

# ARM

CLIMATE RESEARCH FACILITY

## Aerial Facility



Jason Tomlinson, Beat Schmid, John Hubbe, and Jennifer Comstock

Pacific Northwest National Laboratory

ICCAGRA Meeting

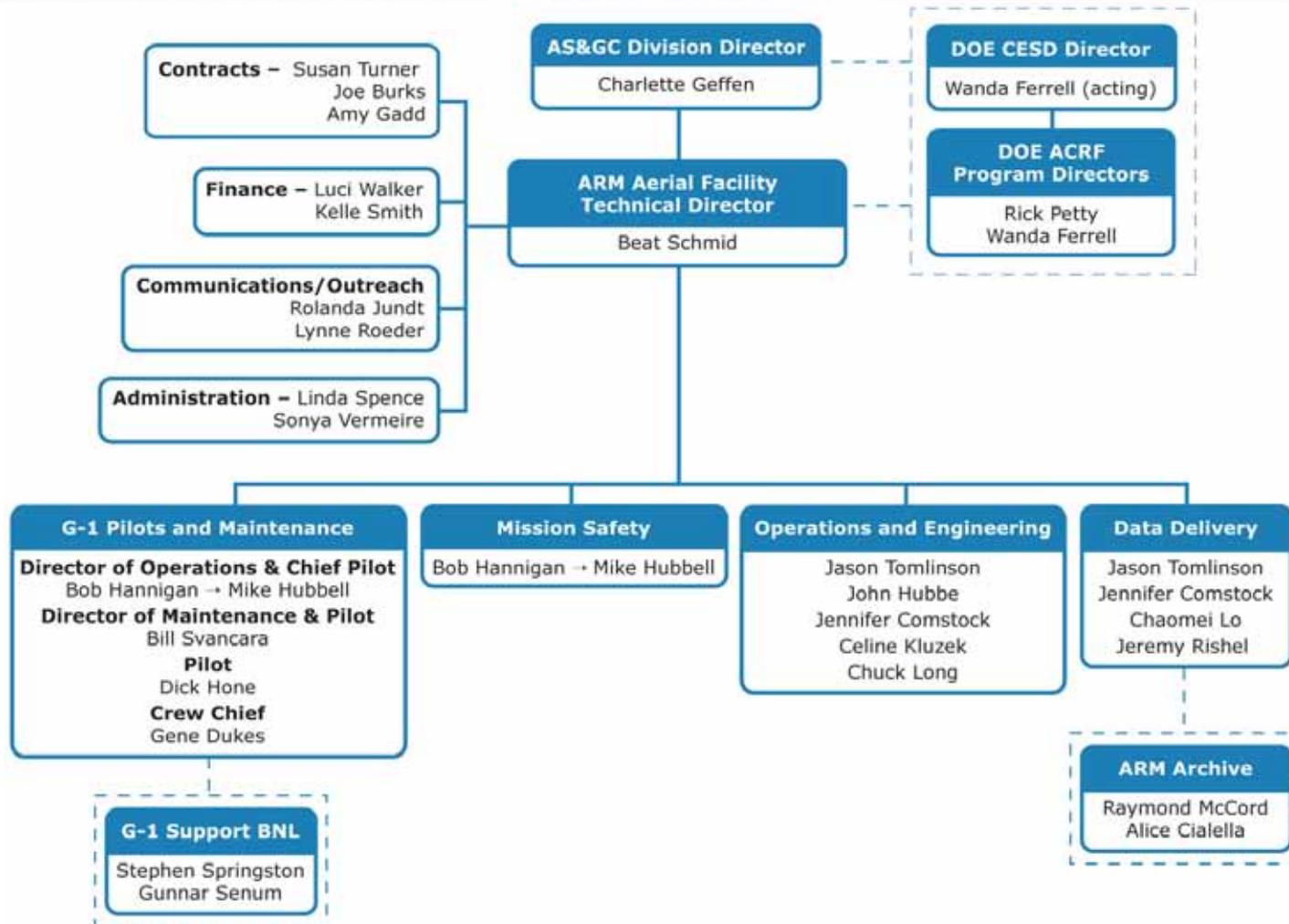
April 6, 2010



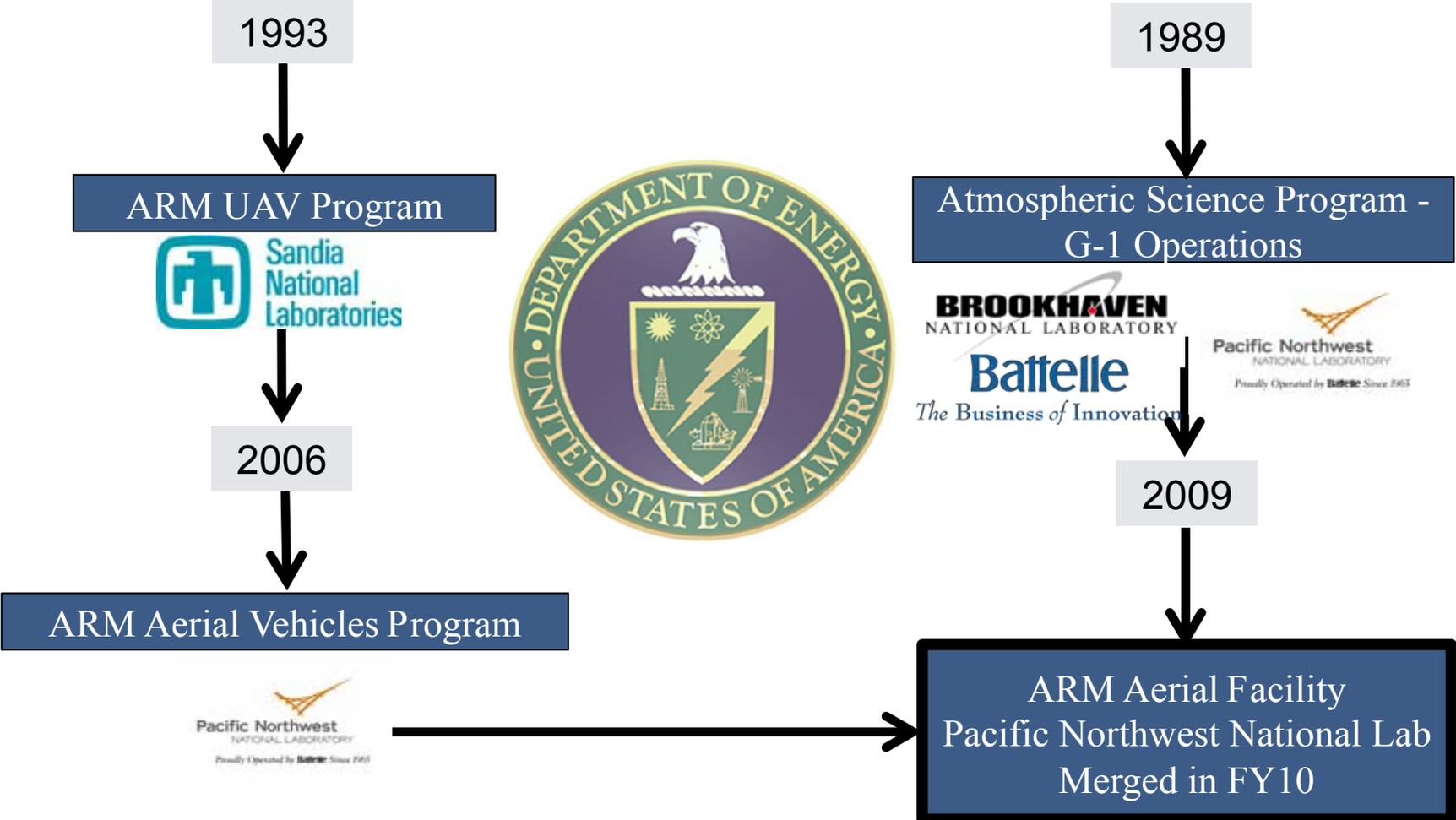
U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

