

Highlights, 2002

by Terri Gregory and many others

Thanks to all SSEC and ASPT employees who provided highlights of their work.

[Acronyms](#) are at the end.

Throughout these highlights, we link to a [longer version](#), without pictures, that is closer to what was originally provided by scientists, engineers, program managers and others. Even more highlights can be found in the State of the Center [presentation](#) by Hank Revercomb, SSEC's director, given December 19, 2002. These pictures and images are all copyright SSEC January 2003.

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Beginnings

Data

Education

Infrastructure

Collaborations

Limelight

Occasions

Research

Honors

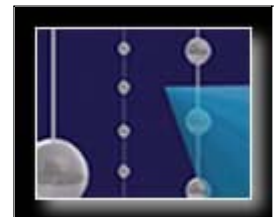
Information

Advances

Earth & Space

Auspicious [Beginnings](#)

[IceCube](#), planned South Polar neutrino telescope, receives \$15 million in first year startup funds from NSF—the biggest single project ever undertaken by the University of Wisconsin—Madison and the second largest project ever run by a university in the United States.



Simulated IceCube event.

[longer version](#)

[Data](#) and Information

Ice

[longer version](#)

New [AWS](#) placed on iceberg C-16, to track movement and weather conditions.

Data decoded from Italian automatic weather stations and the U.S. Antarctic Program AGO to add to AMRC's growing databank.

[AMRC](#) found a new big tabular iceberg, C-19.

Susan Solomon, NOAA scientist and *The Coldest March* author, said she could make temperature comparisons because Charles Stearns invented the Automatic



Weather Station.



Jonathan Thom, Douglas MacAyeal
maintaining an AWS.

Snow

[longer version](#)

The Schwerdtfeger Library, SSEC's special campus library, formally released the Wilson [Bentley snowflake image collection](#) in [May 2002](#).



Fernlike crystal

Record Warm Lows

[longer version](#)

Warmest April low on record tied the low of 66 on April 5, 1929.

Education and Outreach

Neutrinos through the Ice

[longer version](#)

[Astronomy in the Ice](#) was added to the IceCube [Outreach Web site](#).

SSEC with NASA at the EAA

[longer version](#)

SSEC attended the EAA with NASA's DC-8 and crew.



CIMSS researcher Erik Olson poses with fan at EAA

NASA Connects

[longer version](#)

[Dane County Girl Scouts](#) earned weather badge with OSSE, NASA help.



El Niño

[longer version](#)

SSEC scientists helped media educate the public on El Niño.

University Programs

[longer version](#)

With Wisconsin DOT and College of Engineering, OSSE taught Space to PEOPLE.

OSSE shared planetary exploration with Grandparents' University participants.



PEOPLE at Space Place



Grandparents, grandkids and helper [at Space Place](#)

GLOBE

[longer version](#)

Workshops brought teachers from South Africa and Turkey to Madison's O'Keefe Middle School and Lac Courte Oreilles Ojibwa Community College.



GLOBE school teachers at O'Keefe Middle School with M.Mooney (front, left) and S.Limaye (far right)

Working with High School Students

[longer version](#)

OSSE talked to Gallaudet University's Model Secondary School for the Deaf in Washington, D.C.

CIMSS researchers helped infuse weather satellite data into Waunakee High School science curriculum.

Teacher Professional Development

[longer version](#)

OSSE gave workshops to enthusiastic Wisconsin and Illinois high school teachers for new course in Astronomy and Space Science.

OSSE and IceCube outreach presented at Wisconsin Society of Science Teachers conference.

Infrastructure

The Schwerdtfeger Library

[complete version](#)

With a major space and holdings evaluation, the Library is developing its unique collection and maintaining a core collection of atmospheric science texts and journals to support research.

Getting the Ship into Shape

[complete version](#)

Loading dock completely cleared of surplus equipment.

Huge ICDS warehouse holdings inventoried.

All SSEC stored belongings moved to a warehouse.

The Season of Water—Major water disaster averted, several times, with 35-year-old valves replaced, one by one.

