



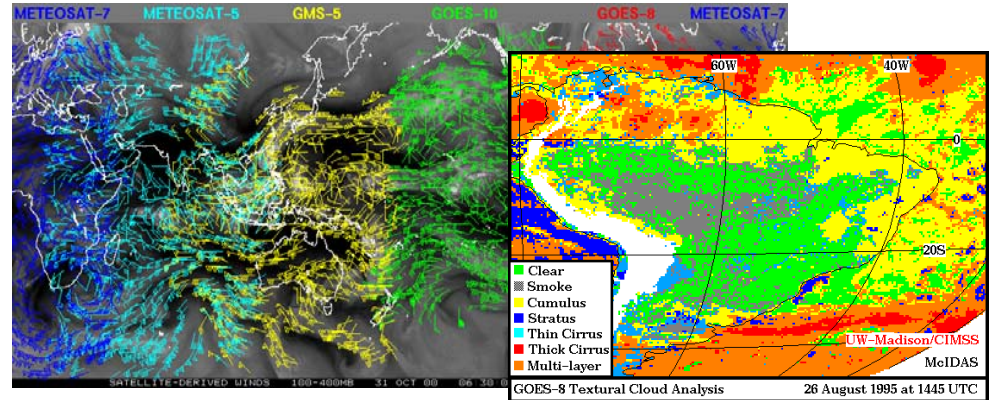
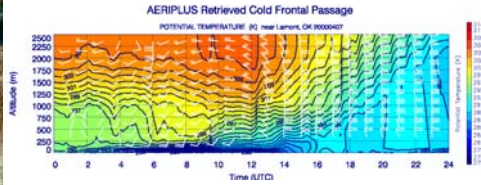
# Next 25 years of CIMSS



- ◆ CIMSS is prepared to match or exceed its major impact of the last 25
- ◆ Continue the end-to-end perspective, that encompasses new observing concepts, algorithms, data handling and processing innovations, ground system concepts and prototype development, better models
- ◆ Maintain local symbiotic relationships with SSEC & Department of Atmospheric & Oceanic Sciences
- ◆ Strengthen the NASA connection and maintain the strong NOAA partnership

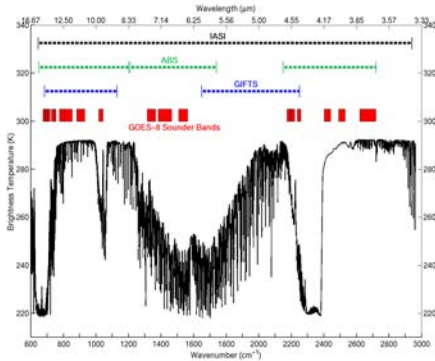
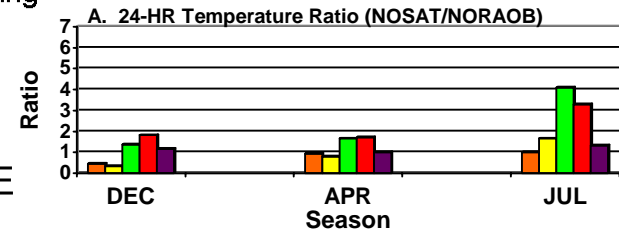
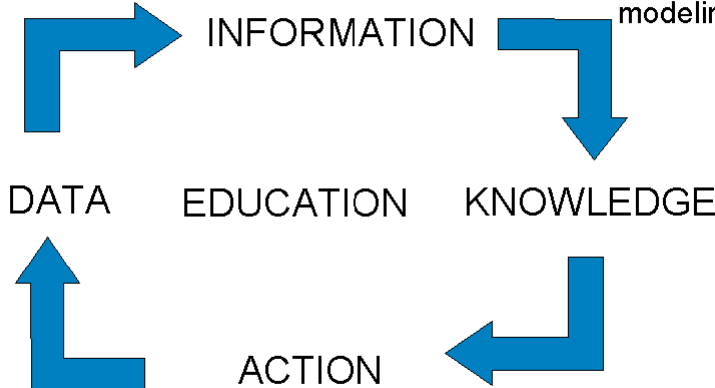


# Steve's Conceptual Structure of CIMSS



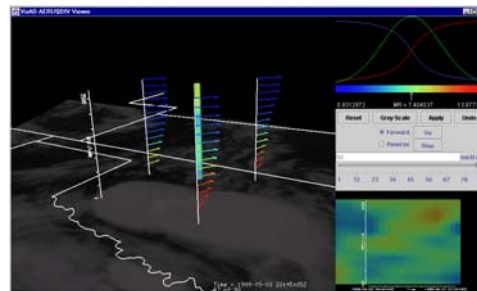
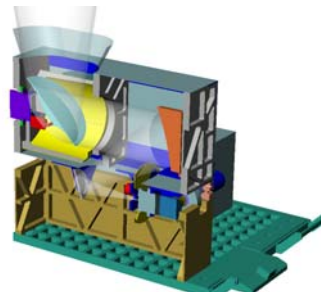
algorithms

theory modeling

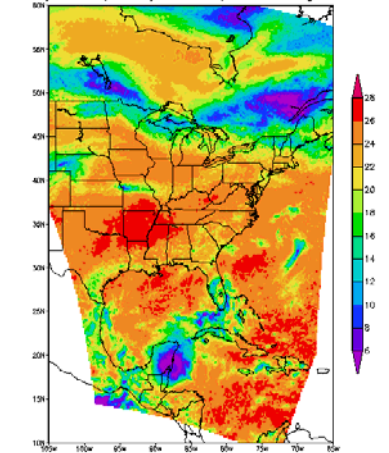


new instruments

applications



Daily Insol (MJ day<sup>-1</sup> m<sup>-2</sup>) for 17 August 99

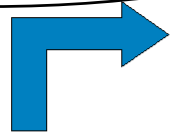


# Sounding: Much of what we are now starting will get more sophisticated & lead to ever growing impacts

**Sounding over land**

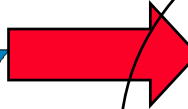
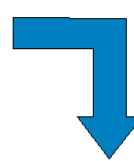
**Simultaneous Cloud Characterization**  
**Unified spatial and spectral processing**  
**Routine Trace Gas retrieval**

