONTACT

+ CALL LETTER

+ ICCAGRA

+ REPORT TO CONGRESS

**SUBORBITAL SCIENCE PROGRAM**

Our mission is to enable science research and applications of unique aircraft and sensors to provide in-atmosphere observations that augment space systems and characterize regional or localized phenomena at high spatial and temporal resolutions.

**ABOUT THE SUBORBITAL SCIENCE PROGRAM**

The Suborbital Science Program within the Earth Science Division is responsible for providing aircraft systems that further science and advance the use of satellite data. The primary objectives of this program are to:

- Conduct in-situ atmospheric measurements with varying vertical and horizontal resolutions
- Collect high-resolution imagery for focused process studies and sub-pixel resolution for spaceborne calibration.
- Implement "sensor web" observational strategies for conducting earth science missions including intelligent mission management, and sensor networking.
- Demonstrate and exploit the capabilities of uninhabited and autonomous aircraft for science investigations
- Test new sensor technologies in space-like environments
- Calibrate/validate space-based measurements and retrieval algorithms

To meet these observing objectives, we need a suite of sustained, ongoing platforms and sensors on which investigators can rely from year to year; from these known capabilities the Science Mission Directorate can develop observing strategies. However, an ongoing capability will be resource-constrained and eventually technology-constrained, so that not all observing requirements will be met with the limited core capability. Therefore the program will facilitate access to other platforms or sensors on a funds-available, as-needed basis, to accommodate unique and/or occasional requirements. The program will also look constantly for new, evolving technologies to demonstrate their applicability for Earth science. Depending on the success of the demonstrations and the observing needs, the core capability is expected to evolve and change over time. The speed and extent of change will be balanced against the need for established, known capabilities for long-term planning.

**RESEARCH OPPORTUNITIES**

**Aircraft Catalogue Solicitation**  
NASA Science Mission Directorate Announcement  
+ Synopsis  
+ Solicitations

**International Polar Year Science Mission Directorate**  
NASA Research Announcement  
+ Read More

**NSPIRES**  
**Atmospheric Composition, Tropospheric Composition, and Climate Coupling Experiment**  
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**ADDITIONAL LINKS**

**science @ nasa**  
Science @ NASA  
The Science Mission Directorate Website  
+ Read More  
+ Strategic Plan (pdf)

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