[longer version with juicy details](#)



Staff at Work

Human Resources team resolutely faced great growth and change, working with more than ever before retirements, staff changing classifications, student salary increases, international staff and students' visa updates, and leaves of absence and changes in status.

[complete version with table](#)

They also answered letters from 100s of applicants.

They helped SSEC's 200+ staff make the right benefits choices when they're hired and when they leave SSEC and all stages between.

SSEC's Human Resources team documented the hiring process over the past three years and noted that growth is outstripping exits. See the [table](#).

SSEC's **purchasing team** showed an increase in purchasing activity from 2000 through 2002. Over the last two years, the number of orders has increased by 67% and the dollar volume by 467%!

[longer version with details and table](#)

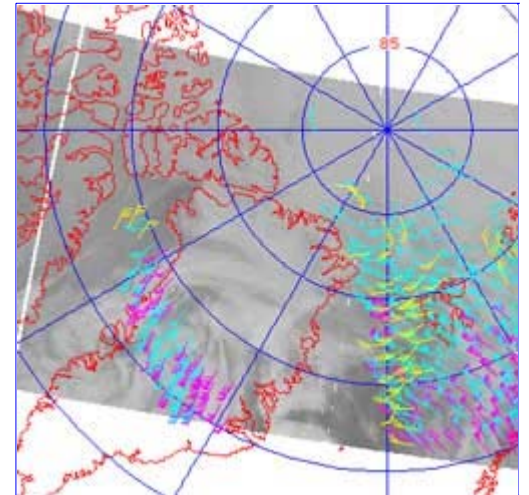
Innovative Collaborations

For NCAR's Convective Weather and Oceanic Weather Product Development Teams, [GOES data is processed](#) to find thunderstorms about to form.

[longer version with juicy details](#)

[MODIS winds](#) make [positive impact](#) on [ECMWF forecasts](#).

[longer version](#)



SSEC participated with USDA, NASA in [SMEX](#) with [Scanning-HIS](#), vegetation data, [models](#).

[longer version](#)

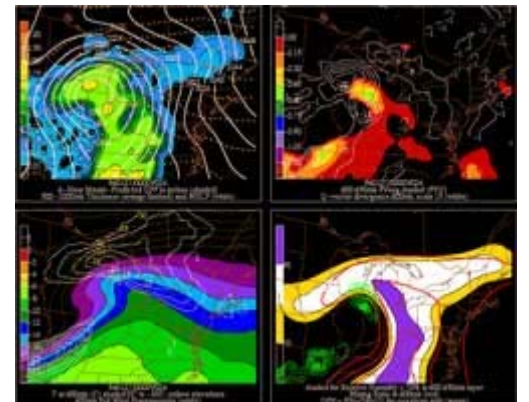
[VISITView](#) used to [demonstrate satellite imagery](#) in on-line world-wide collaboration.

[longer version](#)

[Wetzel ingredients](#) used widely by NWS forecasters.

[longer version](#)

[For more maps](#), click on Introduction to the Ingredient Maps, in the left frame.



sample map of twice-daily Wetzel ingredients

IceCube Education Resource Center works with Belgian IERC Institution Lead in joint US-Belgian [teacher-in-Antarctica project](#).

[longer version](#)

In the Limelight

[longer version](#)

SSEC's MODIS imagery featured frequently in NASA's Earth Observatory Web site, such as this one showing dark water off Florida's coast in August.





[IceCube](#) logo developed, representing ice-bound detectors in stylized fashion.



Francis Halzen presents neutrino research, especially the innovative telescope IceCube, at UW–Madison Roundtable in October.

Momentous Occasions

[Aqua is launched](#), giving radically higher spectral resolution with greatly improved vertical information.

[longer version](#)

Huge hail seen during [IHOP](#).



Tom Achtor, SSEC executive director for science, demonstrates size of hail in Oklahoma/Texas storm, May 23, 2002.