algorithms



INFORMATION

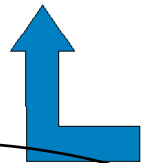
theory modeling



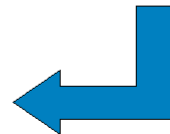
DATA

EDUCATION

KNOWLEDGE



ACTION



new instruments

applications

**Nowcasting**  
**NWP Impact**  
**Chemical**  
**Transport**  
**AIR Quality**

**GIFTS/HES (GOES-R)**

**CrIS + VIIRS + ATMS**  
**(NPOESS)**

# GIFTS: Assembled & ready for Thermal Vacuum Testing at SDL

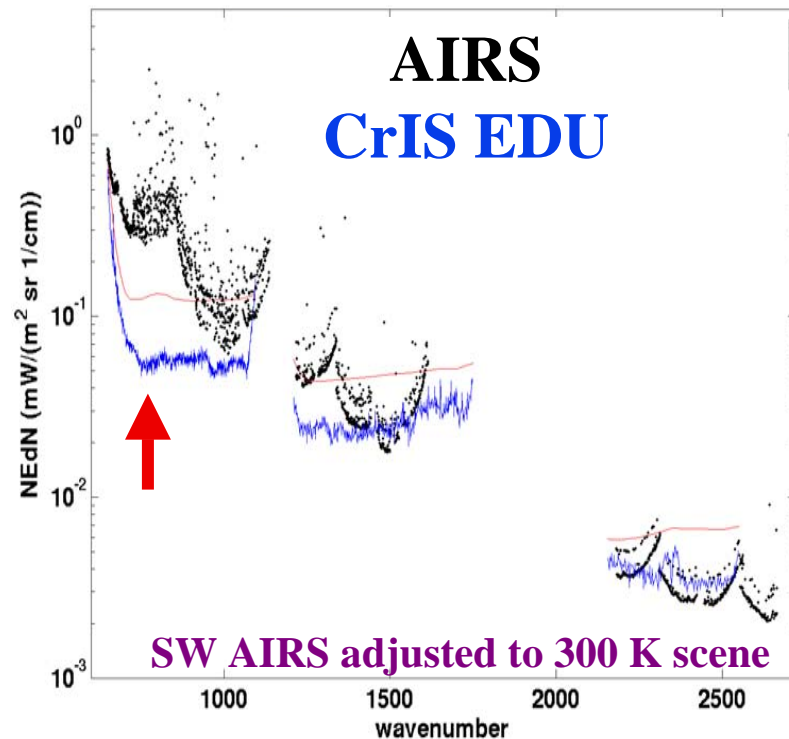
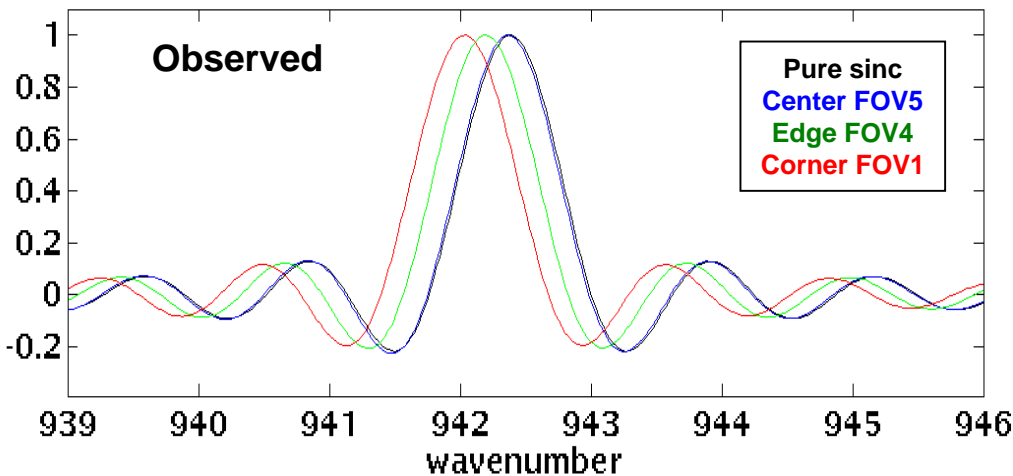


SSEC  
Blackbodies

**June  
2005**

# CrIS, AIRS Successor for NPOESS, will be even better

1. Radiometric Calibration:  $<0.4$  K
2. Spectral Calibration: Instrument Line Shape (ILS) extremely well known and stable from first principles
3. Noise: 4x smaller than AIRS in the LW CO<sub>2</sub> region

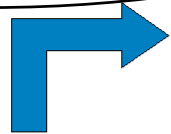


# Winds: Passive Infrared gives good coverage

**Tracking Retrieved  
Water Vapor Features**

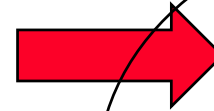
**Tracking from tandem S/C &  
2<sup>nd</sup> View angle for Stereo**

algorithms



INFORMATION

theory  
modeling

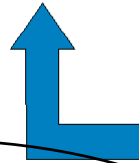


DATA

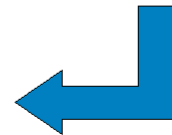
EDUCATION

KNOWLEDGE

**NWP Impact**



ACTION



applications

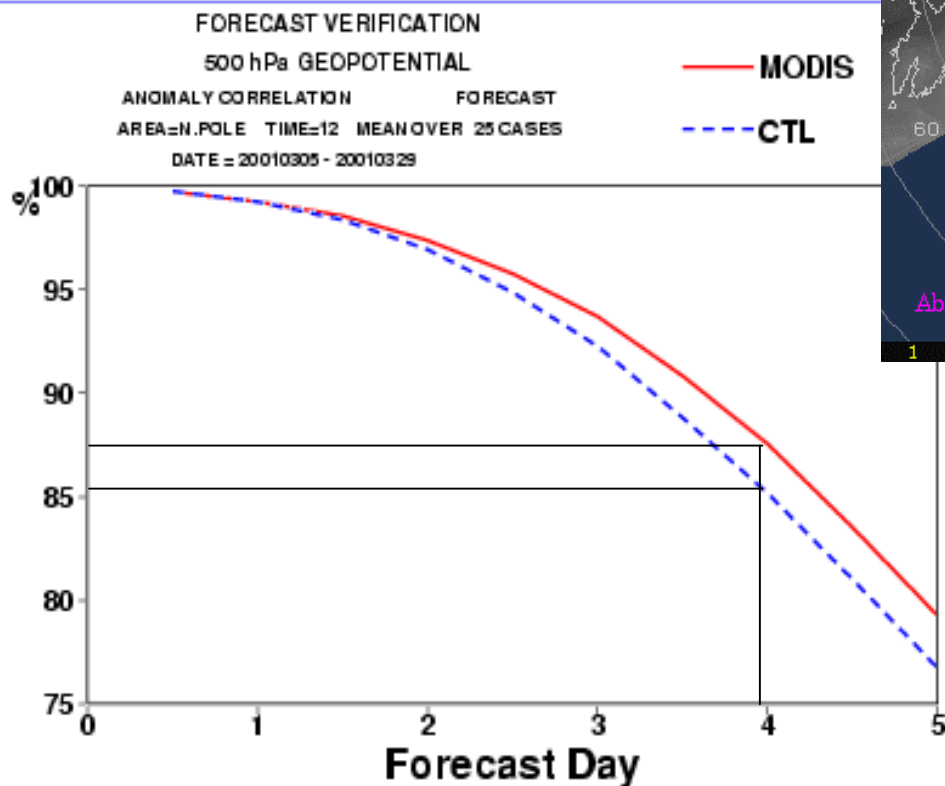
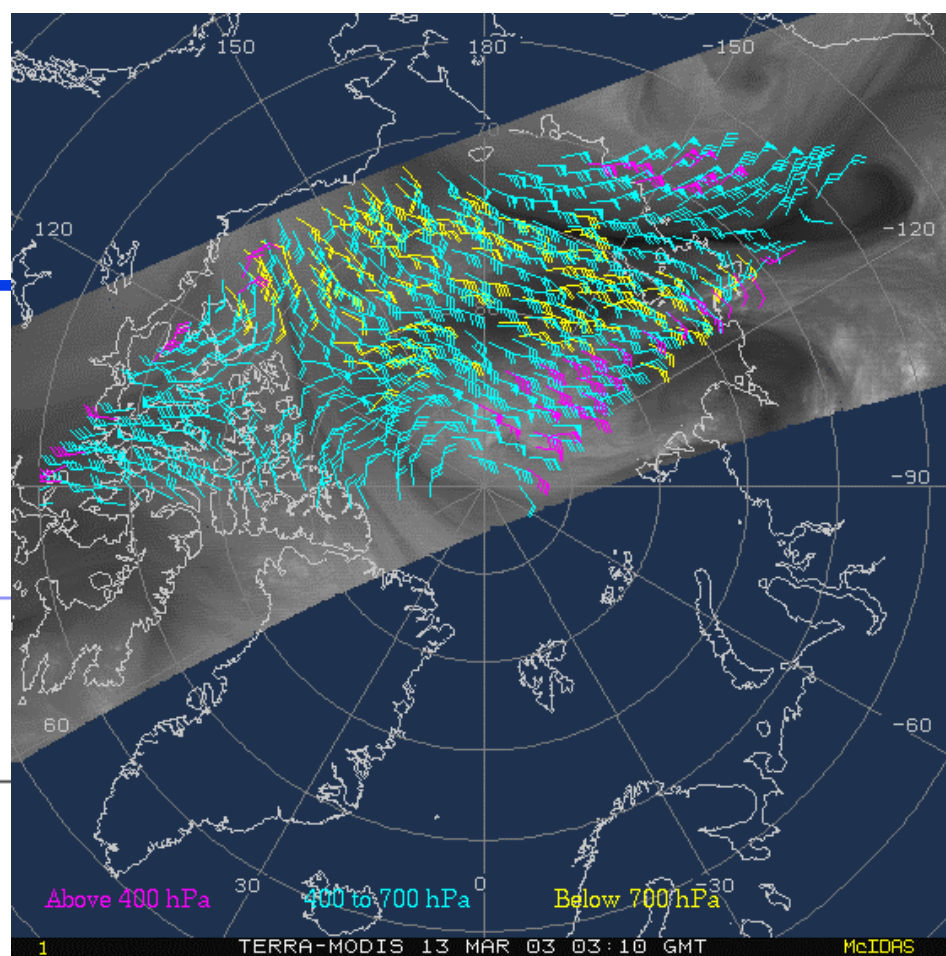
new instruments

