

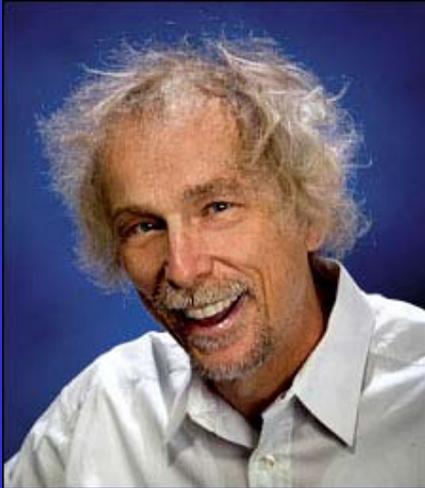


ARM Orientation: Overview and History

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ARM Chief Scientist
Brookhaven & NASA



ARM Chief Scientist Team



Andy Vogelmann



Ric Cederwall



Yangang Liu



Sharon Zuhoski



Pavlos Kollias

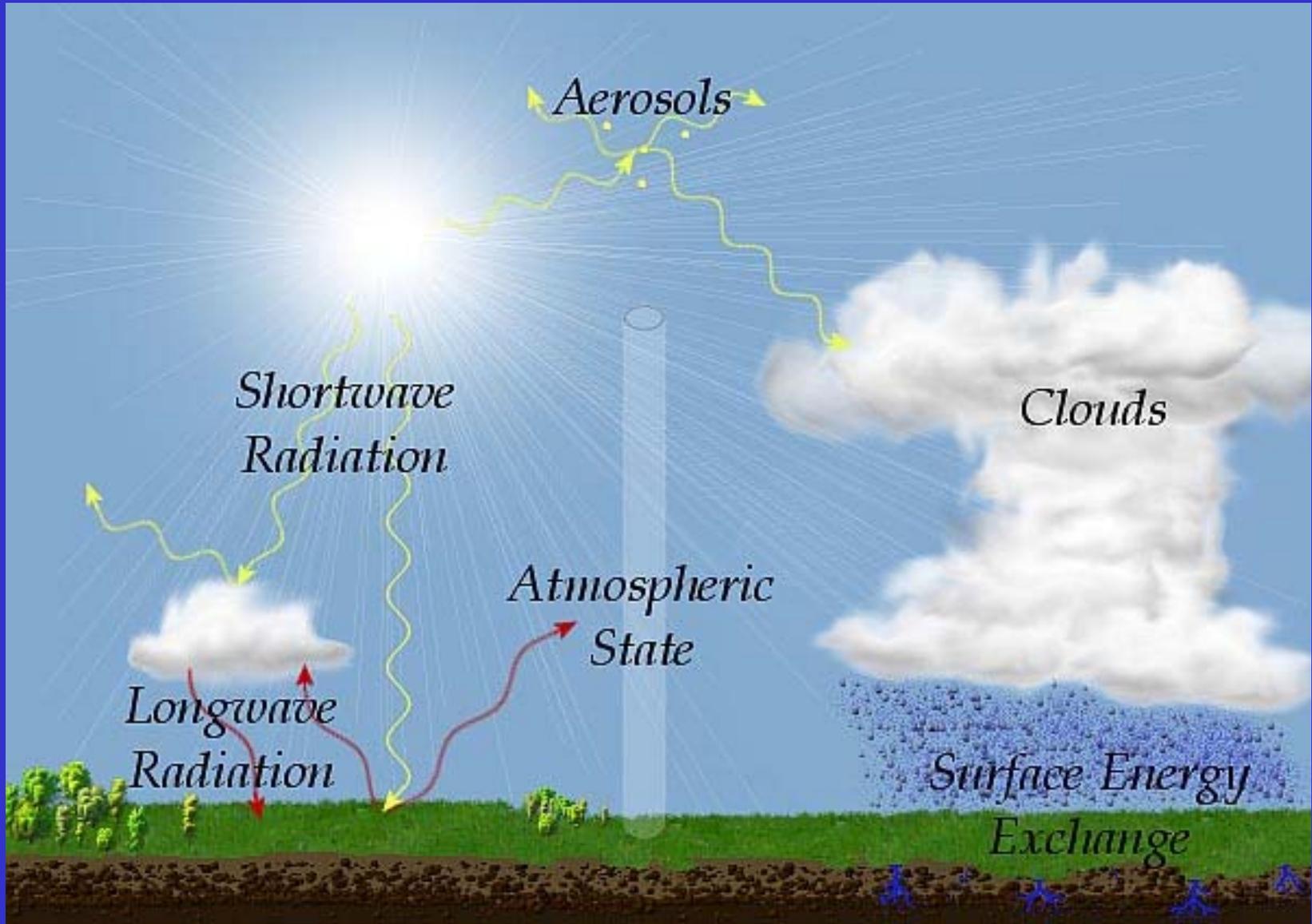


ARM in a nutshell

- Created to improve cloud and radiation physics and cloud simulation capabilities in global climate models
- Provides products from continuous AND episodic field measurements to advance global climate models
- Largest global change research program in DOE (\$55M/yr; ~\$14M/yr for Science Team)

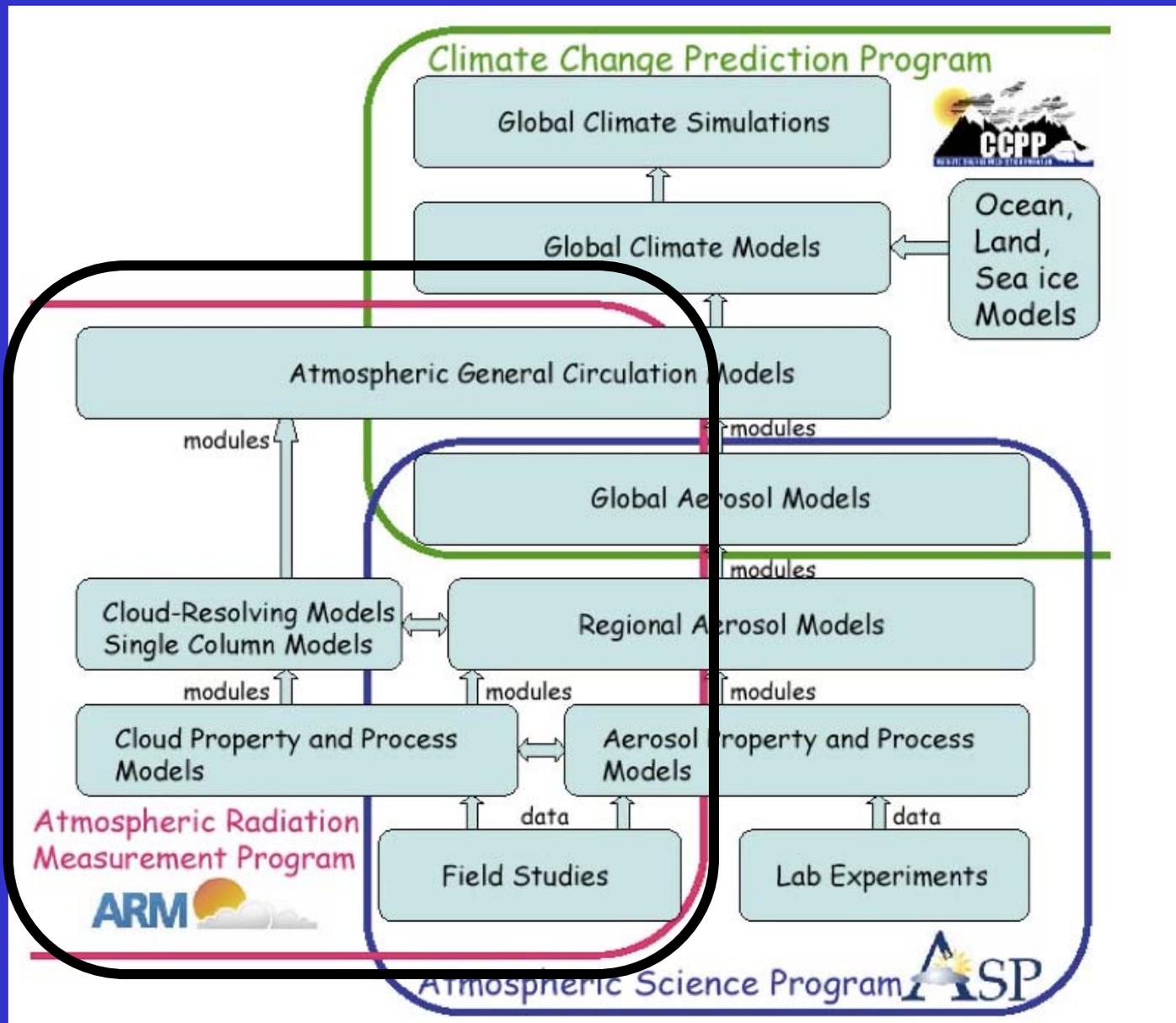


ARM Focus Areas





ARM's place in DOE climate program





What are ARM's expectations?

