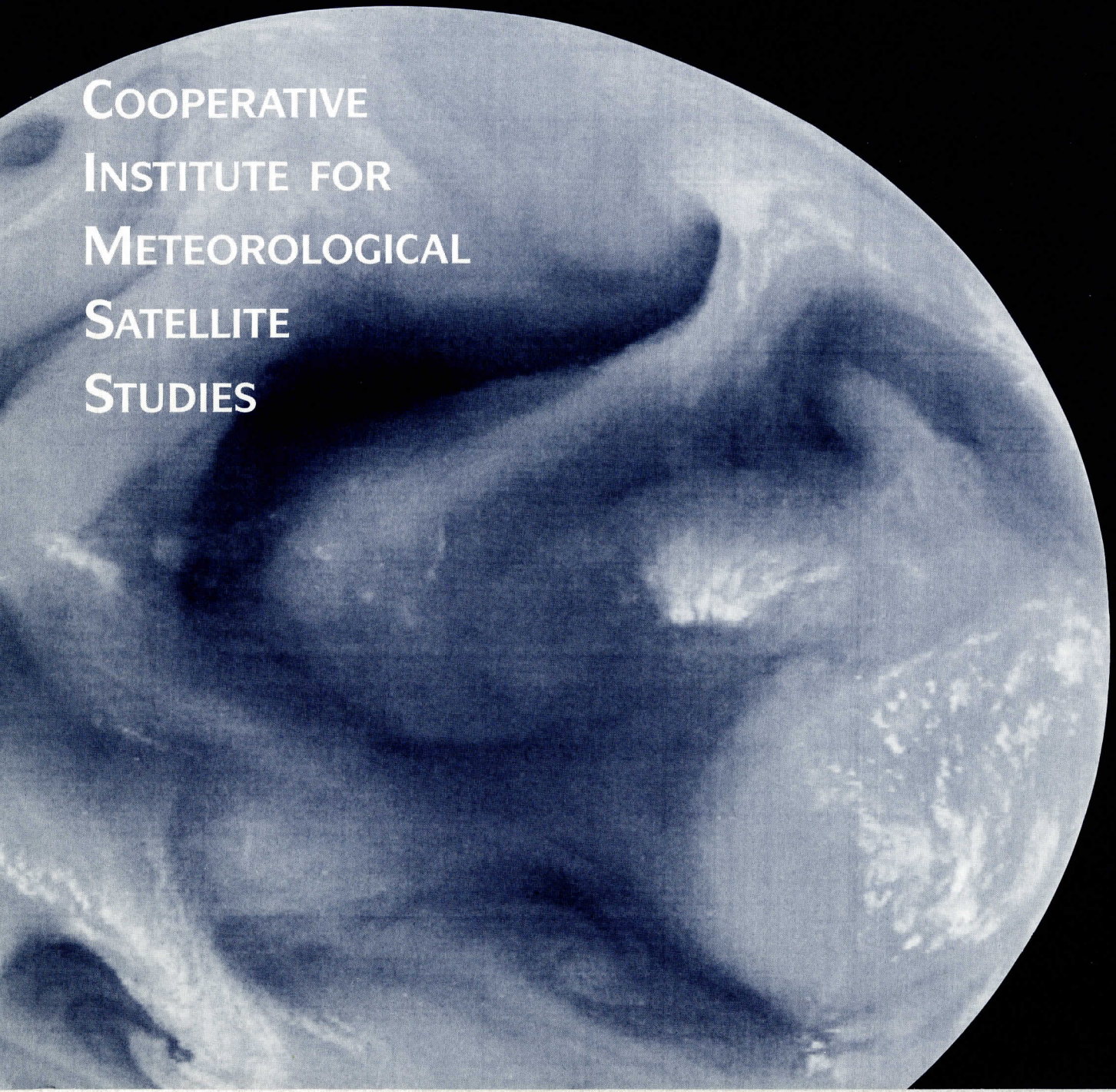
Space Science and Engineering Center
University of Wisconsin–Madison

REPORT TO THE BOARD OF DIRECTORS
COOPERATIVE INSTITUTE FOR METEOROLOGICAL SATELLITE STUDIES (CIMSS)
17 DECEMBER 1999

A REPORT from the



COOPERATIVE INSTITUTE FOR METEOROLOGICAL SATELLITE STUDIES

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COOPERATIVE INSTITUTE FOR METEOROLOGICAL SATELLITE STUDIES (CIMSS)
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prepared by
Thomas Achtor
Leanne Avila

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CIMSS BOARD OF DIRECTORS
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Steven Ackerman, UW Department of Atmospheric and Oceanic Sciences

Henry Revercomb, UW/SSEC/CIMSS

An Overview of the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin-Madison

CIMSS was established in 1980 to formalize and support cooperative research between the National Oceanic and Atmospheric Administration's (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS) and the University of Wisconsin-Madison's Space Science and Engineering Center. Sponsorship and membership of the Institute was expanded to include the National Aeronautics and Space Administration (NASA) in 1989.

During the 1980s, a need emerged for joint federal - university research centers to support the NOAA weather research program. The CIMSS was established to focus on the development and testing of the operational utility of new weather satellite observing systems to improve weather analysis and forecasts. Federally sponsored university institutes such as CIMSS have proved to be very cost effective organizations for conducting research and development programs.

CIMSS develops and successfully implements techniques and products for using geostationary and polar orbiting weather satellite visible, thermal and microwave radiation observations to improve forecasts of severe storms, including tornadoes and hurricanes. CIMSS plays a major role in the transfer of new technology into operational practice.

CIMSS plays a major role in instrument design and testing, and related software development, for improved space-based measurements of the earth's atmosphere. CIMSS is very active in national and international field programs, testing new instrumentation, data processing systems and assessing the geophysical utility of measurements.

Current research also focuses on the development and testing of computer-based analysis and forecast techniques that use observations from existing and planned spacecraft and ground-based weather observing systems as part of a national program to greatly improve weather forecast capabilities for the next decade. The optimal use of satellite data in climate and global change studies has become another essential part of the CIMSS mission.

CIMSS serves as an international center for research on the interpretation and uses of operational and experimental satellite observations and remote sensing data acquired from aircraft and the ground. These data are applied to a wide variety of atmospheric and oceanographic studies and evaluated for their potential operational utility. The CIMSS international role is further strengthened through its visiting scientist program that hosts sabbaticals for several foreign scholars each year.

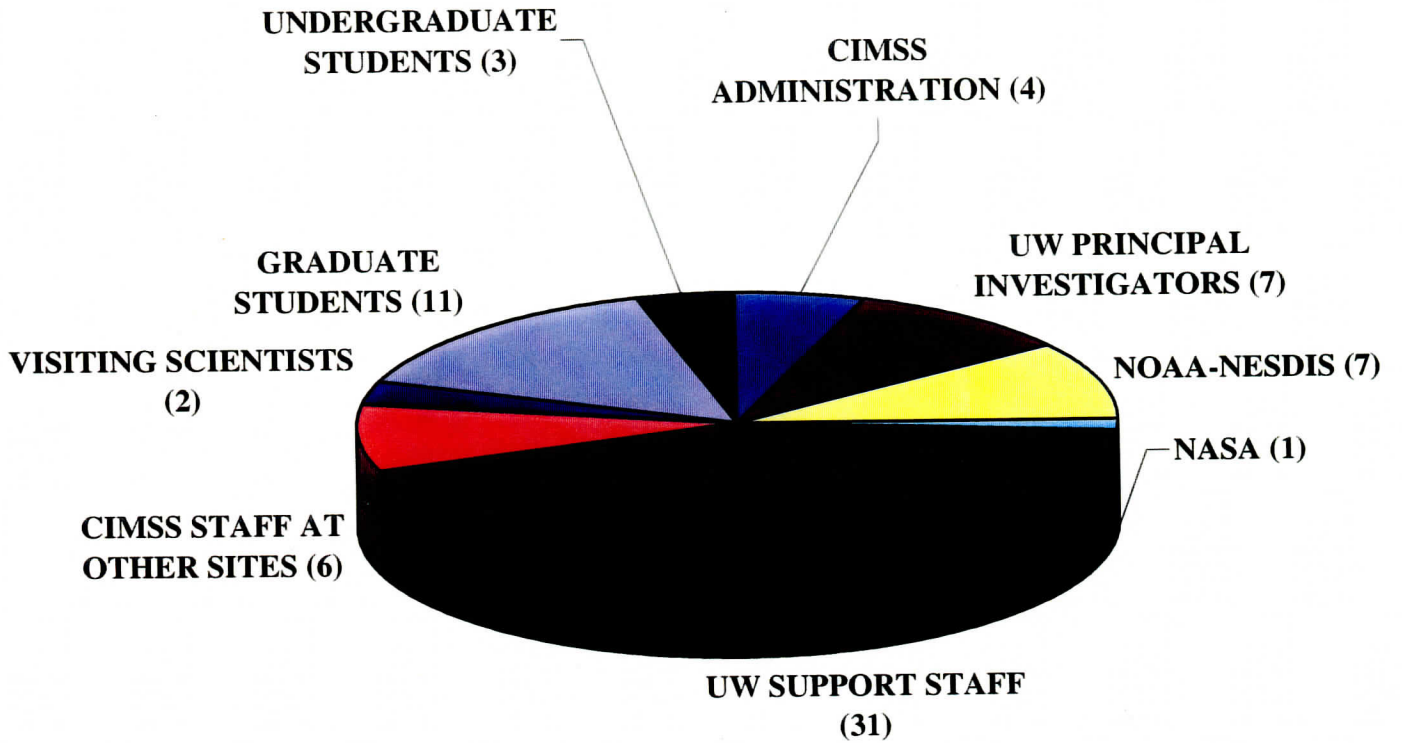
CIMSS' relationship with the UW-Madison Department of Atmospheric and Oceanic Sciences provides graduate student research support to more than ten students per year. The education/research center link provides an excellent path for young scientists entering geophysical fields.

Visit the CIMSS WWW Home Page at **http://cimss.ssec.wisc.edu**

Organizational Structure within the University of Wisconsin System

Research institutions with the University of Wisconsin system are administered through the Graduate School. The Space Science and Engineering Center (SSEC) is a research institution employing roughly 200 scientists, engineers, programmers and support staff. The SSEC program includes development of the Man-computer Interactive Data Access System (McIDAS), development and construction of spacecraft instrumentation and scientific investigations of earth and other planetary environmental systems. Within the SSEC, the Cooperative Institute for Meteorological Satellite Systems (CIMSS) is a research arm conducting scientific investigation from passive remote sensing systems for meteorological and surface-based applications.

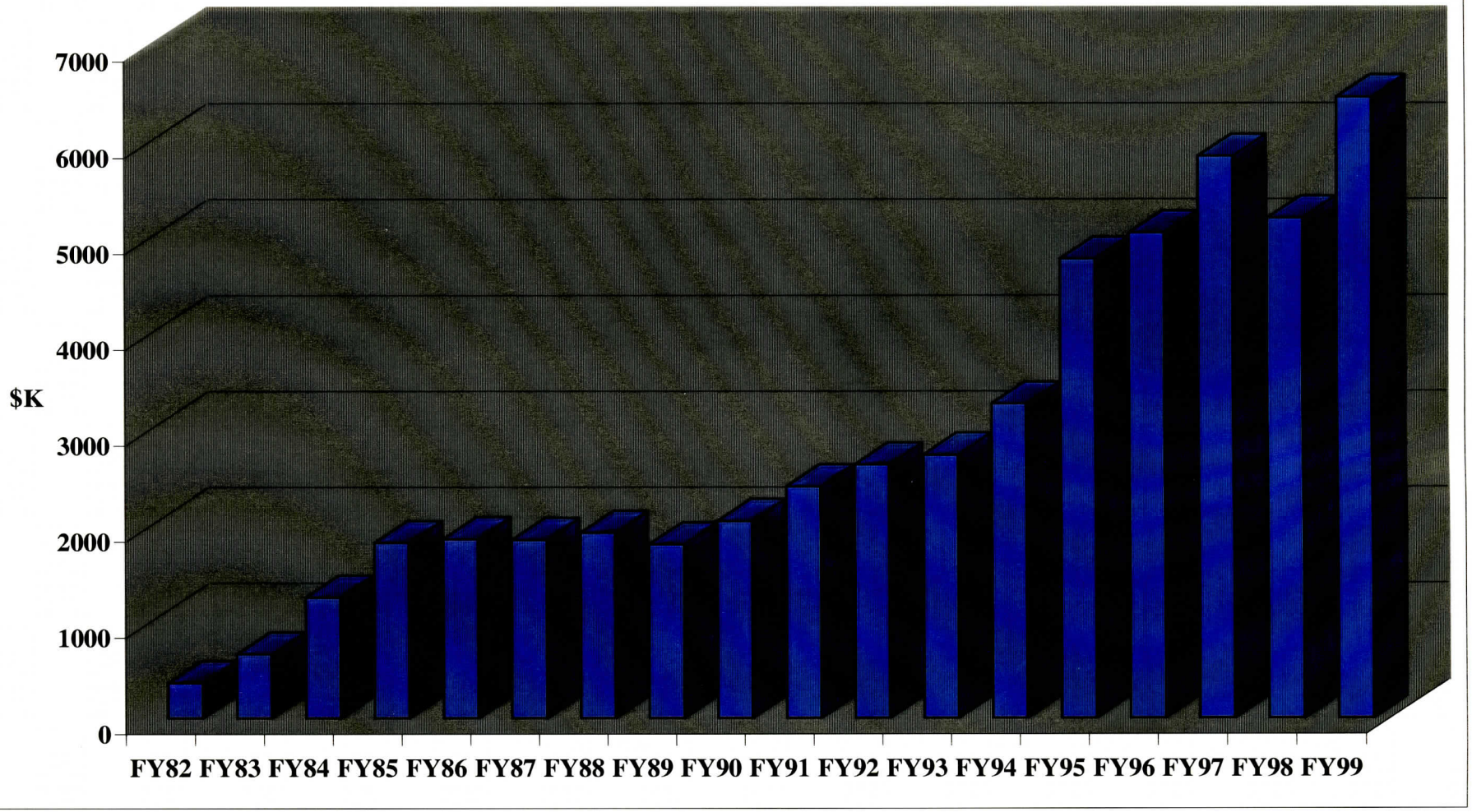
CIMSS PERSONNEL (72 ASSOCIATES)



CIMSS PERSONNEL SUMMARY: (72 Associates)		December 1999
CIMSS ADMINISTRATION: (4)	Steve Ackerman	Director
	Tom Achtor	Senior Research Program Manager
	Leanne Avila	Project Assistant II
	Rosalyn Pertzborn	Associate Outreach Specialist
UNIVERSITY PRINCIPAL INVESTIGATORS: (7)	George Diak	Senior Scientist
	Allen Huang	Associate Scientist
	Bob Knuteson	Assistant Scientist
	Robert Pincus	Visiting Professor
	Bill Raymond	Senior Scientist
	Henry Revercomb	Senior Scientist
	Chris Velden	Assistant Scientist
NOAA/NESDIS ASPT PERSONNEL: (7)	Paul Menzel (PI)	Senior Scientist
	Elaine Prins (PI)	Team Leader
	Robert Aune	
	Geary Callan	
	Jeff Key (PI)	
	Tim Schmit	
	Gary Wade	
NASA PERSONNEL (1)	Bryan Baum (PI)	
UNIVERSITY SCIENTIFIC AND PROGRAMMING STAFF (31)	Scott Bachmeier	Assistant Researcher
	Gail Bayler	Senior Research Specialist
	Ralph Dedecker	Senior Instrument Technician
	Joleen Feltz	Research Specialist
	Wayne Feltz	Assistant Researcher
	Veronica Fisher	Research Intern
	Richard Frey	Assistant Researcher
	Ray Garcia	Instrument Technician
	Liam Gumley	Associate Information Innovator
	Mat Gunshor	Senior Research Specialist
	Ben Howell	Researcher
	Dan LaPorte	Associate Researcher
	Szu Chia Lee	Research Specialist
	Jun Li	Associate Researcher
	John Mecikalski	Assistant Researcher
	Chris Moeller	Associate Researcher
	Fred Nagle	Researcher
	Shaimi Nasiri	Research Intern
	Jim Nelson	Associate Researcher
	Tim Olander	Research Specialist
	Tom Rink	Associate Instrumentation Tech
	Tony Schreiner	Associate Researcher
	Chris Sisko	Assistant Instrumentation Innovator
	Dave Stettner	Assistant Researcher
	Kathy Strabala	Assistant Researcher
	Jonathan Thom	Research Specialist
	Dave Tobin	Assistant Researcher

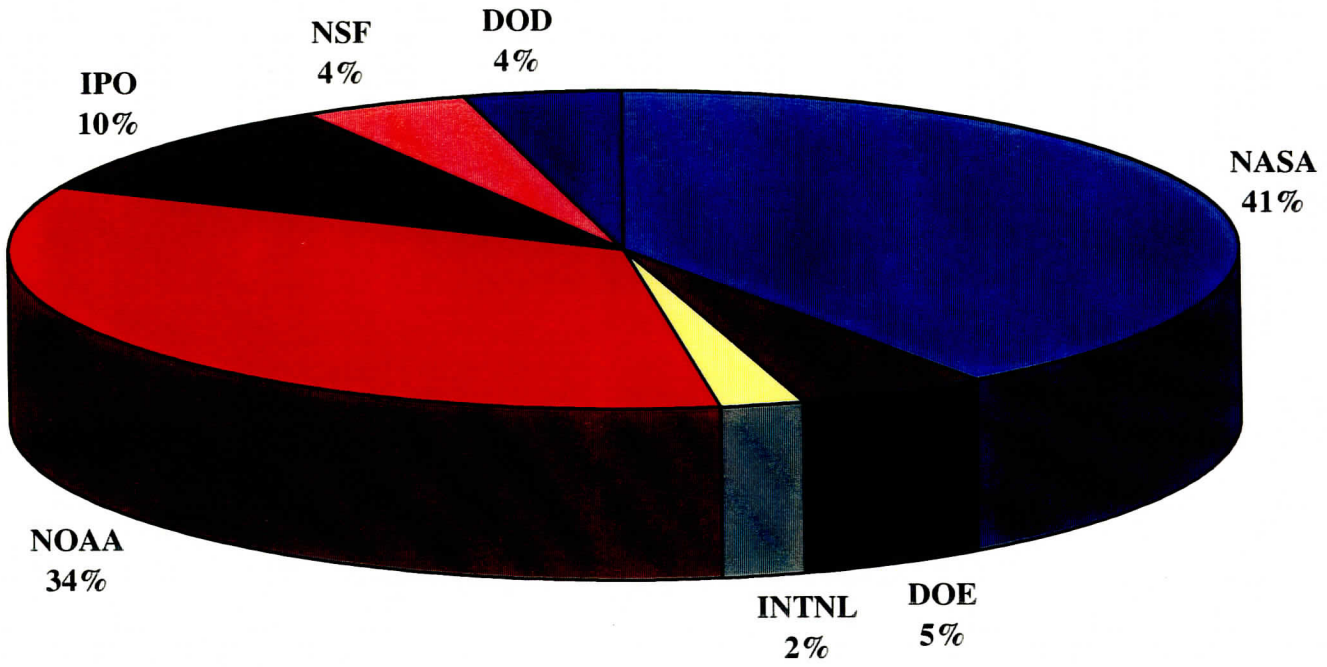
	Tom Whittaker	Senior Information Innovator	
	Hal Woolf	Researcher	
	Xiangqian Wu	Assistant Scientist	
	Tom Zapotocny	Associate Scientist	
VISITING SCIENTISTS: (2)	Youri Plokhenko	NCAR Fellow	
	Robert Rabin	National Severe Storms Laboratory	
POST DOCTORS: (0)	none		
STAFF AT OTHER SITES: (6)	Bormin Huang	LaRC/Assistant Researcher	
	Dan DeSlover	LaRC/Assistant Researcher	
	Jim Jung	NSC/Assistant Researcher	
	Paul vanDelst	NSC/Associate Researcher	
	Ma Xia Lin	Associate Researcher	
	Connie Spinoso	BoM/Research Associate	
GRADUATE STUDENTS: (11)	Paolo Antonelli	pH	Smith
	Kurt Brueske	pH	Ackerman/Velden
	Nick Nalli	pH	Smith
	Ed Mierkiewicz	pH	Roessler
	Xuanji Wang	pH	Ackerman/Key
	Howard Berger	MS	Ackerman/Velden
	Gregg Gallina	MS	Ackerman/Velden
	Monica Harkey	MS	Ackerman/Baum
	Erik Olson	MS	Ackerman
	Chris Schmidt	MS	Menzel
	Hong Zhang	MS	Menzel
HOURLY EMPLOYEES (3)	Jason Brunner		Achtor
	Steve Dutcher		Dedecker
	Robin Tanamachi		Knuteson

CIMSS SPENDING HISTORY: 1982-1999



CIMSS FY99 SPENDING

Total: $6.4M



CIMSS GRANT AND CONTRACT SUMMARY

By Agency

October 1999

NOAA PROGRAMS	AGENCY	PI/PM
2205 ABS/ABI STUDIES	NOAA	Huang/Schmit
Studies in support of NOAA next generation Sounder and Imager.		
8010 NOAA BASE	NOAA	Ackerman/Achtor
Broad support for CIMSS programs and infrastructure, including program management, education and outreach, students, visiting scientists, and workshops and seminars.		
8041 LANDFALLING HURRICANES	NOAA	Velden
Collaboration with the NCEP/TPC to create an improved low level wind analysis using GOES VIS cloud winds. Includes student working at TPC the past summer.		
8042 WINDS OSSE	NOAA	Huang / Velden
Observing System Simulation Experiment using GOES and future weather satellite wind data sets in forecast analysis and prediction system.		
8043 HIGH PERFORMANCE COMPUTING	NOAA	Hibbard / Whittaker
Development of high level protocols for Earth Science information, applicable to a wide variety of NOAA data holdings, encoding all the necessary metadata to allow the data to be fused in distributed, collaborative 3-D visualizations.		
8050 GOES PRODUCT ASSURANCE	NOAA	Ackerman/Achtor
Support for the GOES I-M Product Assurance Program (GIMPAP). Includes activities in retrieval, satellite cloud product, derived product imagery, biomass burning, SST, collaboration with NWS, instrument calibration / navigation, GPS, and CIMSS NSC and UCAR support.		
8059 VISIT	NOAA	Ackerman/Bachmeier
Virtual classroom project to develop techniques and methods for NWS forecasters training on satellite data interpretation and forecast applications.		
8063 USWRP - MODELING	NOAA	Raymond
Focus is on data assimilation and modeling studies.		
8067 SOUNDER OSSE	NOAA	Huang
Observing System Simulation Experiments with current and future sounder instruments on model analysis and forecast impact.		

8068 RADIATIVE TRANSFER MODELING NOAA Ackerman

Collaboration on developing a radiative transfer model for NPOESS instrument studies.

8069 NOAA –K CAL/VAL NOAA vanDelst

Support NOAA –K calibration and validation studies. Field programs to collect NOAA –K underflight data for validation.

NASA PROGRAMS AGENCY PI/PM

1230 PICASSO-CENA NASA Ackerman

Validation of MODIS data using LIDAR and AIRS data. Also, retrieval of aerosol with LIDAR AND IR.

1900 SURFACE ENERGY BUDGET – SHEBA NASA Key

To assess, using satellite, aircraft, and surface observations, the effects of horizontal variations of cloud and surface properties on the surface radiation budget.

1910 ANTARCTIC CLOUD PROPERTIES NASA Key

To develop a satellite based cloud climatology of the south polar region and to determine the influence of clouds on the surface energy balance using models and satellite data.

1920 POLAR SEA SURFACE EXCHANGE NASA Key

Development and application of algorithms to derive cloud and surface properties from satellite, particularly from AVHRR.

3000 CLOUD RETRIEVALS NASA Pincus

Developing a comprehensive error budget for MODIS retrievals of cloud optical thickness and particle size. Also, understanding the impact of cloud horizontal variability and on developing non-local measures of uncertainty.

3010 NASA CLOUD MODELS NASA Pincus

Understanding radiative transfer in spatially variable clouds by developing simple models of cloud structure for use in radiative transfer calculations

3170 FIRE – 3 DATA ANALYSIS NASA Ackerman/Revercomb

Continuing work on FIRE and SUCCESS data sets, focusing on cirrus cloud detection and cloud microphysics

3260 MOPPITT VALIDATION NASA(UMBC) Knuteson

Use AERI measurements to support validation activities; with Wallace McMillian

3270 CO CLIMATOLOGY NASA(UMBC) Knuteson

Apply AERI measurements and temperature/moisture retrieval for CO retrieval.

3410 BIOMASS / AEROSOL NASA Menzel/Prins

Collaborative effort with NASA-Goddard et al. to characterize aerosol radiative forcing in the Atlantic Basin associated with urban/sulfate, Saharan dust, and biomass burning aerosols.

3500 MODIS NASA Menzel/Ackerman

Participation in the EOS/MODIS science team, including MAMS and MAS field programs, calibration issues, and development of meteorological products (e.g., cloud mask, cloud properties, atm. profiles) and visualization software.

3510 AIRS-ALGORITHM DEV. NASA Smith/Huang

Participation in the EOS/AIRS instrument program, including HIS, SHIS and NASTI field programs, information content studies, and thermodynamic retrieval algorithm development.

3513 WALLOPS 99 FIELD PROGRAM NASA Smith/Huang

Participation in the 1999 Wallops Field Experiment supporting NAST. This is a placeholder until funding comes from IPO/LaRC.

3520 AIRS-CALIBRATION STUDIES NASA Revercomb

Participation in the EOS/AIRS program, including HIS, SHIS and NASTI field programs, and calibration and transmittance modeling work.

3530 ADEOS NASA Revercomb

Participation on the JMS ADEOS/IMG Science Team.

3531 SHIS-KWAJALEIN FIELD PROGRAM NASA Revercomb

Scanning HIS deployment to Kwajalein Is. (Tropical Pacific) for data gathering in support of TRMM.

4456 CIMSS STAFF AT LARC NASA Ackerman/Achtor

Financial support for CIMSS staff member Bormin Huang to work as a visiting scientist at NASA Langley on NPOESS retrieval methods.

4480-82 GIFTS PROPOSAL PREPARATION NASA Paulos/Huang/Velden

Support to complete studies and Phase II of the NMP EO3 GIFTS proposal.

5846 SURFACE ENERGY BALANCE NASA Diak

Technique development and studies examining the surface - atmosphere energy exchange. Using models of soil and vegetation and atmospheric PBL to diagnose land surface fluxes of moisture and heat at 10 km resolution over continental scales.

5856 AMSU MODEL IMPACT NASA Diak

Simulation experiments with new data sources, focusing on the development and testing of AMSU-B products and their information contribution. Major products include estimation of microphyscial components such as cloud water, rain water, etc.

5870	EOS / ASTER VALIDATION	NASA	Diak

Validation of ASTER data using MODIS.

5880	RESAC	NASA	Diak

Formation of a Regional Earth Science Applications Center. Program applies science results, technologies and data products to help resolve issues with regional economic and policy significance and to support regional assessments supporting the U.S. Global Change Research Program.

NAVY/DOE/NSF PROGRAMS		**AGENCY**	**PI/PM**
1220	SUOMI VIRTUAL MUSEUM	NSF	Ackerman

Develop a Web site to recognize and demonstrate the creative ideas of SSEC founder Verner E. Suomi.

1430	NRL TROPICAL SUPPORT	NRL	Velden

Create real time wind data production software that is platform independent. Work on a new targeting scheme. Develop enhanced Dvorak hurricane/typhoon estimation criteria based on multi-platform satellite imagery. Apply AMSU to TC studies.

1435	NRL TROPICAL CYCLONE	NRL	Velden

Study of Tropical Cyclone Intensity Changes in Response to Environmental Vertical Shear.

1600	LONGWAVE RADIATION	NSF	Walden

Support to fabricate and deploy an AERI in the Antarctic to study radiative processes, including ice and water clouds.

1610	ANTARCTIC CLOUDS	NSF	Walden

Cloud studies to support GCM parameterization.

3285	ARM / AERI ALGORITHM	DOE	Knuteson

Meteorological software retrieval and product development for AERI radiance measurements to support the DOE ARM program. Temperature / moisture retrieval software for AERI and development of thermodynamic time series display.

4322	AERI MAINTENANCE	DOE	Revercomb

Maintenance contract to support AERI deployed for DOE.

4455	NORTH SLOPE AERI	DOE	Revercomb

Support for AERI deployed on the North Slope of Alaska.

4666	ARM-CART	DOE	Revercomb

Continued participation in the DOE ARM program, water vapor validation studies, including field programs at the CART site.

IPO PROGRAMS	AGENCY	PI/PM
1210 NPOESS VIIRS AEROSOL STUDIES	AER (IPO)	Ackerman
Aerosol detection with advanced imager on NPOESS platform.		
4446 NAST DATA SETS	IPO	Revercomb
Support for field program data set post processing, meteorological product creation and quality control to produce final product data sets for LaRC and IPO.		
4450 IPO S-OAT ACTIVITIES	IPO	Menzel/Revercomb
Support for activities of the IPO Sounder OAT teams.		