**GIFTS/HES**

**Stereo Cloud & WV  
Imaging--polar orbit**

# MODIS Polar Water Vapor winds

Routine production  
Started in 2003



**Large forecast  
benefit demonstrated!**

# UW Design for Simple Polar Orbiting Imager

4 Silicon micro-bolometer  
Imaging Array Cameras

Rotatable  
Scene Mirror

Cross-track  
Fields of View

## Science

- IR Cloud Information
- Stereo Cloud Height
- Winds (flying in orbit with NPP)

Calibration  
Blackbody

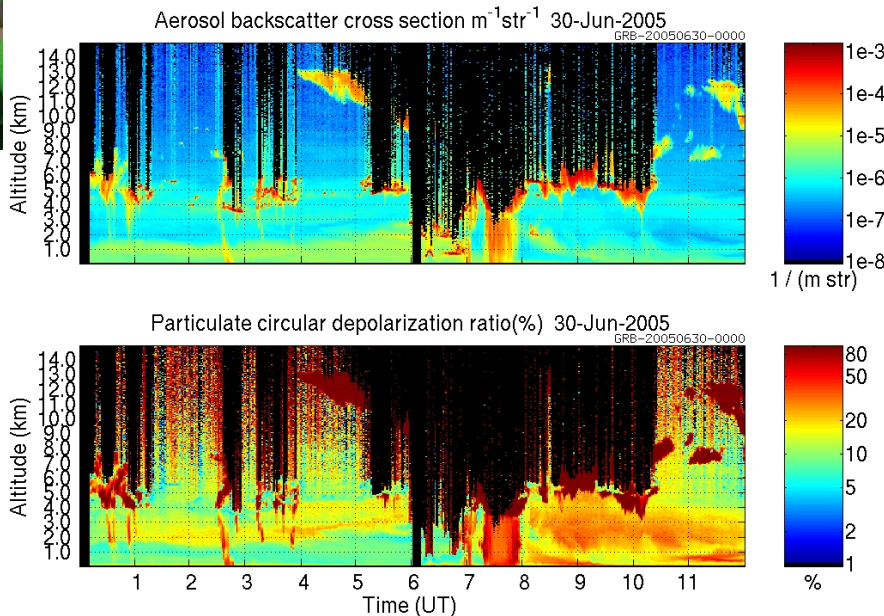
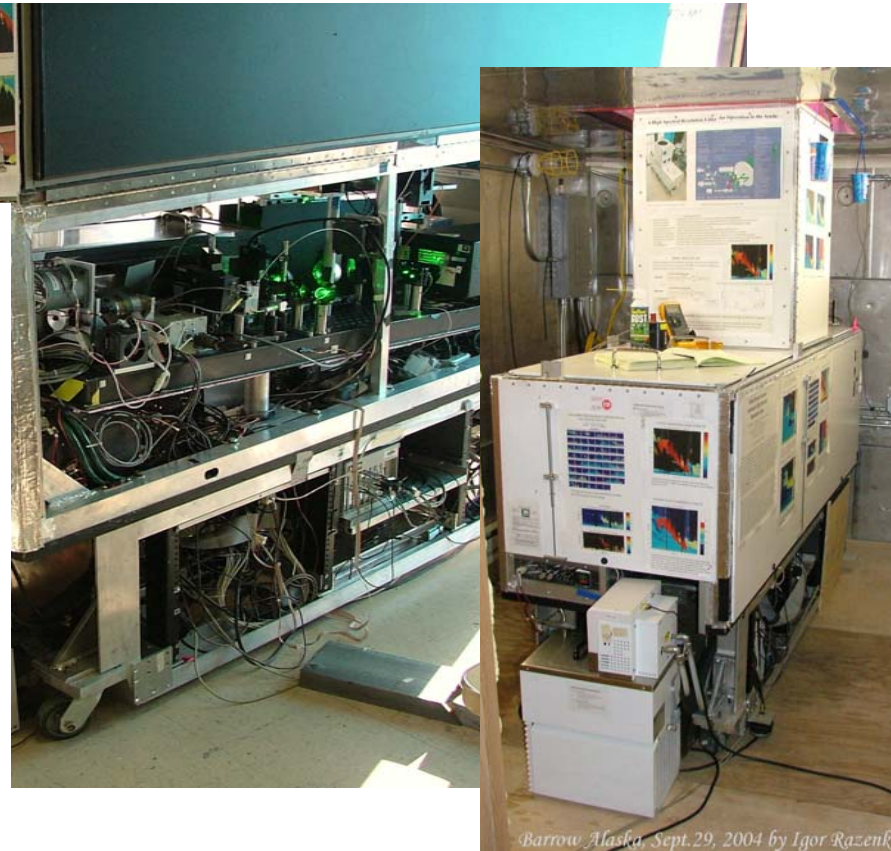
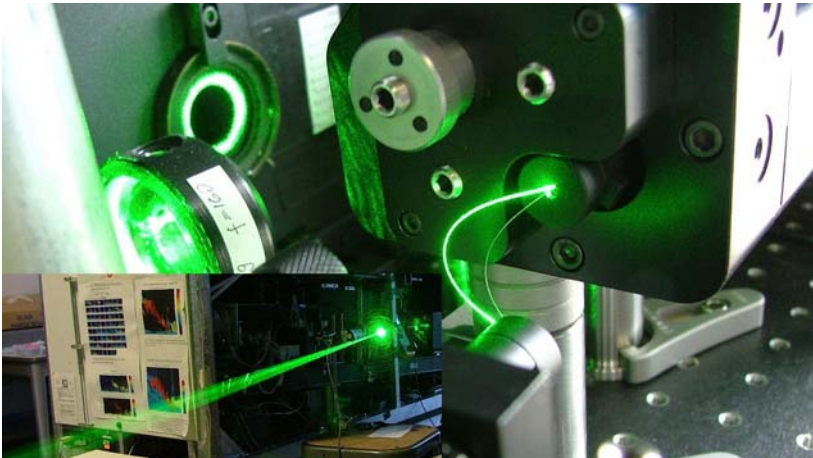
Protective Drum  
Baffle (rotates with  
Scene Mirror)