- Good science - first and foremost !
 - engagement with needs of climate modeling
 - two papers/yr per grant (average)
 - at least one science highlight per year
 - annual RIMS progress report



ARM also expects you to participate in...

- one Working Group
- a Focus Group (increasingly important)
- a field campaign (encouraged)
- annual Science Team Meeting (bring one poster & submit as PDF file)
- a Fall WG meeting



What are the two major components of ARM?

Infrastructure:

Develop and run ground-based (in situ and remote sensing) meas't facilities

Acquire data 24/7, archive and publish it

Science:

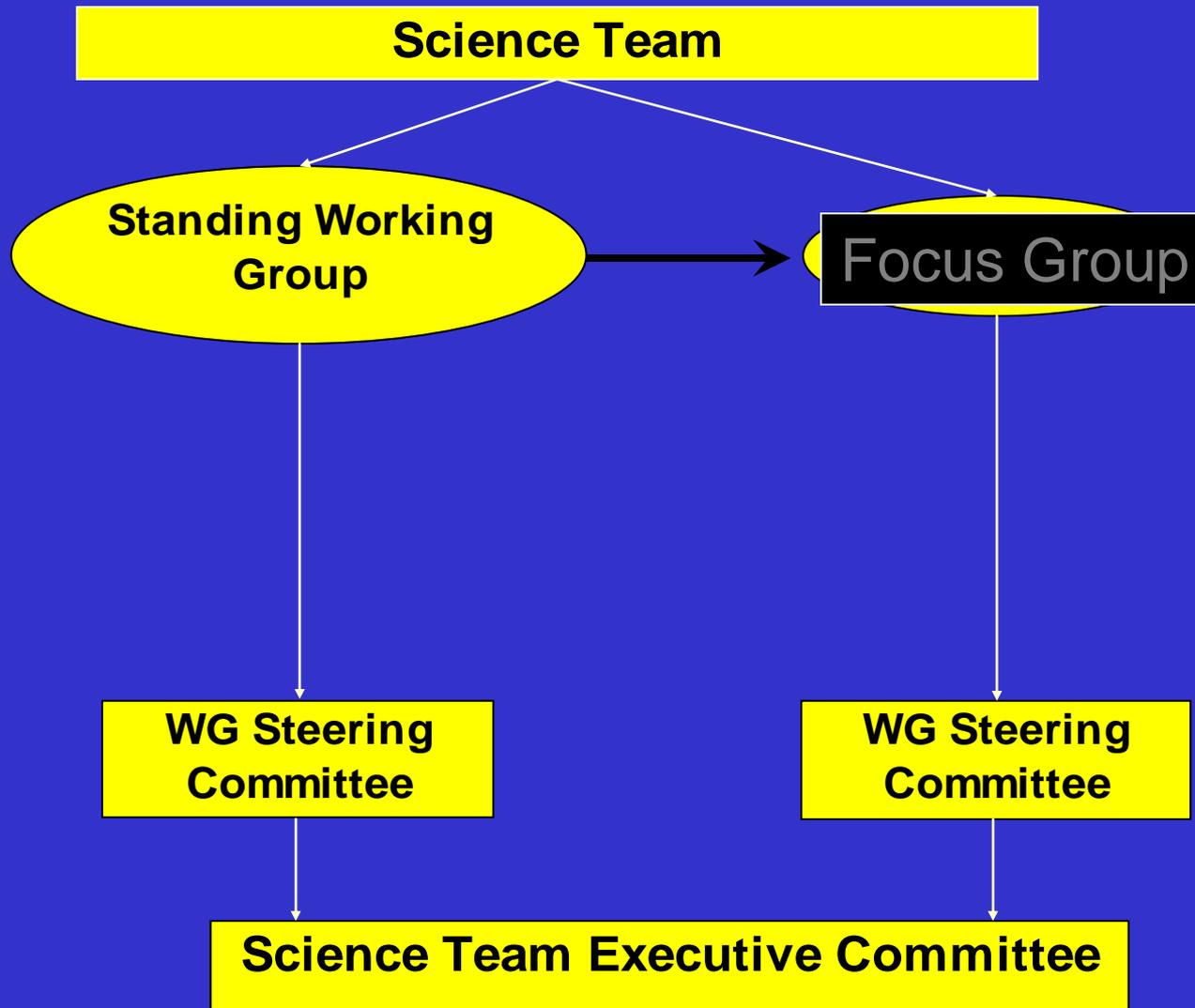
Data analysis

Physical modeling

Parameterization development
and testing



ARM Science Team Structure





Working Groups

- Cloud Modeling
- Cloud Properties
- Radiative Processes
- Aerosol

Focus Groups

- CLOWD (Clouds with Low Optical Depth)
- BBHRP (BroadBand Heating Rate Profile)
- Vertical Velocity for Climate Modelers
- Surface Flux Study Group
- Radar, Lidar, Longwave/Microwave
- IOPs (eg TWP-ICE)



We also expect you to interact with the ARM Infrastructure

For starters, get to know:

ARM Instrument Overlord (Jimmy Voyles)

ARM Archive Overlord (Raymond McCord)

Help set priorities, make recommendations

Tell Raymond McCord about data problems

Create, then contribute value-added "PI Products"



What should you become familiar with?

- problems@arm.gov
- VAPs (Value Added Products)
- “Translators”: infrastructure scientists who communicate Working Group VAP and meas’t requirements to developers & instrument leaders
- Instrument Mentors (infrastructure)
- ARM Archive (www.arm.gov)
- Data quality reports, Data Quality Office
- IOP planning and operation



Science Team Meeting structure

- Working Group meetings - Mon
- Plenary sessions: Invited talks
 - (WGs on Tue, from outside ARM on Thu)
- Poster sessions/socials Tu and We evenings
 - Poster talks selected by ARM Exec Comm
- Breakout sessions - attend, organize as interested
- Wed afternoon: "white time"
- Many unannounced Infrastructure meetings
- Exec Comm on Fri



Where did ARM come from? A nutshell history

ICRCCM-1: Intercomparison of Radiation Codes in Climate Models (1980s)

ICRCCM exposed theoretical disarray in clear longwave problems

SPECTRE (SPECTRal Radiance Experiment) was an outgrowth of ICRCCM

SPECTRE took place in Coffeyville, Kansas, in 1991 and used instruments which were adopted by ARM