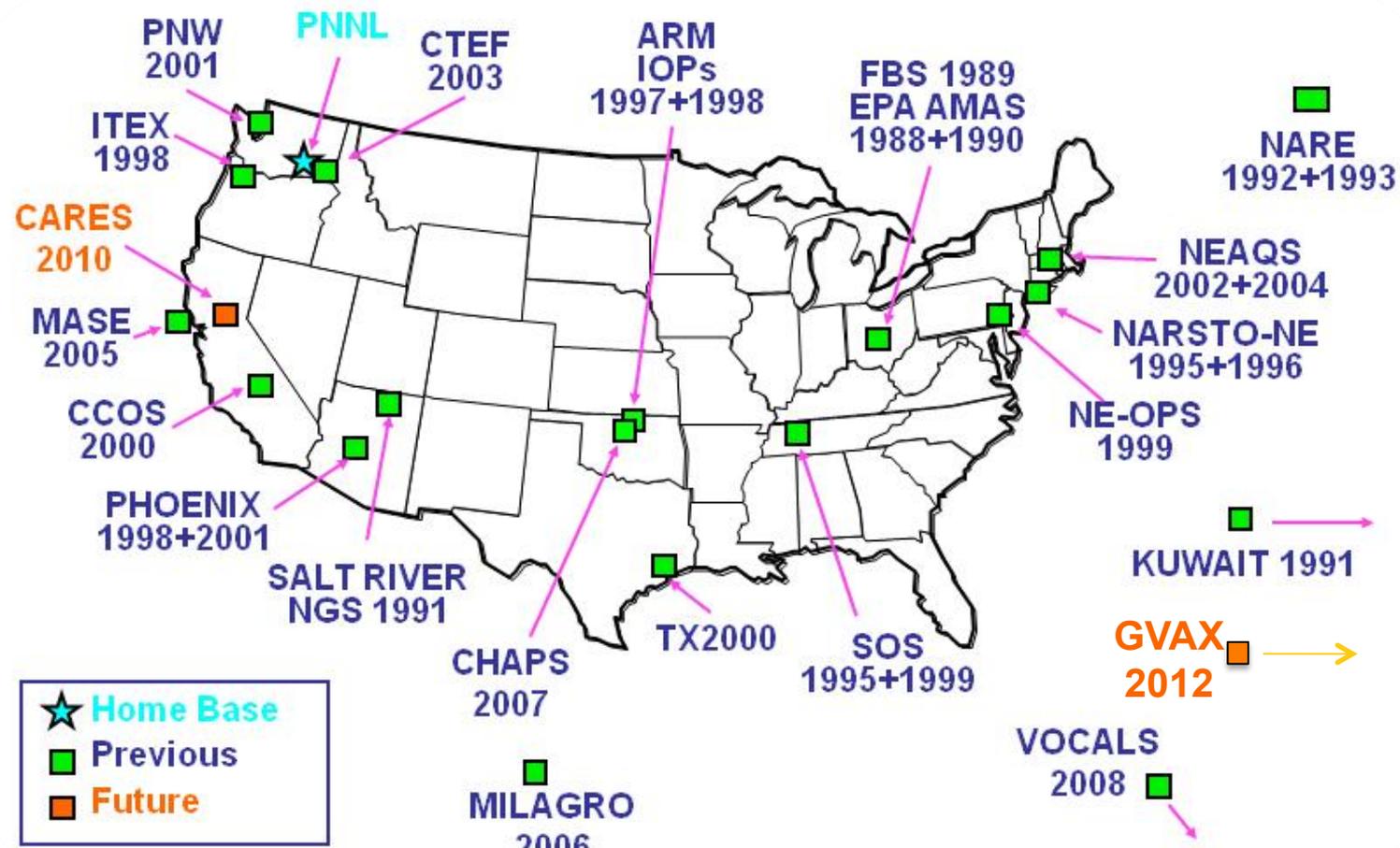
# AAF Organization Chart



# AAF History



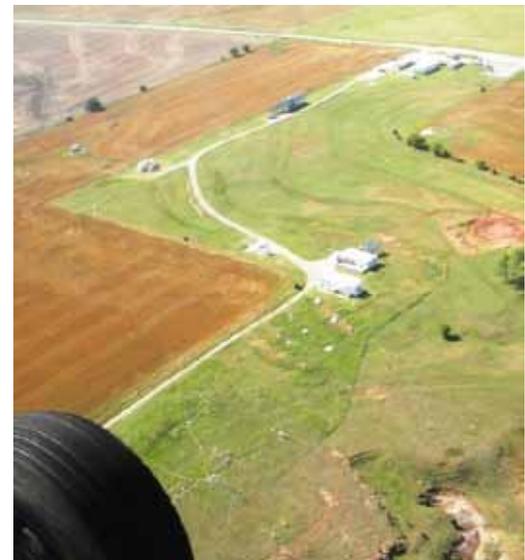
# AAF G-1 Campaigns



★ Home Base  
 ■ Previous  
 ■ Future

# AAF Past Campaigns

- CLASIC over the SGP site; June 2007
- ISDAC over the NSA site; April 2008
- RACORO over the SGP site; Jan – June 2009
- So far worked with 11 different aircraft:
  - ER-2, Lear 25, P-3, B-200, CV-580, J-31, G-1, Twin Otters (2), C206, Bell 206





## Aircraft Technical Information

<b>Length:</b> 63.75 feet (19.44 m)	<b>Wingspan:</b> 78.33 feet (23.88 m)	<b>Height:</b> 23.33 feet (7.11 m)
<b>Cabin space:</b> 165 square feet	<b>Maximum gross weight:</b> 36,000 pounds (16,330 kg)	
<b>Cabin payload:</b> 4,200 pounds	<b>Endurance with max payload:</b> 4 hours	<b>External probes :</b> 8
<b>Crew capacity:</b> 2 pilots, 4 scientists	<b>Research Power:</b> 500A @ 28 VDC (10 KVA @ 110 VAC)	