Research Progress

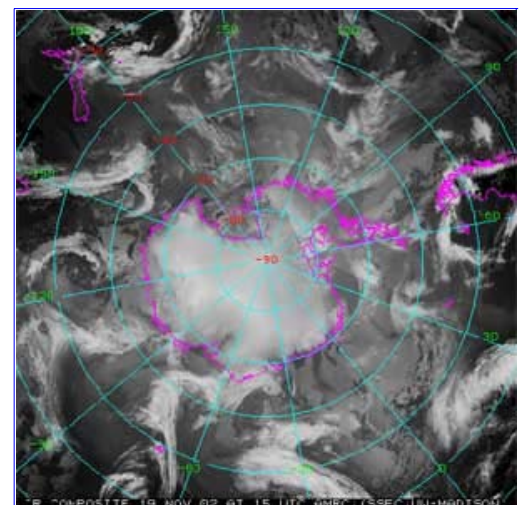
AMRC Advances

[longer version](#)

Prime Web product, Antarctic composite, is improved.

Tenth anniversary celebrated, staff increased.

Fog, chief reason for Antarctic flight cancellations, studied.



Aviation

GOES satellite data study shows that satellite data may improve FAA forecasts.

CIMSS Research Using MODIS Data

TPW algorithm from MODIS data runs operationally at Goddard Space Flight Center showing greater accuracy over deserts, provides many other advantages.

MODIS data used to estimate strength and height of low-level atmospheric temperature inversions.

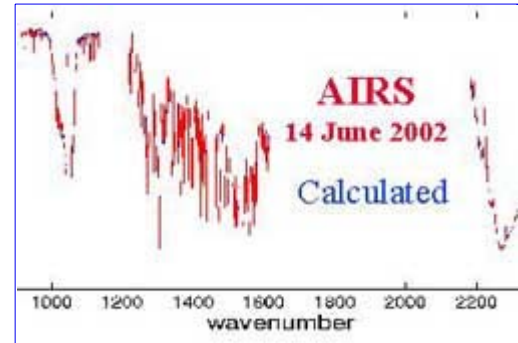
Research with New AIRS Data

AIRS initial retrievals are compared with RAOB, MODIS and GOES retrievals.

[longer version](#)

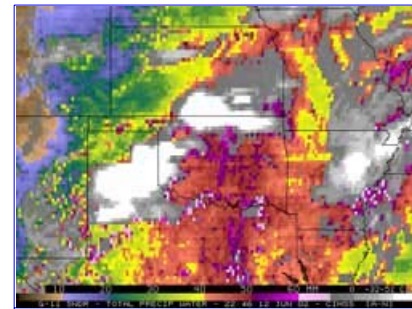
[longer version](#)

[longer version provides juicy details](#)



CIMSS' GOES Team [achieved myriad objectives](#), including:

- Single field-of-view GOES [sounder products](#) for IHOP
- Continuous [5-minute imaging](#) from GOES-11
- Invaluable input for Mitre Corporation's GOES-R imager and sounder [Cost-Benefit Analysis](#)
- GOES-9 Sounder products evaluated for use as GMS backup
- [GOES-8/10 Imager Clear-Sky \(average\) brightness temperature product](#) for ECMWF model
- [CO₂ slicing technique](#) enabled measurements to be directly used to determine cloud altitude



Total precipitable water derived from GOES sounder information during IHOP

HES Development

[longer version](#)

More bands suggested for proposed next generation imager.

MODIS data used in ABI compression study.

High-spectral AVIRIS aircraft data simulates visible and near-infrared ABI bands.

Library Research Support

[complete version](#)

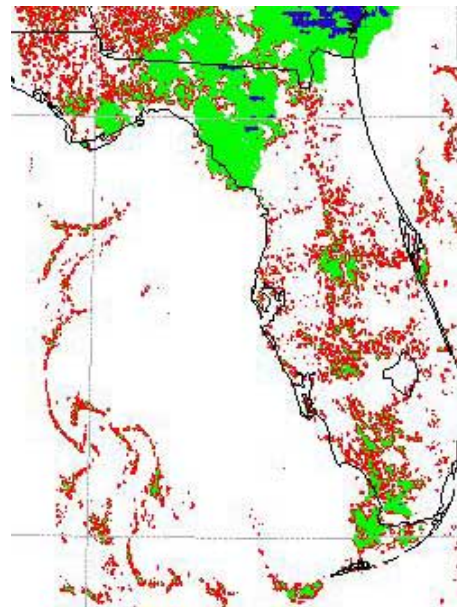
Schwerdtfeger Library staff made unique and varied research contributions.