ARM grew out of SPECTRE



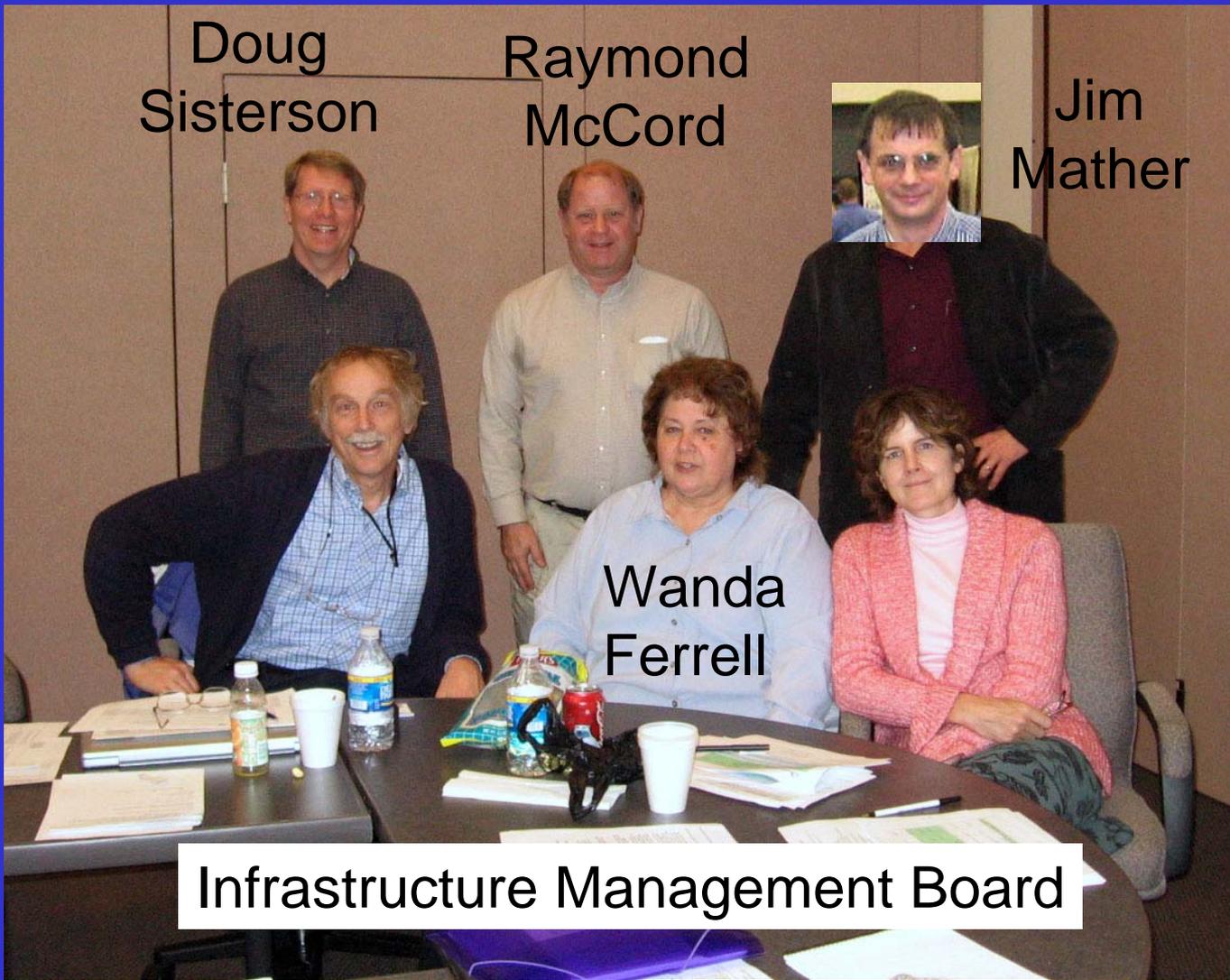
ICRCCM-1: Paris Workshop Report (1988) set our feet on the road to ARM

“In the 1984 report of the ICRCCM Frascati, Italy, workshop, a new sort of surface-based measurement program was called for, taking advantage of existing spectrometers and some of the advanced profiling technologies under active development.”

“The participants feel that the rather large inter-model discrepancies cannot be decisively resolved by further calculation, but only by well-calibrated spectral observations.”



ARM Leaders



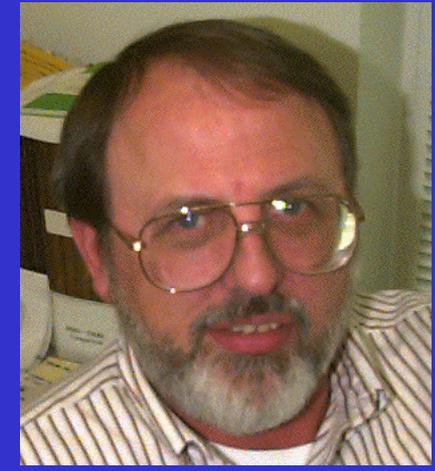
Doug
Sisterson

Raymond
McCord

Jim
Mather

Wanda
Ferrell

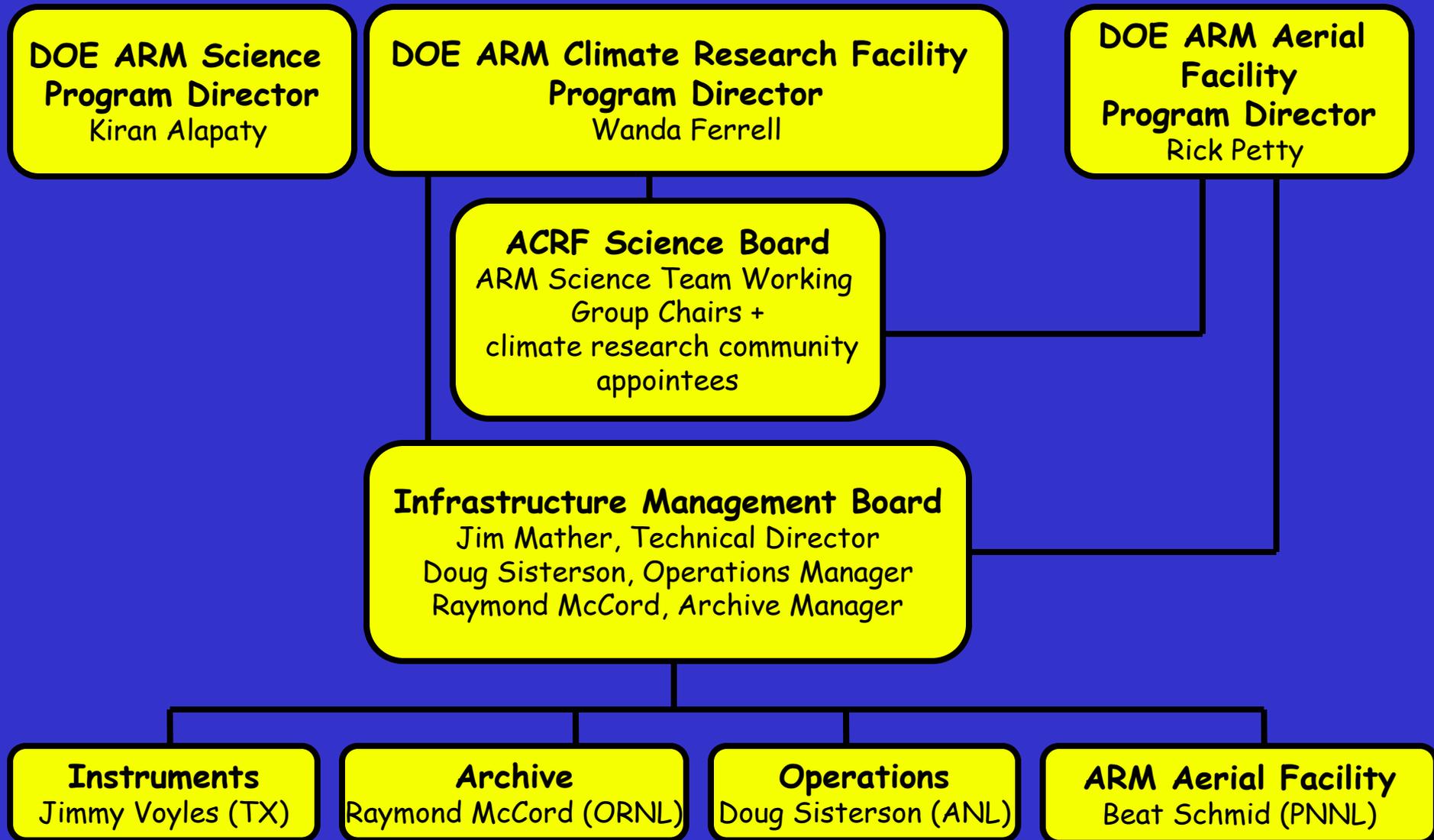
Infrastructure Management Board



Bob Ellingson,
STEC Chair



ARM Organizational Structure





ARM is a DOE User Facility

- called ARM Climate Research Facility (ACRF)
- ARM no longer exists just to serve its own Science Team, but the broader climate community
- Outside community can submit proposals for use of ACRF, including Mobile Facility and aircraft
- Larger proposals reviewed by ACRF Board (Aug)
- Smaller proposals (under \$25K) reviewed by IMB
- Recent examples: magnetic field, tectonic motions, radon, validation for NASA satellites