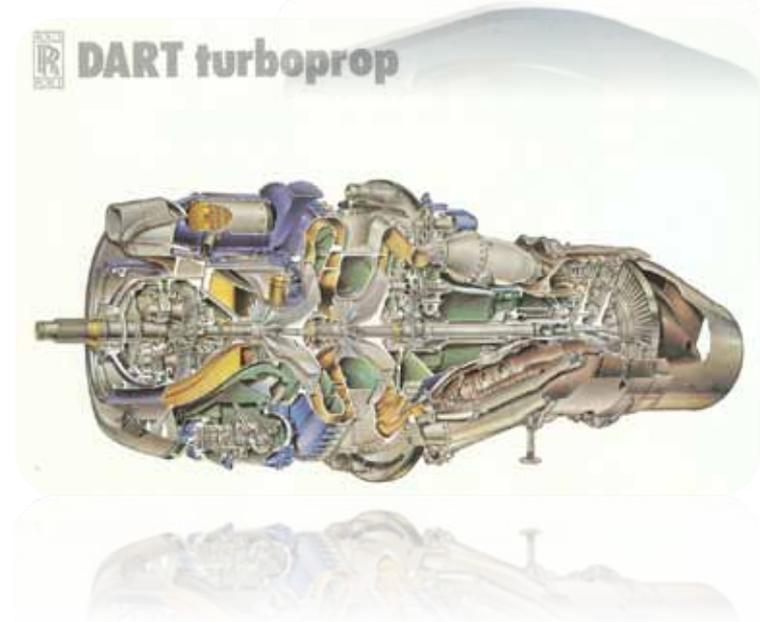
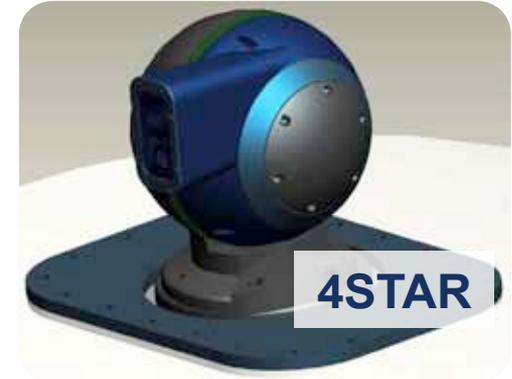
# G-1 Improvements

- Wing Pylons
  - The G1 can now carry 8 probes
    - 6 probes on the wing pylons
    - 2 probes on the nose pylons



# G-1 Improvements (Battelle Capital)

- Zenith looking port for radiometers
  - 4-Star engineering is proceeding well
- Antenna
  - Update TCAS to agree with EU requirements
- Rolls Royce DART1860 Engines
  - More power (2.5%)
  - Greater Fuel efficiency (10-12%)
  - Higher operating ceiling
- Higher capacity generator X
- Power distribution and inverter X upgrade
  - Higher capacity inverters for 115/230 VAC



# Recovery Act

- Procured 18 aircraft/met state parameter probes, cloud probes, and aerosol & gas instruments
- Also funding improvements to the G1
  - New instrument rack
  - New data system
    - fanless brick computers, aircraft LAN upgrade, new IP based KVM, SEA M300, and Labview based data acquisition
  - Instrument Integration and Setup



# Recovery Act



## Adlink MXE-1000

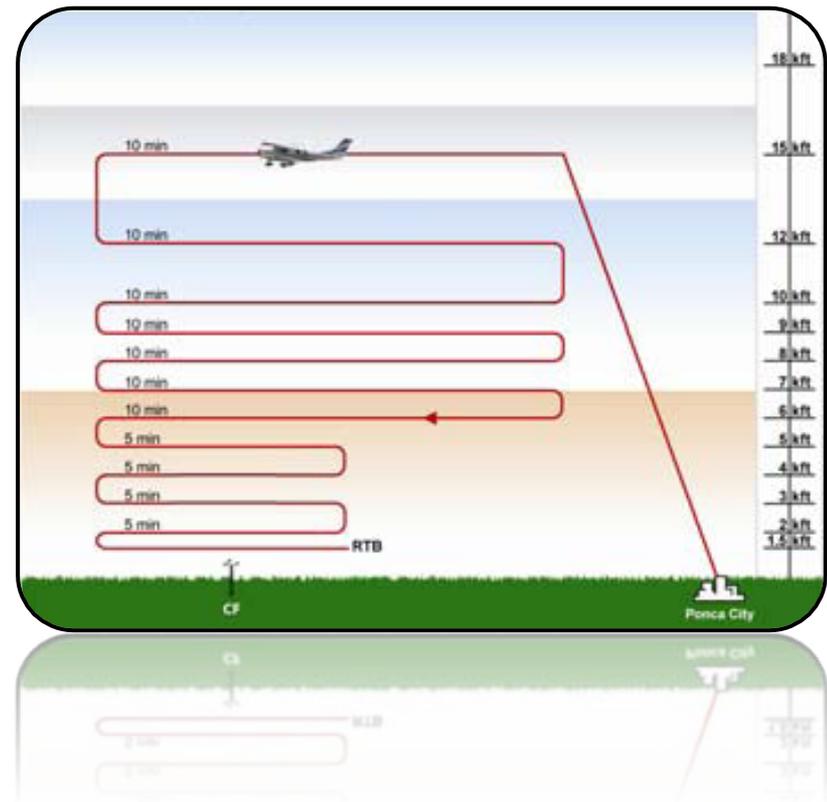
- Intel® Atom™ N270 1.6 GHz processor
- -20°C to 70°C
- Built-in 6 VDC to 36 VDC input
- 100G shock and 5G vibration resistance
- **Can fit 6 of the bricks into a 1U space!**