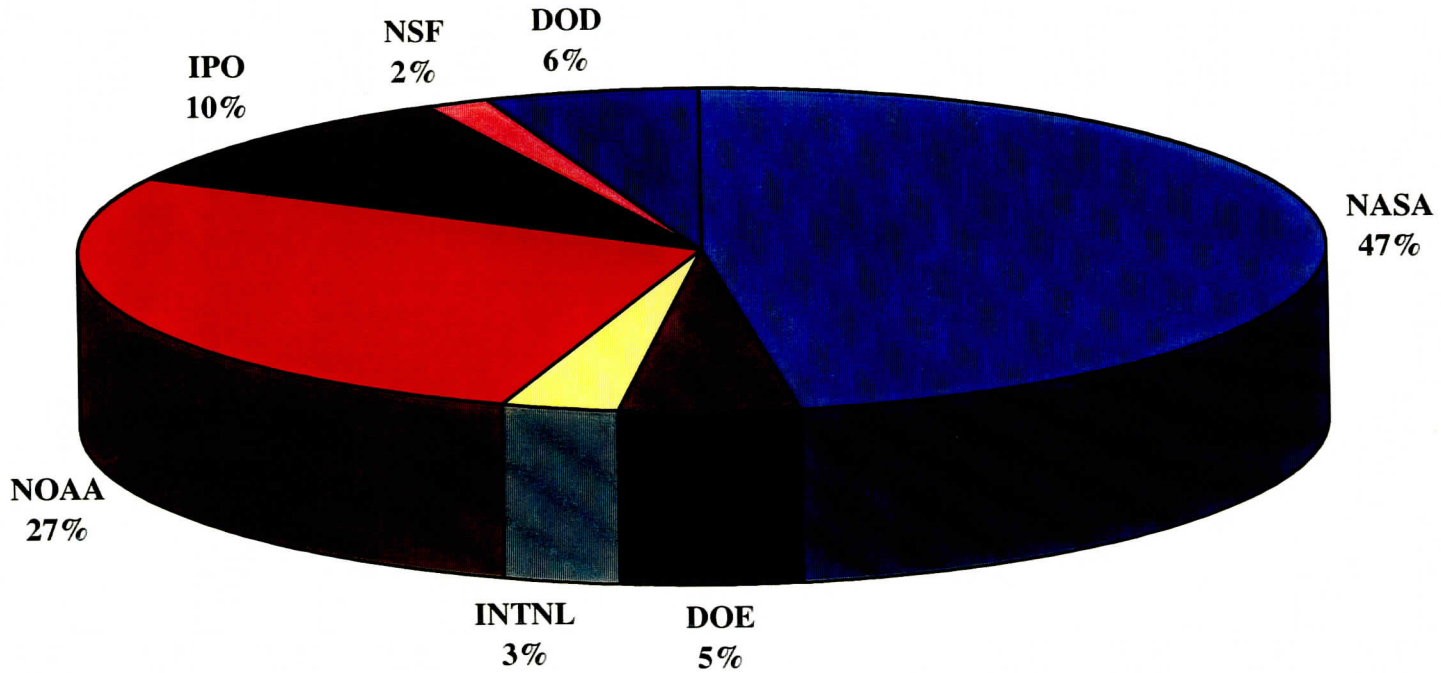
INTERNATIONAL/PRIVATE SECTOR	AGENCY	PI/PM
1027 ATOVS / IAPP	none	Achtor
Revenue from licensing of the International TOVS Processing Package (ITPP) and International ATOVS Processing Package (IAPP) to commercial organizations.		
1200 NASDA / ADEOS TEAM	JMA	Ackerman
Project to transform the MODIS Cloud Mask developed at CIMSS to work with the Japanese Global Imager (GLI) which will be on ADEOS II (and is similar to MODIS).		
4407 CWB WINDS	CWB	Huang/Velden
For Central Weather Bureau, Taiwan, to provide geostationary wind data sets to their numerical prediction center.		
5881 CASE INSOLATION PRODUCTS	Private	Diak
Creation of Solar Insolation products from GOES archived data.		

Programs Awaiting Project Numbers:

CERES	NASA	Baum
Cirrus cloud parameterization studies for General Circulation Models.		
MODIS	NASA	Baum
Cirrus microphysical and optical property retrieval.		

CIMSS EXPECTED FUNDING: FY2000

Estimated: $6.5M



CIMSS PROPOSAL SUMMARY

covering FY99
updated October 1999

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PROPOSALS FUNDED

A Proposal to Construct an EOS Direct Broadcast Facility at SSEC
Fox, Gumley
NASA, $350,750
Submitted in October 1998 **(Funded #1042)**

A Distributed Object Science Data Protocol for Advanced Collaboration
Menzel, Hibbard
NOAA, $100,000
Submitted in November 1998 **(Funded #8043)**

High Spectral Resolution FTIR Observations for the ARM Program
Revercomb
DOE, $310,000
Submitted in November 1998 **(Funded #4666 w/ mods)**

The Collection and Analysis of High Spectral Resolution IR Radiances as Part of FIRE III
Ackerman, Revercomb
NASA, $44,000
Submitted in December 1998 **(Funded #3170, continuation)**

The Midwest Center for Natural Resource Management
Diak, et. al.
NASA, $1,500,000 (shared)
Revised Budget submitted in December 1998 **(Funded #5880)**

Participation in NOAA-K Calibration/Validation Activities
vanDelst, Achtor
NOAA, $100,000
Submitted in December 1998 **(Funded #8069, continuation)**

Field Deployment for Special Emissivity Measurements: Desert Radiance III
Knuteson
NRL, $31,980
Submitted in January 1999 **(Funded #3280)**

Observational Study of Tropical Cyclone Intensity Changes in Response to Environmental Vertical Shear
Velden
ONR, $150,000
Submitted in January 1999 **(Funded #1435)**

Agreement on the Pre-Launch Standard Product Algorithm Development for the Global Imager Aboard the Advanced Earth Observing Satellite II
Ackerman
NASDA (NASA), $10,900 and $60,000
Submitted in January 1999 (**Funded #1200, continuation**)

Repair of the North Slope of Alaska AERI
Revercomb
DOE, $19,522
Submitted in February 1999 (**Funded #4455**)

Maintenance and Support of Operational ARM AERI Systems
Revercomb
DOE, $59,656 and $40,707
Submitted in February 1999 and August 1999 (**Funded #4322**)

Participation in the GOES Product Assurance Plan
Johnson, Achtor
NOAA, $830,000
Submitted in February 1999 (**Funded #8040, continuation**)

Continuation of the Data Analysis Software Development for the AERI
Knuteson
DOE, $165,000 (shared)
Submitted in February 1999 (**Funded #3285, continuation**)

Development of Atmospheric Retrievals using Satellite Data from Microwave Sounding Instruments
Diak
NASA, $50,000
Submitted in January 1999 (**Funded #5856, continuation**)

Analysis of Combined PICASSO-CENA and MODIS Data
Ackerman
NASA,
Submitted in May 1999 (**Funded #1230**)

A Proposal for Continued Participation in the NOAA ERL USWRP
Raymond
NOAA, $60,000
Submitted in May 1999 (**Funded #8063, continuation**)

A Proposal to the USWRP: Improving Forecasts of Landfalling Hurricanes
Velden
NOAA, $85,000
Submitted in May 1999 (**Funded #8042, continuation**)

NMP GIFTS Proposal Support
Revercomb
NASA, $186,000
Submitted in June 1999 **(Funded #4480)**

Supplemental Funding to Spectral and Radiometric Calibration of the IMG for ADEOS
Revercomb, Knuteson
NASA, $153,108 (shared)
Submitted in June 1999 **(Funded #3530)**

Engineering and Scientific Support for the NPOESS Airborne Sounder Testbed (NAST) Instrument
Revercomb
NASA (LaRC), $271,478
Submitted in June 1999 **(Funded #4446-4449)**

Improved Algorithm Development for Ocean Observations with EOS/MODIS
Revercomb
U. Miami (NASA), $35,024
Submitted in August 1999 **(Funded #4350)**

Remote Sensing as it Pertains to Agriculture
Diak, $7,500
CASE Corp
Submitted in August 1999 **(Funded #5881)**

Antarctic Cloud Properties and their Effects on the Surface Energy Budget
Key, $145,084
NSF
Submitted in August 1999 **(Funded #1900)**

Documenting, Understanding and Predicting the Aggregate Surface Radiation Fluxes for SHEBA
Key, $40,314
NASA
Submitted in August 1999 **(Funded #1910)**

Continued Support for CIMSS Base Activities
Ackerman, Achtor
NOAA, $265,000
Submitted in June 1999 **(Funded #8010)**

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PROPOSALS REJECTED

The Development of a Conceptual Model for Extra Tropical Transition of Tropical Cyclones
Velden
NSF, $70,000
Submitted in January 1999

Continuous Vertical Profiling of Boundary Layer Temperature and Humidity in Support of the VTMX Research Program
Knuteson, Feltz
DOE, $320,000
Submitted in June 1999

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CURRENTLY PENDING (FUNDING LIKELY)

Application of Remote Sensing to Assess the Impact of Long Term Climate Variability on Coastal Sedimentation
Menzel, Moeller
NASA, $545,537 (shared)
Submitted in February 1999 **(We have heard it is funded)**

World Deltas: A Baseline of Change
Menzel, Moeller
LSU (NASA), $224,794 (subcontract, shared)
Submitted in February 1999 **(We have heard it is funded)**

Accounting for Sub-grid Scale Variability of Clouds and Water Vapor in Large Scale Models based on ARM Observations
Pincus
DOE, $229,846
Submitted in June 1999 **(We have heard it is funded)**

Field Support and Data Analysis for SHIS Participation in the NAPScar Field Program
Revercomb
NOAA, $24,000
Submitted in February 1999 **(We have heard it is funded)**

Continuation of High Spectral Resolution FTIR Observations for the ARM Program: Clear and Cloudy Sky Applications
Revercomb, Knuteson, et. al.
DOE, $677,934
Submitted in June 1999 **(We have heard it is funded at a lower level)**

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CURRENTLY PENDING

Atmospheric Compensation Study in Support of SEBASS (Desert Radiance Follow-up)
Knuteson, Feltz
NRL, $43,586
Submitted in June 1999

Cooperative Study of Hurricane Variations using CAMEX-3, TRMM, AMSU and other Data Sets
Velden
UMBC (NASA), $25,367
Submitted in June 1999

A Study of High Latitude Polar Highs and Cloud Drift Winds
Raymond
NSF, $412,165
Submitted in June 1999

The Collection and Analysis of High Spectral Resolution IR Radiances as Part of FIRE III
Ackerman, Revercomb
NASA (LaRC), $134,000
Submitted in June 1999

Interactive Visualization of the Global Water Cycle
Ackerman, Santek
NSF, $553,785
Submitted in July 1999

Extra Tropical Transition of Tropical Cyclones
Velden
NSF, $112,846
Submitted in August 1999

A Distributed Object Data Protocol for Advanced Collaboration using JAVA and VIS-AD
Menzel, Hibbard, Whittaker
NOAA, $150,008
Submitted in August 1999

Monitoring and Modeling of Land Surface Energy and Water Fluxes using Enhanced Pathfinder Database
Diak, Norman
NASA, $580,558
Submitted in September 1999

Land Surface Temperature and Emissivity from Combined MODIS and AIRS Data

Knuteson, Revercomb
NASA, $572,525
Submitted in September 1999

Mesoscale Assimilation of Real Time MODIS and AIRS Data
Huang, Menzel, et. al.
NASA, $750,000
Submitted in September 1999

International MODIS and AIRS Processing Package for EOS Direct Broadcast Data
Huang, Gumley
NASA, $749,859
Submitted in September 1999

Application of Polar Pathfinder Datasets for Intercomparison of Arctic Regional Models
Key
U of Colorado (NASA)
Submitted in September 1999

Polar Cloud Properties from Combined Satellite Measurements
Ackerman, Key
NASA, $908,778
Submitted in September 1999

Parameterizing Cumulus Momentum Transport ... for Application in Regional Climate Models
Mecikalski
NASA, $74,353
Submitted in September 1999

Determination of Momentum Transport, Organization and Temporal Intensity of Deep Convection using Remotely Sensed Data from TRMM
Mecikalski
NASA, $116,699
Submitted in October 1999

Analyses of Infrared Validation Data in Support of TRMM
Revercomb, Knuteson, et. al
NASA, $300,010
Submitted in October 1999

1999 REVIEWED LITERATURE

Achutuni, R. and P. Menzel, 1999: Space systems consideration in the design of advanced geostationary operational environmental satellites. *Adv. Space Res.*, **23**, 1377-1384.

Anderson, M. C., J. M. Norman and G. R. Diak, 1999: ALEX - A reversible model of atmosphere-land exchange. Accepted for Publication, *Agric. For. Meteor.*

Baum, B. A., D. P. Kratz, P. Yang, S. Ou, Y. Hu, P. F. Soulen, and S-C. Tsay, 1999: Remote sensing of cloud properties using MODIS Airborne Simulator imagery during SUCCESS. I. Data and models. In press, *J. Geophys. Res.*

Baum, B.A., P. F. Soulen, K. I. Strabala, M. D. King, S. A. Ackerman,W. P. Menzel, and P. Yang, 1999: Remote sensing of cloud properties using MODIS Airborne Simulator imagery during SUCCESS. II. Cloud thermodynamic phase. In press, *J. Geophys. Res.*

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CIMSS 1999

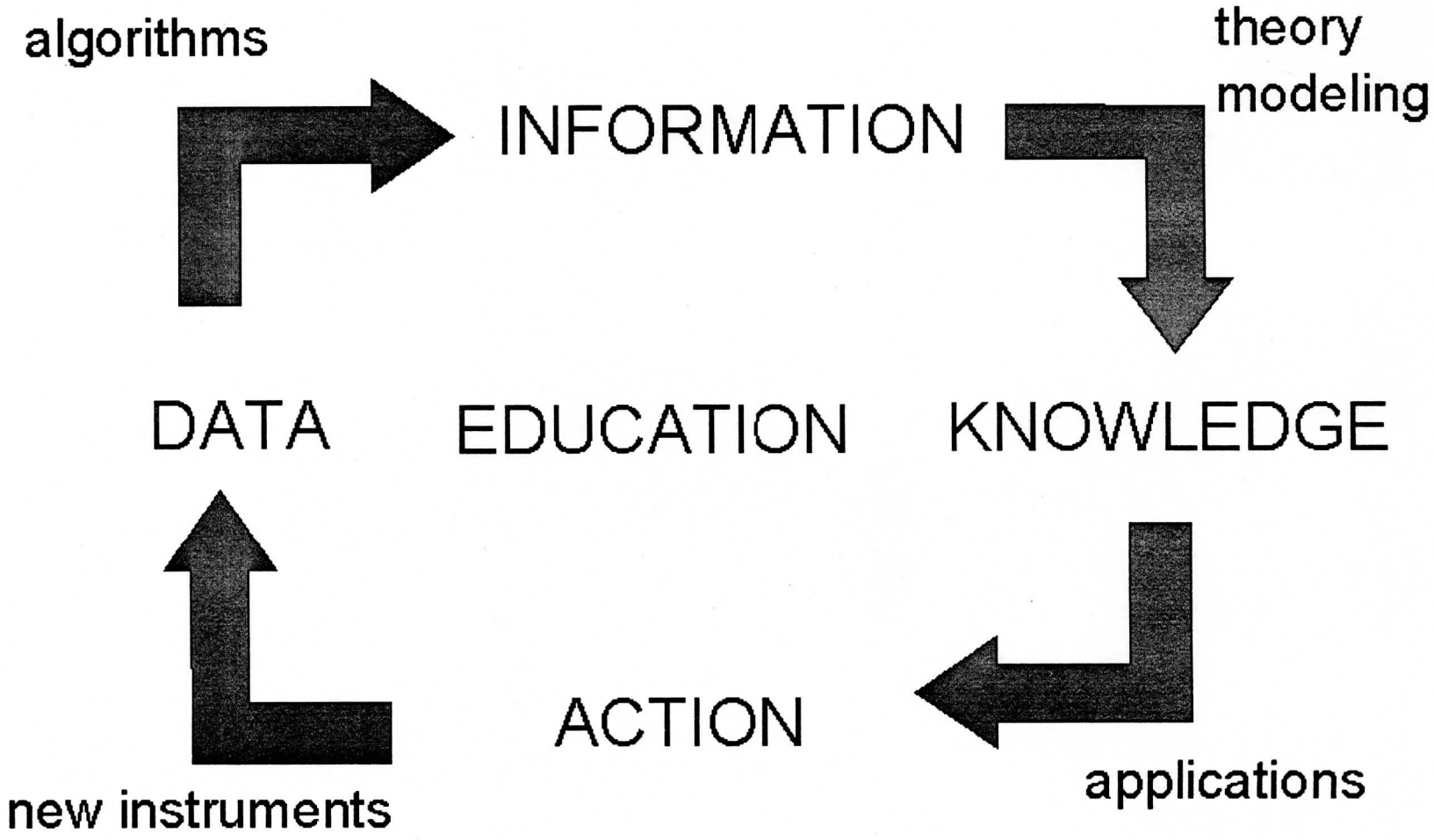
CIMSS

Cooperative Institute for Meteorological Satellite Studies

Space Science and Engineering Center

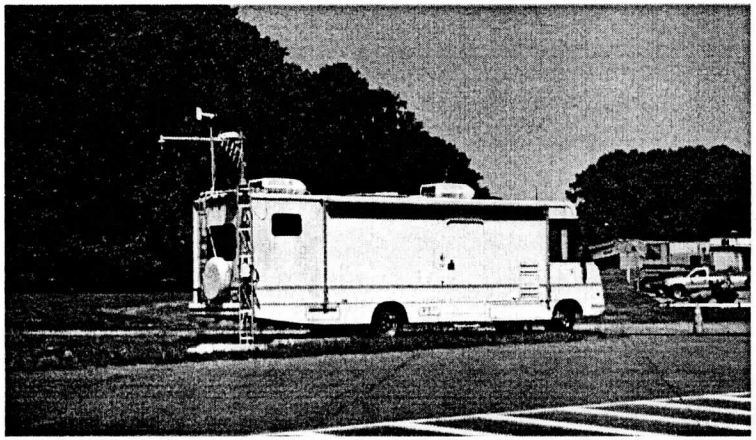
UNIVERSITY OF WISCONSIN–MADISON

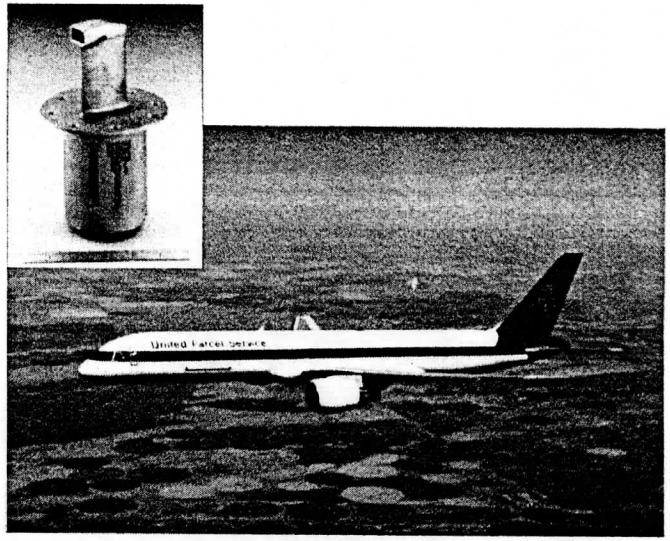
1225 West Dayton Street
Madison, Wisconsin 53706
608–263–7435 608–262–5974 (fax)

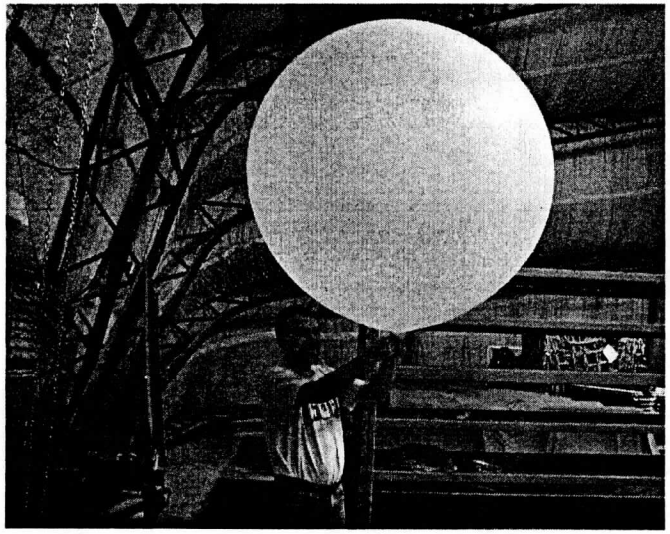

algorithms
INFORMATION
theory
modeling
DATA
EDUCATION
KNOWLEDGE
ACTION
new instruments
applications

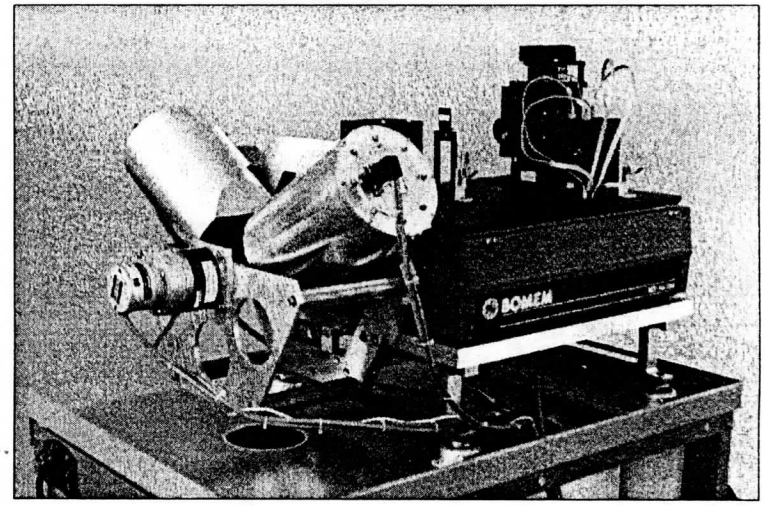
Water Vapor Validation Experiment Louisville, Kentucky

September 22 - October 2, 1999

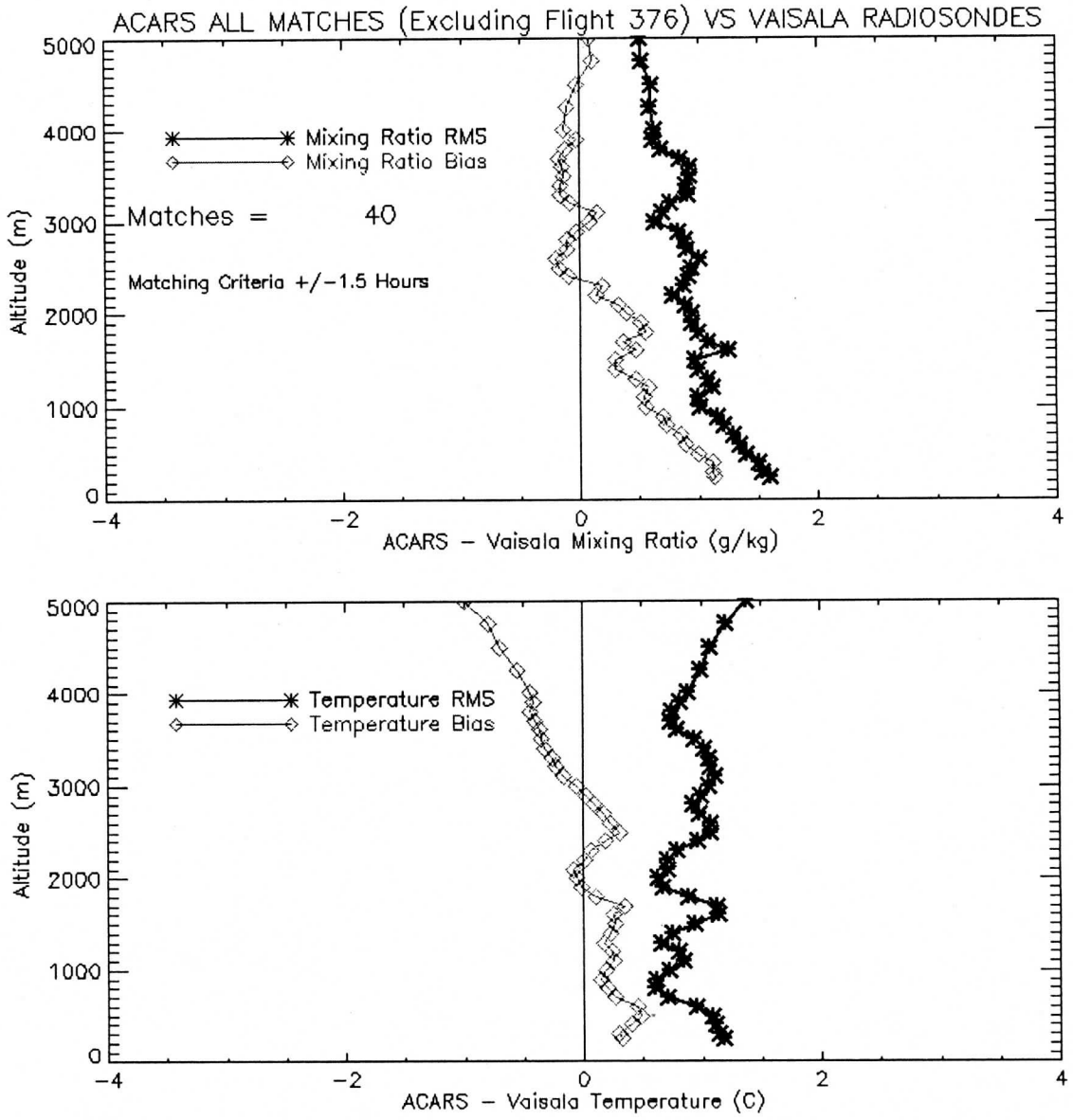




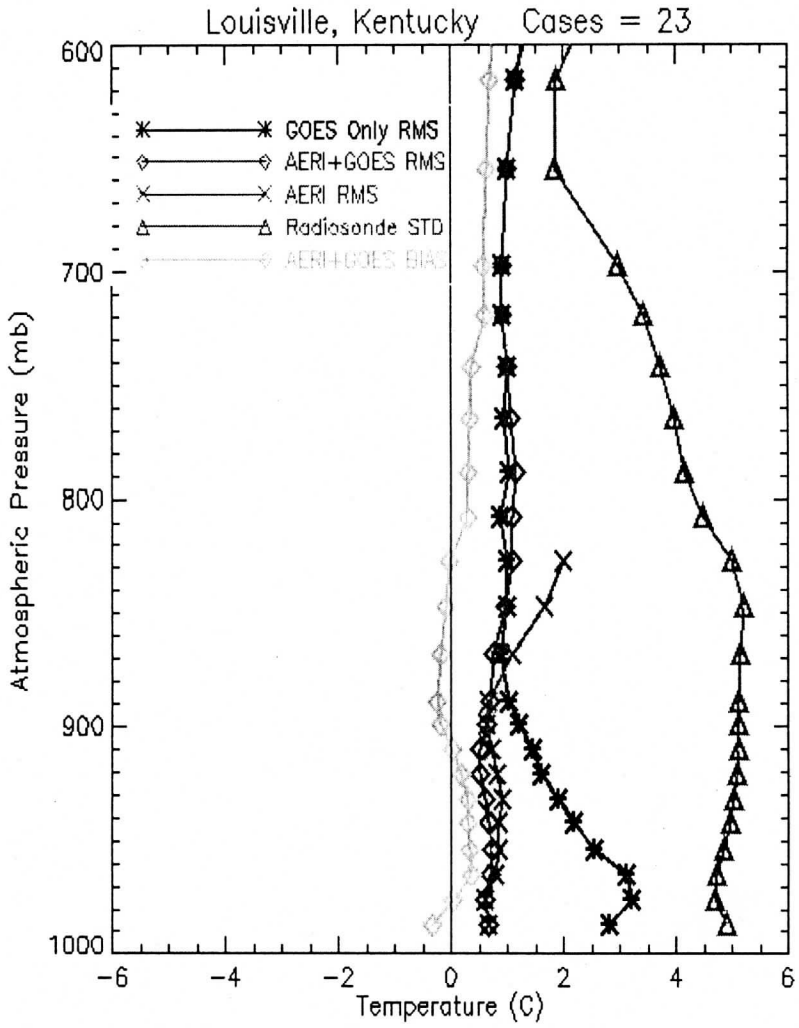


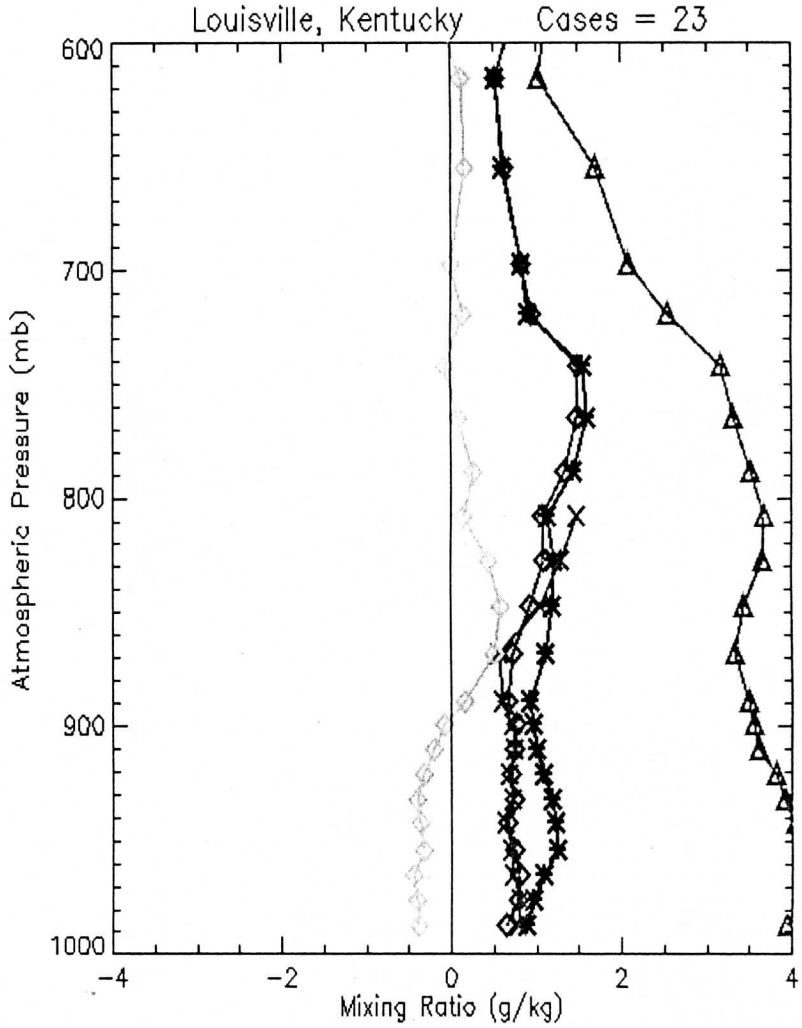


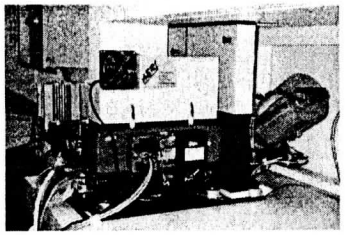
UPS Aircraft Water Vapor Sensor Statistics Compared to Radiosondes