ARM Measurement Philosophy

- Multiple fixed sites plus mobile facilities
- Multi-year routine meas'ts of climate quality
- Mix of bleeding-edge and standard instruments
- Episodic field campaigns (IOPs)
- Aircraft capabilities (AVP)
- External data (satellite, Mesonets, analyses,...)
- Measure same variable multiply





ARM sites

2009 AMF: Azores

2007 AMF: Germany

2008 AMF: China

1996

North Slope
Alaska Region

Tropical Western
Pacific Region

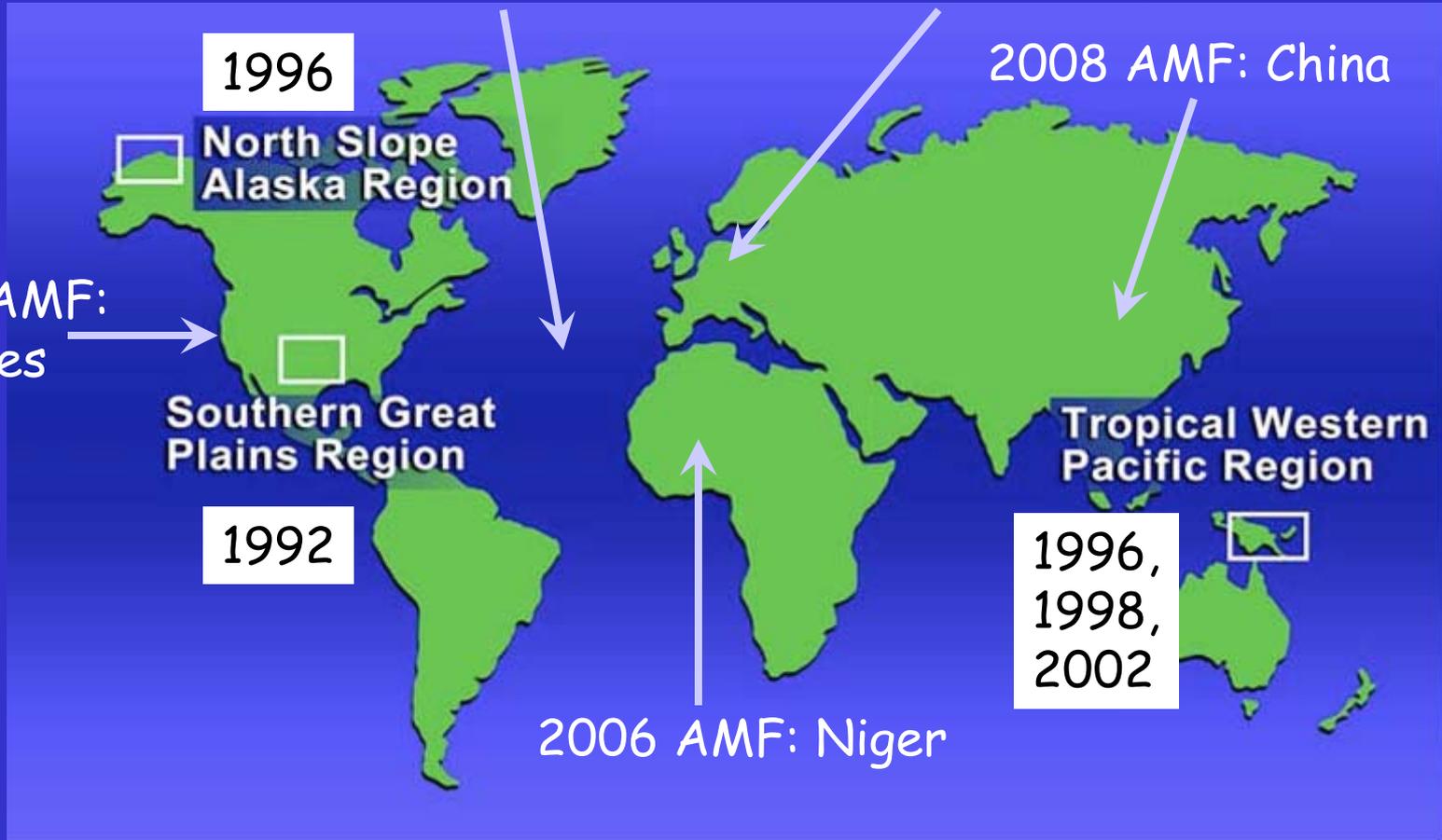
1996,
1998,
2002

2006 AMF: Niger

Southern Great
Plains Region

1992

2005 AMF:
Pt Reyes

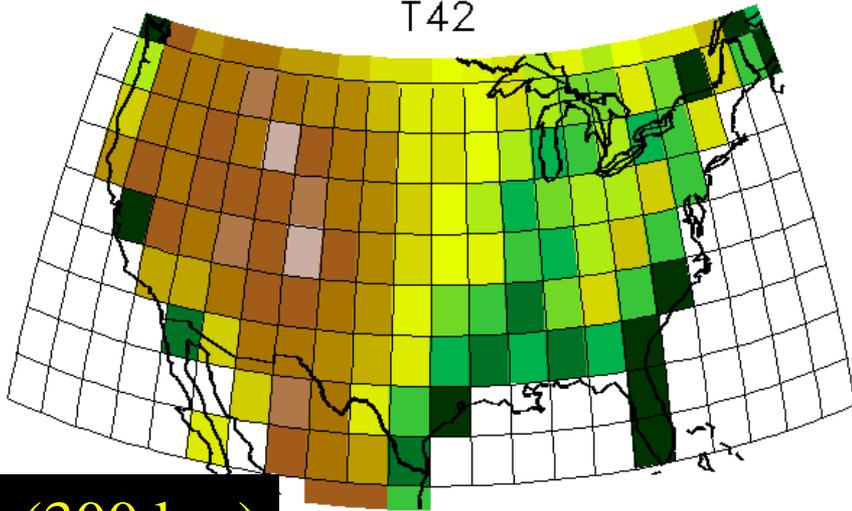


AMF = ARM Mobile Facility



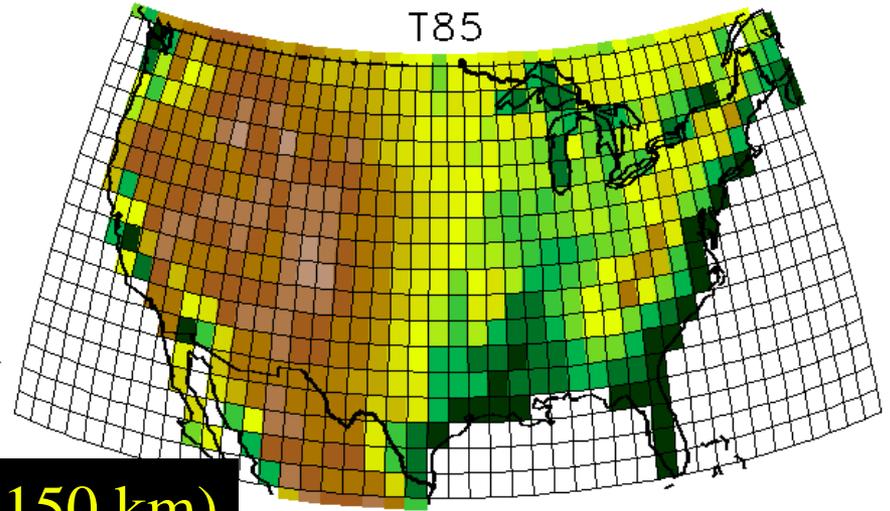
Horizontal Grid Resolutions, future GCMs