# ARM-ACME – FY10 (FY11?)

## ARM Airborne Carbon Measurement Experiment (ACME)

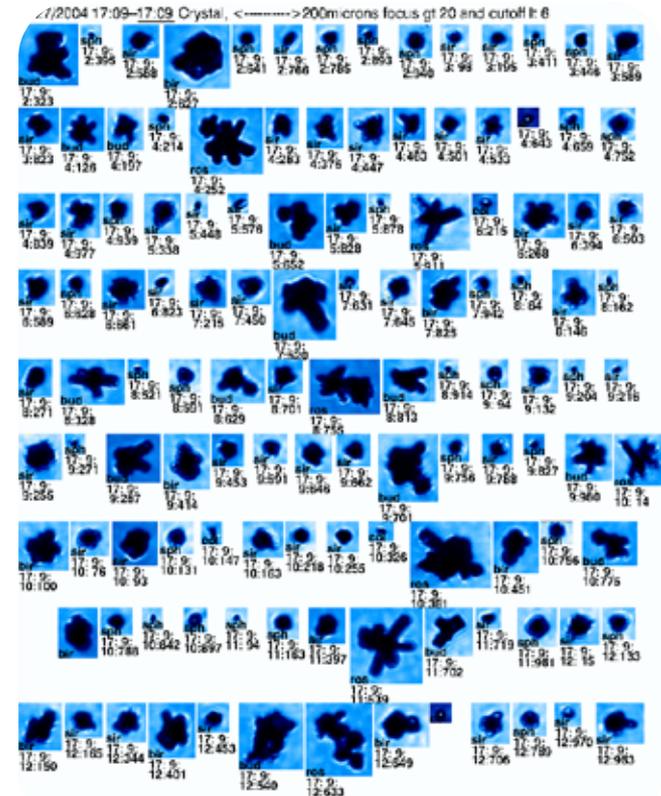
- Routine flights over the SGP site using a Cessna 206
- Measurements of carbon cycle gases and ozone



# SPartICus – FY10

## Small Particles in Cirrus

- Routine Measurements of small ice crystals in cirrus clouds.
- Conducted over the SGP site to facilitate improvement in retrievals
- Will try to coordinate with A-train overpass
- December 1<sup>st</sup>, 2009 to May 31<sup>st</sup>, 2010



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# SPartICus – FY10

## Small Particles in Cirrus

- SPEC Learjet 25
  - 190 Research hours and 10 test flight hours
- Instruments
  - FSSP, CDP, 2D-S, 2D-P, CPI, PCASP, Deep Cone Nevzorov, Rosemount, AIMMS-20, and DLH (NASA – LaRC)