**IRCIR Provides Full Cross-track Coverage using  
Four Uncooled 640 x 480 Arrays**



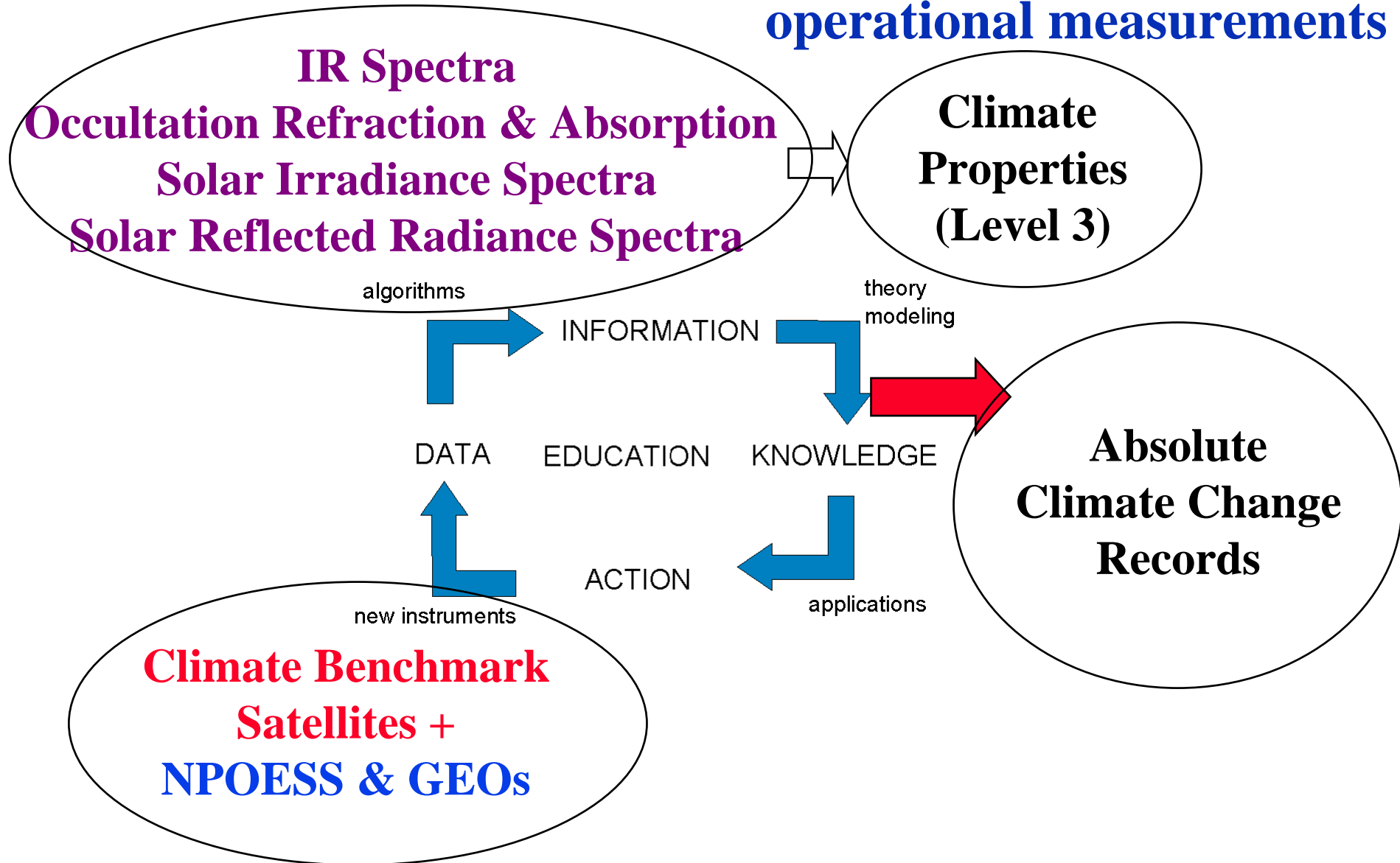
# And don't forget LIDAR for winds & clouds: the local talent is definitely some of the best

## Arctic HSRL (High Spectral Resolution Lidar)



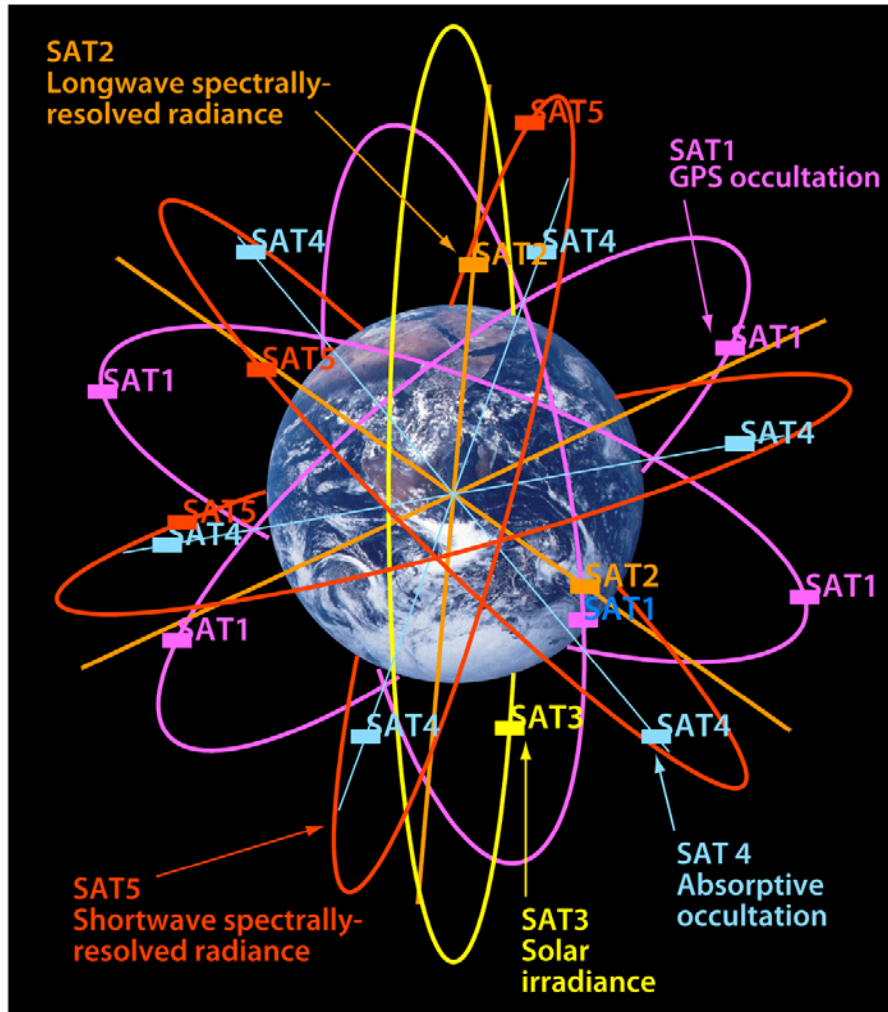
Barrow Alaska, Sept. 29, 2004 by Igor Razenk