T42



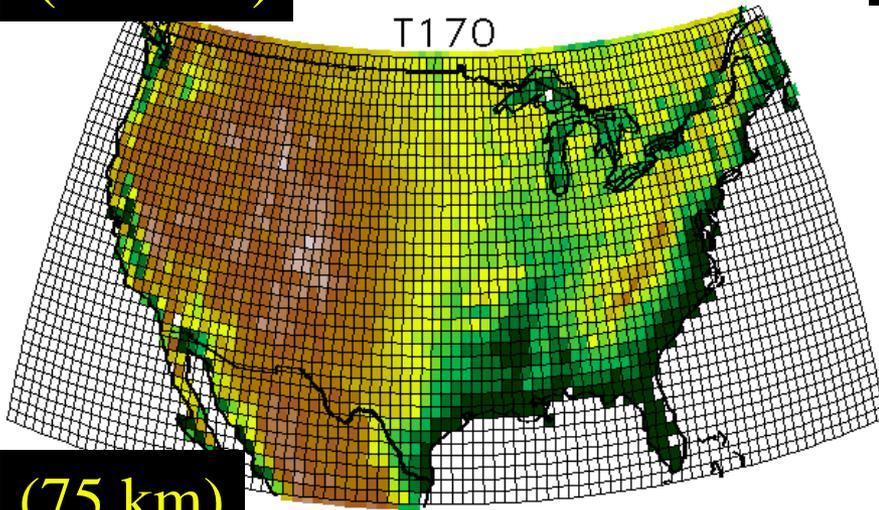
(300 km)

T85



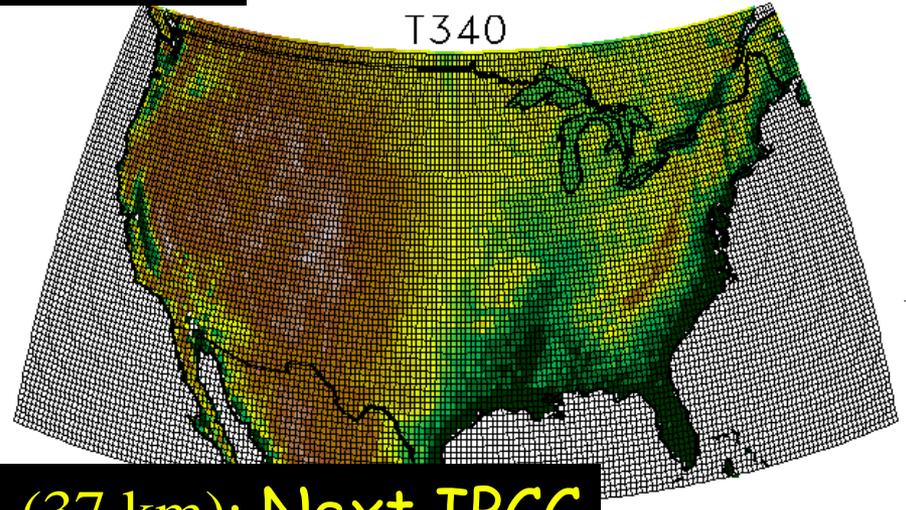
(150 km)

T170



(75 km)

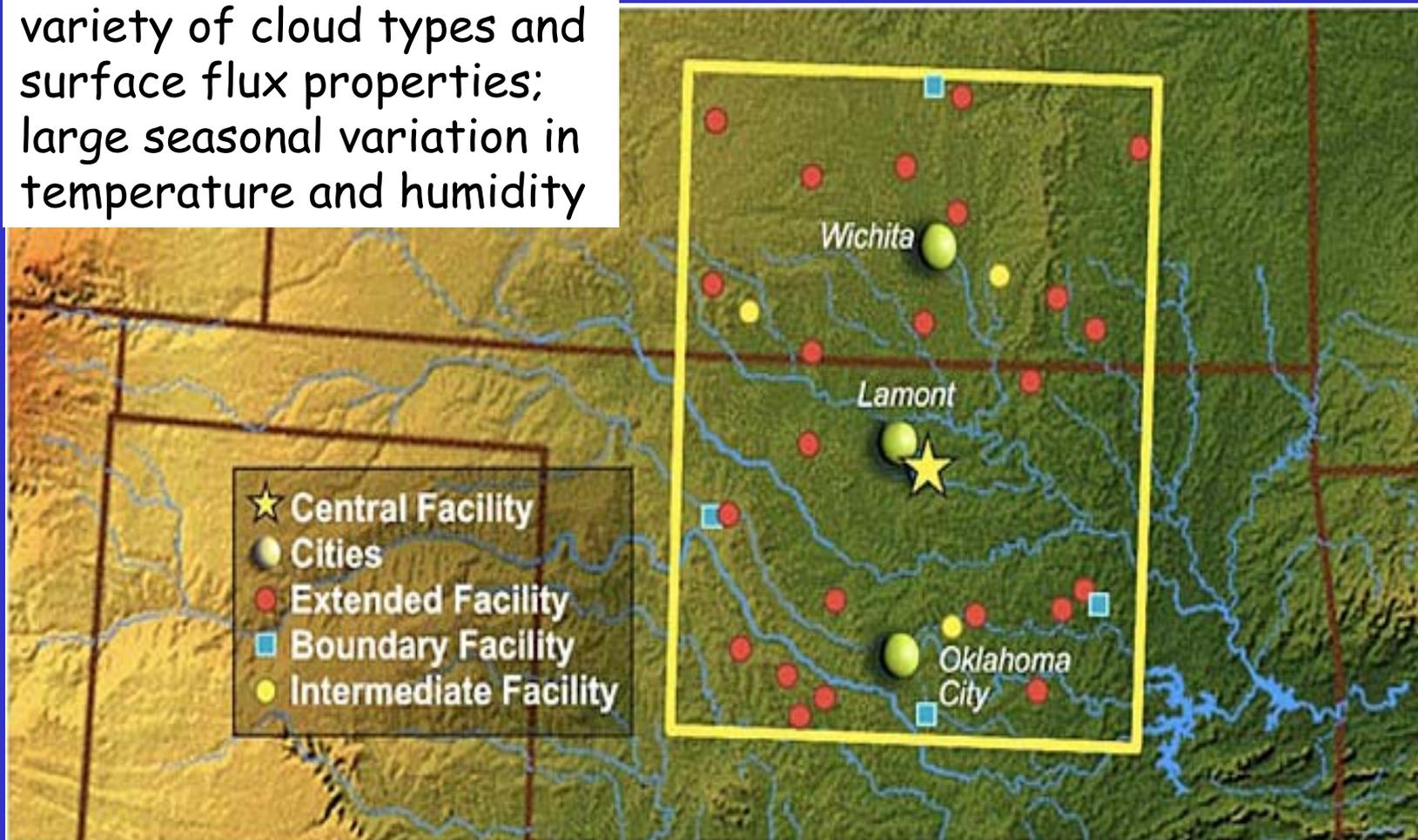
T340



(37 km): Next IPCC

SGP (23 Extended, 4 Boundary, & 3 Intermediate Facilities)

variety of cloud types and surface flux properties;
large seasonal variation in temperature and humidity