AERI, GOES, and RAOB matches for Louisville, KY field experiment







Conclusions of AERI Demo

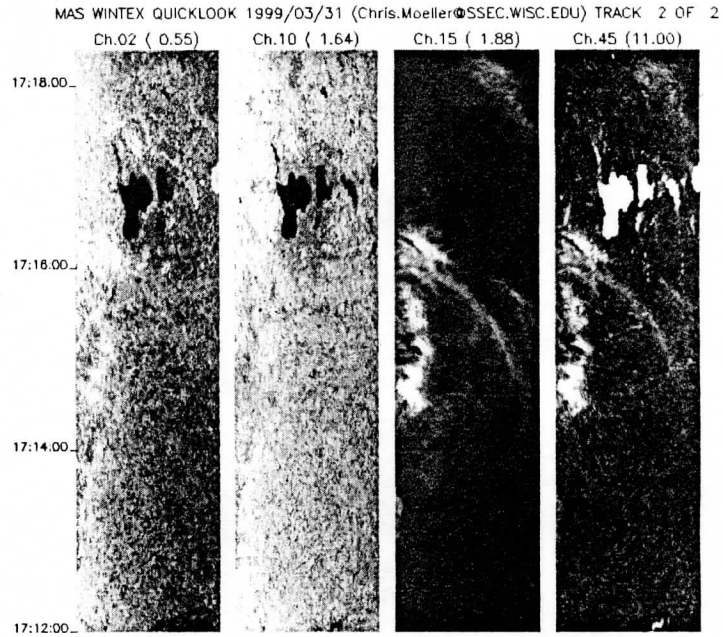
Ground based AERI provides continuous monitoring of temperature / moisture changes in boundary layer

Synergistic use with GOES provides continuous tropospheric temperature / moisture profiling

- Temperature / moisture profiles provided at better than 250 meter vertical resolution in near real-time every ten minutes in the boundary layer
- With GOES hourly tropospheric soundings within 1 C rms of raob T(p) up to 200 hPa
- Oklahoma / Kansas AERIs useful for NWP model validation and data assimilation in near real-time over DOE ARM site domain
- High temporal resolution stability indices to forecast convective destabilization before severe thunderstorm initiation
- Low cost environmentally hardened robust AERI system possible with commercial partner

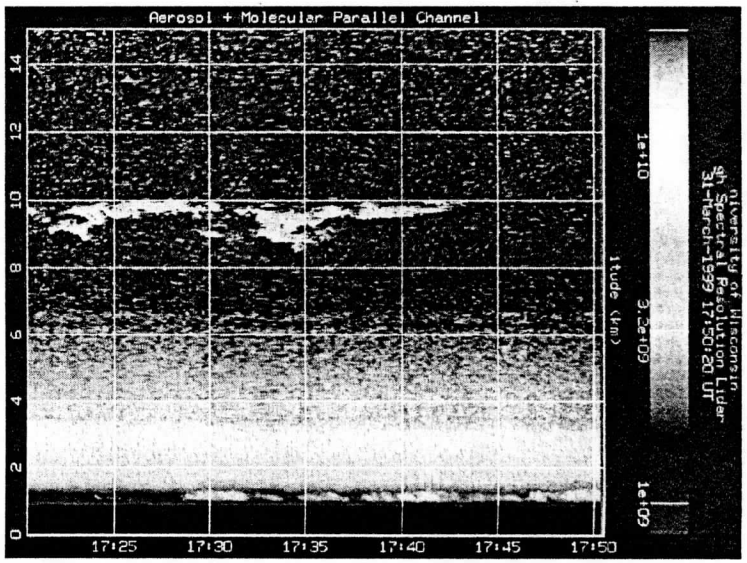
WINTEX

Winter Experiment
March 1999



DATA

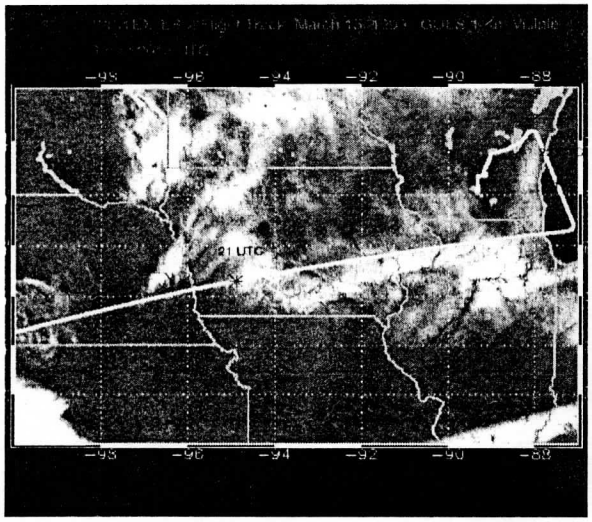
- 8 ER-2 Science Flights
- MAS, NAST, S-HIS
- Day/Night, Cloud/Clear



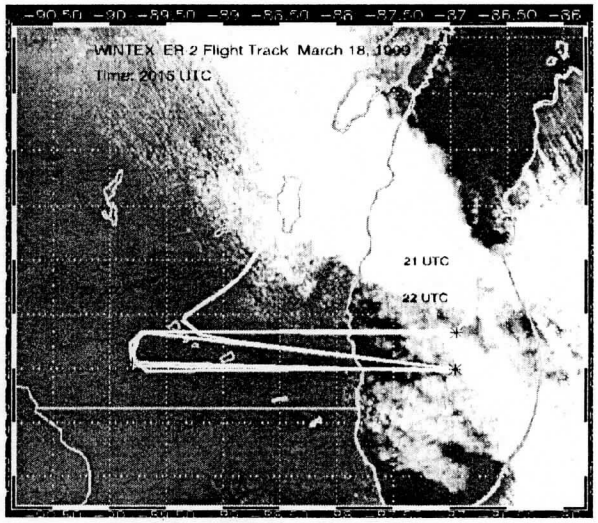
SCIENCE

- MODIS Cloud Mask testing
- Atmospheric Sounding
- IR Calibration

WINTEX yields unique data over cirrus clouds with SHIS and MAS



March 15 ,1999



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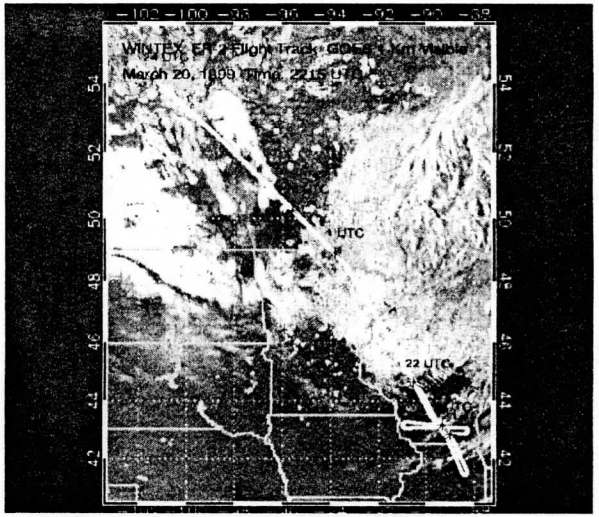

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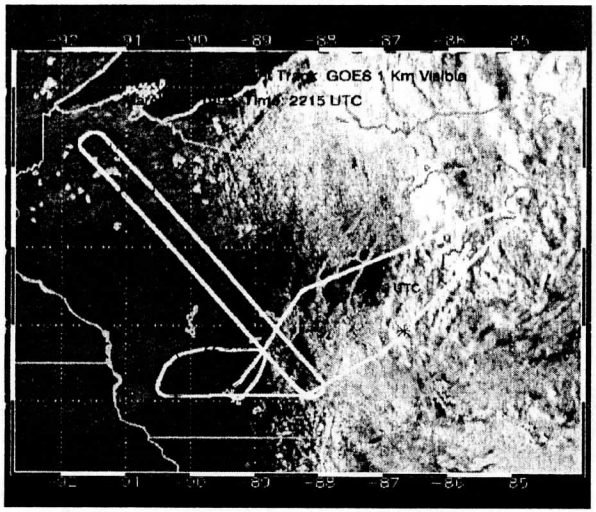

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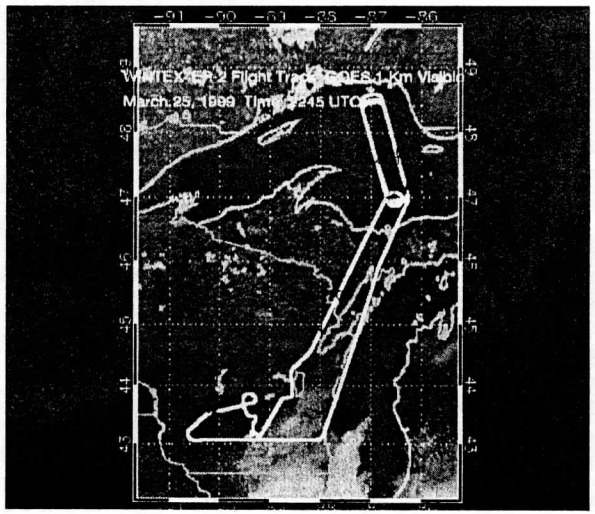
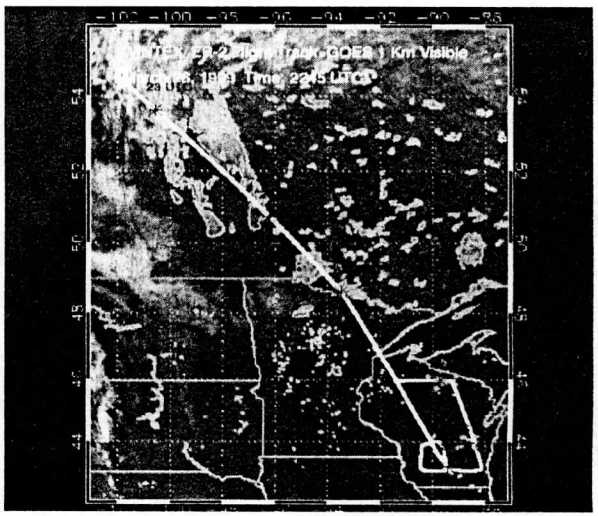


March 25 ,1999



March 26 ,1999

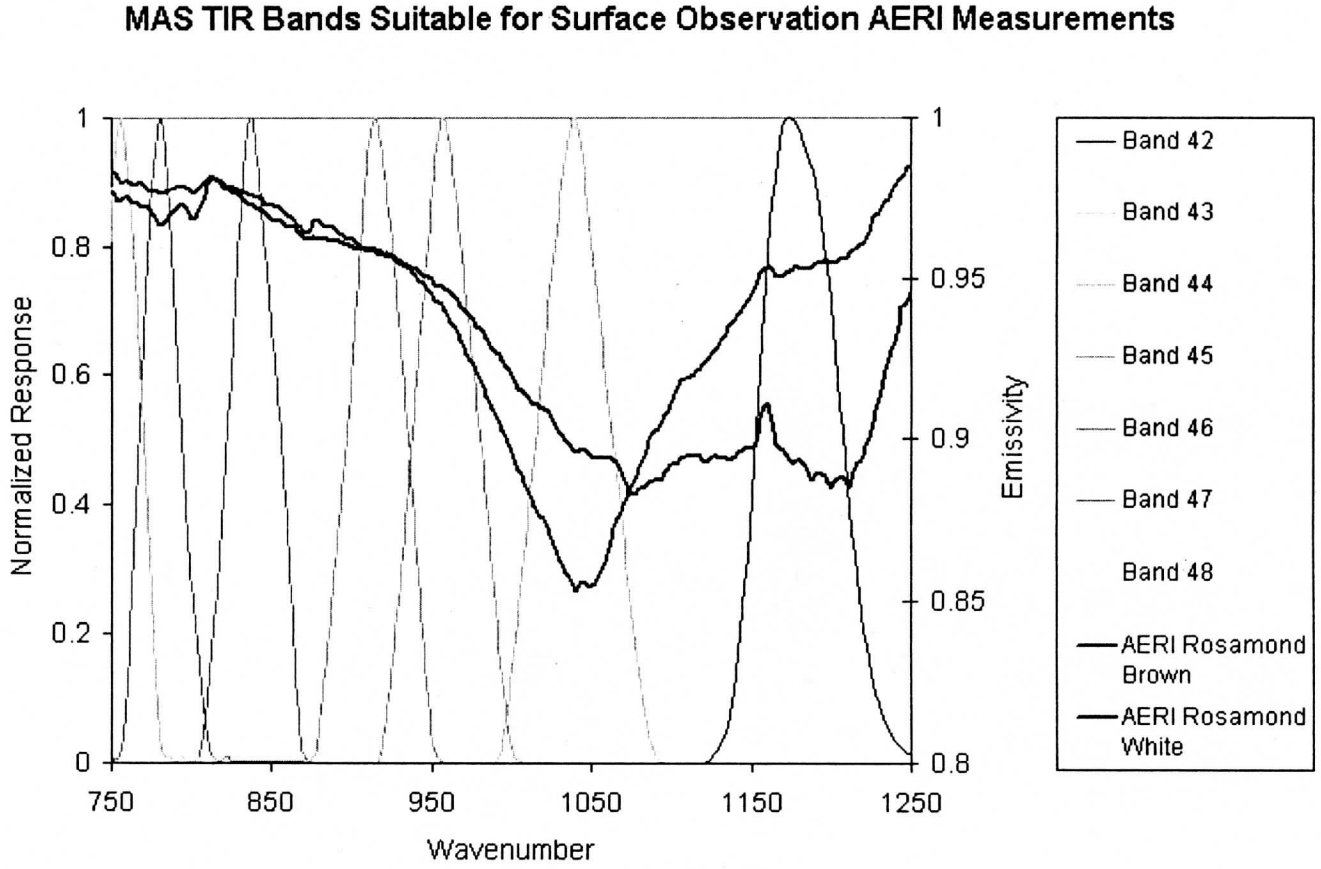
Instrumentation

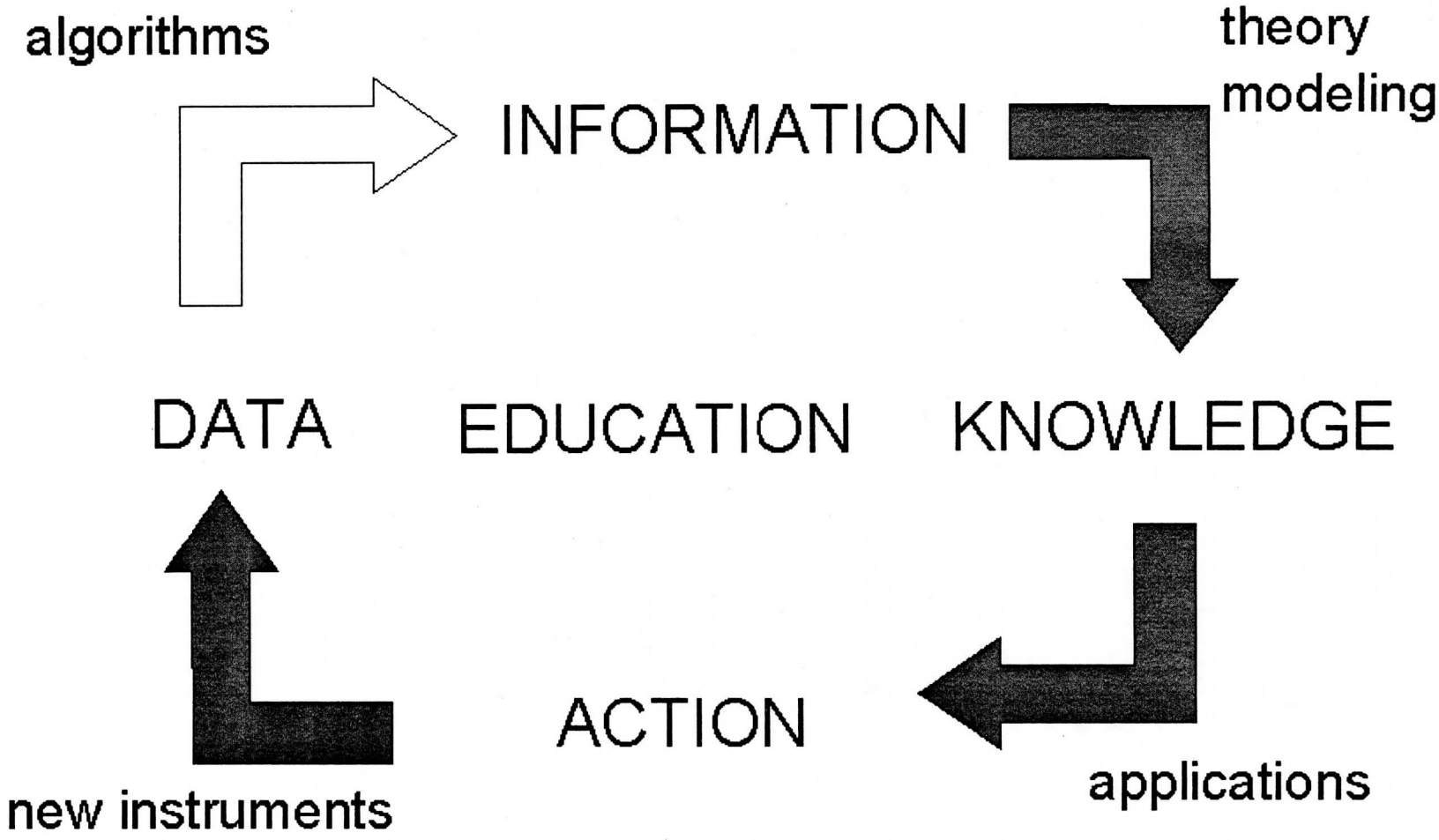
AERI

- Atmospheric Emitted Radiance Interferometer.
- 0.5 cm^{-1} resolution over 3.3 – 18 μm.

Data

Playa Characterization (2)




algorithms
INFORMATION
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new instruments
applications

Satellite-Derived Winds R&D

- **Development of an advanced QC approach**
  - *** Quality Indicators integrated into the auto-editing procedure**

- **Experimental production of Meteosat 5/7 winds**

- **Evaluation of winds derived from rapid scans**
  - *** GOES-10 science checkout data sets**
  - *** Tropical cyclones**

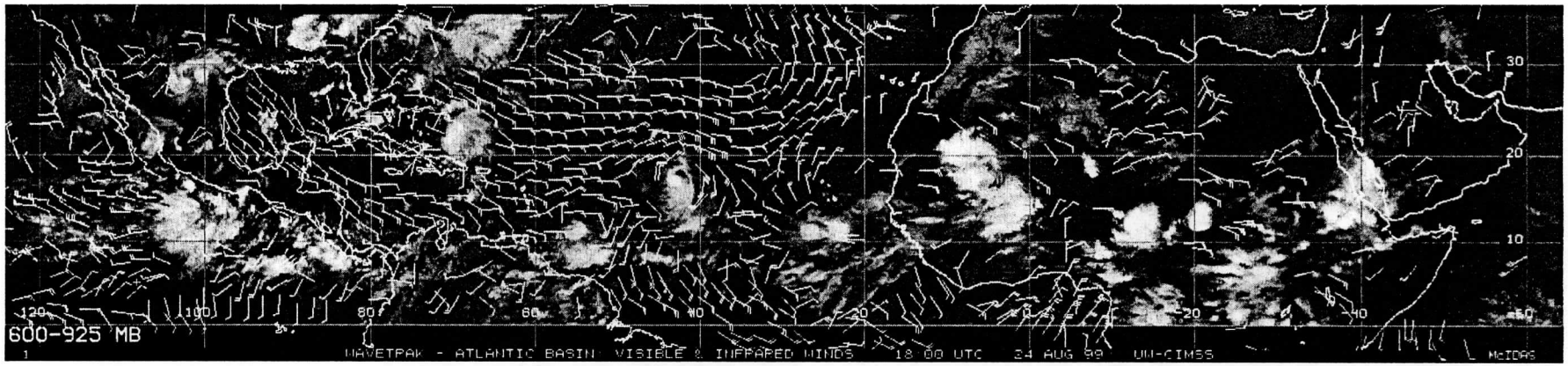
- **Development and evaluation of winds derived from GOES 3.9 micron imagery**

- **Experimental high-resolution winds from VIS imagery around tropical cyclones distributed to AOML/HRD for inclusion in real time surface analyses used extensively by NHC/TPC in 1999**

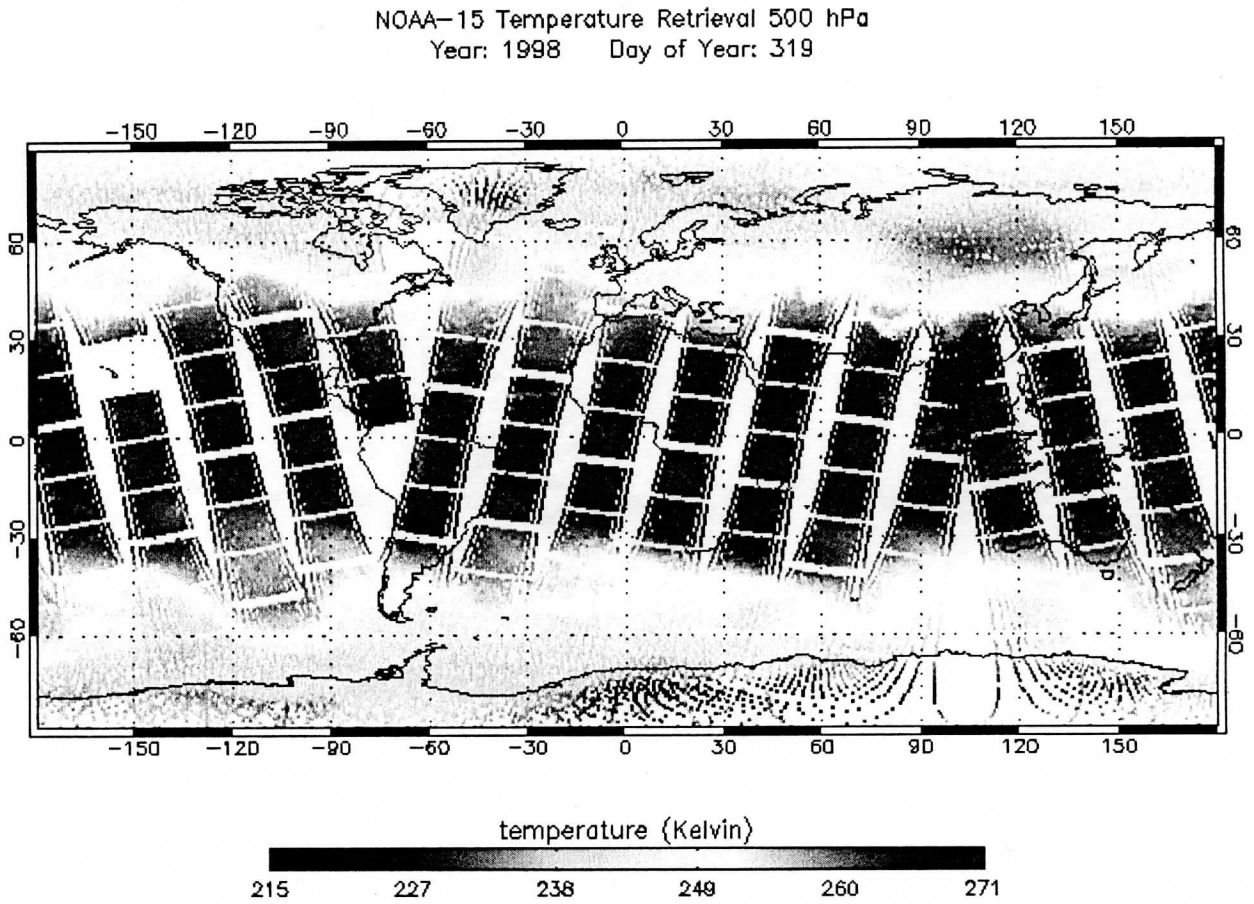
- **Development of vertical wind shear analyses for NHC and JTWC**
  - *** Derived from high-res. 3-D analyses of multispectral sat. winds**
  - *** Found very useful by NHC and JTWC forecasters in 1999**
  - *** Currently being tested in the operational SHIPS intensity prediction model (DeMaria/CIRA)**

Construction of 'Wavetrak' product

Time-continuous plots/movies of low-level sat. winds to track developing waves in the tropics (avail. over CIMSS web site)



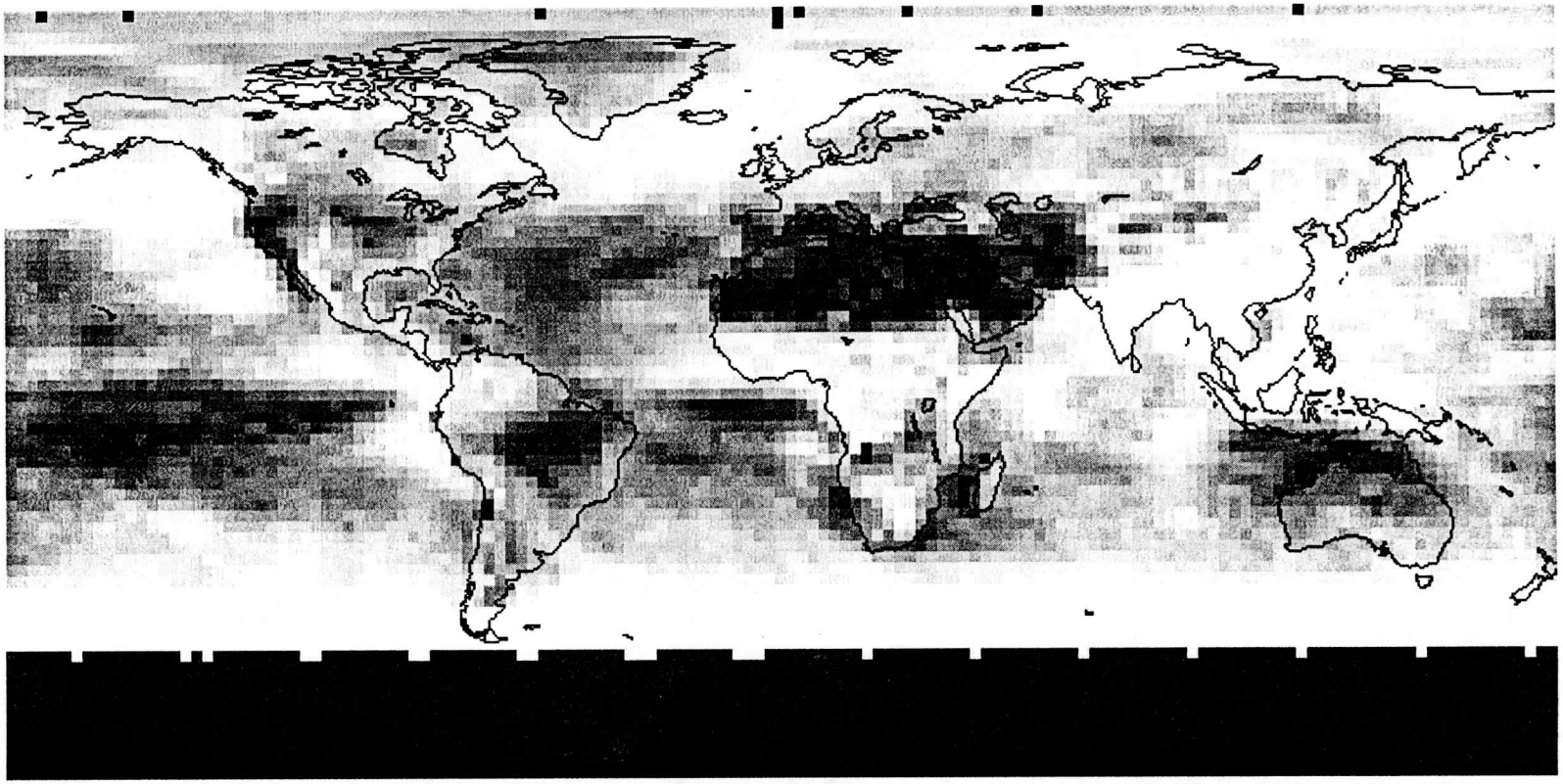
AMSU-A and HIRS/3 Products from International ATOVS Processing Package