# Climate (1): New Small Satellite Constellation to benchmark change for future generations & to upgrade operational measurements



# THE CLIMATE BENCHMARK CONSTELLATION

## *A Critical Category of Small Satellite Observations*



- ◆ Absolute IR Spectrally Resolved Radiance
- ◆ Microwave Occultation & Cross-link Absorptive Radio Occultation
- ◆ Spectrally Resolved Absolute Solar Irradiance & Shortwave Reflected Radiance

# Climate (2): NPOESS Preparatory Program (NPP) to evaluate NPOESS Products (EDRs) and generate Climate Data Records (CDRs)

**Atmosphere  
Product Evaluation and  
Algorithm Test Elements (PEATE)  
of NPP Science Data Segment**

**CDRs**

algorithms

theory  
modeling

\*\*

**Cal/Val**

\*\*

DATA

EDUCATION

KNOWLEDGE

ACTION

new instruments

applications

**NPOESS Instruments**

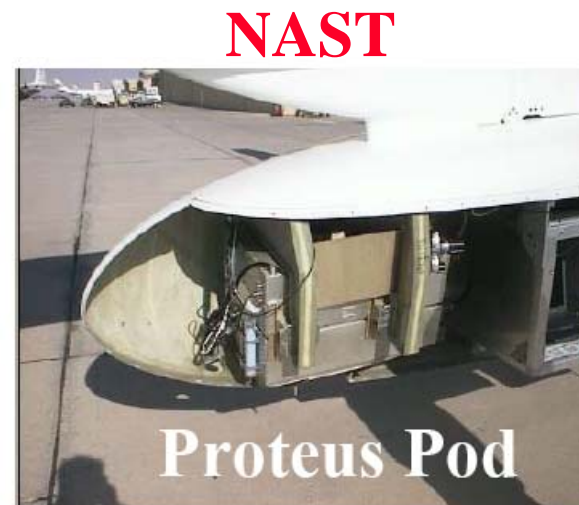
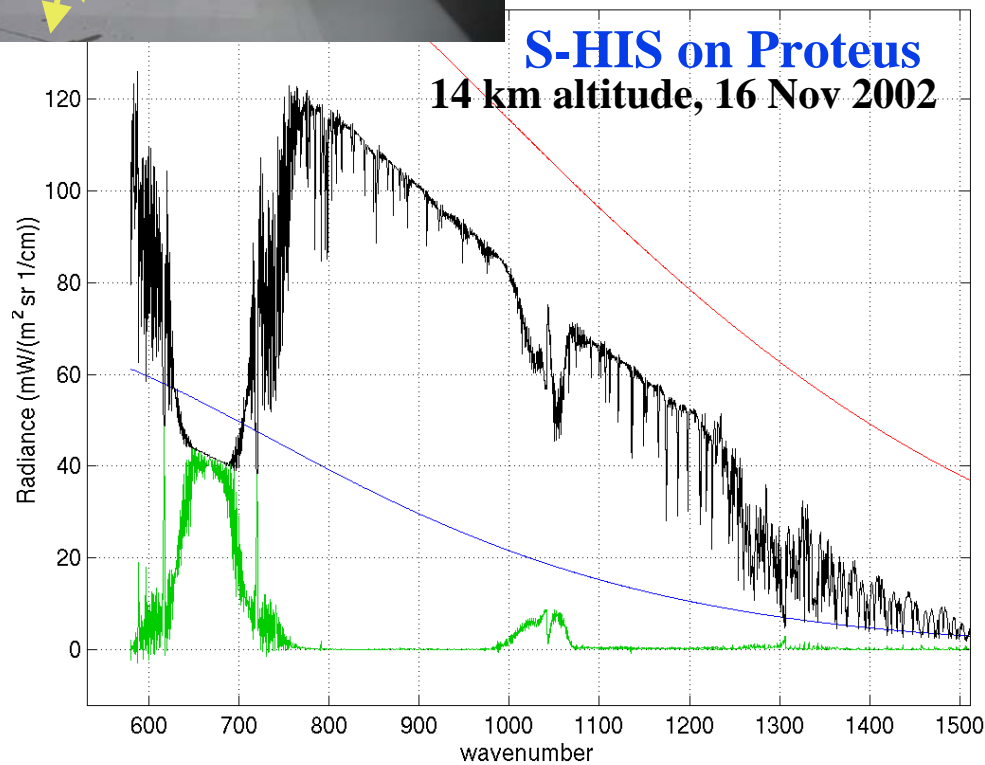
**Absolute  
Climate Change  
Records**

INFORMATION

# S-HIS & NAST: Tool for Research & Satellite Validation



**Proteus (IPO & ARM-UAV)**



**NAST**

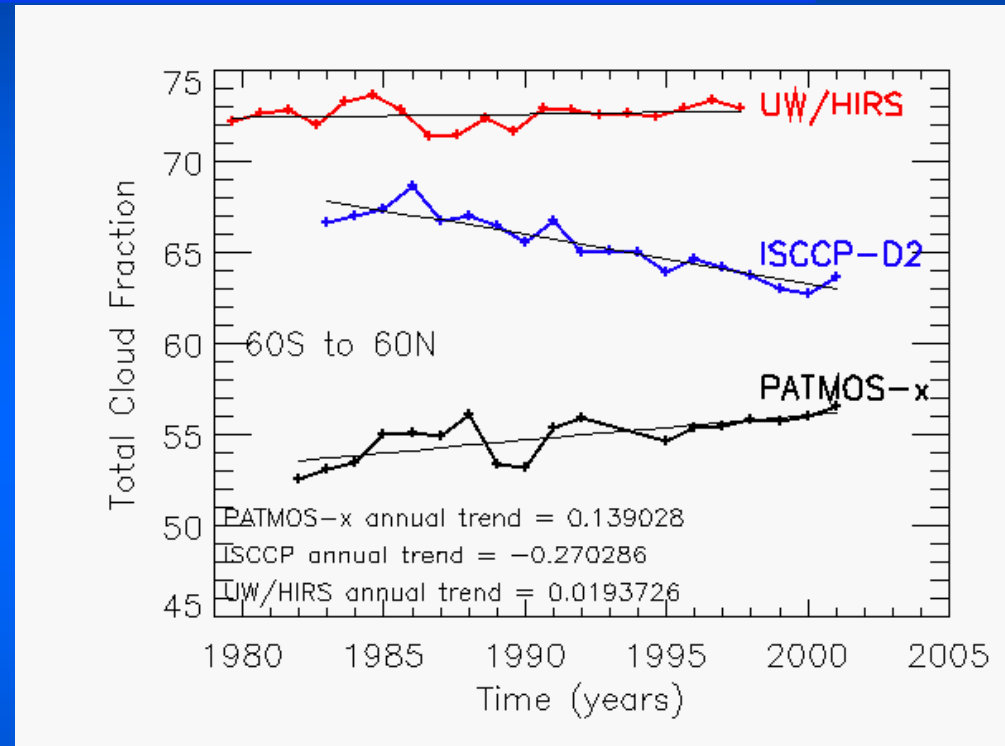
**We still have much to learn from the NAST and S-HIS aircraft Instruments**