SGP is a slight rise in flat farmland

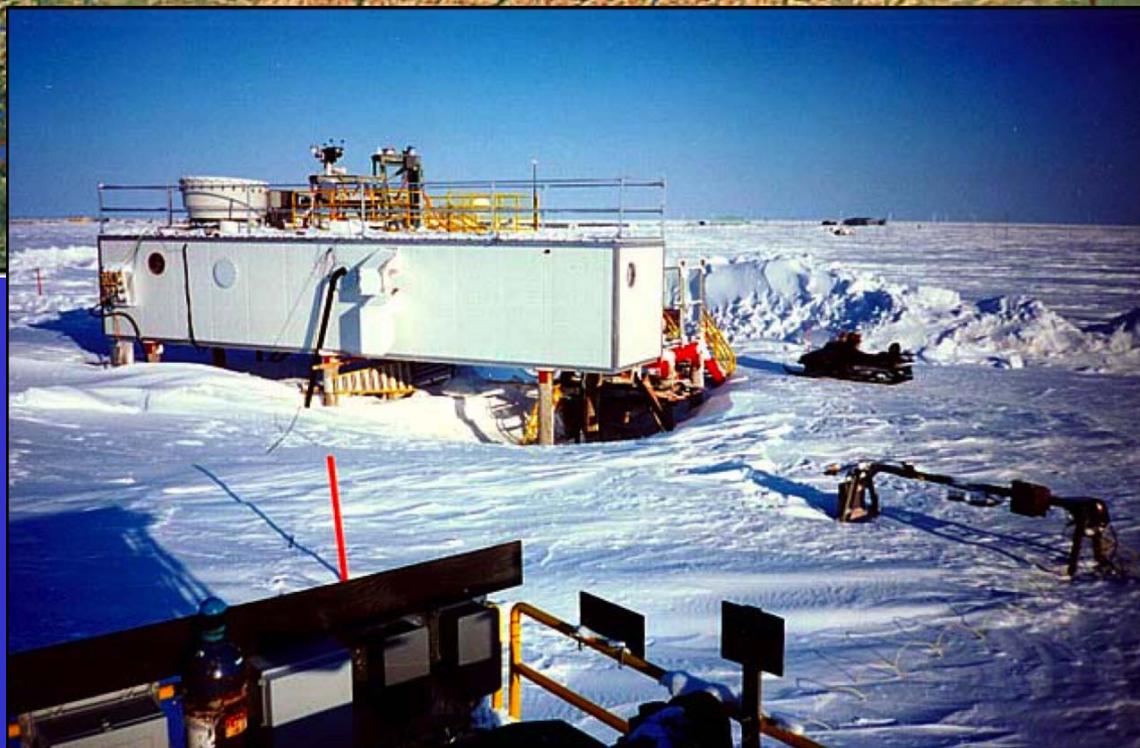




Southern Great Plains site

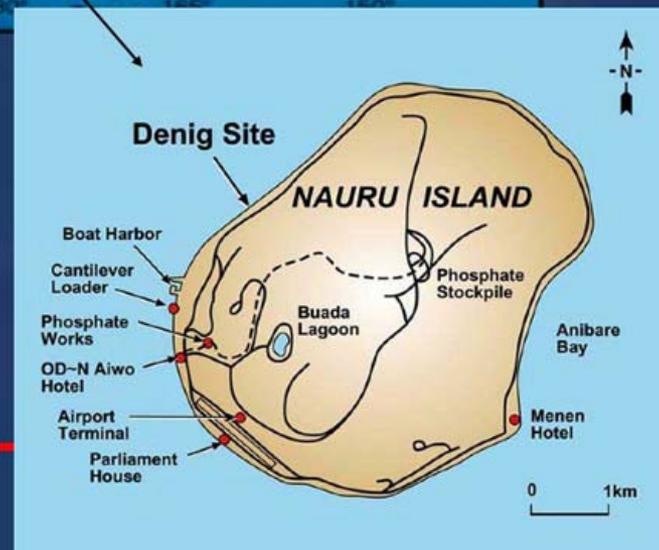
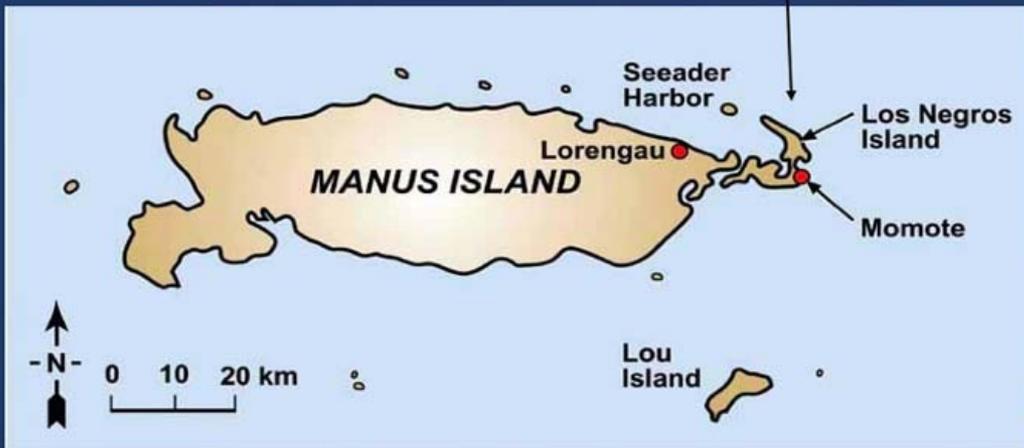
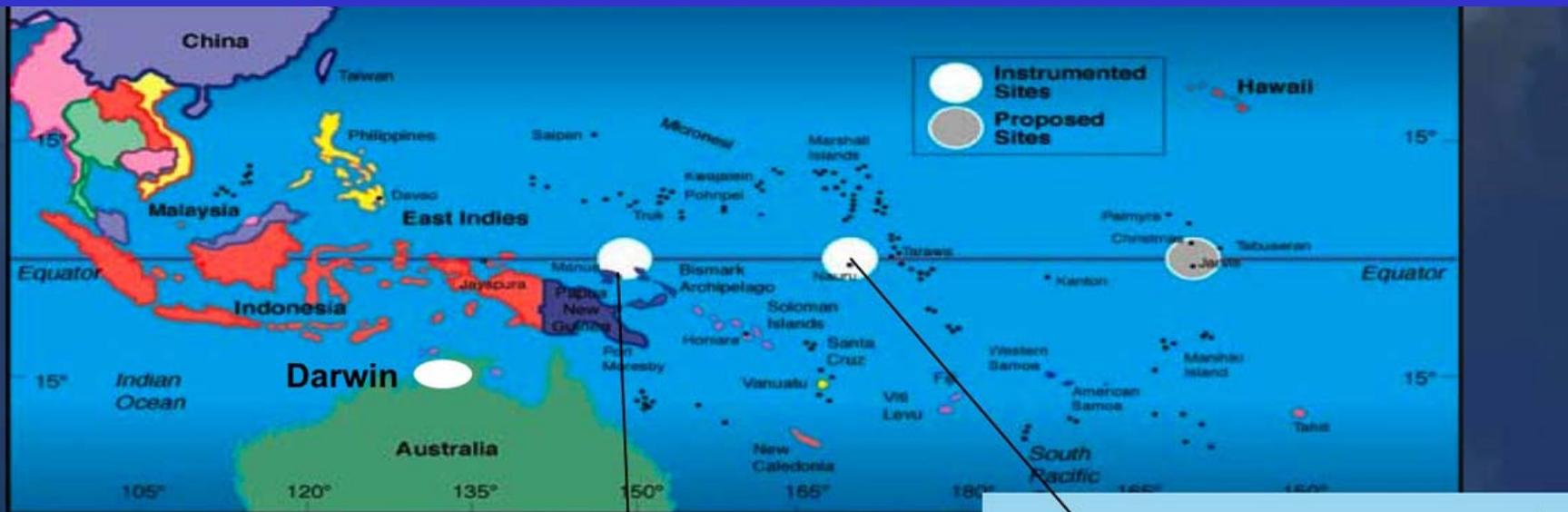