CIMSS Cloud Retrieval

- MODIS
- GLI
- AVHRR
- AVHRR/HIRS
- GOES
- MAS/HIS

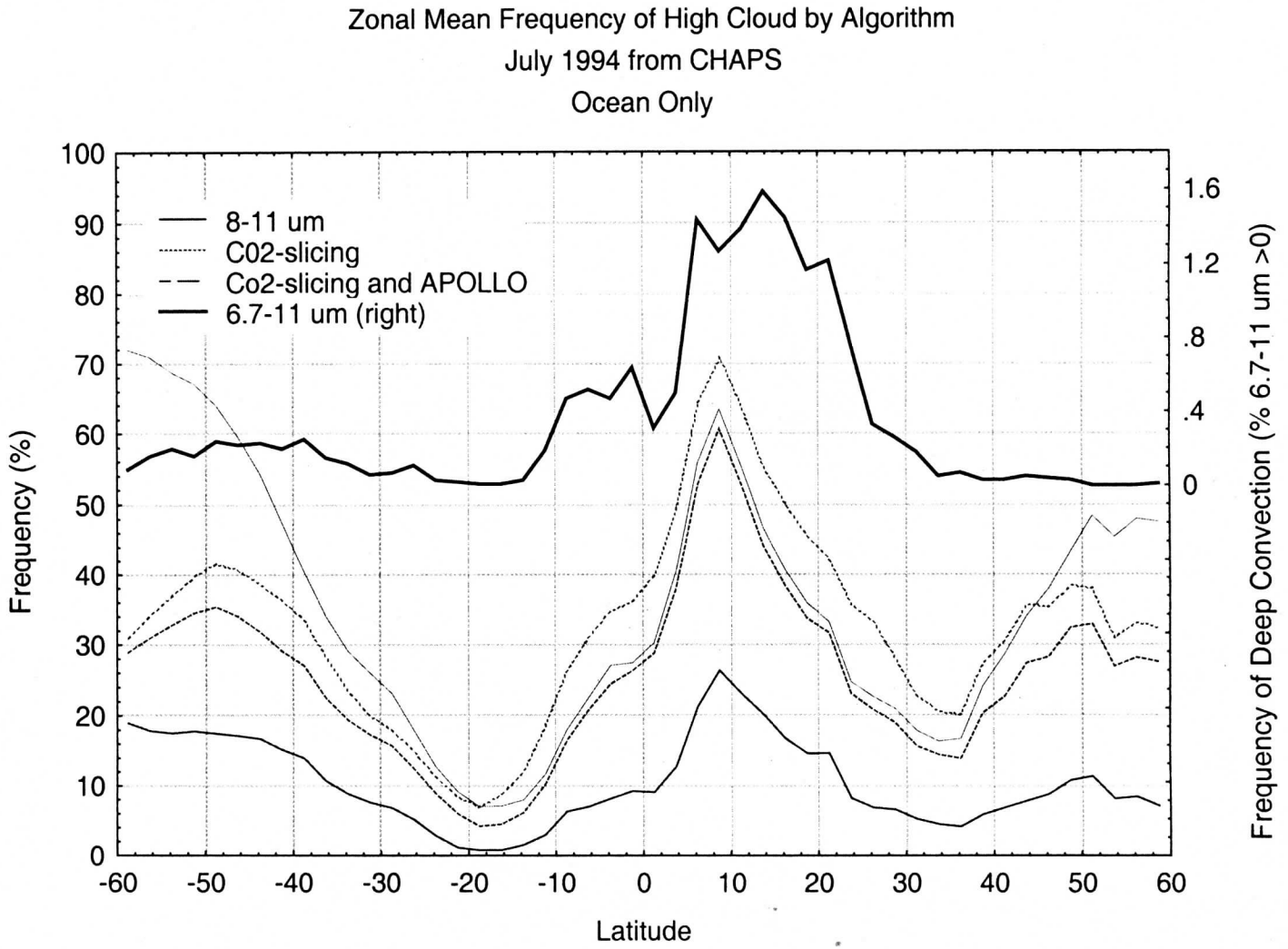
AVHRR Global Product

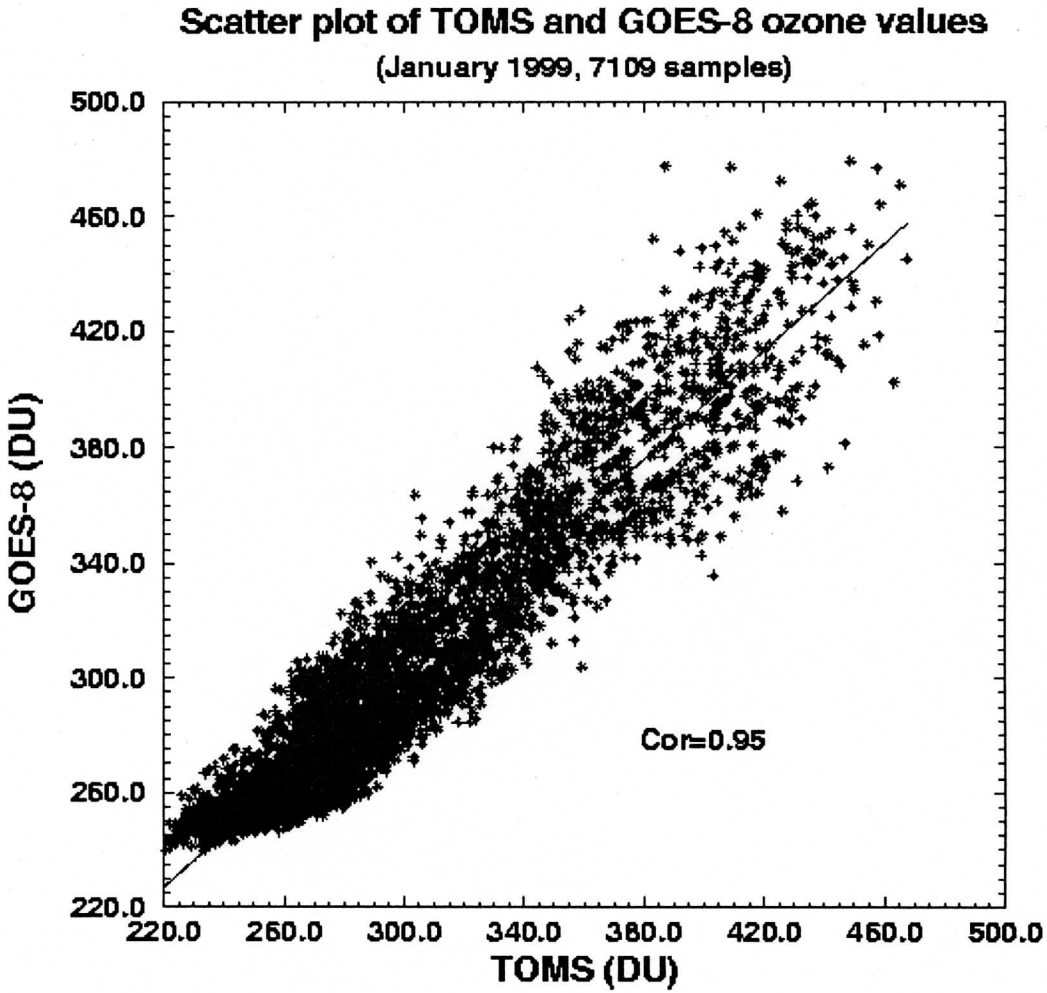


COMPOSITE PERCENT CLOUD COVER

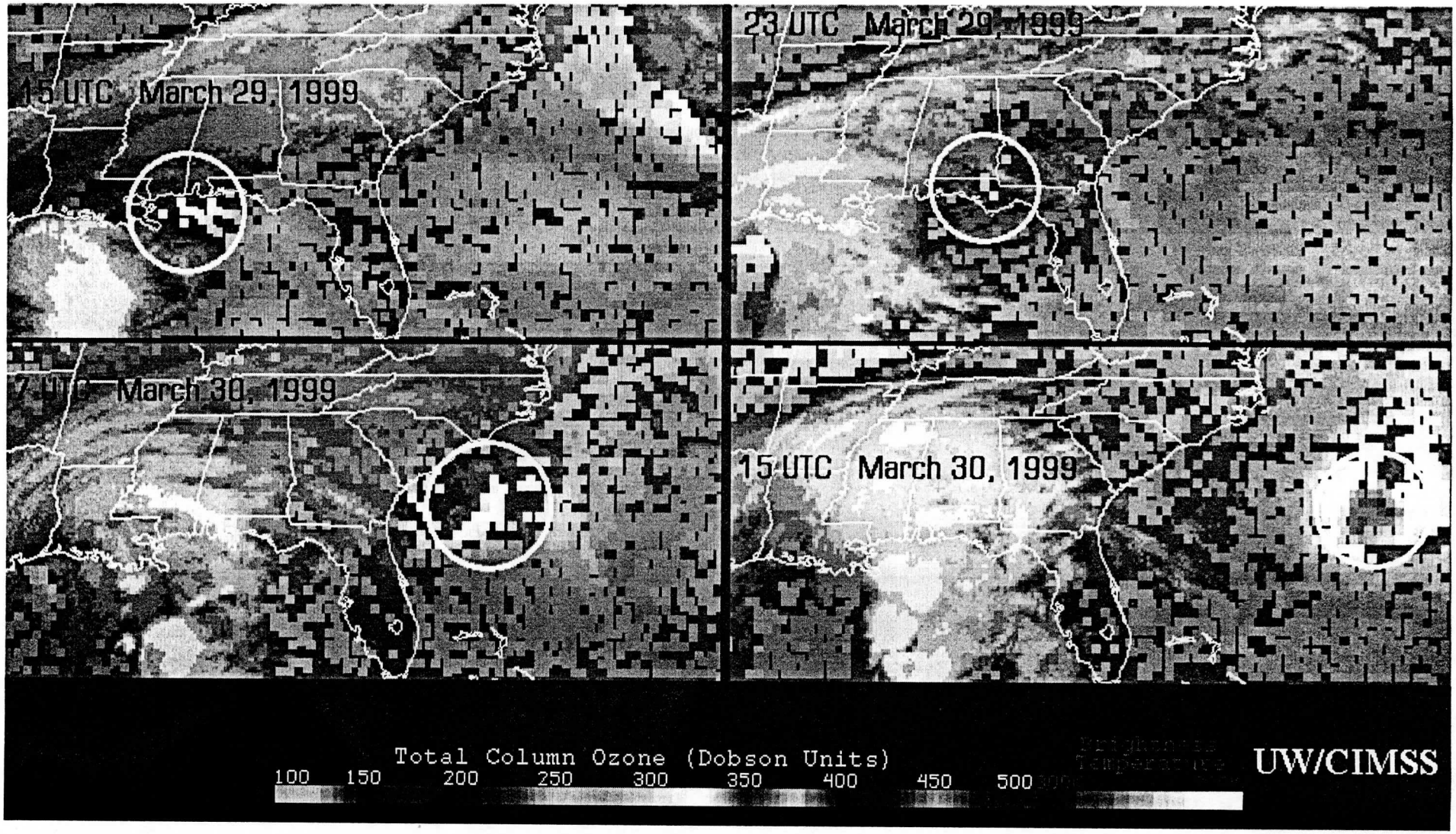
McIDAS

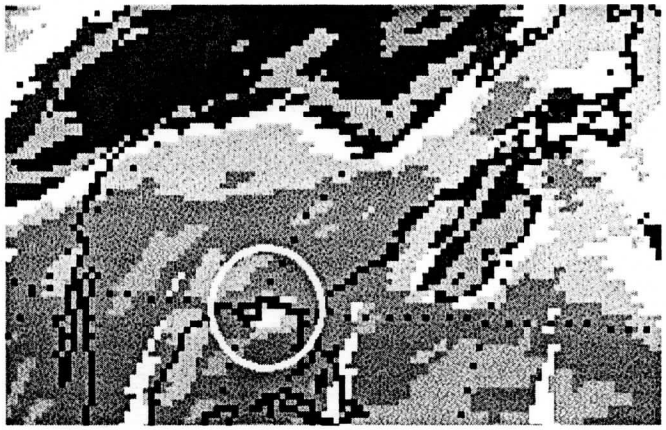
CHAPS


Zonal Mean Frequency of High Cloud by Algorithm
July 1994 from CHAPS
Ocean Only
8-11 um
C02-slicing
Co2-slicing and APOLLO
6.7-11 um (right)
Frequency (%)
Frequency of Deep Convection (% 6.7-11 um >0)
Latitude
100
90
80
70
60
50
40
30
20
10
0
1.6
1.2
.8
.4
0
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60

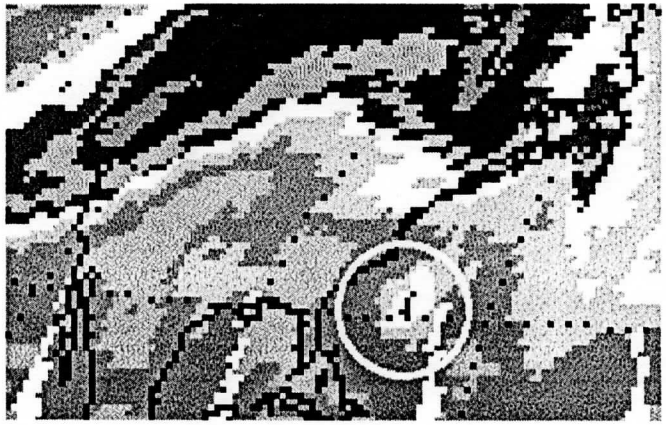

Scatter plot of TOMS and GOES-8 ozone values
(January 1999, 7109 samples)
GOES-8 (DU)
TOMS (DU)
500.0
460.0
420.0
380.0
340.0
300.0
260.0
220.0
220.0
260.0
300.0
340.0
380.0
420.0
460.0
500.0
Cor=0.95

Cor:

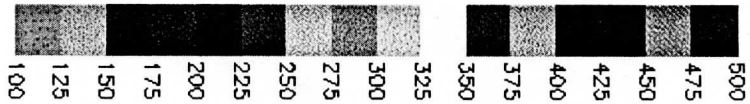

15 UTC March 29, 1999
23 UTC March 29, 1999
March 30, 1999
15 UTC March 30, 1999
Total Column Ozone (Dobson Units)
100 150 200 250 300 350 400 450 500
UW/CIMSS



EP/TOMS Total Ozone Mar 29, 1999



EP/TOMS Total Ozone Mar 30, 1999

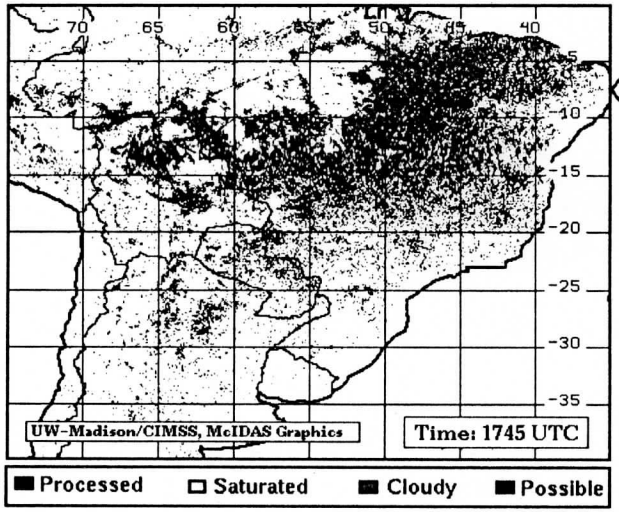


GSFC/916

University of Wisconsin-Madison
Cooperative Institute for Meteorological Satellite Studies

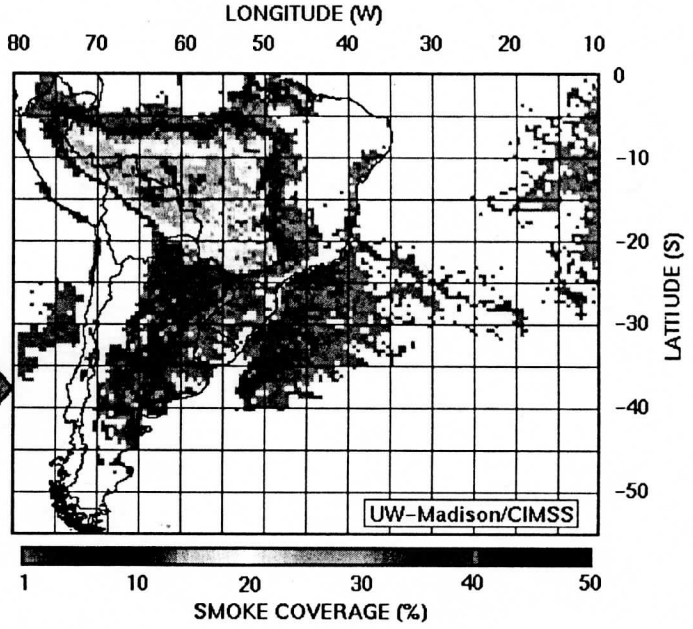
http://cimss.ssec.wisc.edu/goes/burn/abba.html

GOES-8 Fire and Smoke Product Summary for the 1998 Fire Season in South America



GOES-8 ABBA 1745 UTC fire pixel composite for the 1998 fire season in South America. Distinct burning patterns are identified along rivers and in areas of recent road construction in the Amazon basin.

GOES-8 ASADA 1145 UTC smoke composite for the 1998 fire season in South America. The highest occurrence of smoke coverage days are found collocated with or downwind of the most intensive burning regions.



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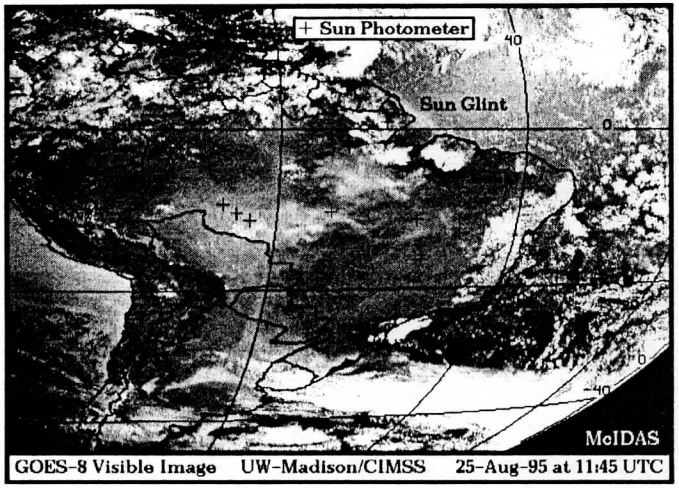
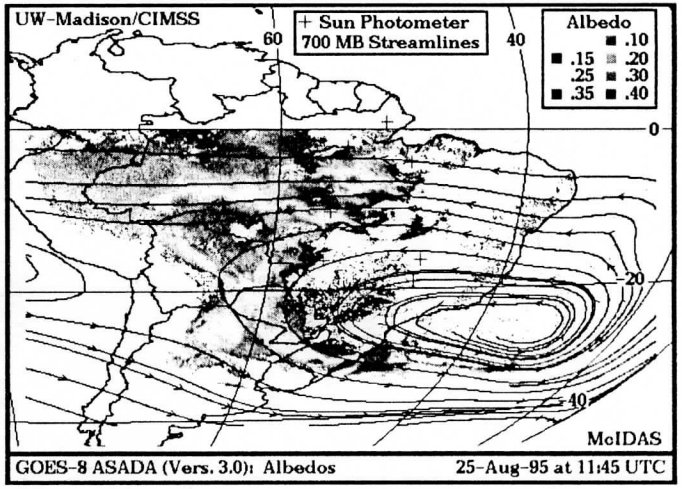
http://cimss.ssec.wisc.edu/goes/burn/abba.html

GOES Experimental Multispectral Cloud and Smoke Analyses

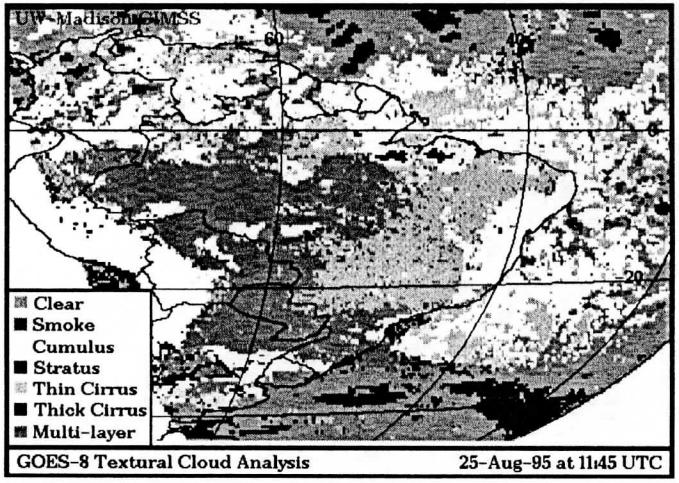
UW-Madison/SSEC/CIMSS NOAA/NESDIS/ORA ASPT



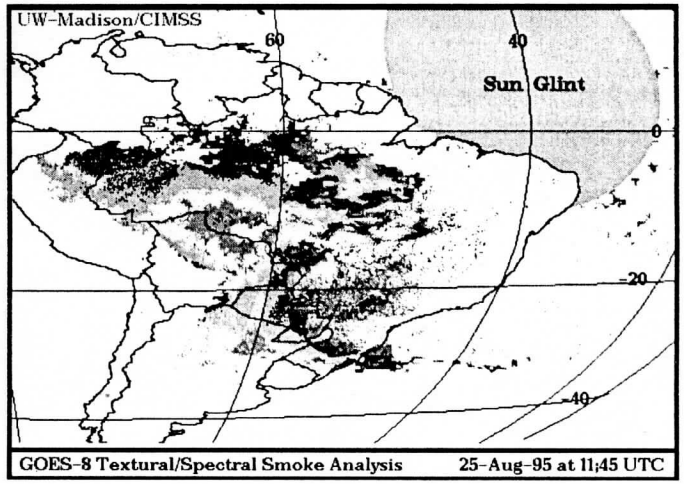
GOES-8 Visible Image UW-Madison/CIMSS 25-Aug-95 at 11:45 UTC



GOES-8 ASADA (Vers. 3.0): Albedos 25-Aug-95 at 11:45 UTC



GOES-8 Textural Cloud Analysis 25-Aug-95 at 11:45 UTC

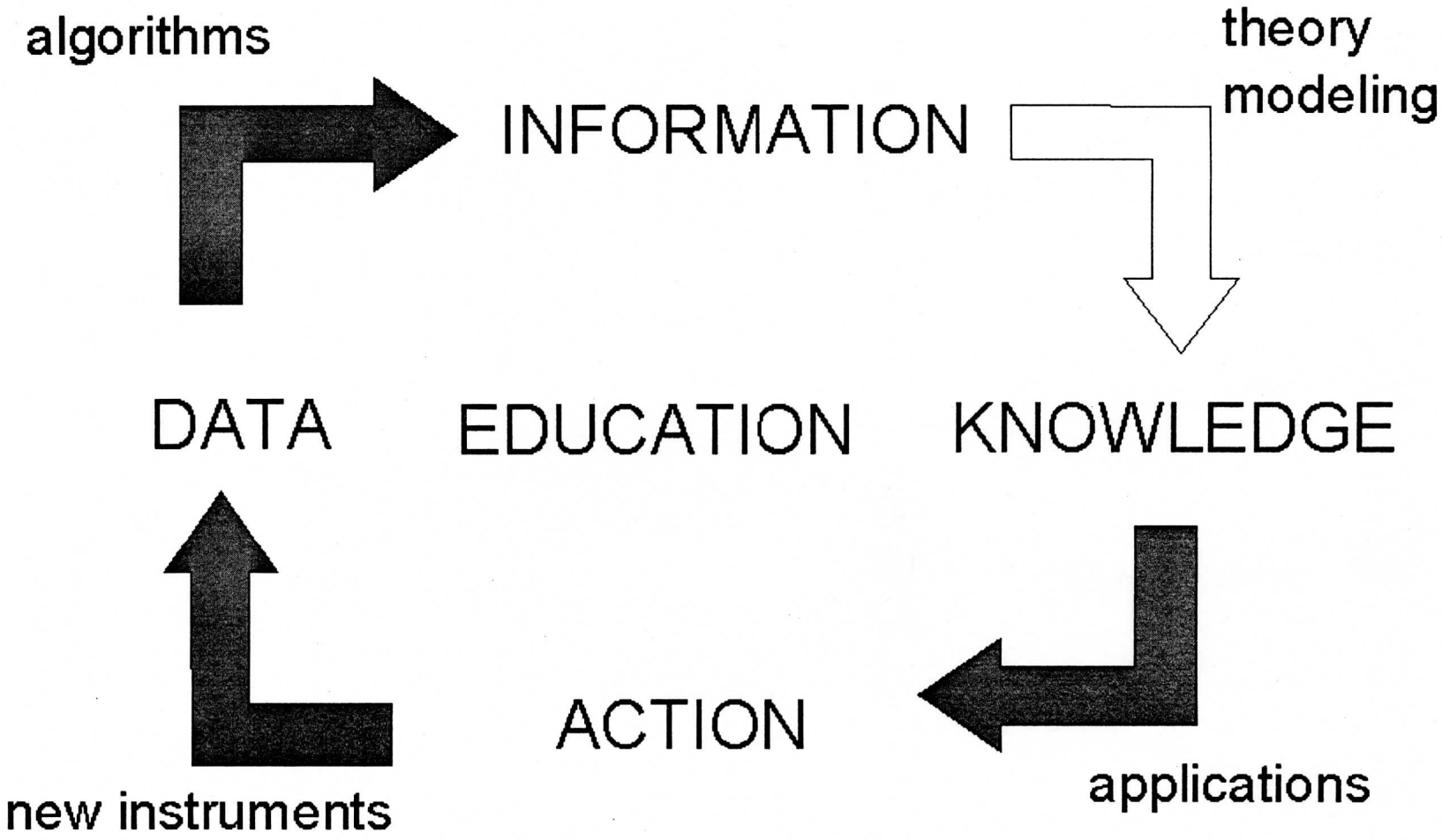


GOES-8 Textural/Spectral Smoke Analysis 25-Aug-95 at 11:45 UTC

Leo/Geo inter-calibration shows all Geos are within 0.5 C

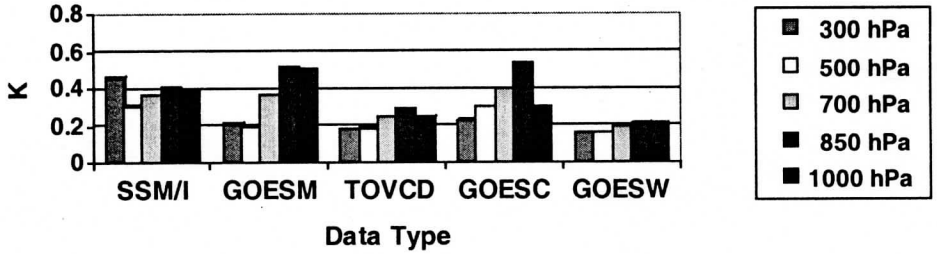
Feb to Jul 1999 IR window comparison of NOAA-14 HIRS and G-8, G-10, M-5, M-7, GMS-5

Delta (geo – leo)	G-8	G-10	M-5	M-7	GMS-5
# of Comparisons	9	36	9	18	6
Abs Mean	0.31	0.23	0.28	0.40	0.40
Mean	-0.06	-0.13	-0.24	-0.40	0.05
Standard Deviation	0.36	0.23	0.26	0.19	0.59

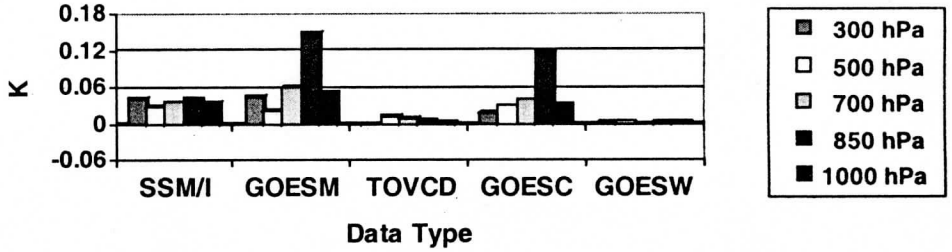

algorithms
INFORMATION
theory
modeling
DATA
EDUCATION
KNOWLEDGE
ACTION
new instruments
applications