<http://acrf-campaign.arm.gov/sparticus>

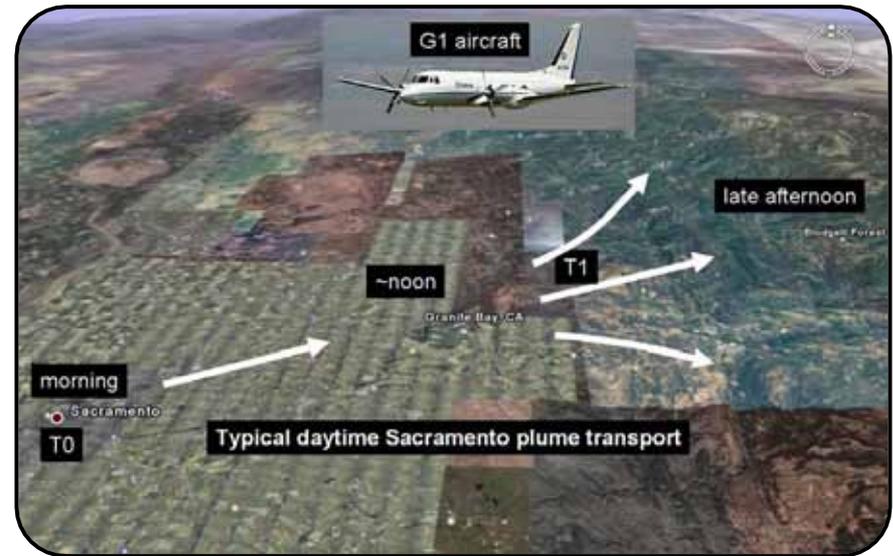
# Instrument Maturation– FY11

- **Airborne Open Polar/Imaging Nephelometer for Ice Particles in Cirrus Clouds** - J. Vanderlei Martins
- **Aircraft Integration and Flight Testing of 4STAR** - Connor Flynn
- **Further Development of the HOLODEC 2 (Holographic Detector for Clouds 2) Instrument** - Raymond Shaw
- **Parameterization of Extinction Coefficient in Ice and Mixed-Phase Arctic Clouds During ISDAC** - Alexei Korolev
- **The Maturation and Hardening of the Stabilized Radiometer Platforms** - Anothony Bucholtz

# CARES – FY10

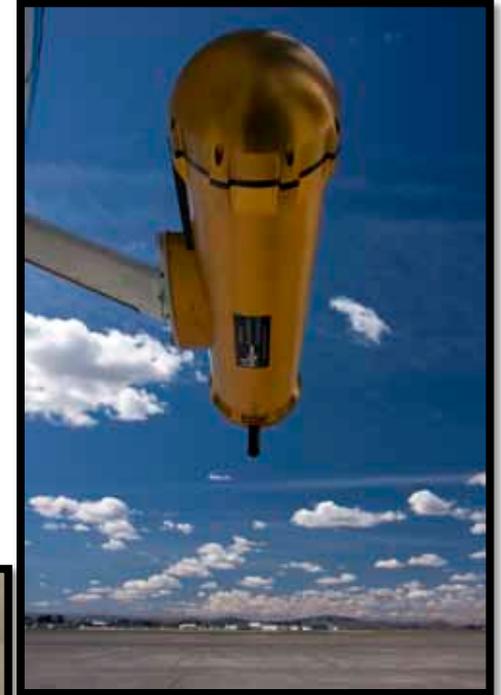
## Carbonaceous Aerosols and Radiative Effects Study (CARES)

- Evolution of the Sacramento Plume
  - 2 Ground Sites (T0 & T1)
- 72 flight hours on the G1
  - June 2 – 28, 2010
- Coordination
  - NASA B200
    - HSRL & RSP
  - CalNex - NOAA WP-3D



<http://acrf-campaign.arm.gov/cares/>

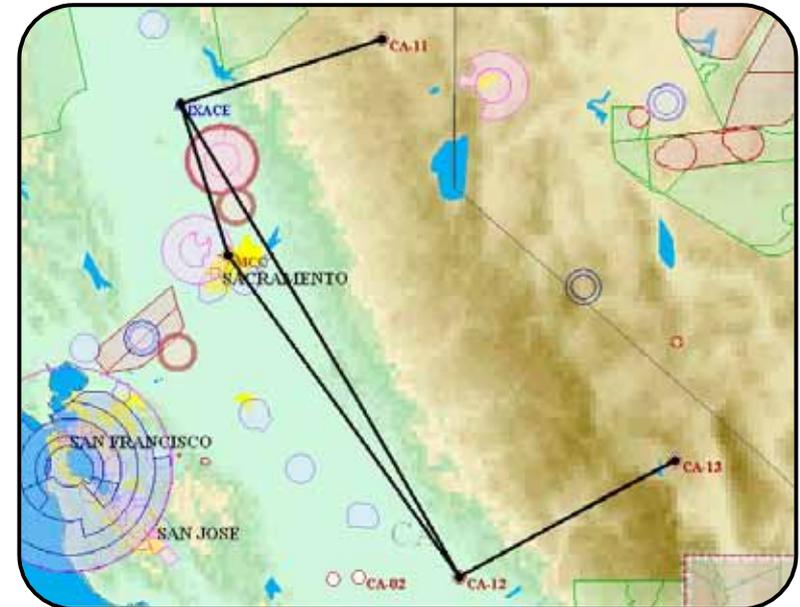
# CARES – Test Flights



# CEC/CalWater – FY11

## California Energy Commission- CalWater

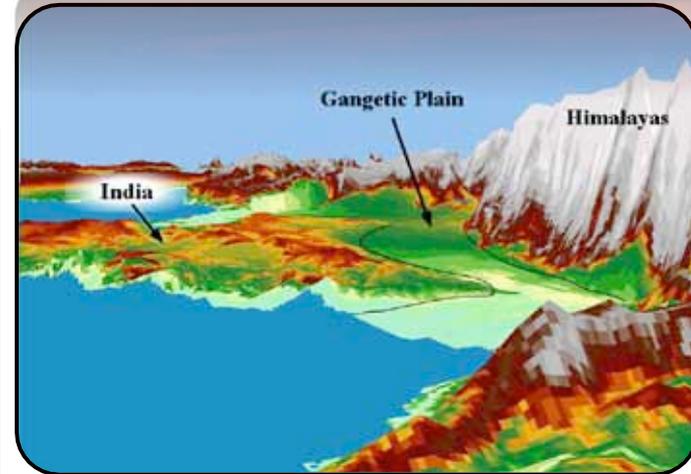
- Investigating the effects of anthropogenic emissions on winter precipitation in the California Central Valley and Sierra Nevada mountain range
- 80 flight hours on the G1
  - January and February of 2011
- Measurements
  - Atmospheric state, LWC/TWC, cloud microphysics, aerosol, and gases
  - Collaborating with CIRPAS on several instruments