North Slope Alaska (no sea ice coverage)





3 Tropical Western Pacific sites chosen for deep convection, high water vapor, El Nino



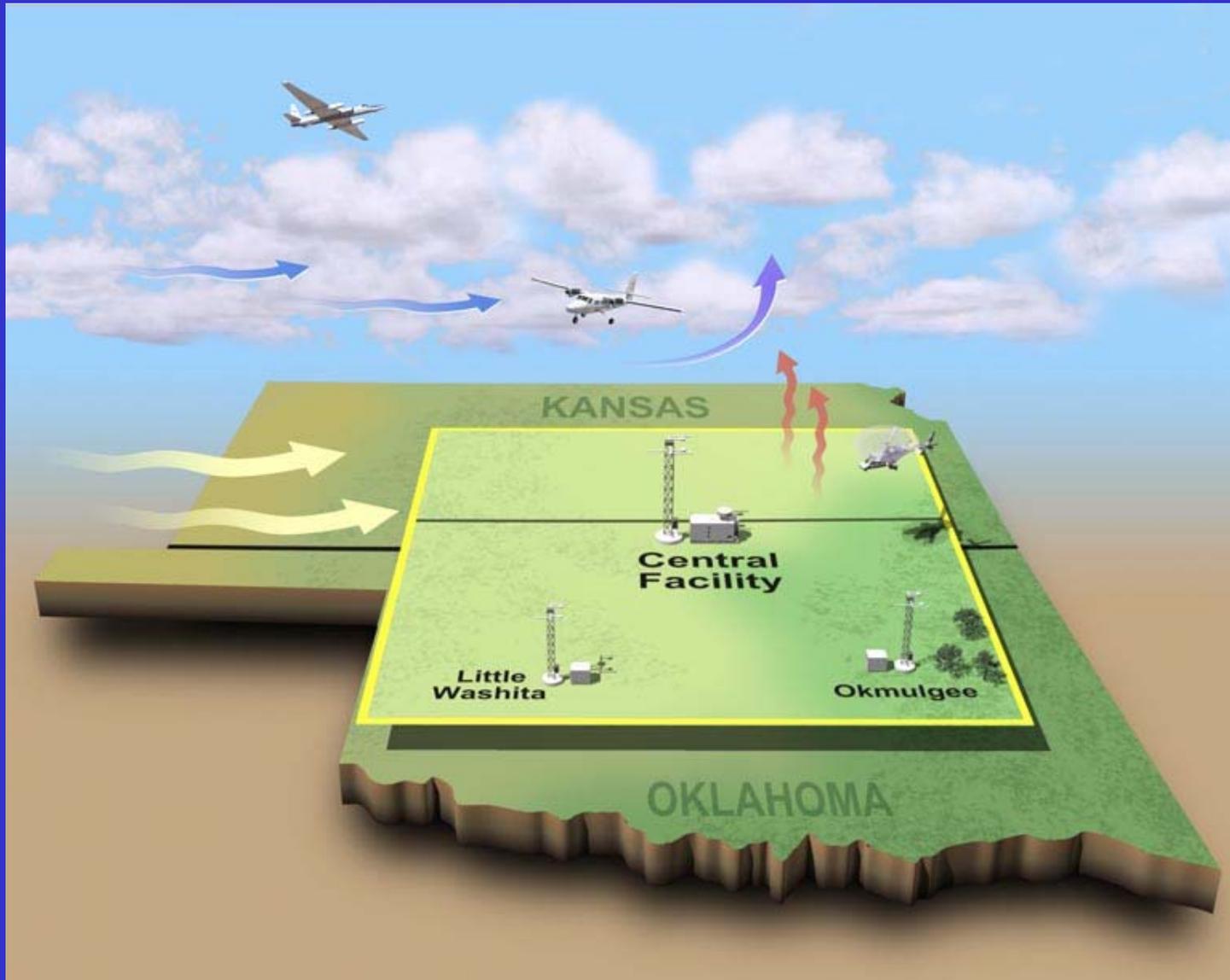


A 2006 IOP: TWP-ICE, Darwin, Australia





CLASIC IOP, SGP, June 2007





CLASIC IOP, SGP, June 2007





CLASIC IOP, SGP, June 2007





RHUBC-II at 5.4 km in Chile, Fall 2009





RHUBC-II at 5.4 km in Chile, Fall 2009





ARM Mobile Facility 2006 — Niger, Africa





ARM Mobile Facility 2007 — Black Forest, Germany





ARM Mobile Facility - China, 2008





ARM Mobile Facility - China, 2008





Mobile Facility to Azores, 2009

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Mobile Facility to Azores, 2009





What else are we working on?

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Back Forward Reload Stop http://science.arm.gov/wg/cpm/scm/statistical_summaries.html

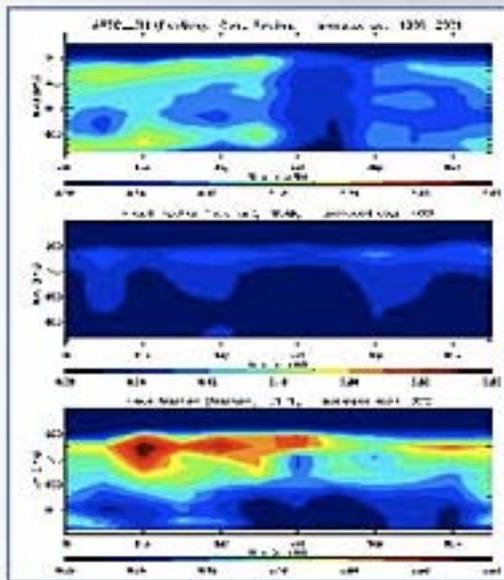
Home Bookmarks Red Hat, Inc. Red Hat Network Support Shop Products Training

Statistical Summaries of ARM data for Climate Modelers

The ARM program collects unique data related to radiation, clouds, water vapor, and aerosols of great value to climate modelers. This web page provides a few sample analyses of multi-year data from the Southern Great Plains site with comparisons to climate model simulations for the same location.

Seasonal Cycle at the Southern Great Plains

Cloud Fraction from the Cloud Radar



ARSL, CAM and GFDL Cloud Fraction

Explore the data yourself

Would you like to explore the data yourselves?

[Browse the Dataset](#)

[Quick look plots](#)

[Seasonal and diurnal cycle](#)

The dataset extends the following years: 1999 - 2001.

There is more data available including data for the satellite observations, surface sensible and latent heat fluxes, and surface meteorology.

Would you like to download the data for your own exploration?