OSE showing positive impact of Sat data for T and RH at 00-hr and 24-hr

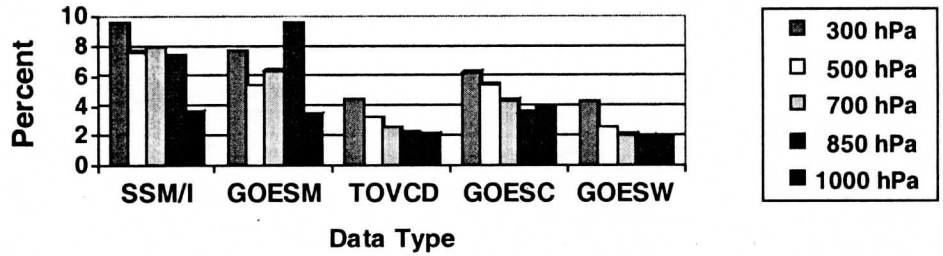
A. 00-HR RMS Temperature Sensitivity (July 14-23, 1999)



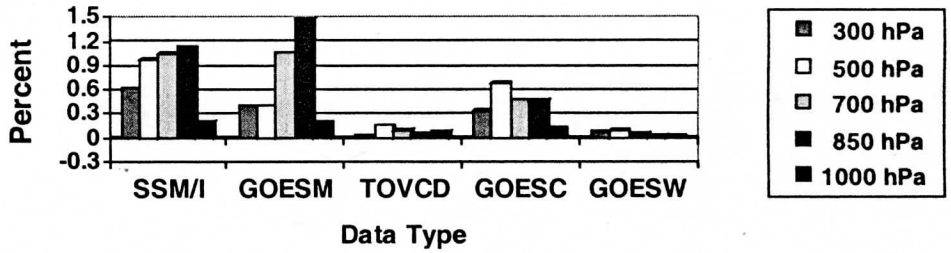
A. 24-HR RMS Temperature Forecast Impact (July 14-23, 1999)



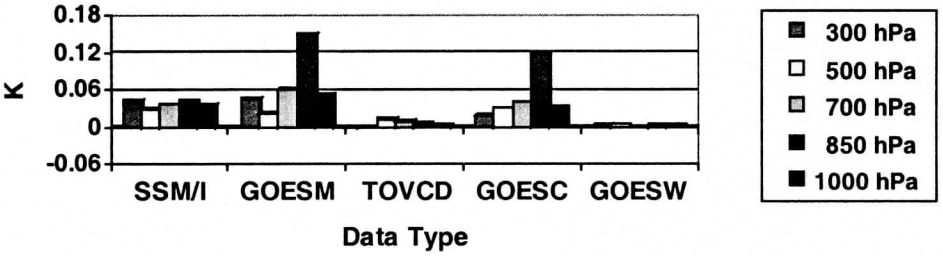
B. 00-HR RMS Rel. Humidity Sensitivity (July 14-23, 1999)



B. 24-HR RMS Rel. Humidity Forecast Impact (July 14-23, 1999)

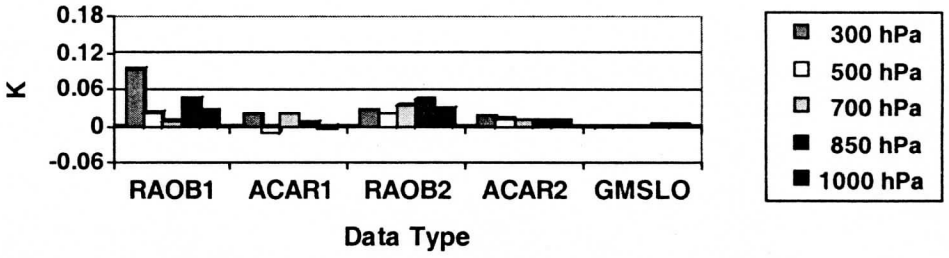


A. 24-HR RMS Temperature Forecast Impact (July 14-23, 1999)

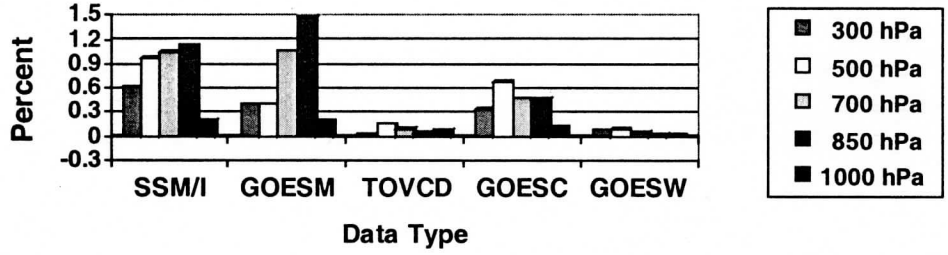


Comparison of Sat and Non-sat forecast impact

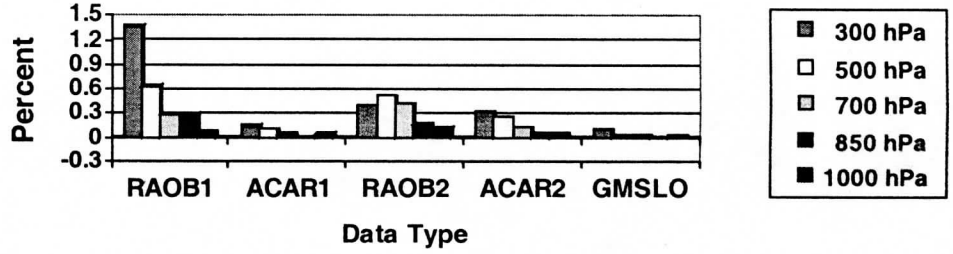
A. 24-HR RMS Temperature Forecast Impact (July 14-23, 1999)



B. 24-HR RMS Rel. Humidity Forecast Impact (July 14-23, 1999)



B. 24-HR RMS Rel. Humidity Forecast Impact (July 14-23, 1999)



CIMSS/NWP Collaborations

Satellite-derived Winds Data Assimilation and Model Impact Experiments

* Navy and ECMWF – NORPEX datasets

* NCEP/EMC GDAS and ETA (Su, Derber, Lord)

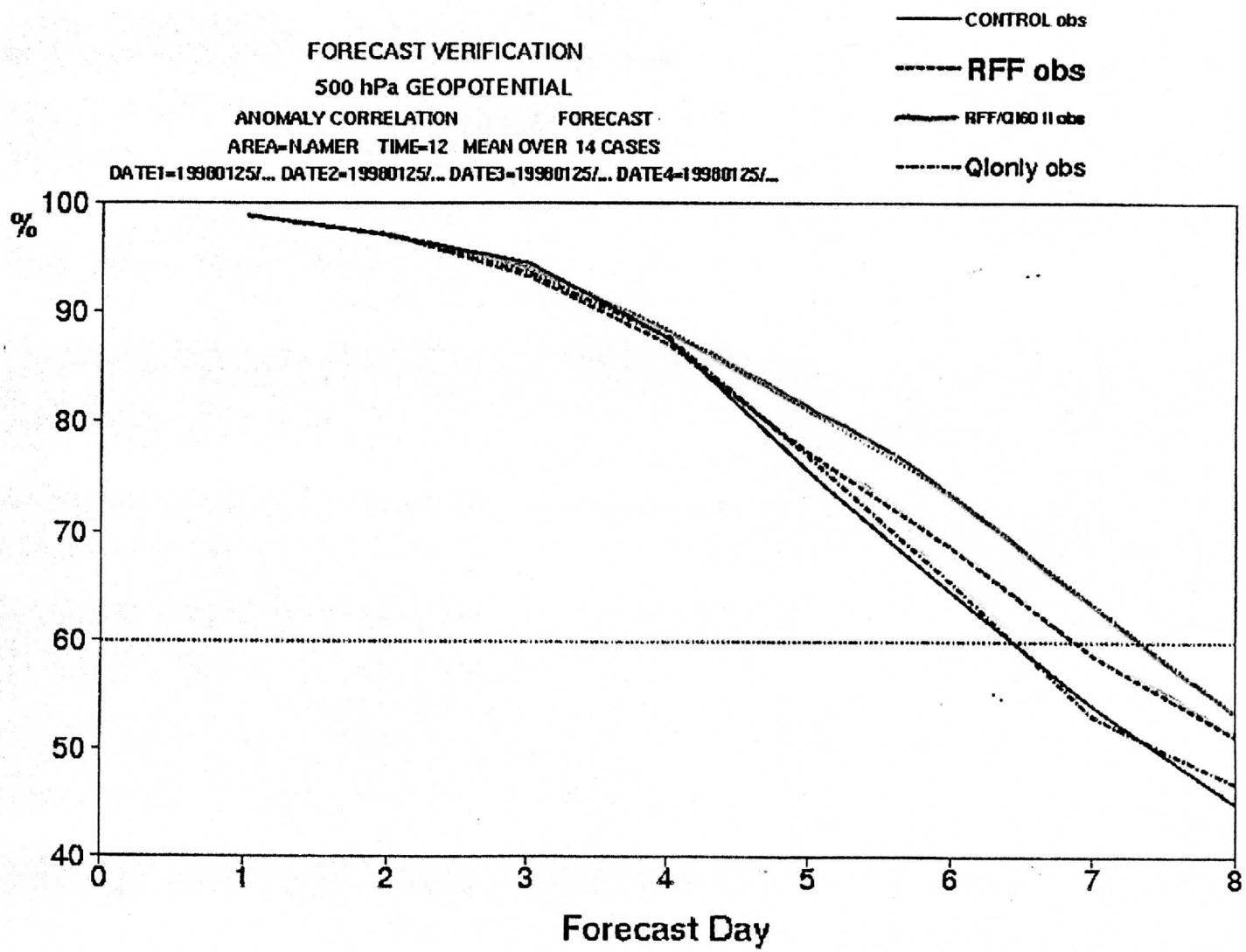
* GFDL Hurricane Model (Soden, Tuleya)

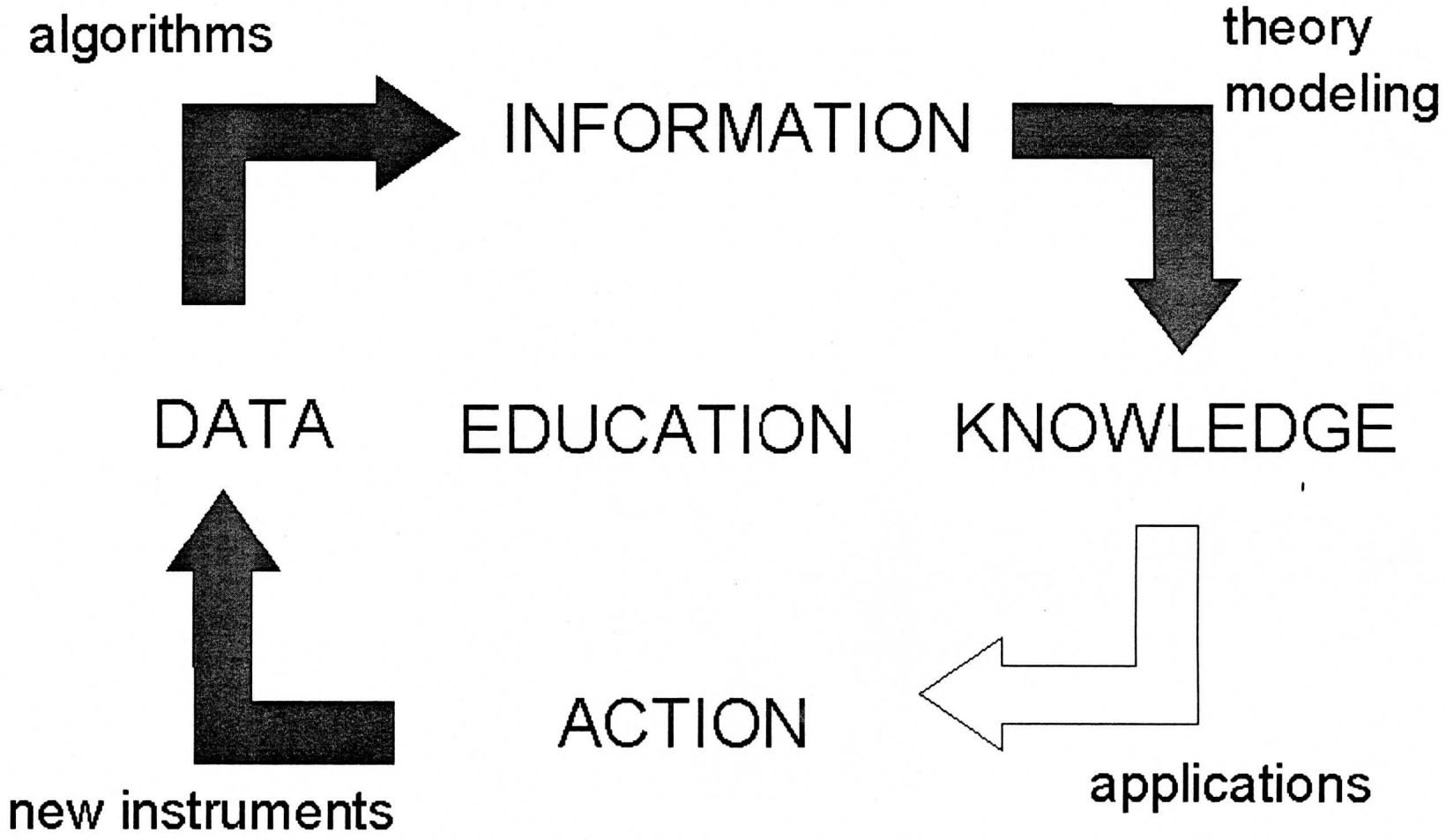
* Numerous regional and mesoscale studies (PSU, FSU, NCAR, NASA)

* Multi-satellite satwind datasets being distributed to India and Taiwan NWP centers for evaluation

IMPACT OF SATWINDS ON ECMWF FORECASTS DURING NORPEX

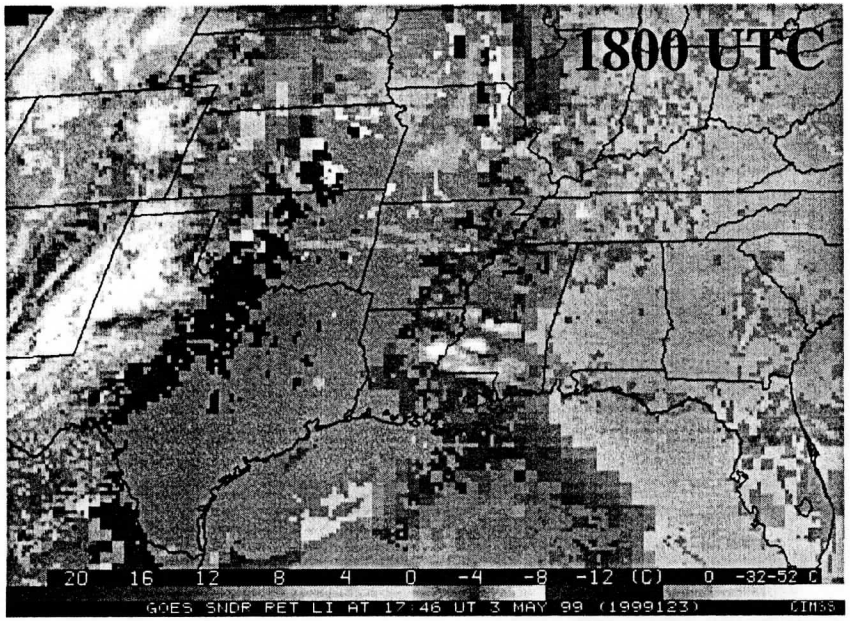
[from Holmlund, Velden + Rohn ... submitted to MWR]

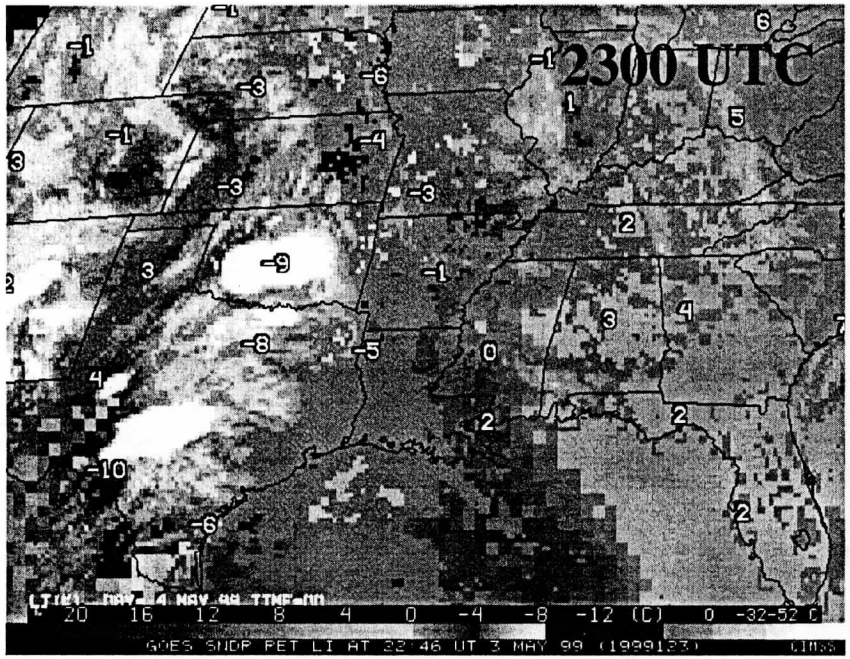



algorithms
INFORMATION
theory
modeling
DATA
EDUCATION
KNOWLEDGE
ACTION
new instruments
applications

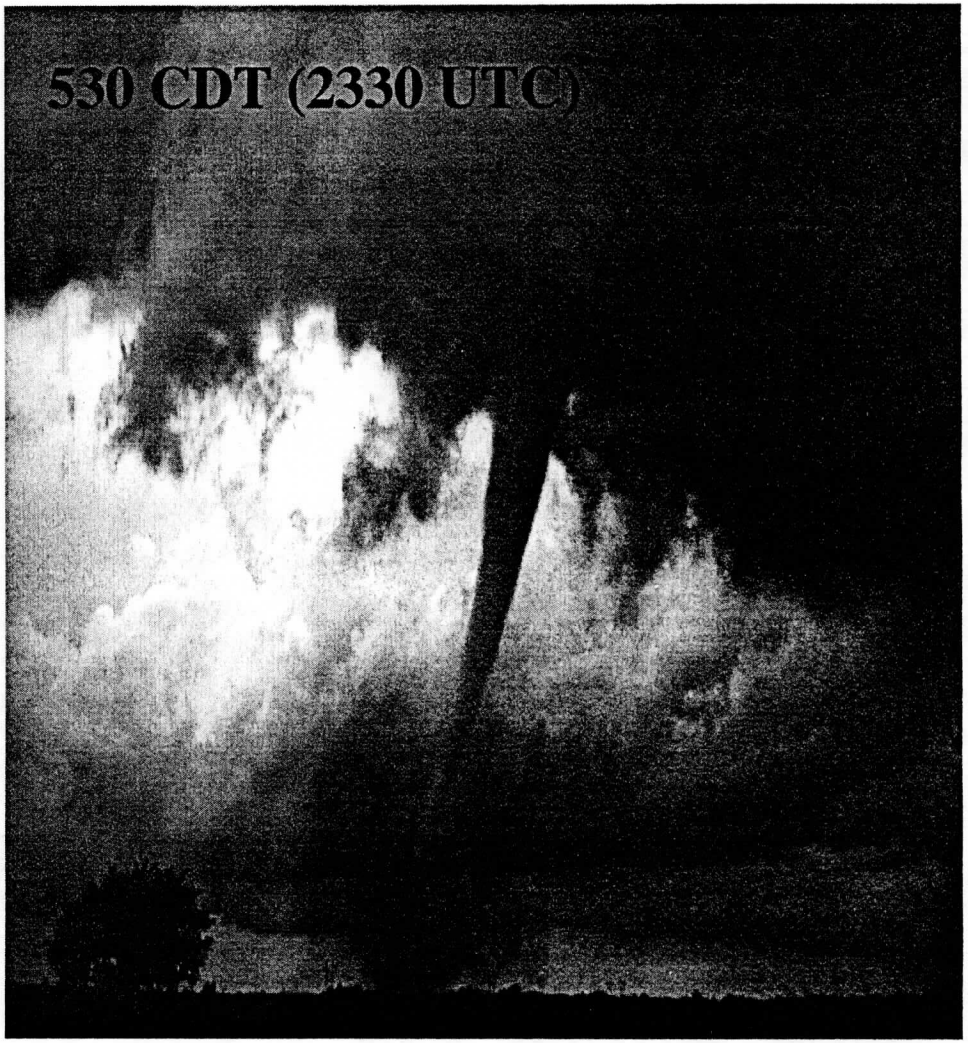
GOES Sounder DPI in NWS FOs
OK tornado 3 May 99

View from space

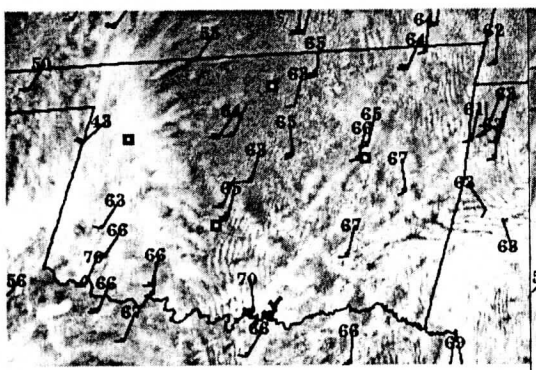




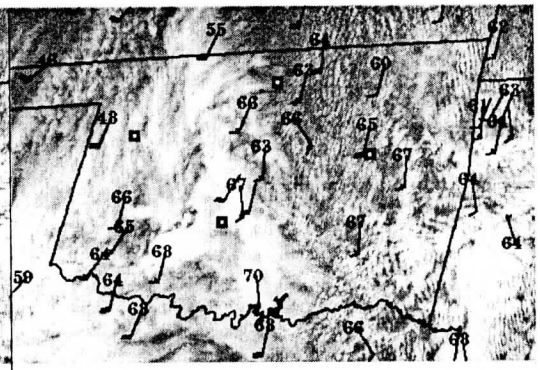
View from ground



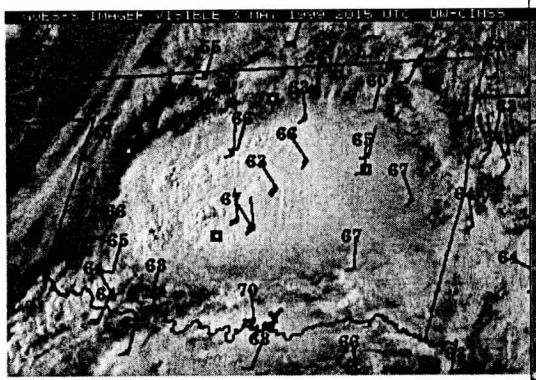
AERI DETECTING PRECURSORS OF CONVECTIVE INTIATION FOR MAY 3, 1999 OKLAHOMA CITY TORNADO



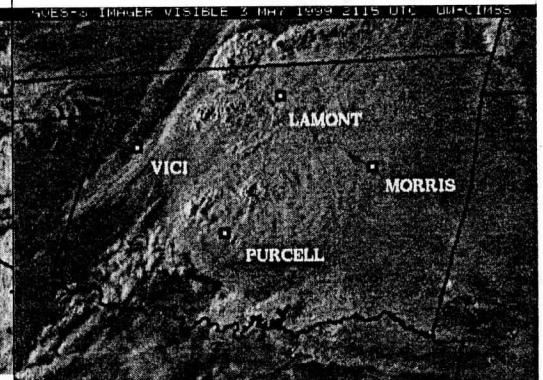
20 UTC 3 MAY 1999 SFC WIND (KTS) AND DEWPOINT TEMP (F)

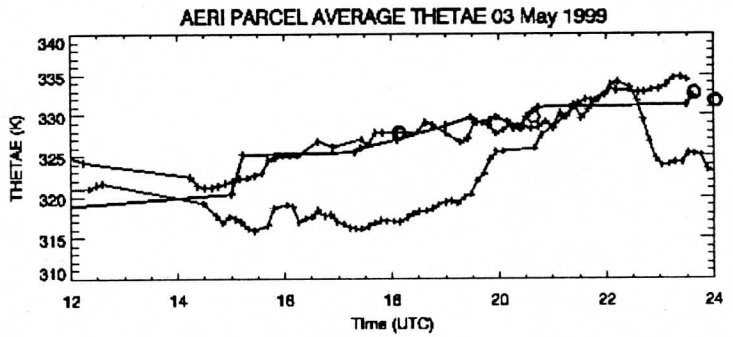


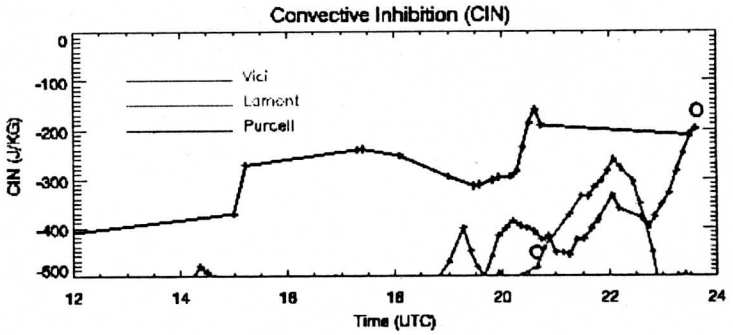
21 UTC 3 MAY 1999 SFC WIND (KTS) AND DEWPOINT TEMP (F)

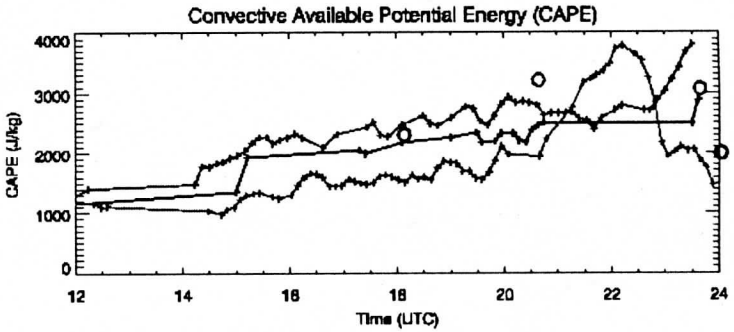


23 UTC 3 MAY 1999 SFC WIND (KTS) AND DEWPOINT TEMP (F)









UW-Madison Branch:

Products for Agricultural, Environmental, and Forest Managers

Applying NASA Earth Science to key regional issues

Upper Midwest

Regional Earth Science Applications Center

http://resac.gis.umn.edu/

Tasks: Overview & Conceptual Framework

Agriculture

- Soil moisture in top 15 cm - time of planting and trafficability
- Grain drying - farm energy use
- Pest and disease indicators - plant health, pesticide use

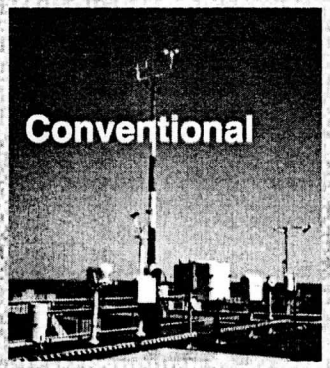
Forestry

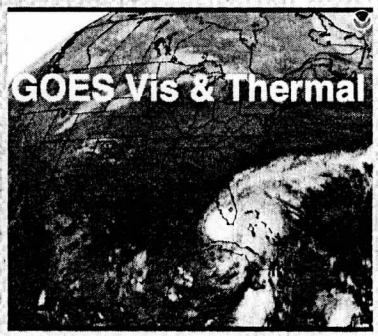
- Growth and yield models for sustainable harvests
- Scenarios for CO_2 sequestering

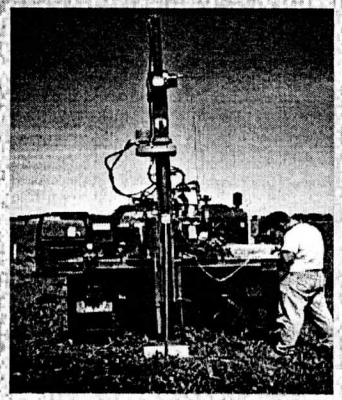
Ecosystem Services & Water Resources

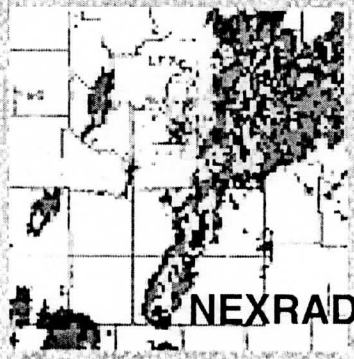
- Water resources in the Midwest, climate change effects
- Effects of CO_2 fertilization

Data

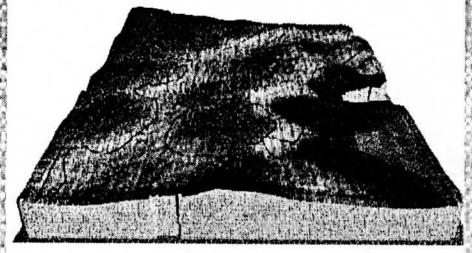


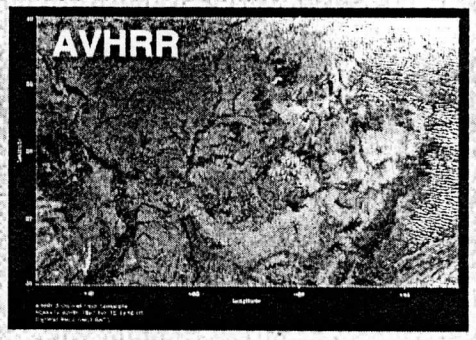




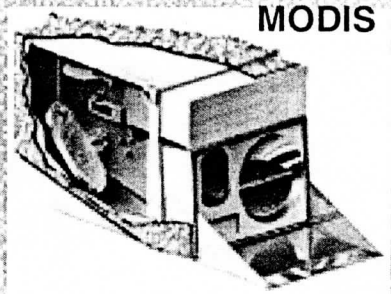


Topography, soil properties, etc.