# GVAX – FY12

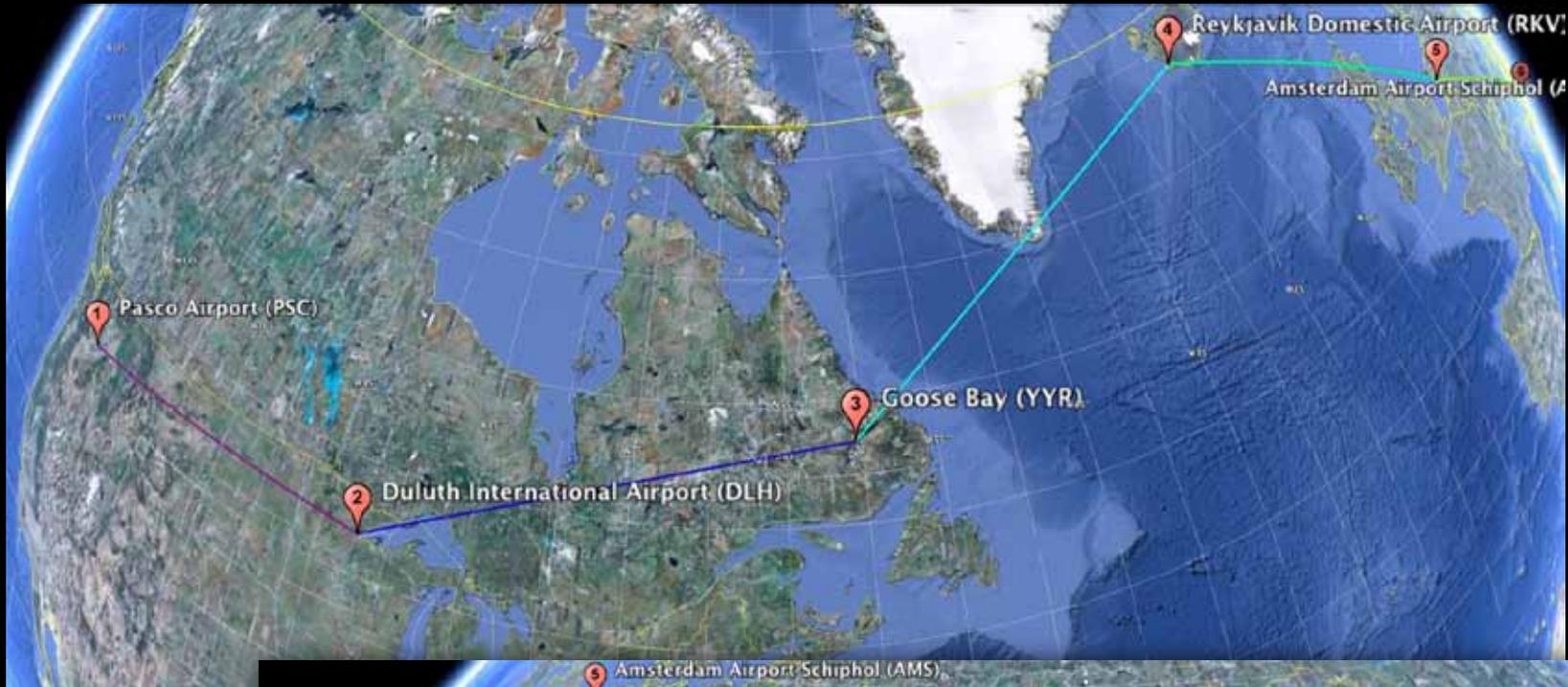
## Ganges Valley Aerosol Experiment

- Study the impact of increasing aerosols on the Indian Summer Monsoon, specifically the impact on precipitation
- G-1 Aircraft
- Coordinated with the ARM Mobile Facility
- January to March, 2012
  - Specific dates TBD



# GVAX – FY12





# AAF Proposal Process

- Submit Preproposal
  - Short summary of proposed campaign
  - Reviewed by the Infrastructure Management Board and/or ARM Science Board
  - PI should demonstrate funding for research is secured
  - **Due February 1**
- Submit Full Proposal
  - Reviewed by ARM Science Board
    - Ranked on scientific merit, feasibility, and costs
  - **Due May 1**
- **Final Decision by October**



**Need measurements for your research?**

Use the ARM Climate Research Facility!