# Look to add many more products to our work on Climate Trends

## Comparison of Total Cloud Amount Trends

The figure shows Total Cloud Amount time series from 60S to 60N for July

- **PATMOS-x does not exhibit the downward trend seen in ISCCP**
- **Differences in magnitude are likely due to PATMOS-x weighting of partly cloudy pixels. ISCCP and HIRS do no weighting of partly cloudy pixels**



***PATMOS-x trends are preliminary until calibration work is finished***

Patmos: Andy Heidinger & Mike Pavolonis  
UW/HIRS: Paul Menzel & Don Wylie

# **GEOSS: The ground-based Component is important too**

**Direct Broadcast Algorithms  
for Widely Distributed  
International Applications**

**Aviation  
Weather  
Products**

algorithms

theory  
modeling

INFORMATION

DATA

EDUCATION

KNOWLEDGE

**ARM-like  
Cal/Val Networks**

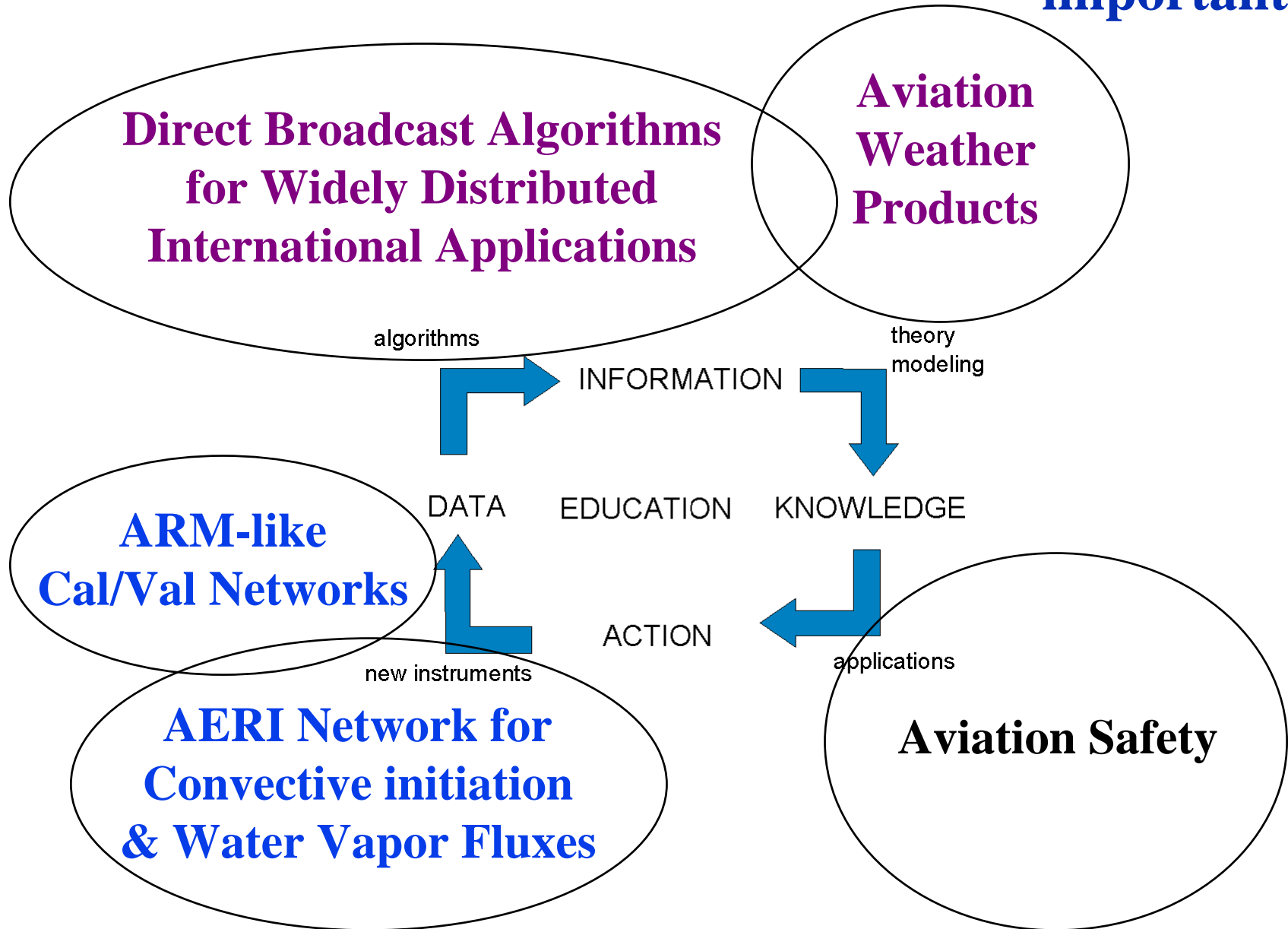
ACTION

applications

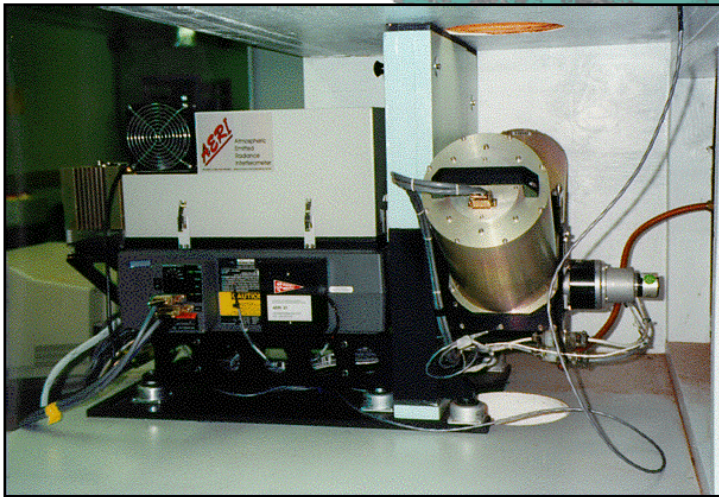
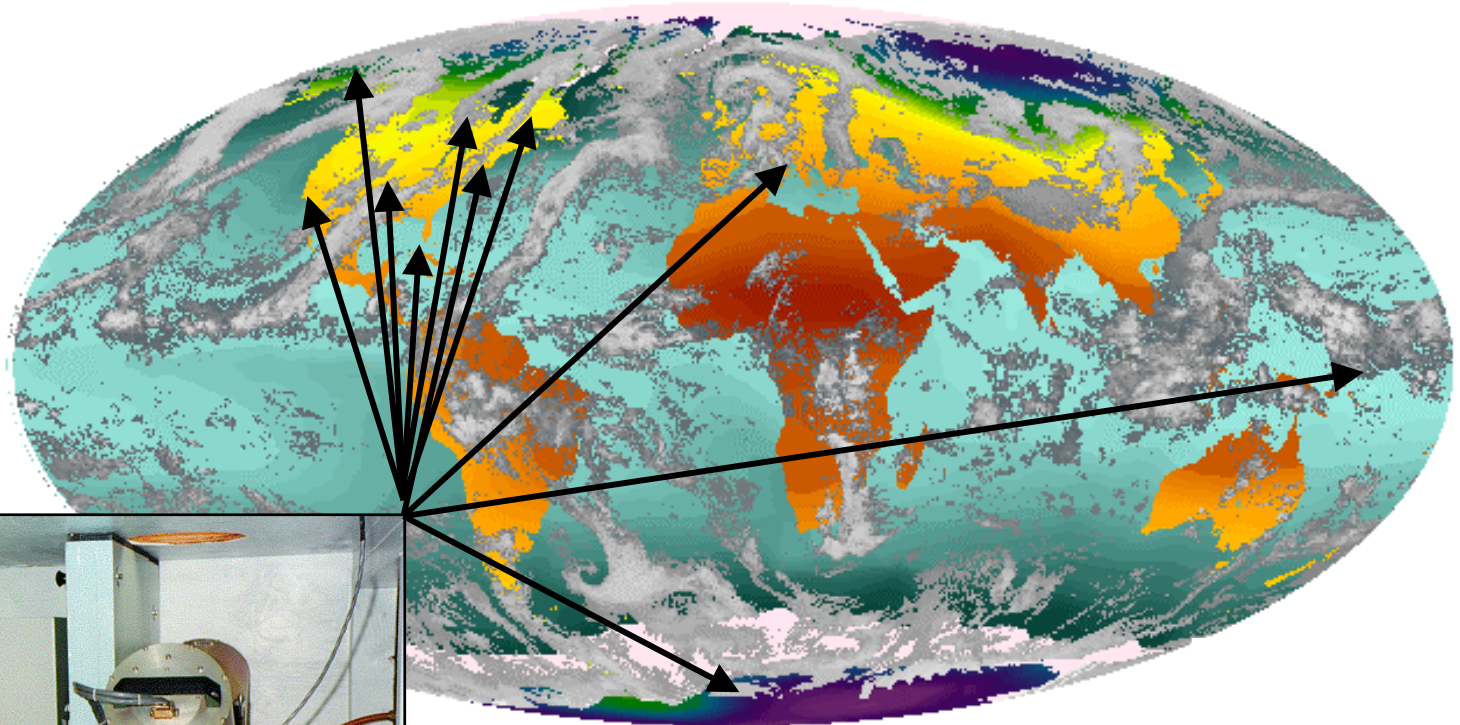
new instruments