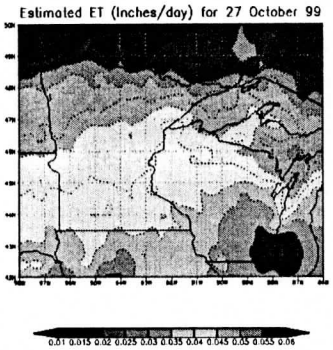


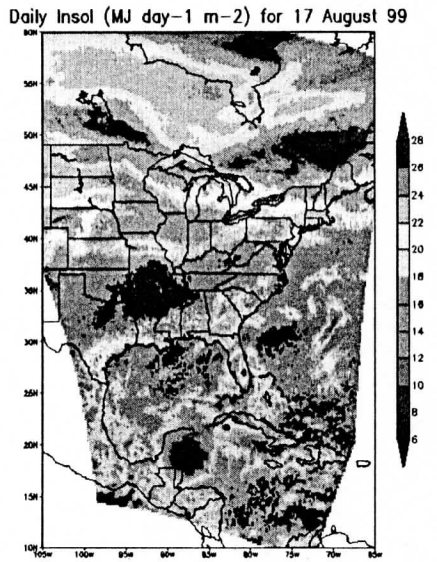
MODIS



Derived Products

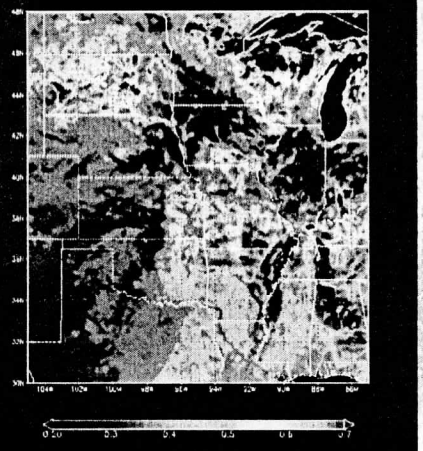
Potential ET



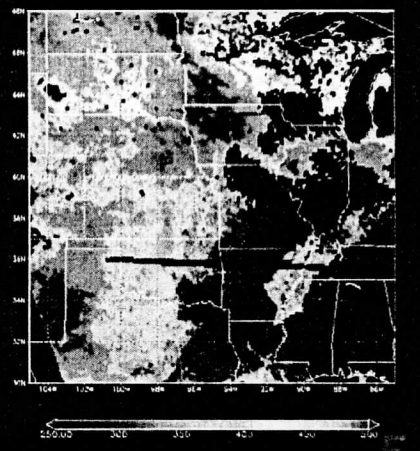


Insolation, PAR (GOES)

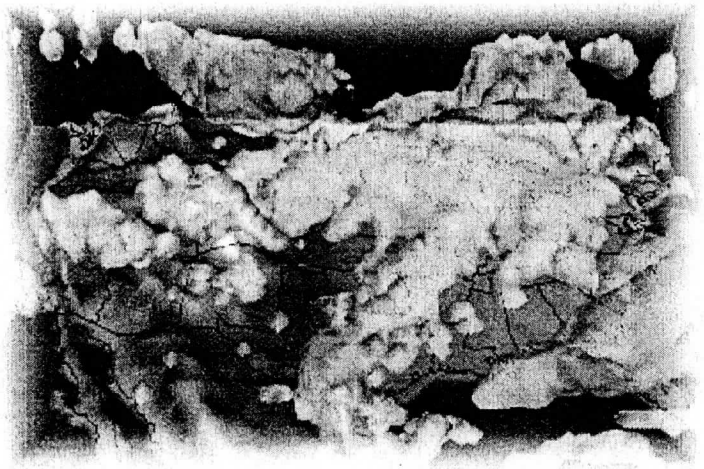
Fraction Cover



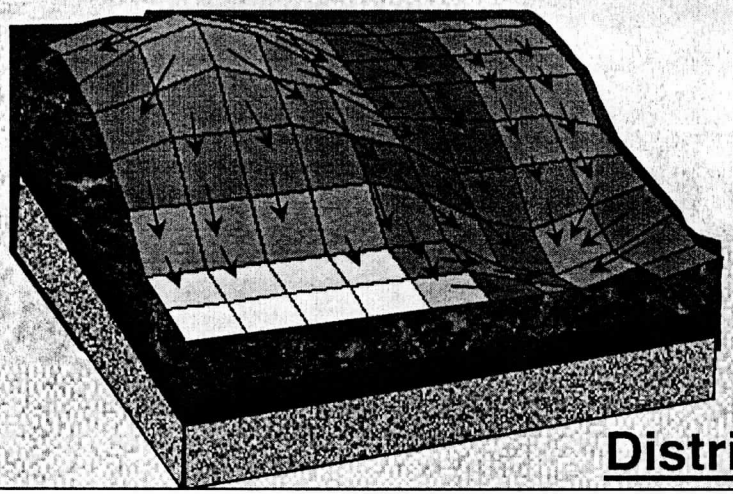
Evapotranspiration



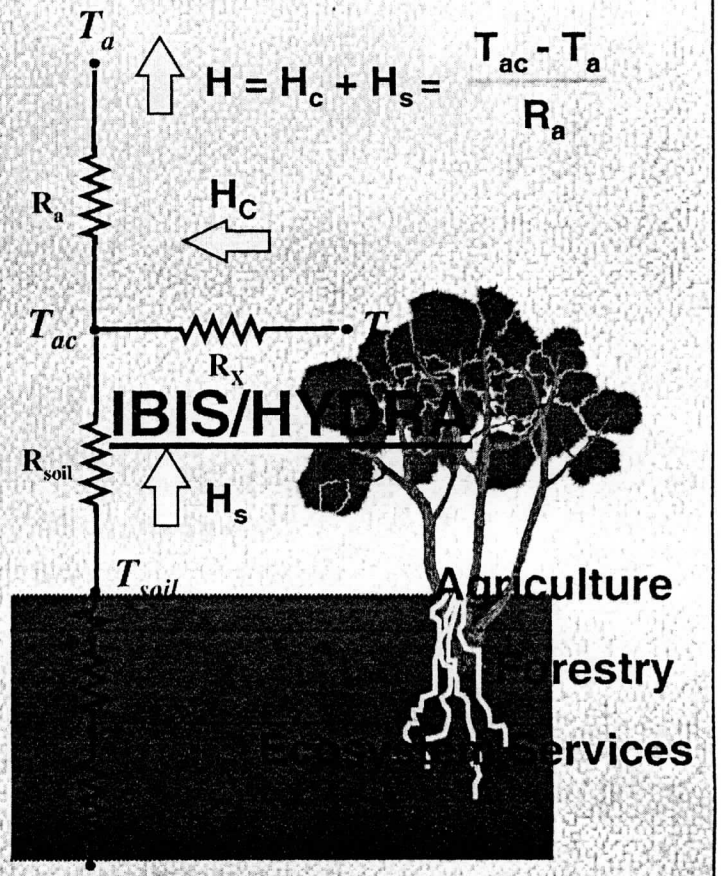
Models

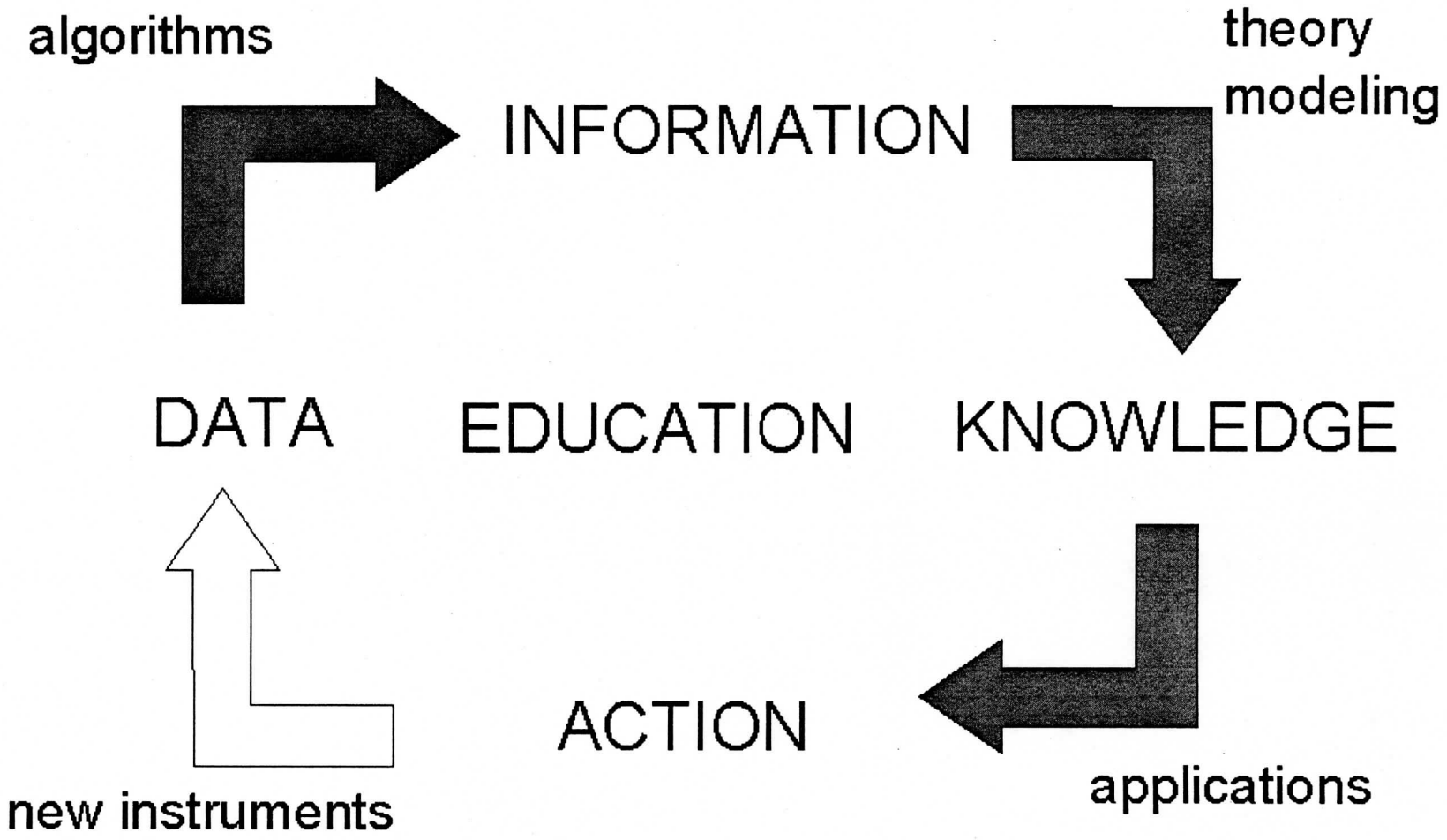


Weather and Climate



Distributed Runoff



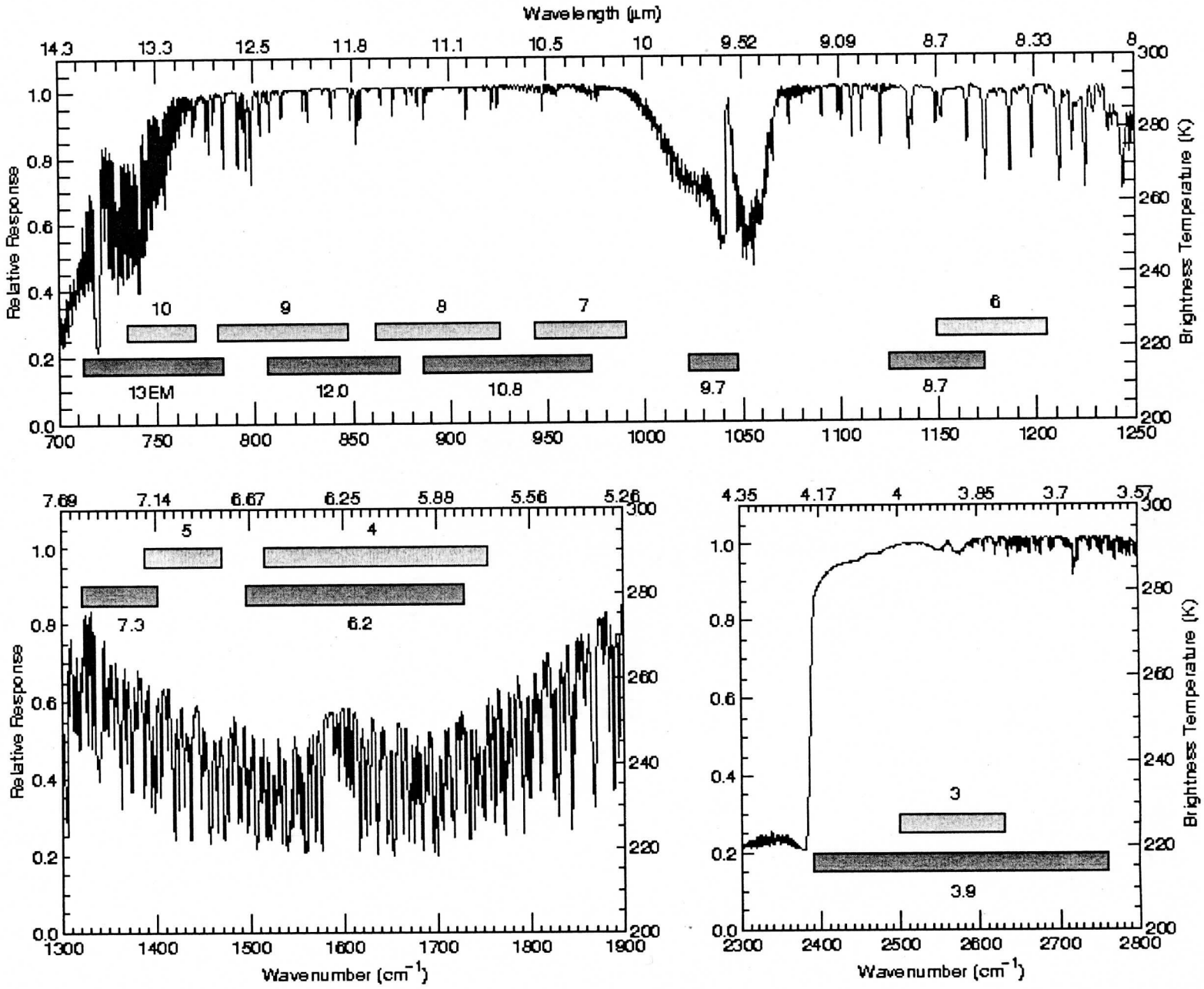

algorithms
INFORMATION
theory
modeling
DATA
EDUCATION
KNOWLEDGE
ACTION
new instruments
applications

Evolving the GOES Capabilities

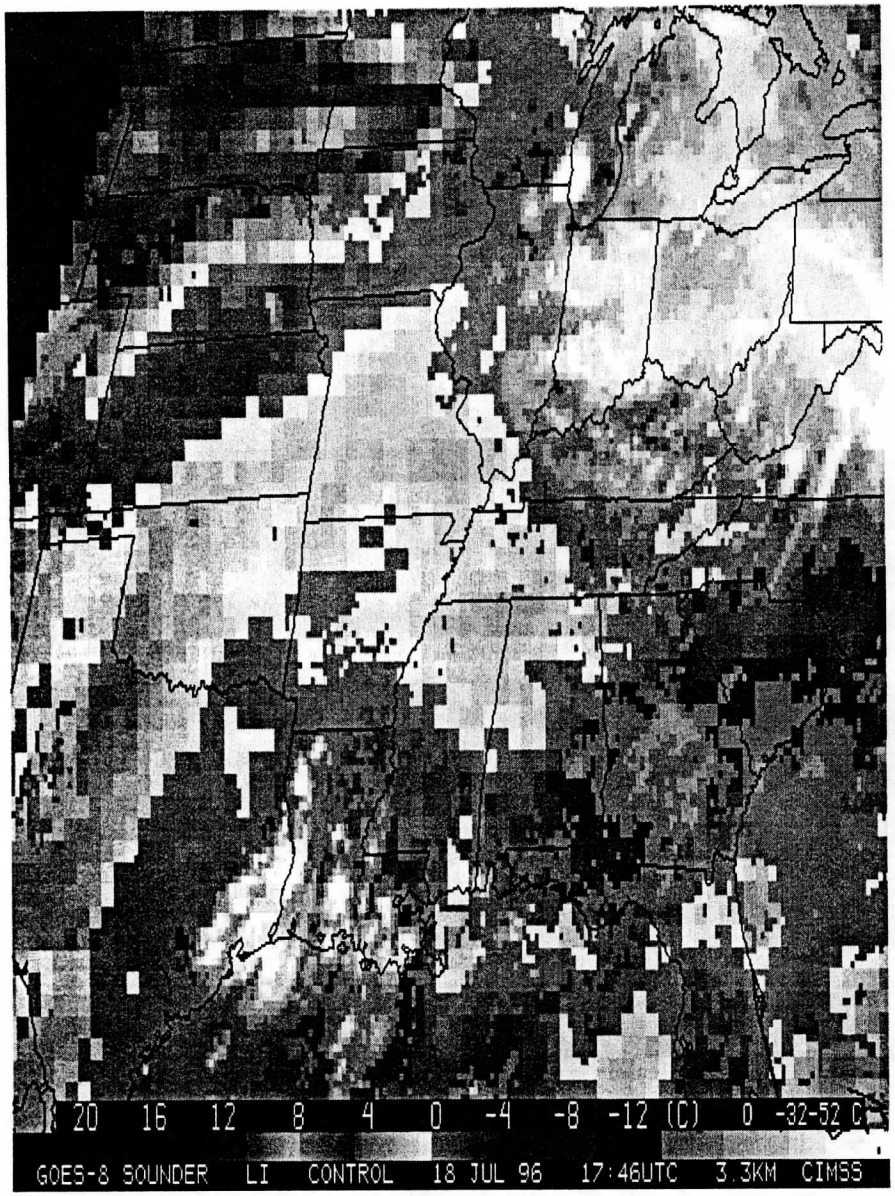
To keep pace with the growing needs for GOES data and products, NOAA must continue to evolve its geostationary remote sensing capabilities.

The Advanced Baseline Imager and Sounder (ABI / ABS) follows this evolutionary path. Current capabilities are enhanced and unmet NWS requirements are addressed .

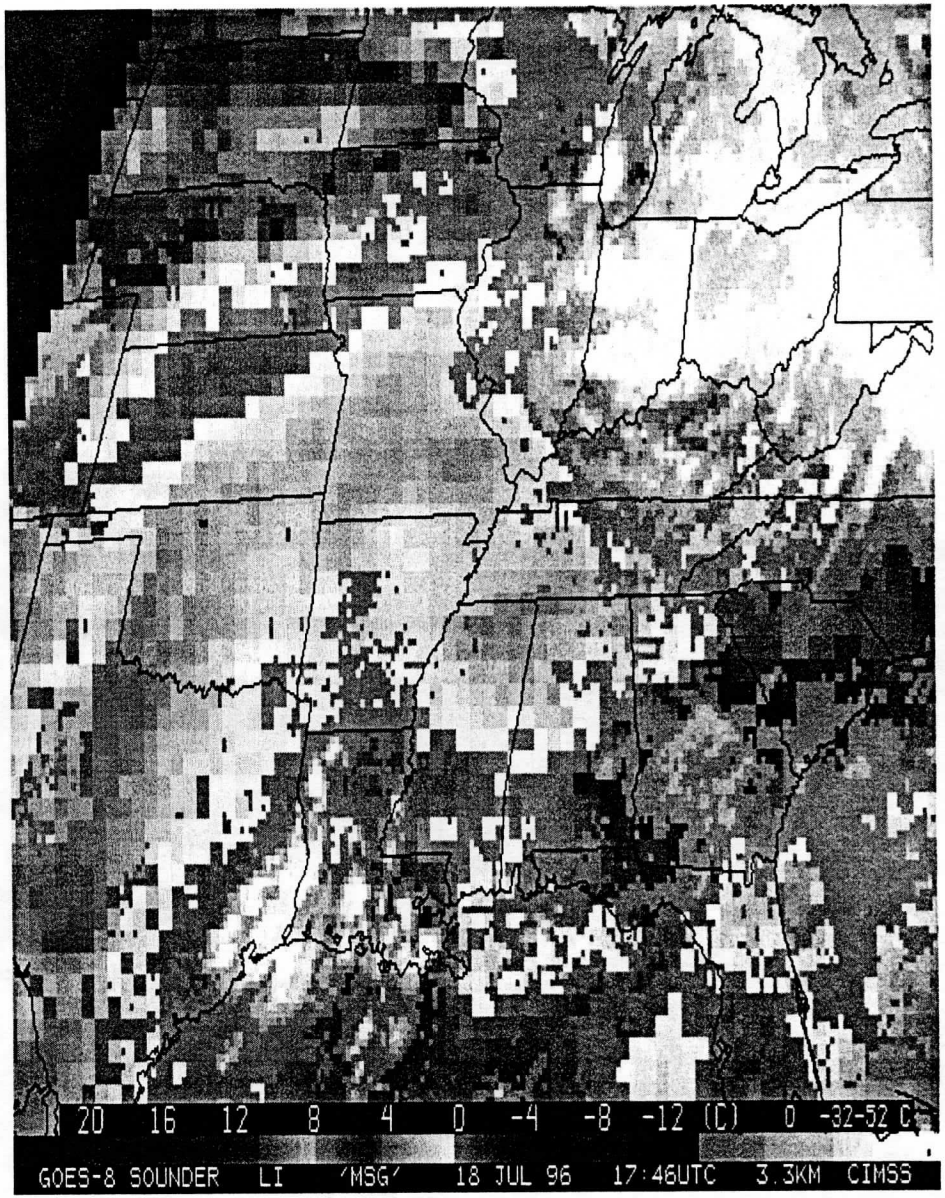
ABI-12 (top bars) and MSG/SEVIRI (bottom bars) Channels



GOES Sounder LI



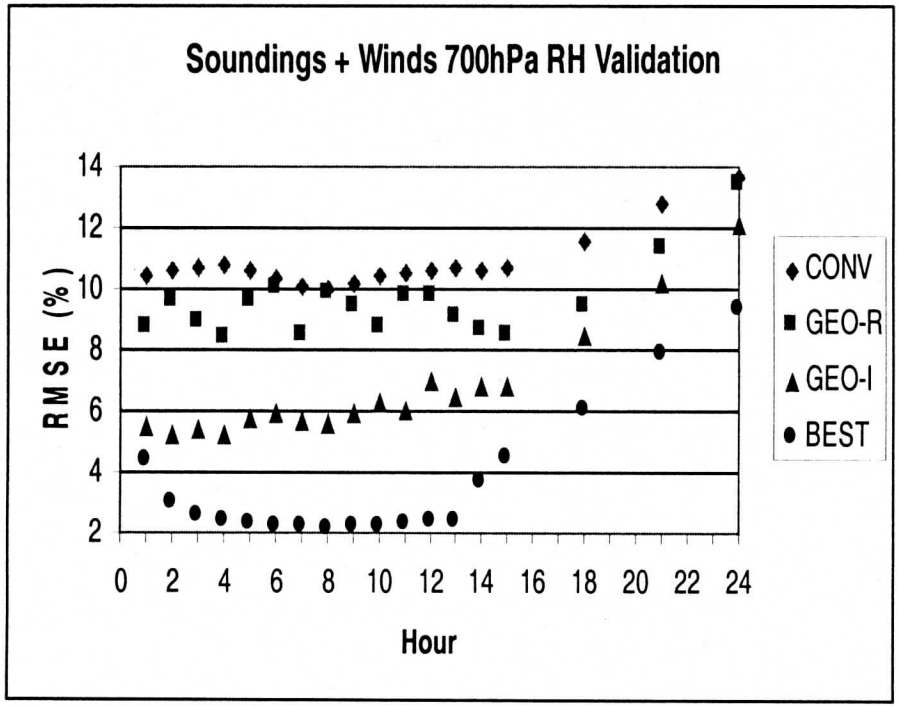
MSG LI

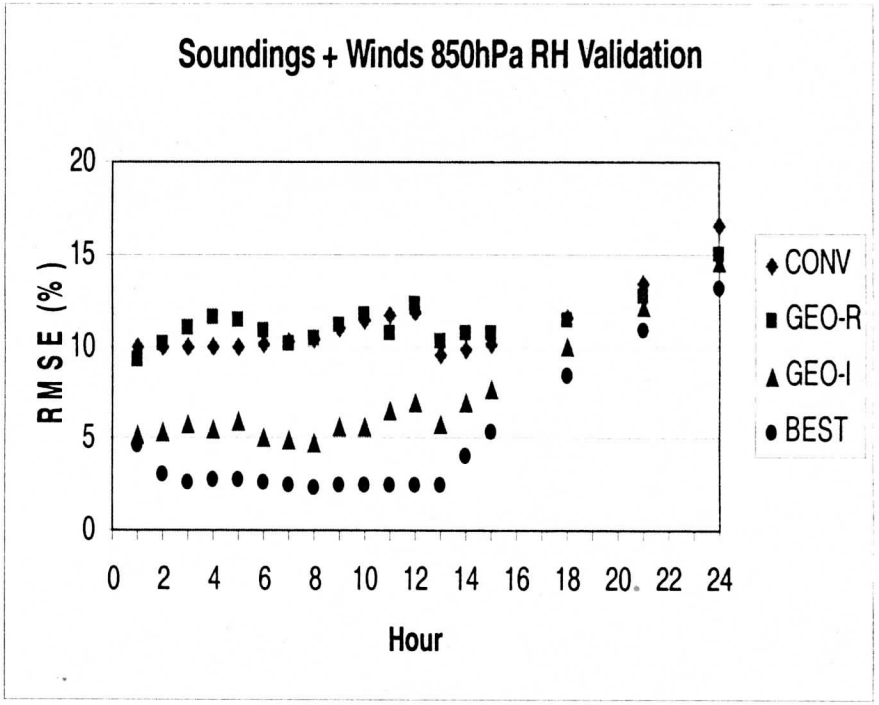


OSSE indicating capability of Geo-Interferometer for adding info to raob, profiler, ACARS network

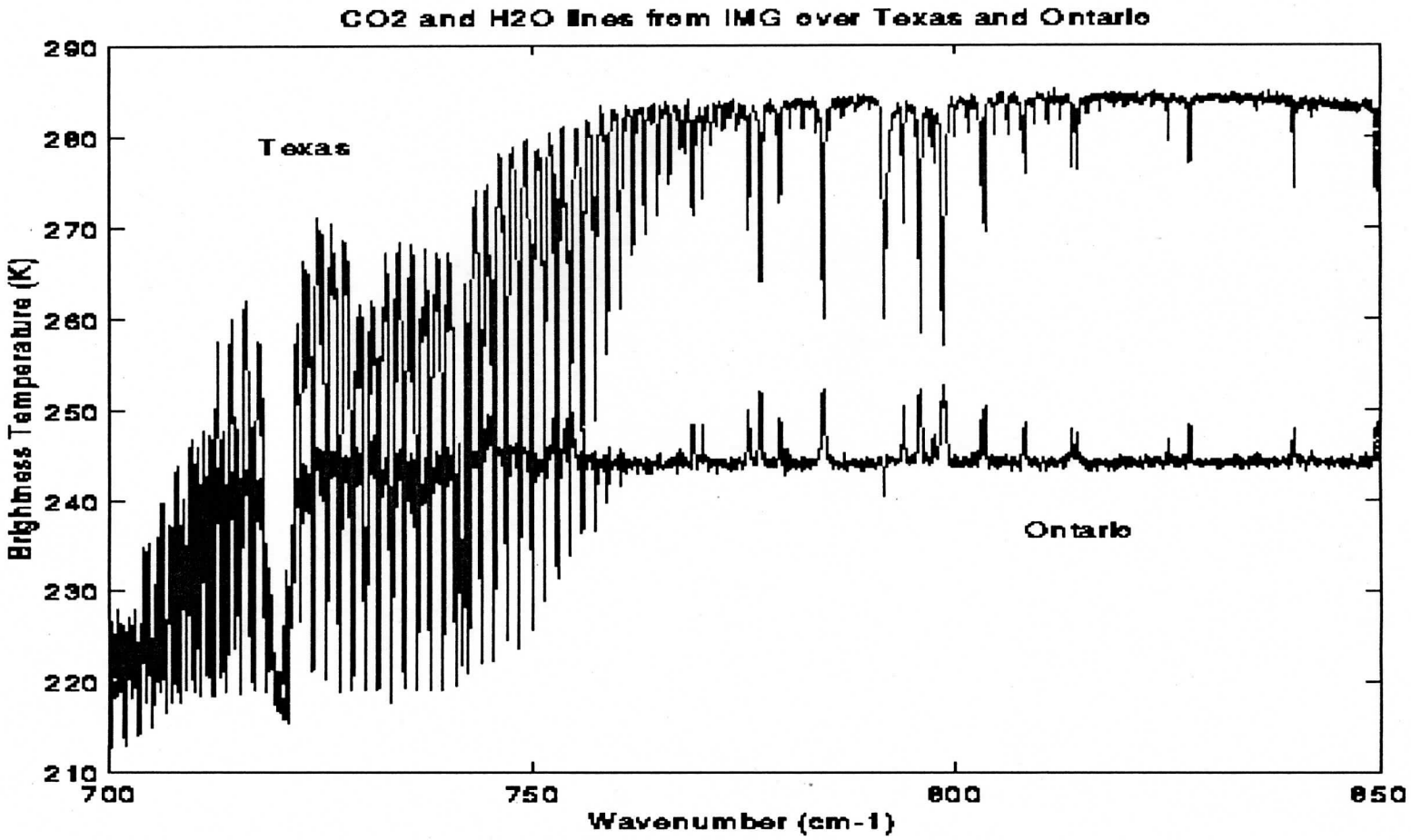
Geo Interferometer penetrates Boundary Layer (BL) to provide low level (850 RH) moisture information:

Geo Radiometer only offers information above BL (700 RH)





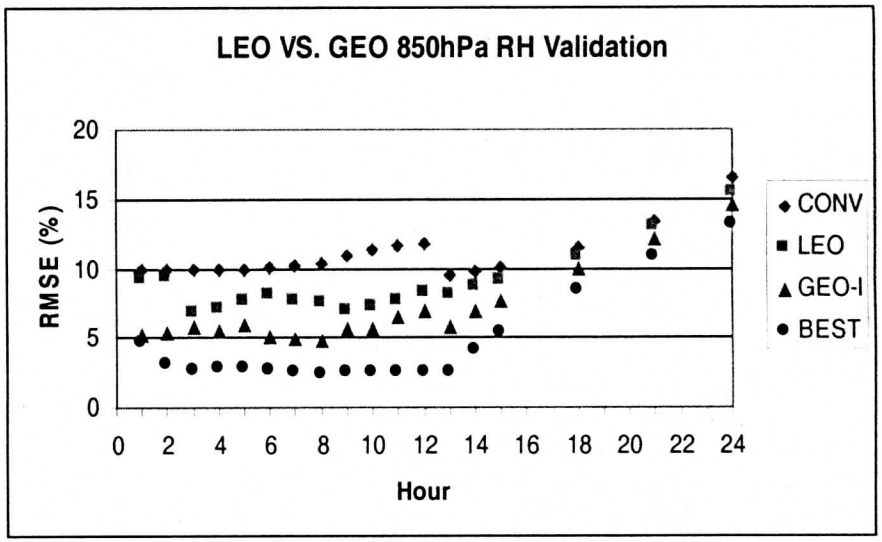
IMG demonstrates interferometer capability to detect low level inversions: example over Ontario with inversion (absorption line BTs warmer) and Texas without (abs line BTs colder)

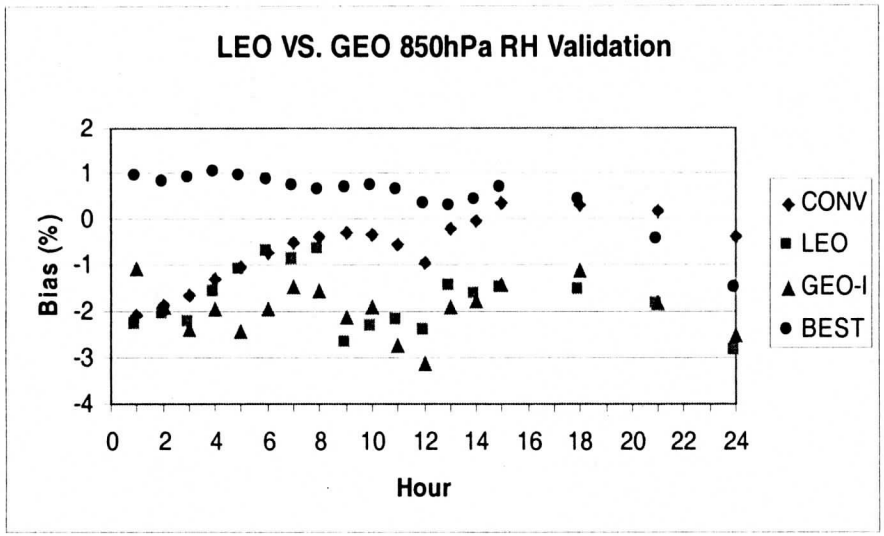


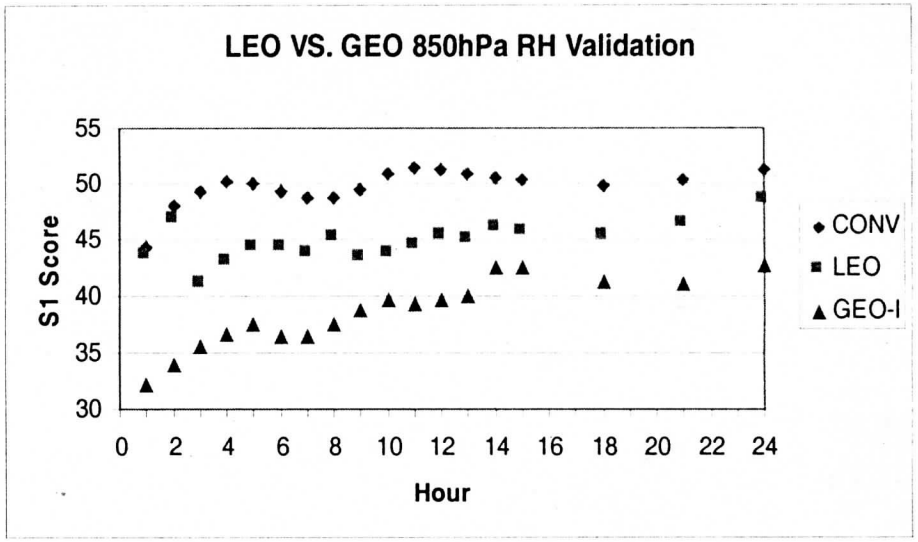
Hourly Geo-I soundings and winds vs 6 hourly Leo-I soundings

Conv (sfc obs, raobs, profiler, acars) vs Conv+Leo-I vs Conv+Geo-I vs Conv+Geo-Prfct (best = no noise)

850 RH



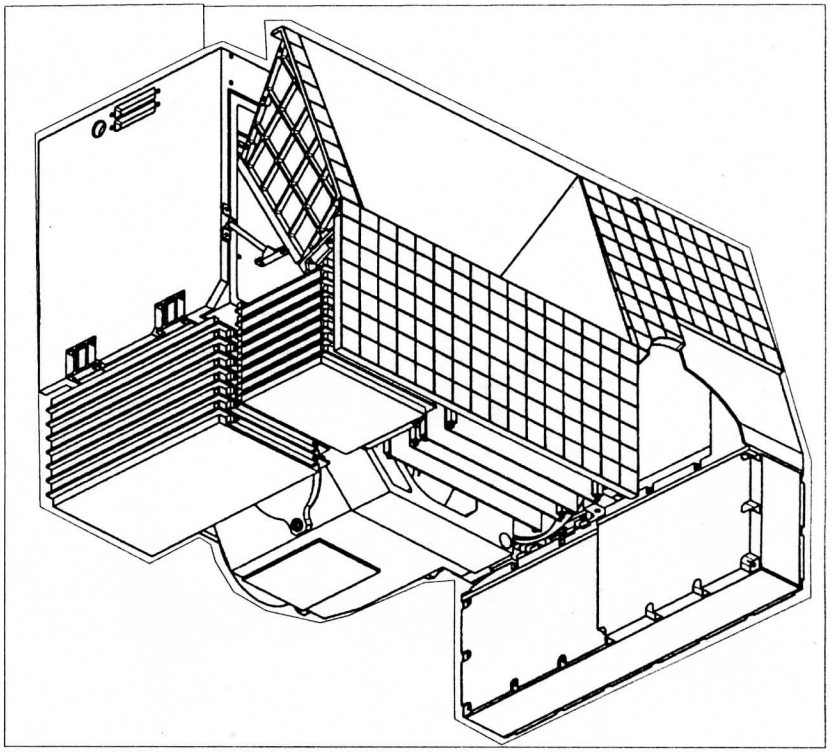




Sensor Design

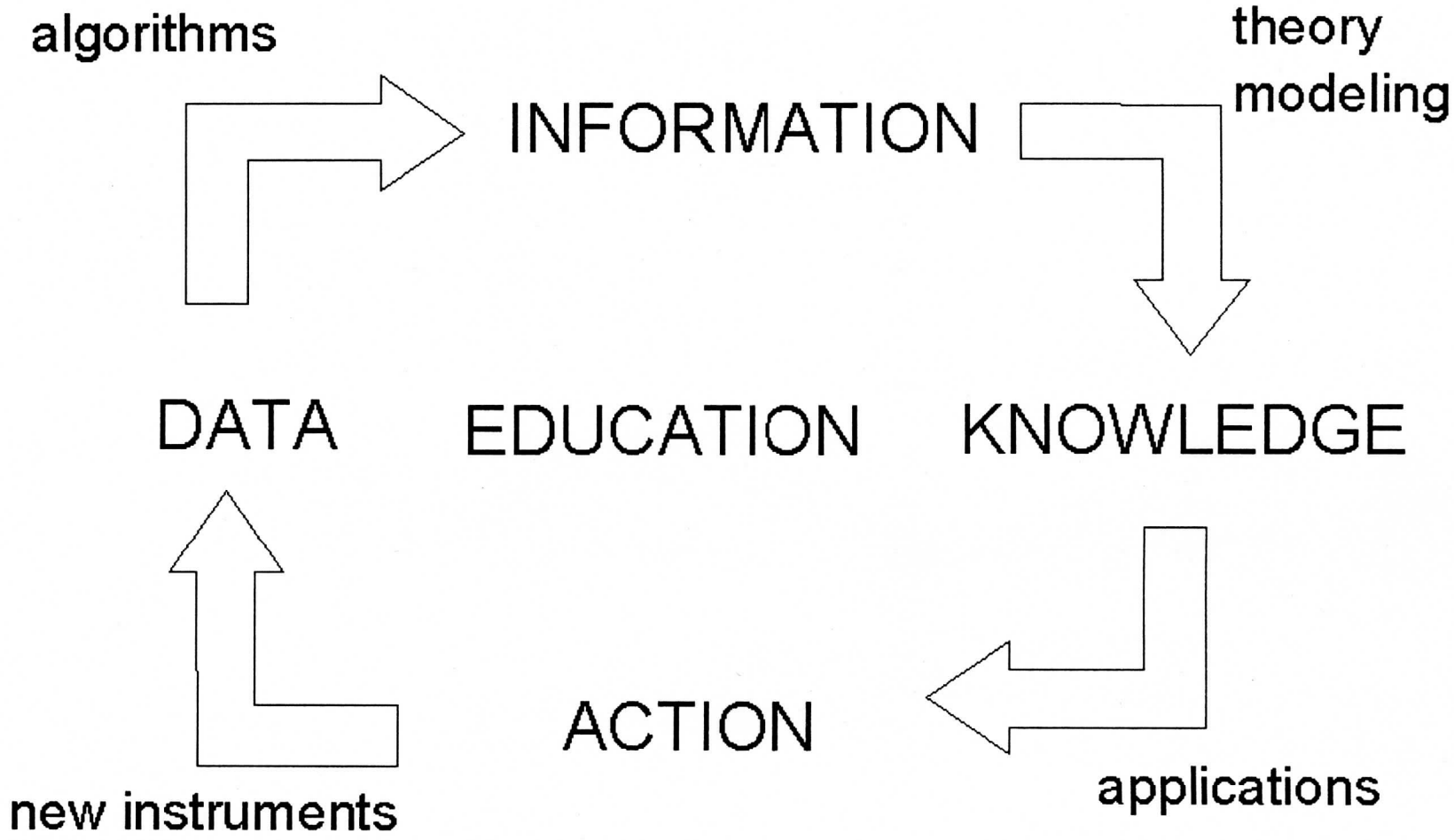
ITT CrIS Sensor Design

- 8 cm Clear Aperture
- 4-Stage Split-Patch Passive Cooler
  - 81K LWIR patch temperature
  - 98K MWIR/SWIR patch
- High-Performance PV Detectors
- 3 x 3 Arrays (14 km IFOVs)
- 3 Spectral Bands
- All-Reflective Telescope
- Proven Bomem Plane-Mirror Michelson Interferometer With Dynamic Alignment
- Deep-cavity Internal Calibration Target based on MOPITT design
- Two-Axis Scene Selection Module with Image Motion Compensation
- Modular design allows future addition of active cooler and larger than 3x3 arrays



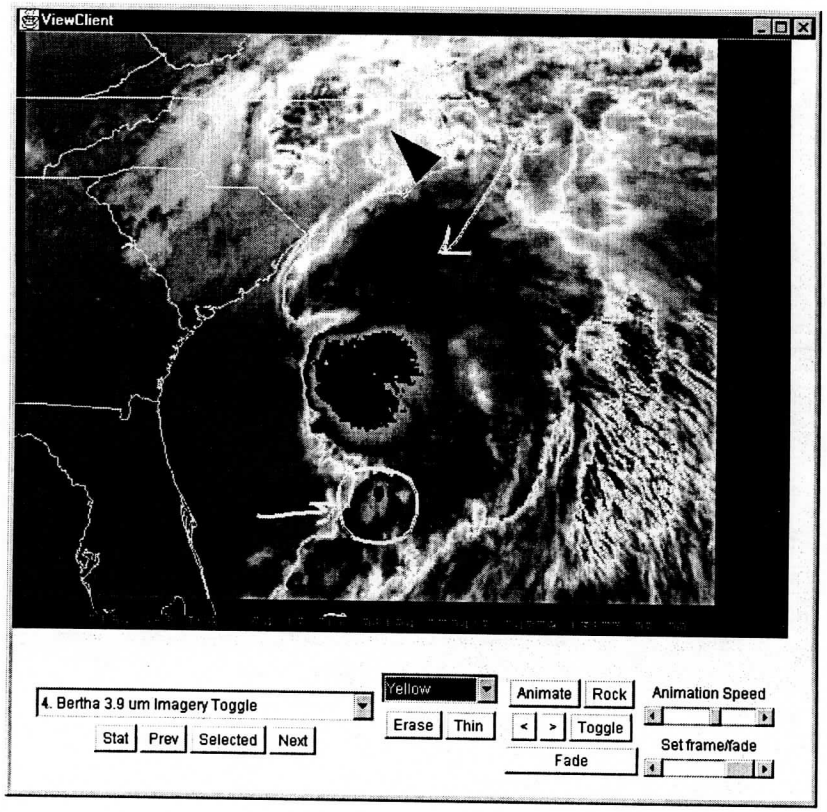
	Requirement	Baseline
Volume	61 x 40 x 40 cm	61 x 40 x 40 cm
Mass	< 81 kg	76 kg*
Power	< 91 W	86 W*
Data Rate	< 1.5 Mbps	1.48 Mbps*

**15% Margin Included*

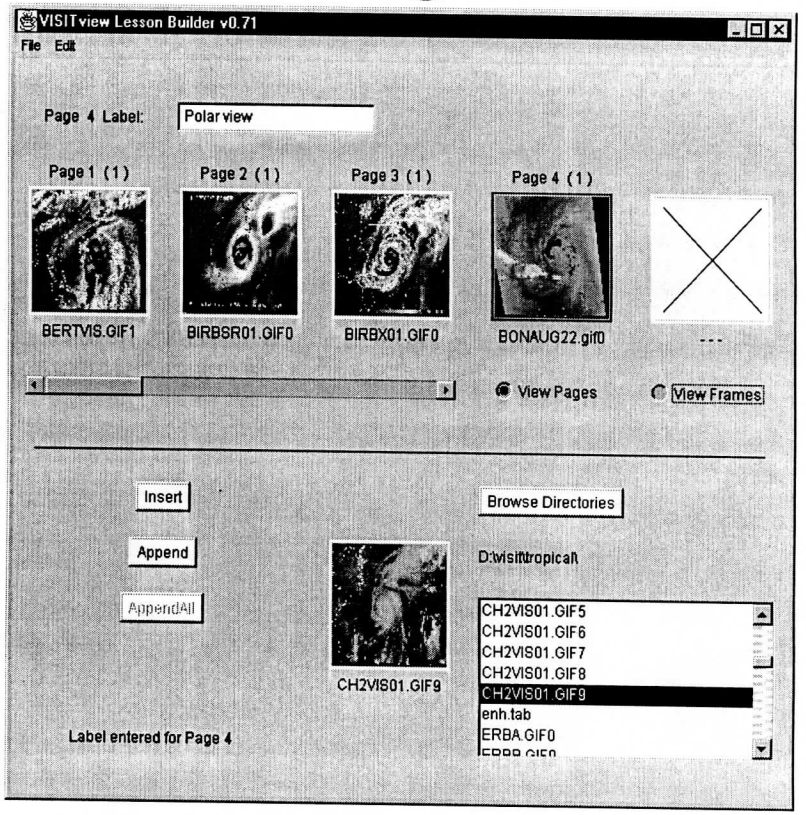

algorithms
INFORMATION
theory
modeling
DATA
EDUCATION
KNOWLEDGE
ACTION
new instruments
applications

VISITview

Distance Learning & Collaboration Tool for Teletraining

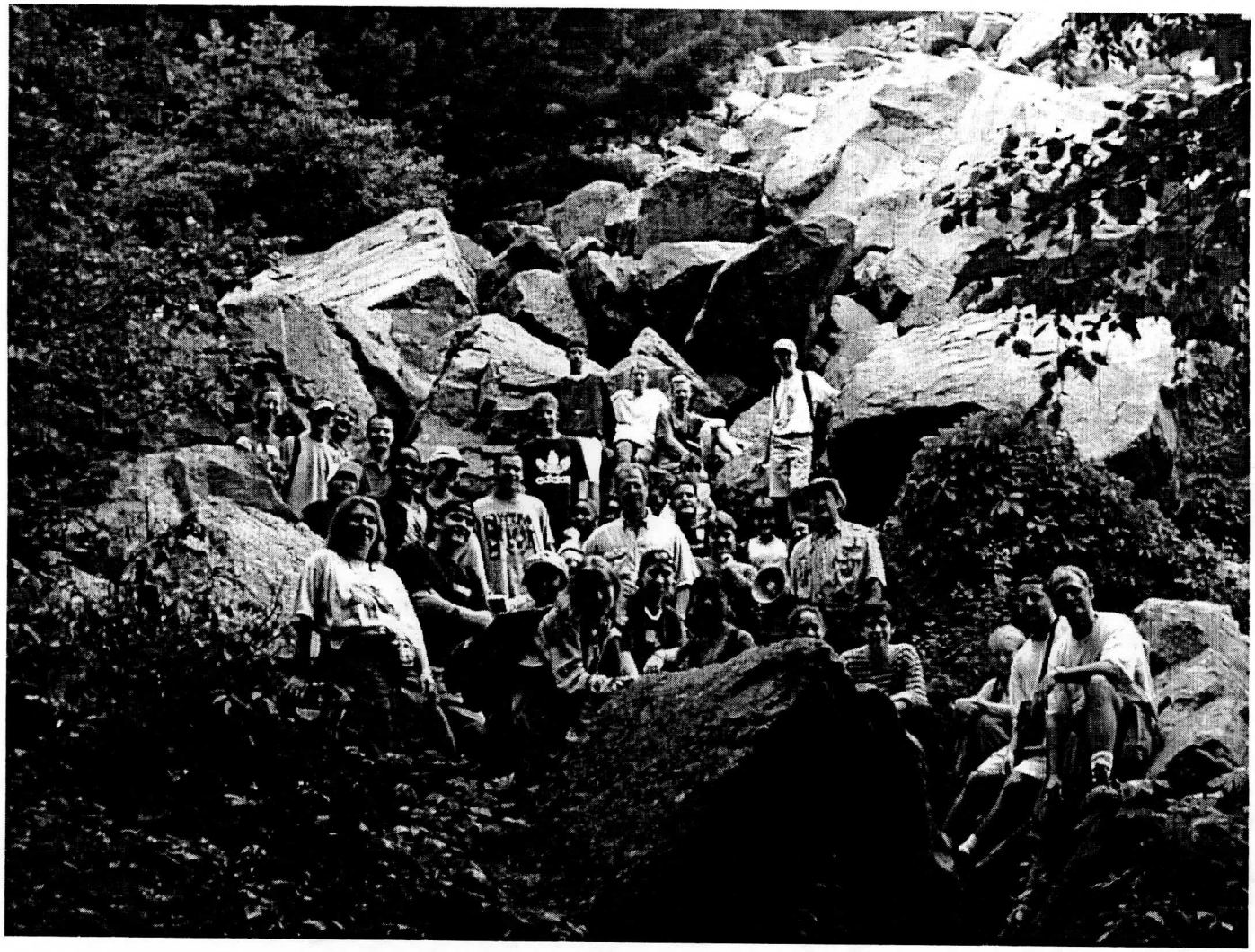


During a Teletraining Session



Using the Lesson Builder

Summer Workshops

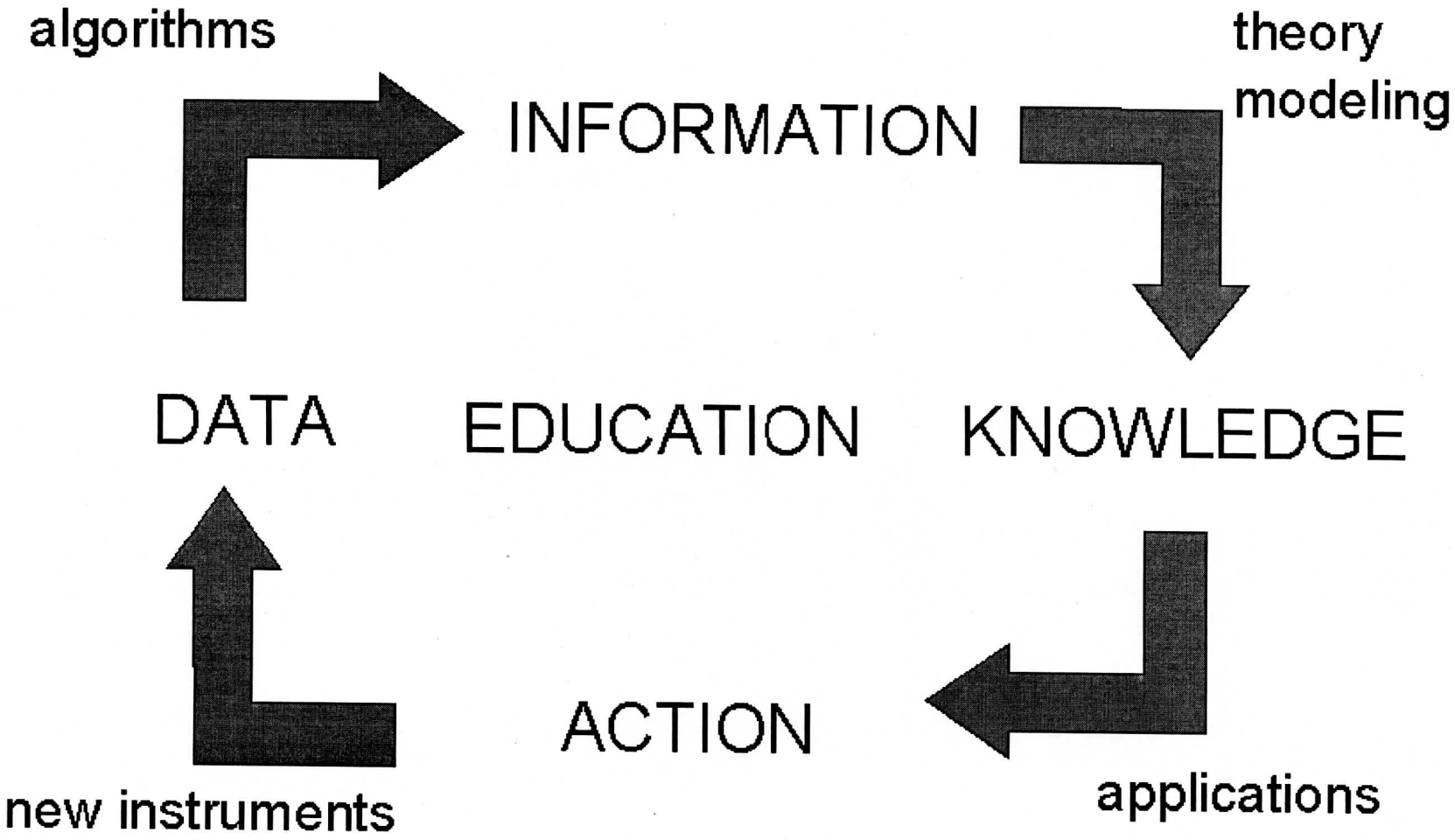


Suomi Web Museum

- Focuses on remote sensing from satellites.
- Museum type structure
- Hands-on

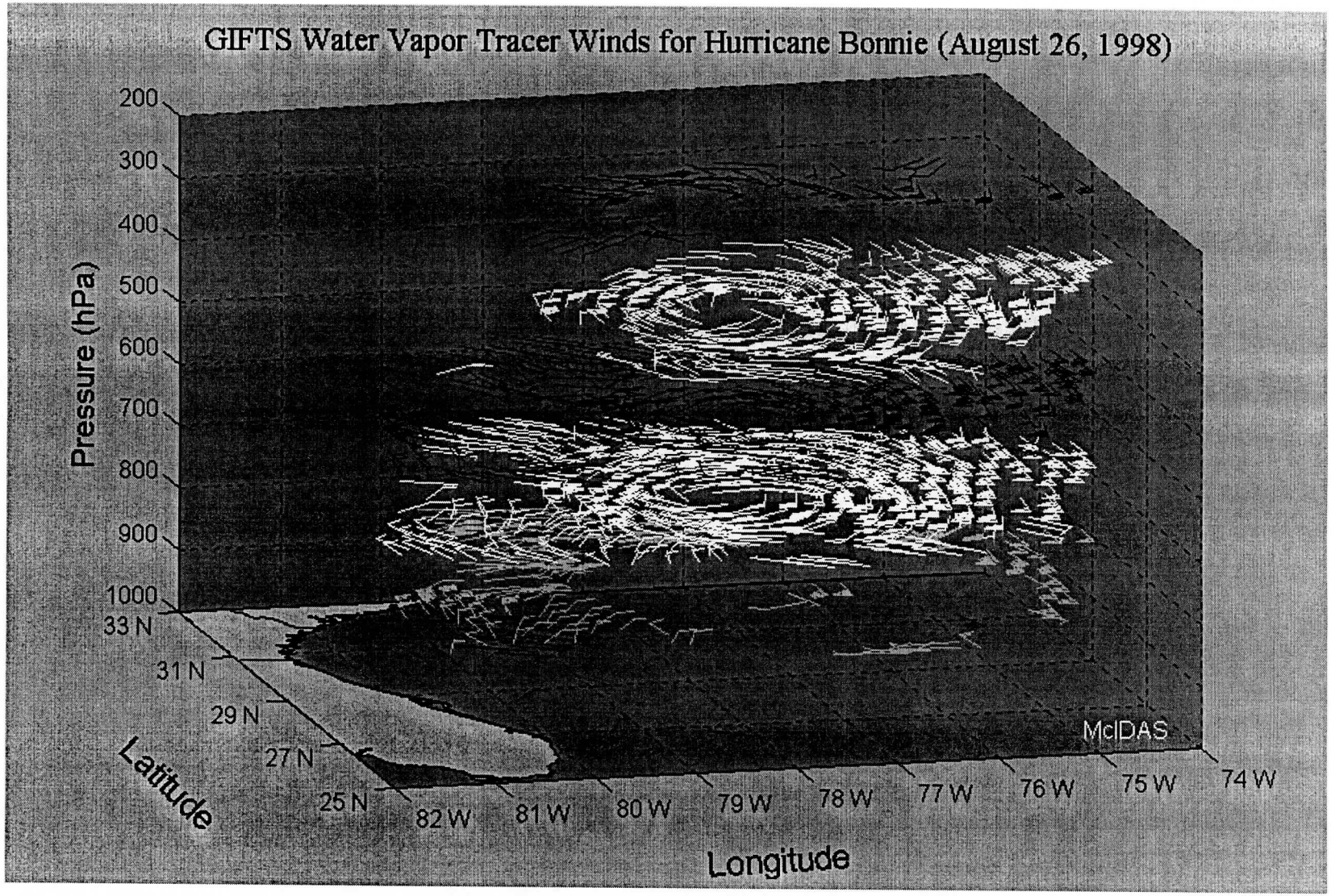
Http://Profhorn.meteor.wisc.edu/wxwise/museum/