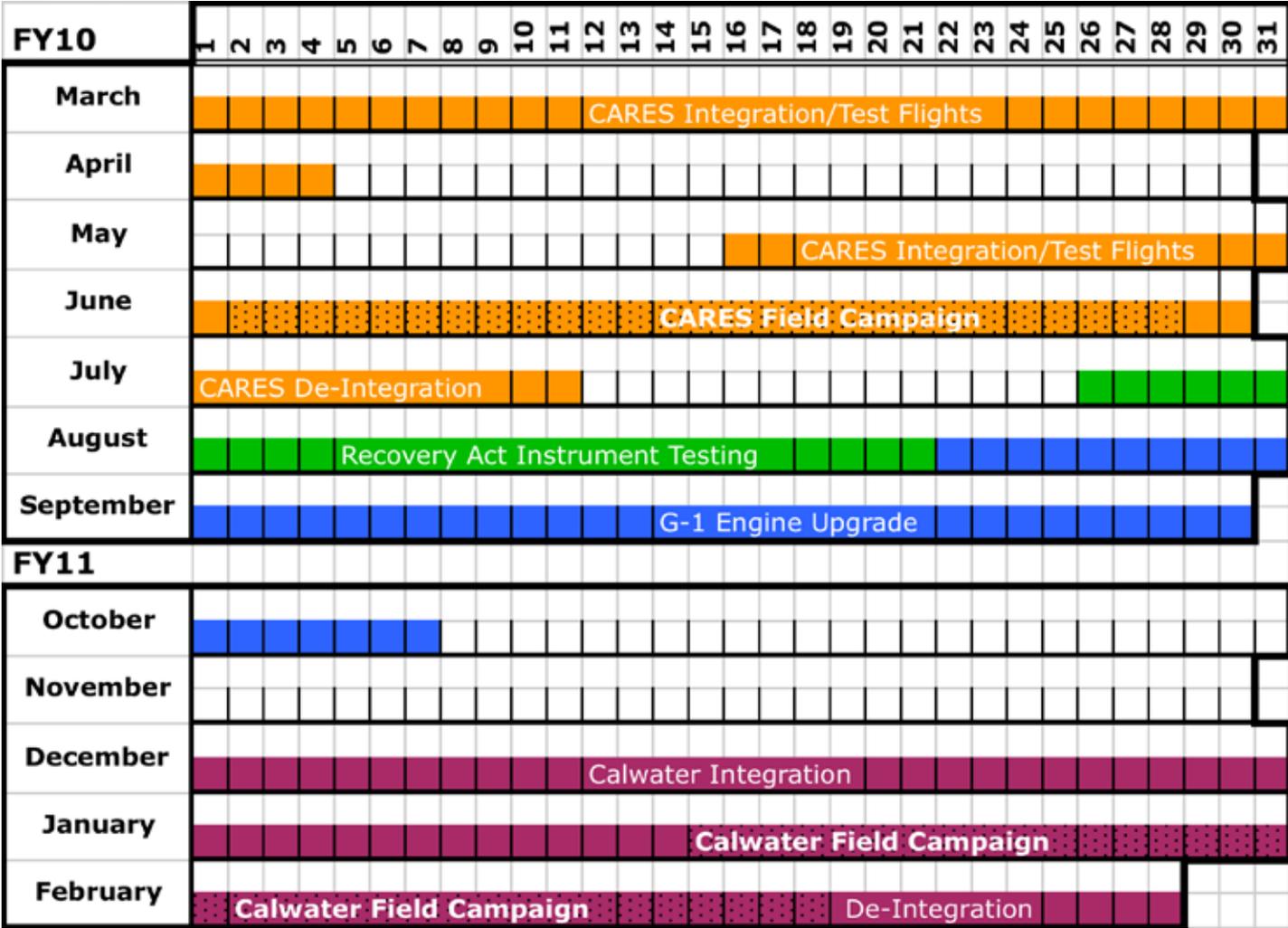
- Aerosol
- Atmospheric State
- Atmospheric Carbon
- Radiometric
- Cloud Properties
- Surface Properties

- Instrumented sites in Alaska, Oklahoma, Tropical Pacific
- Mobile facilities and aerial platforms provide measurement flexibility
- Existing capabilities being expanded through the Recovery Act.

**PROPOSALS DUE FEBRUARY 1; ASK US FOR DETAILS!**

<http://www.arm.gov/campaigns/submit-proposals>

# AAF Overview



# More Information

## ARM



<http://www.arm.gov>

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## ARM Aerial Facility



<http://www.arm.gov/sites/aaf.stm>

**ARM**

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