**AERI Network for  
Convective initiation  
& Water Vapor Fluxes**

**Aviation Safety**



# AERI SYSTEMS AROUND THE WORLD



**UW AERI - 2 (AERIBAGO, SSEC)**

**DOE AERI - 7 (Kansas/Oklahoma, Alaska, S. Pacific)**

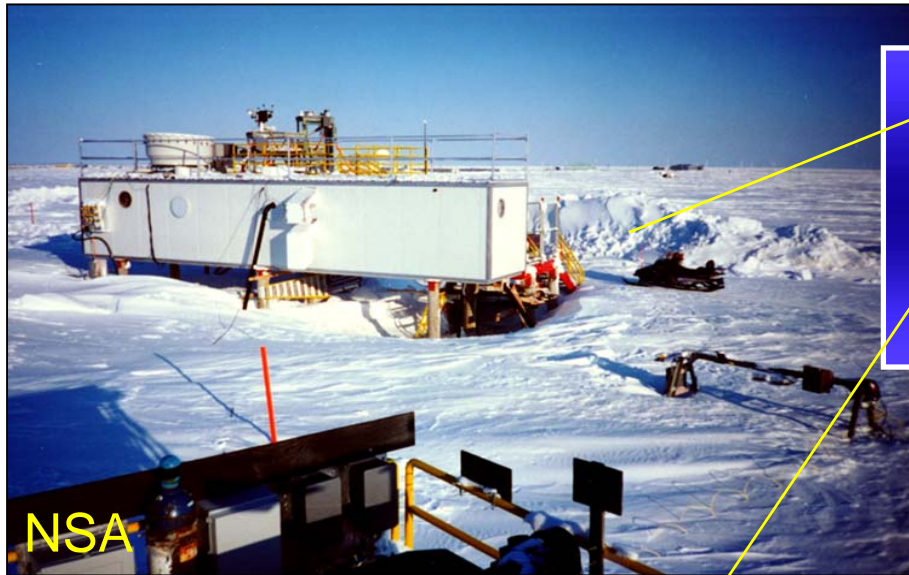
**U-Miami M-AERI - 3 (Florida)**

**Bomem AERI - 4 (Italy, California, Maryland, Canada)**

**U Idaho P-AERI - 1 (Antarctica)**



# ARM Site Atmospheric State Best Estimates



# EOS Direct Broadcast Sites

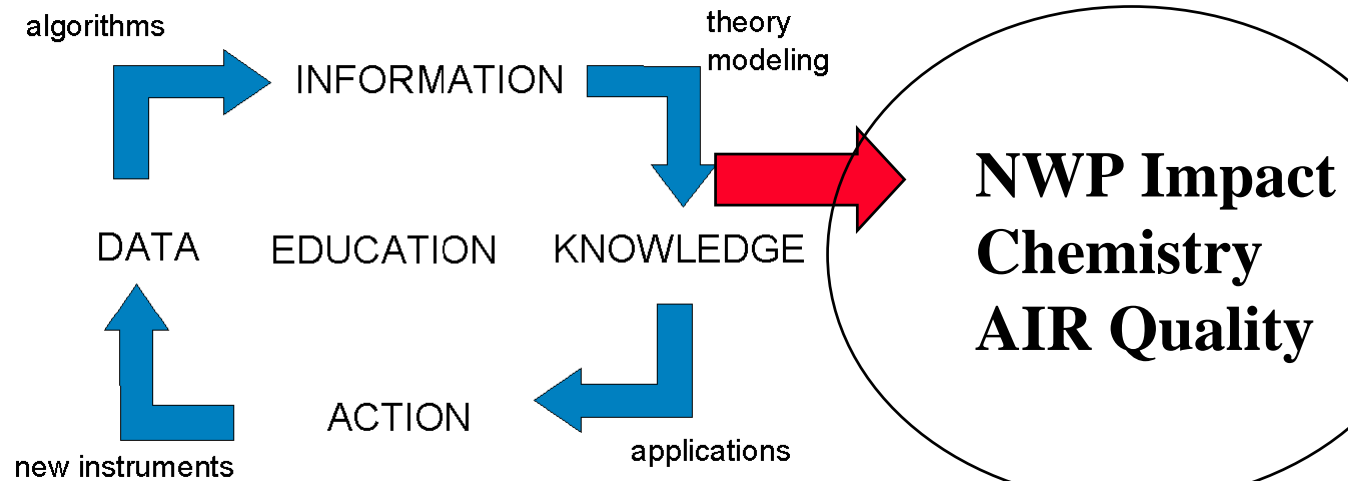


86 sites were known in Nov. 2003

Now more than 100

# Modelling: Both NWP and Chemical Transport will be keenly important

**Isentropic Coordinates  
Chemical Transport  
Cloud Assimilation**



# Collaborative Effort with NCEP (Don Johnson's Group)

The goal is to help ascertain reasons for NCEP model biases and improve weather and medium-range forecasts, especially emphasizing the isentropic approach.

• Diagnostic package developed at the UW is being migrated to NCEP  
(currently working with the Global Modeling Branch)

Collaboration - NASA Langley and the University of Wisconsin - Madison



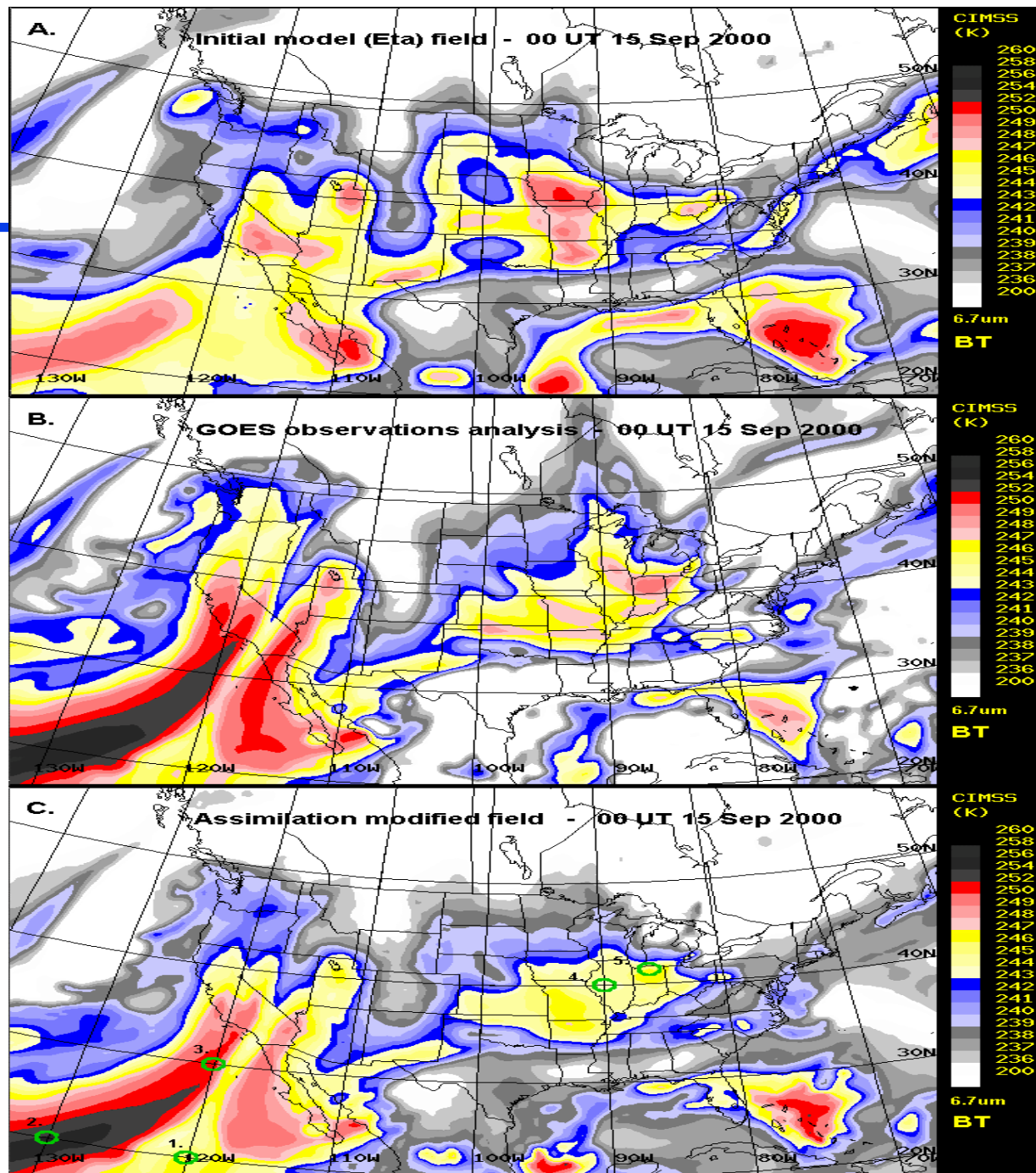
Don Johnson's group with Brad Pierce, NASA LaRC

# Assimilating Cloudy GOES Imager Obs into CRAS

**A. Eta Model  
First Guess**

**B. GOES  $T_b$   
observations for  
Assimilation--  
“Truth”**

**C. CRAS Accepts  
the information &  
Maintains improved  
GOES Correlation  
for > 48 hours**



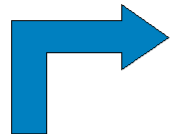