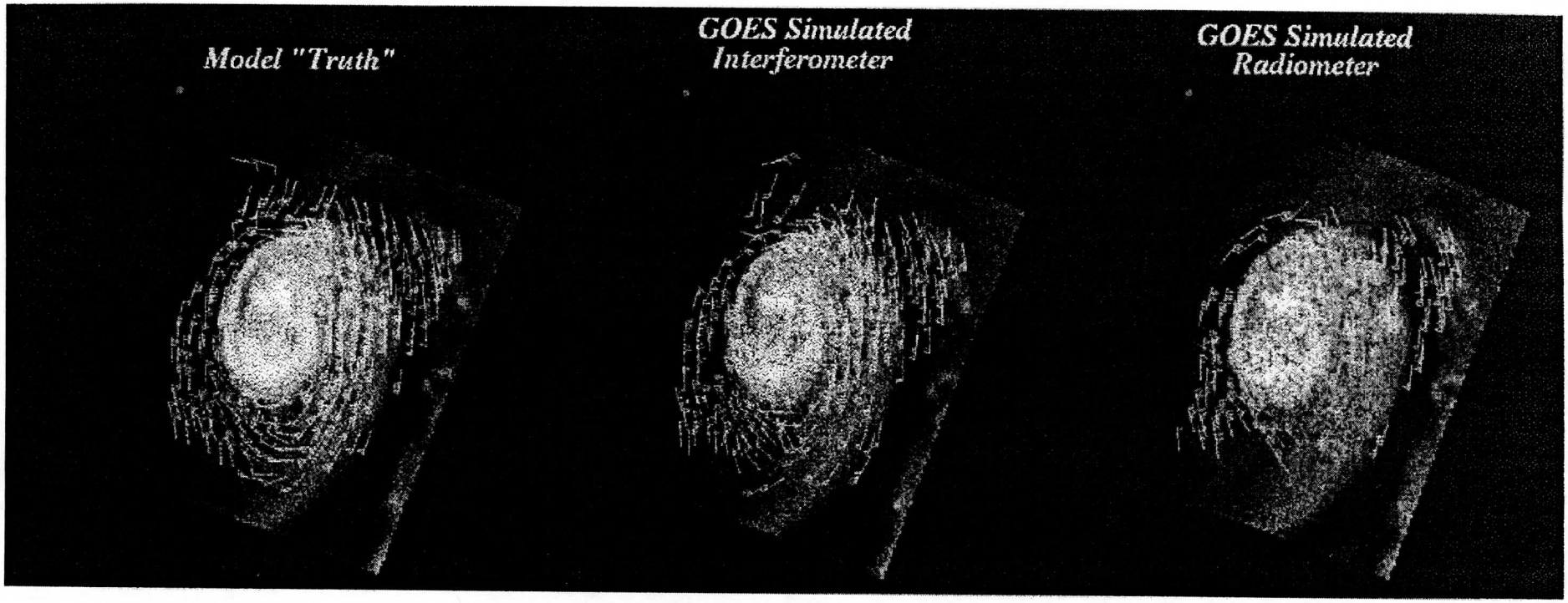
Welcome to the Suomi Virtual Museum

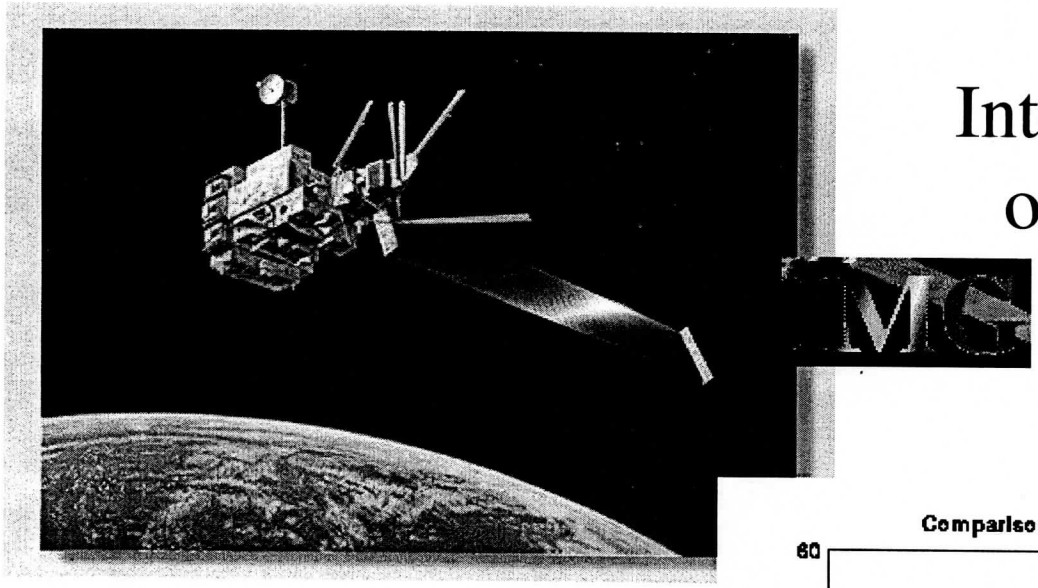


Looking to the future

GIFTS Simulation of Hurricane Bonnie: Winds from Water Vapor Retrieval Tracking

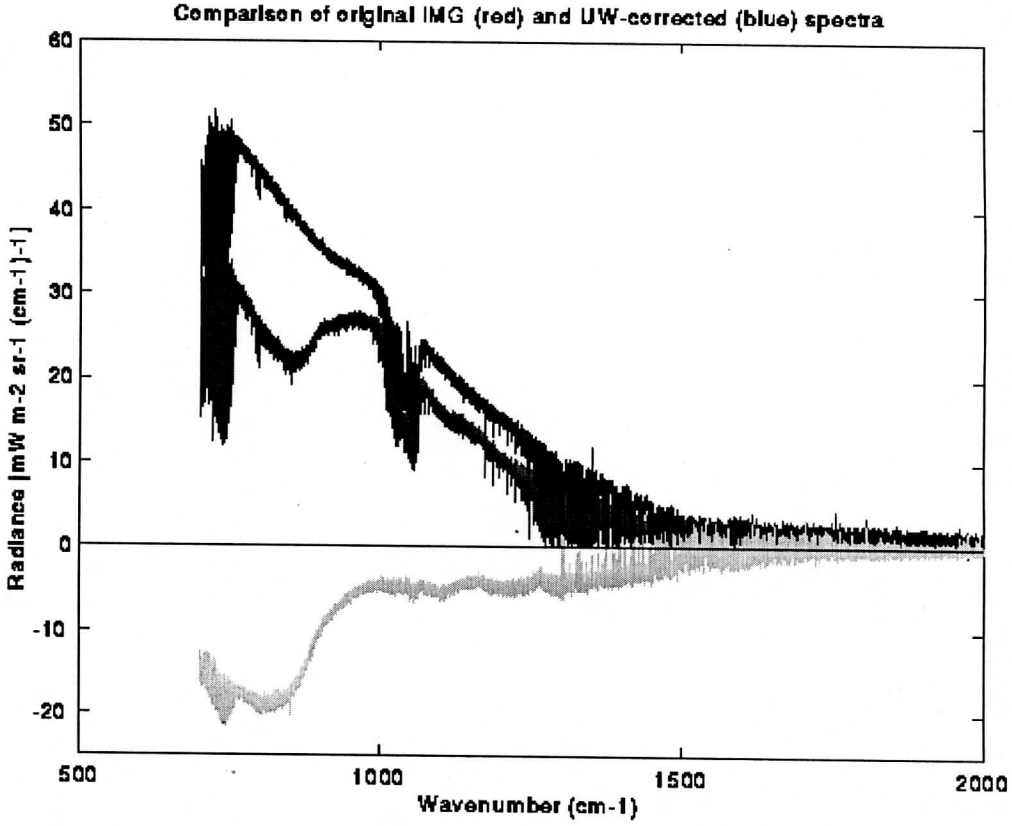



Model "Truth"
GOES Simulated
Interferometer
GOES Simulated
Radiometer



Interferometric Monitor of greenhouse Gases

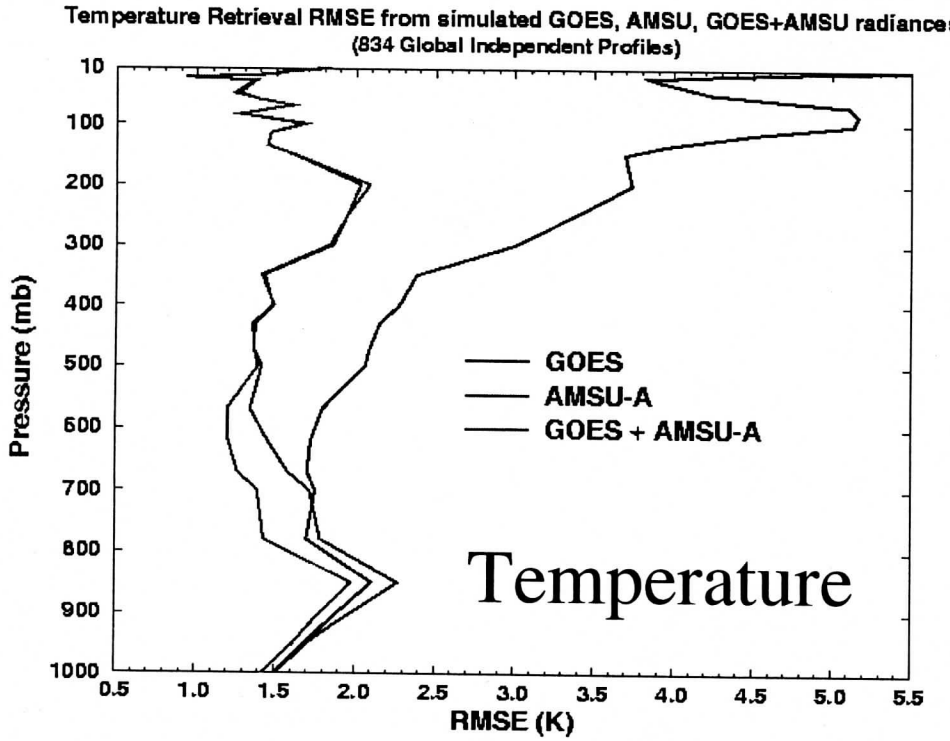
Using a procedure developed at CIMSS, data from the IMG instrument, flown aboard the Japanese ADEOS satellite, has been corrected for large radiometric errors.

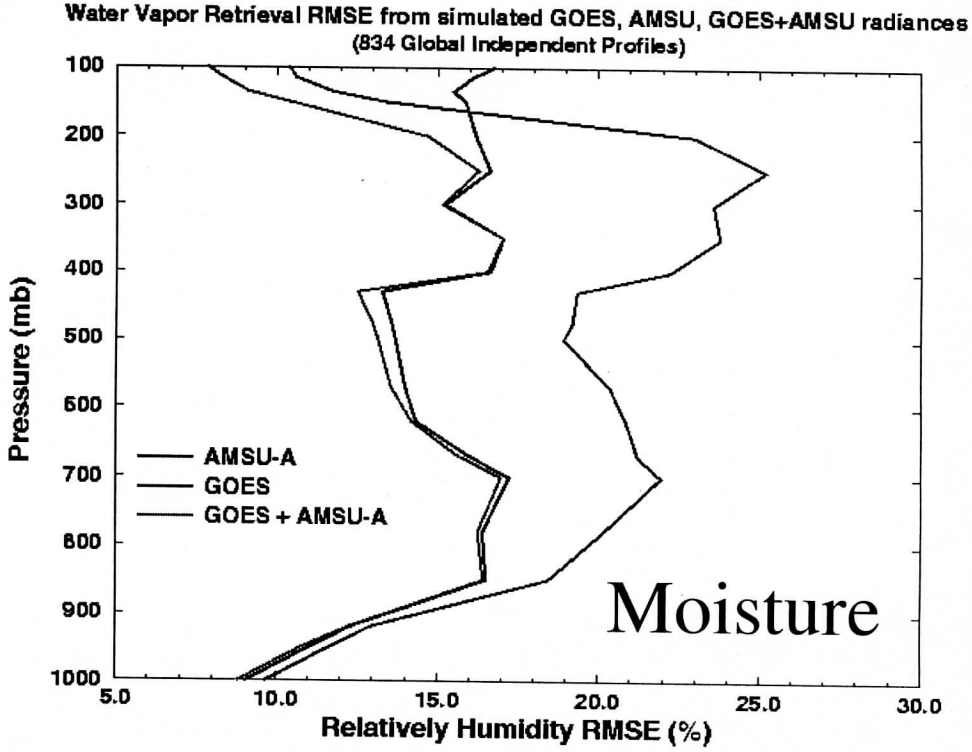


Simulated retrievals using both AMSU-A and GOES radiances.

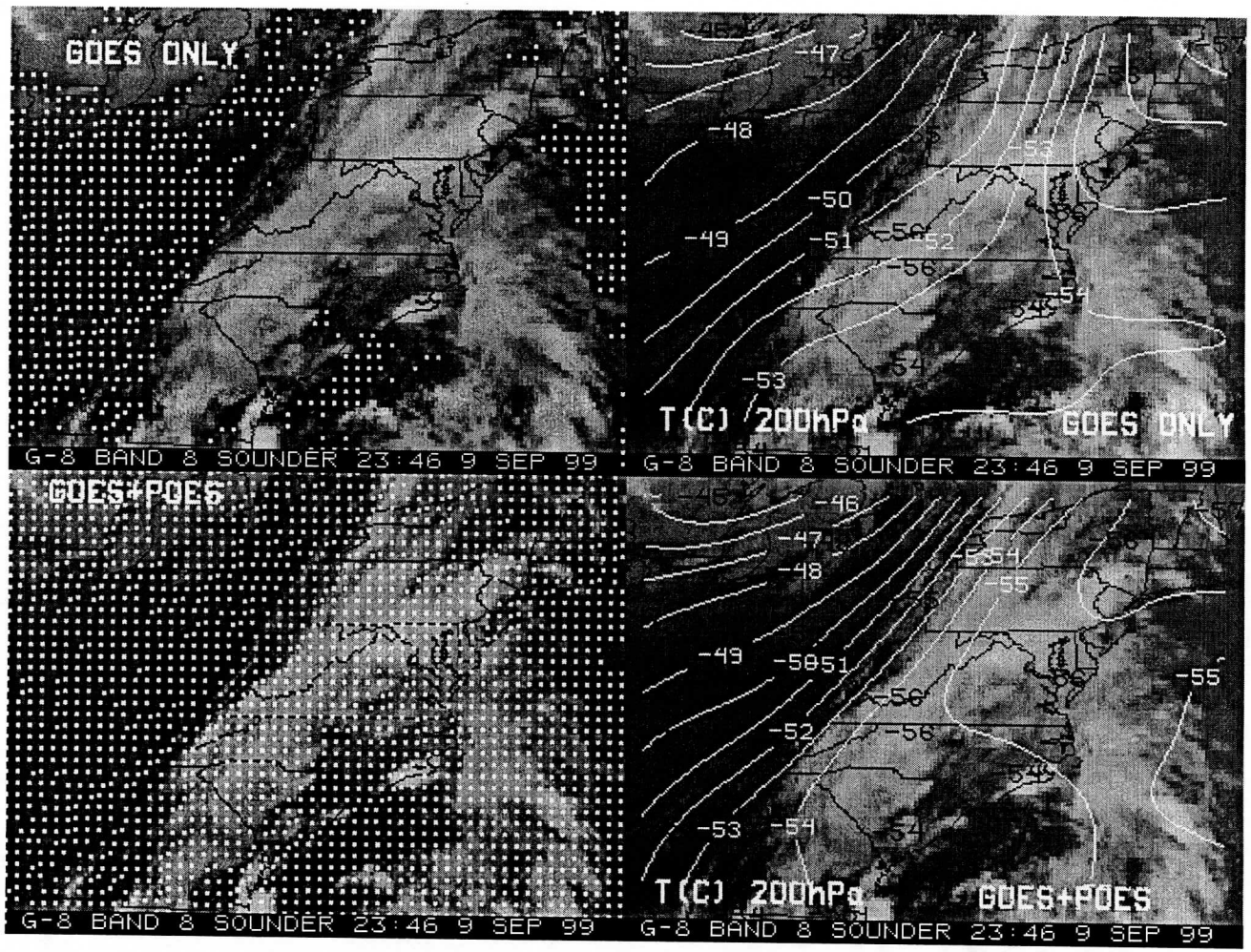
Large improvement to the temperature retrieval using both GOES+AMSU over GOES only is seen.

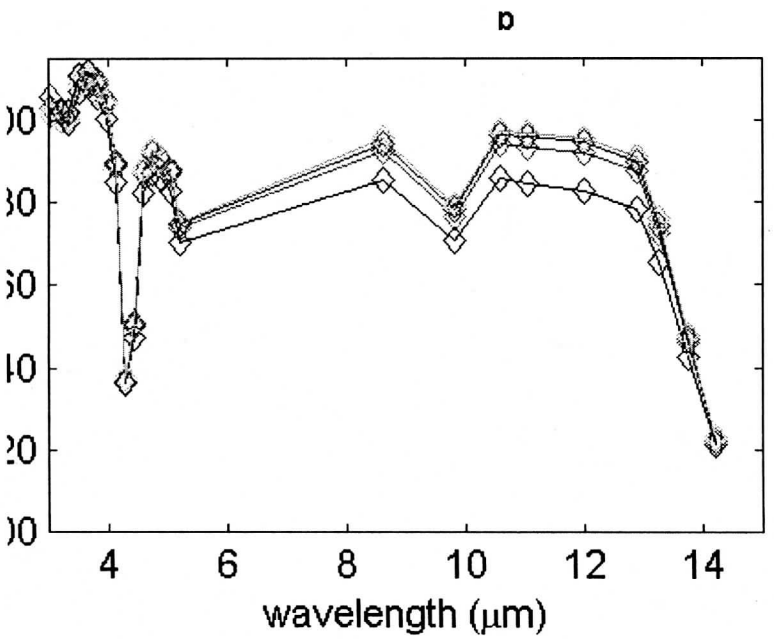
The impact on the water vapor is small (using just GOES and AMSU-A).

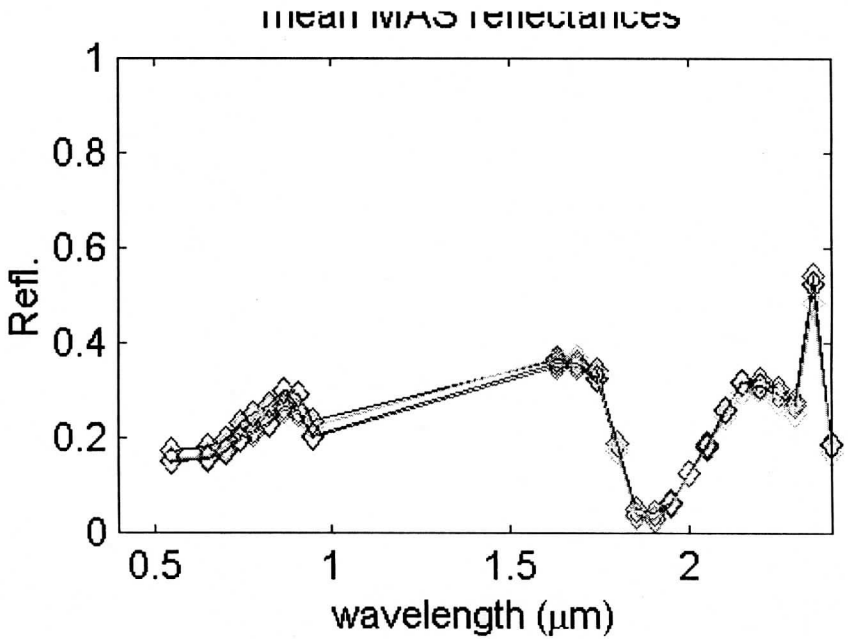


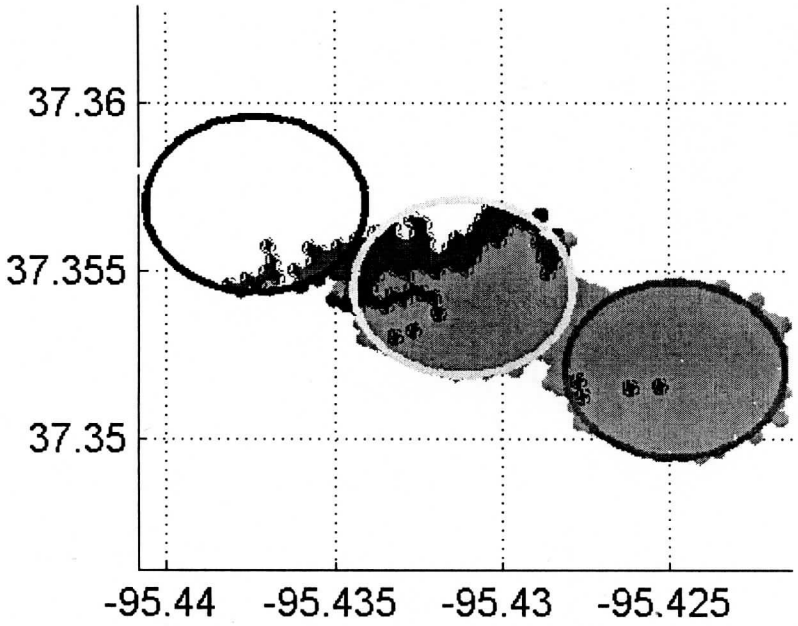


UW/CIMSS


GOES ONLY
G-8 BAND 8 SOUNDER 23:46 9 SEP 99
T(C) 200hPa
GOES ONLY
G-8 BAND 8 SOUNDER 23:46 9 SEP 99
GOES+POES
G-8 BAND 8 SOUNDER 23:46 9 SEP 99
T(C) 200hPa
GOES+POES
G-8 BAND 8 SOUNDER 23:46 9 SEP 99







pixels = 653
cloudy pixels = 211
undecided pixels = 83
probably clear pixels = 15
confident clear pixels = 344

Cloud Mask

EOS Direct Broadcast at SSEC

Acquire EOS direct broadcast data to

1. Provide regional users with near real-time products,
2. Assist MODIS validation by supporting field campaigns,
3. Provide outreach to the non-EOS community.

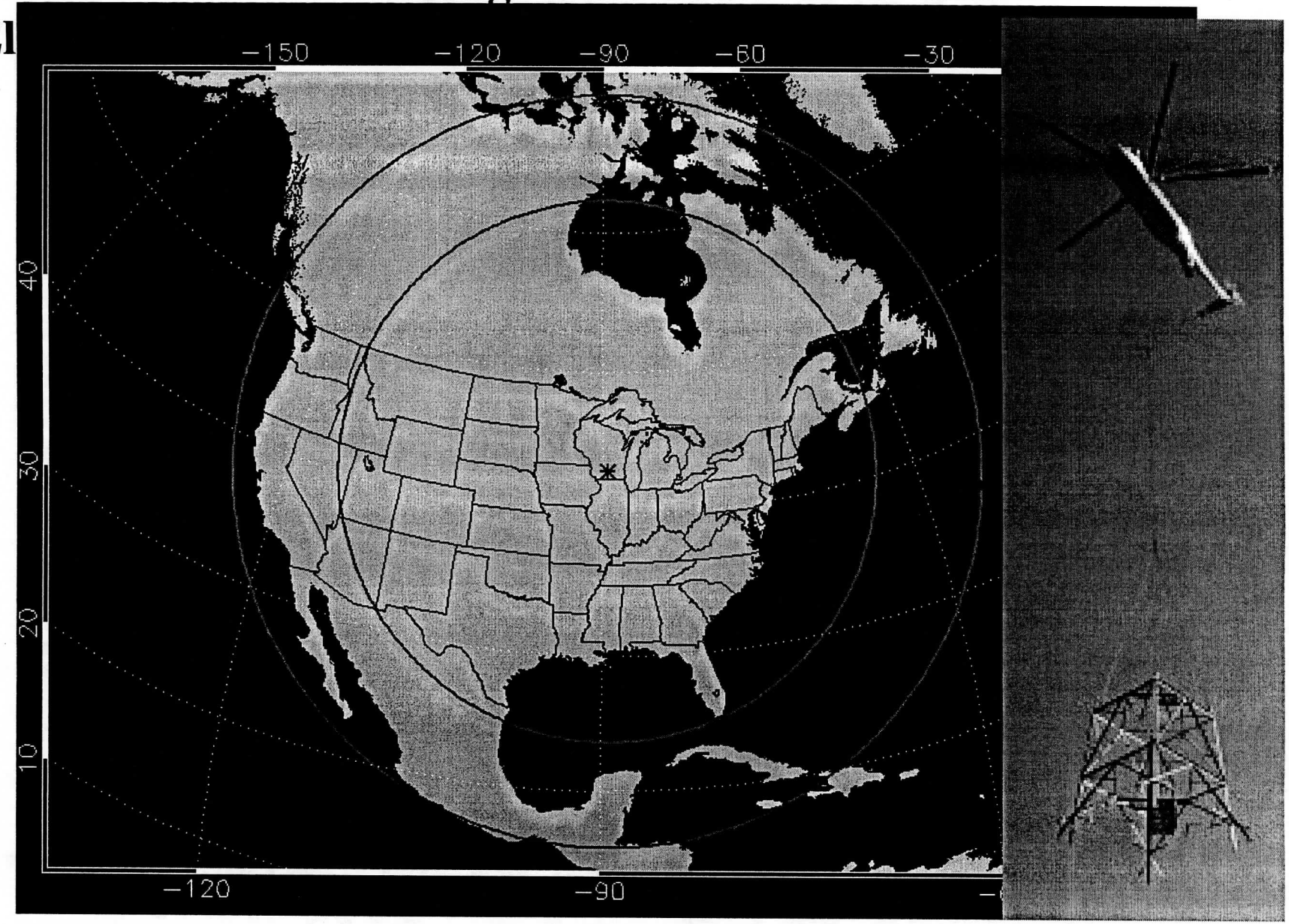
Develop a MODIS direct broadcast processing package to

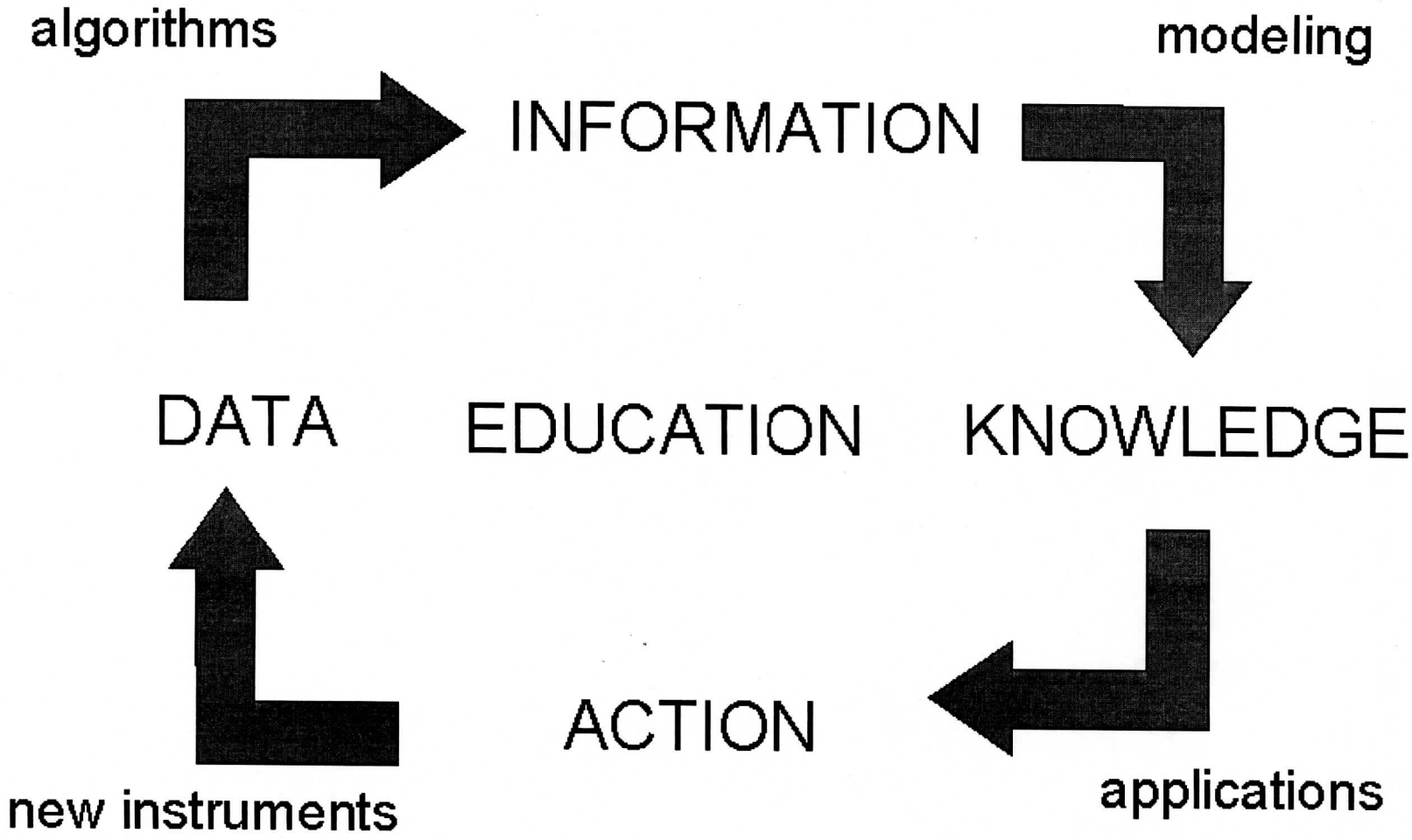
1. Provide software to transform Level-0 to Level-1B and a selection of geophysical products,
2. Enable the international community to directly participate in MODIS calibration and validation.

SSEC rooftop installation has begun

Direct Broadcast Coverage from SSEC at 10° and 0°

El




algorithms
modeling
INFORMATION
DATA
EDUCATION
KNOWLEDGE
ACTION
new instruments
applications