The data used in the statistical summaries is from a 3 year analysis (1999-2001) which is

We produce data products that will help climate modelers:

Climate Modeling Best Estimate



We are pioneering routine cloud flights (RACORO, Jan-Jun 2009)





RACORO, first flight





We are building a 2nd Mobile Facility, for marine deployments





2nd Mobile Facility could go on a platform



California

Oil Platforms may turn into fish habitats



We have permission to fly small UAVs at Oliktok Point, Alaska



nature



**TRAUMATIC
BRAIN INJURY**
Consciousness
raising therapy

**VERTEBRATE
ORIGINS**
Gone fishing

**EATING IN THE
GREENHOUSE**
Are high-CO₂
crops bad for you?



THE HEAT ISON

Atmospheric brown
clouds enhance
climate warming

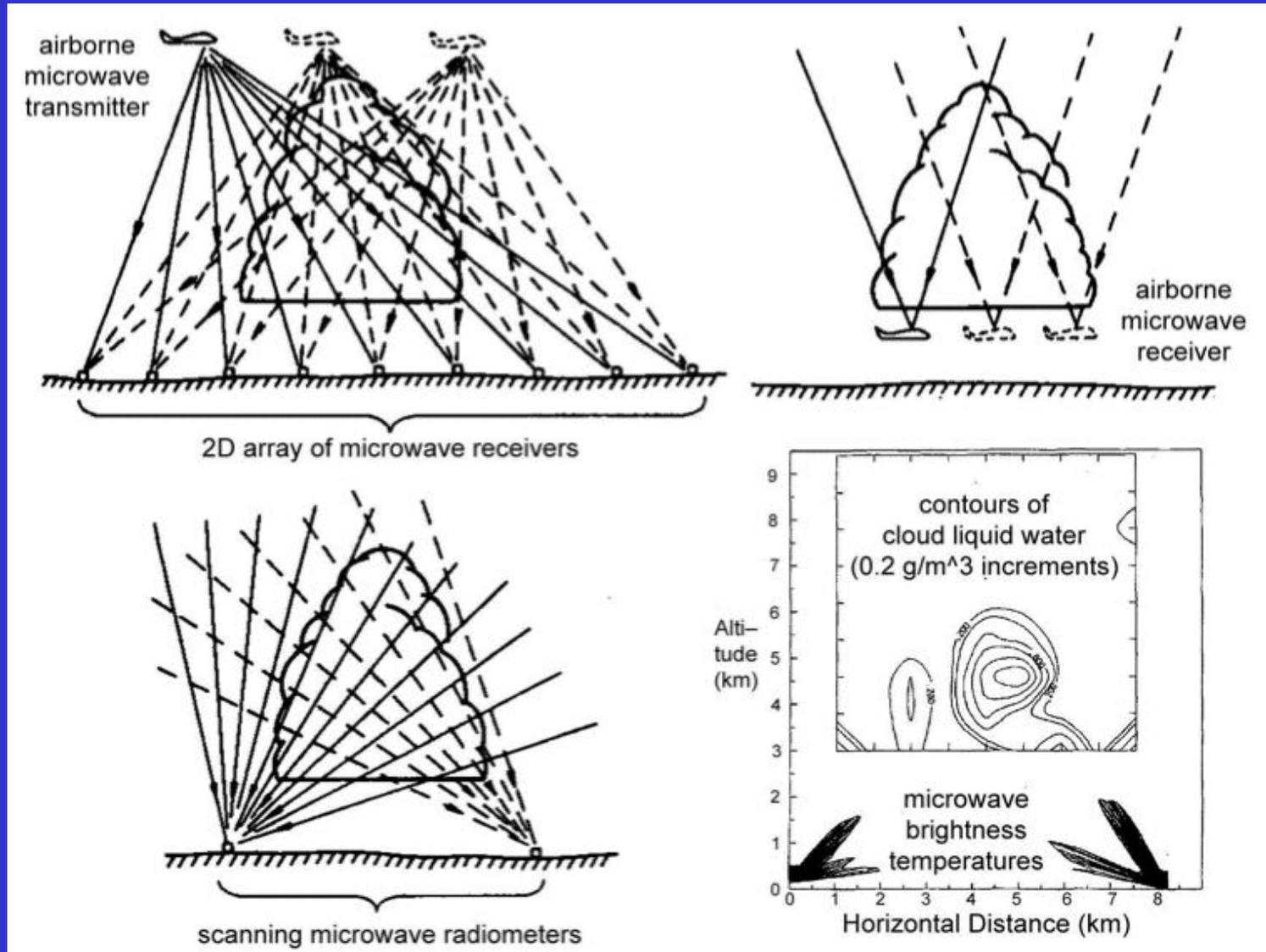


NATUREJOBS
Atmospheric science



With small UAVs
we hope to extend
beyond point
measurements

We are developing cloud tomography (IOP in May at SGP)



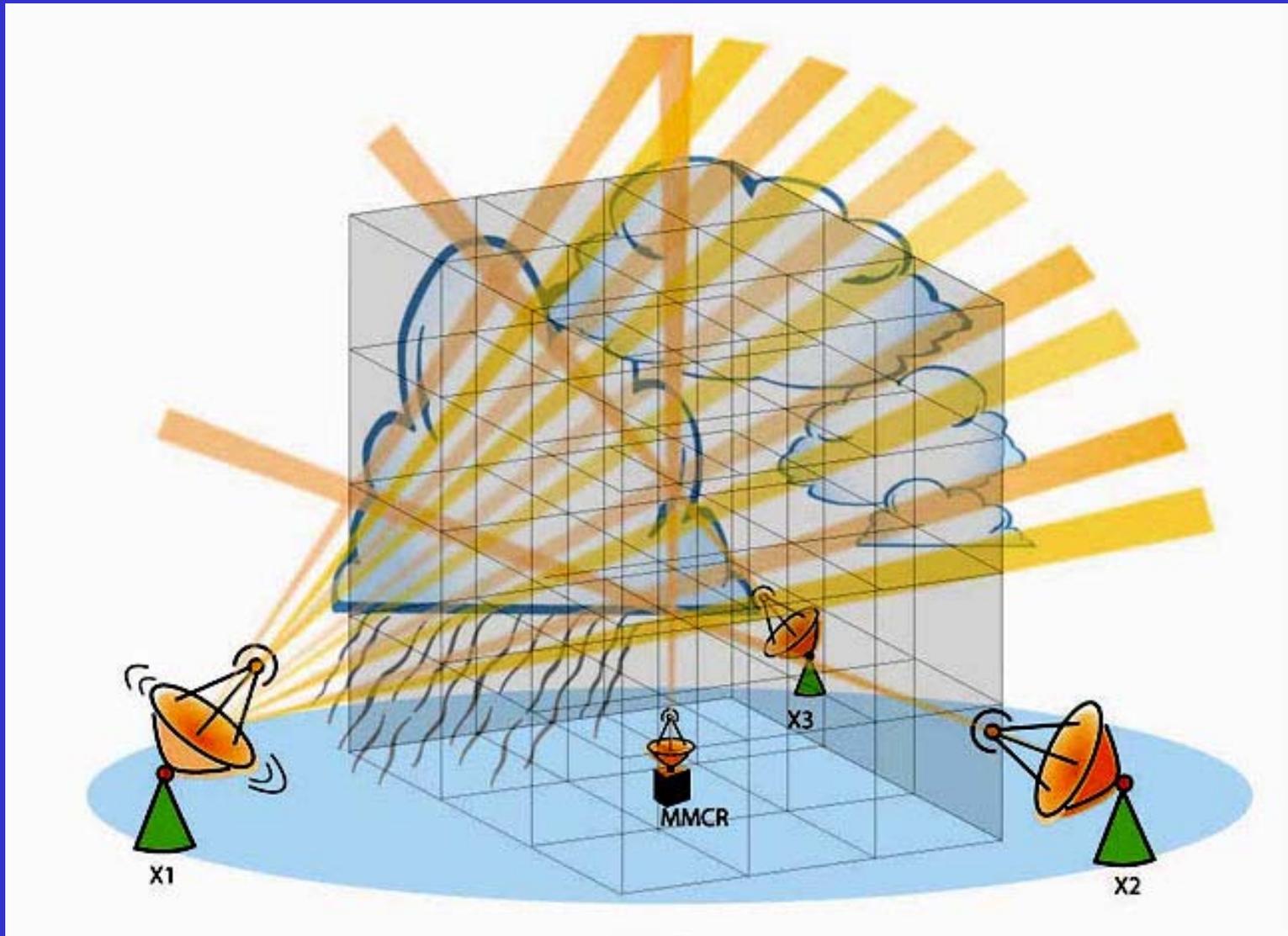


We are in the midst of spending \$60M in stimulus funding for ARM instruments...

and this will occupy a lot of the ARM Infrastructure's attention until Sep 2010

Special sessions on this extraordinary development on Wed afternoon, 2-3 and 3-4

We will be buying lots of scanning radars, both cloud & precip type





Welcome aboard!