# Operational Systems: Key activities for CIMSS Participation & Innovation

**Prototype Data Systems:**  
Optimum use of algorithms, software,  
systems architecture, special purpose hardware  
to optimize access & performance  
in operations

**Cal/Val:**  
analysis &  
technique devel

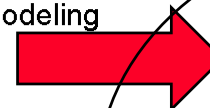
**GOES-R  
NPOESS**

algorithms



INFORMATION

theory  
modeling

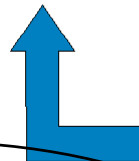


DATA

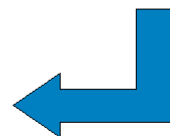
EDUCATION

KNOWLEDGE

**Timely &  
Accurate  
NWP input**



ACTION



new instruments

applications



# Next 25 years of CIMSS



- ◆ **NWP impact from IR soundings & winds has really just begun: the next 25 should see impressive progress**
- ◆ **Expect CIMSS will**
  - Continue to balance and blend work with GOES & POES,
  - Put more emphasis on climate,
  - Further blur the distinction between imaging and sounding approaches,
  - Promote instruments to improve winds from polar orbit
  - Consider the development hardware/software system techniques for proving and prototyping operational feasibility of new algorithms
  - Pursue new observing systems (e.g. SIRICE submm and IR)
- ◆ **The NASA partnership with NOAA should be enhanced— assure a route for demonstration missions to proceed operational system development—CIMSS should work to play a key role in this process, and work to strengthen its NASA connection**
- ◆ **Continue strong commitment to education and training**