Satellite Data *Helps Identify Pre-storm Conditions*

Algorithms developed to identify important precursors of rain-producing convective clouds.

.5–6 hour nowcasts provided of convective initiation across large geographical regions at high spatial resolution (1-5 km).

For the image on the right, and the larger image, cloud elements highlighted in red represent small immature cumulus clouds. The green color highlights mature cumulus that have brightnesses greater than a “time-of-day” dependent threshold. The blue color indicates actively growing deep cumulus (locations where the 6.7–10.7 micron band difference is near 0). It is likely that the “green” cloud elements are precipitating, with the “blue” elements having the heaviest precipitation.



Monitoring Fires with GOES

- GOES WF-ABBA goes operational in NOAA.
- CIMSS Biomass Burning Monitoring Team provides real-time support for North American wildfires.
 - They documented the rapid intensification of wildfires in Colorado, Arizona, and Canada.
 - The team provided fire products to the NWS SPC fire weather forecasters in Oklahoma.
 - Forecasters say, WF-ABBA fire products very useful for fire weather outlooks.
- Studies show good agreement between the WF-ABBA fire product and regions of elevated MOPITT derived CO values.
- Two years of half-hourly GOES Wildfire ABBA fire products provide new insight on wildfires and agricultural burning throughout the Western Hemisphere.
- Biomass Burning Team collaborates with a consortium of international government and university research centers and environmental policy groups to study land cover and land use change, carbon dynamics, and fire dynamics in South America, for two publications.
- San Francisco Exploratorium incorporates Wildfire ABBA into on-line Global Climate Change Research Explorer Web site.
- Two collaborations represent first semi-operational assimilation of satellite-derived fire products into atmospheric models.



GOES-8 Wildfire ABBA Summary
Composite of Filtered Half-Hourly Fire Observations
for the Western Hemisphere

[link to longer version](#)

Polar Science

Polar winds are produced in nearly real time.

Tropical Cyclone Research

Significant strides made in tracking storm intensity.

Toward Simulating GIFTS

MM5 model data used toward deriving wind measurements from



GIFTS observations.

Different weather conditions are simulated in high spatial and temporal resolution.

Highly realistic simulation of initiation and development of convection produced during IHOP with simulated GIFTS data.

[longer version](#)

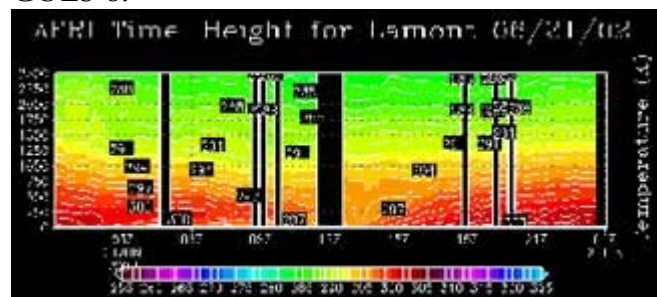
Numerical Modeling

CRAS gives more accurate precipitation forecast using GOES water vapor and cloud-top pressure measurements.

Vegetation fraction information derived from satellite data to be used in MM5 (image at right).

Model (MM5) output used to simulate clouds, GOES-8 brightness temperature (image at right, below).

Methods developed to compare simulated data with actual remotely-sensed observations, including those from the AERI and GOES-8.



Brightness temperatures extracted from MM5 radiative transfer scheme and compared with GOES-8 brightness temperatures.

[longer version](#)

Validating IAPP and ICI Products

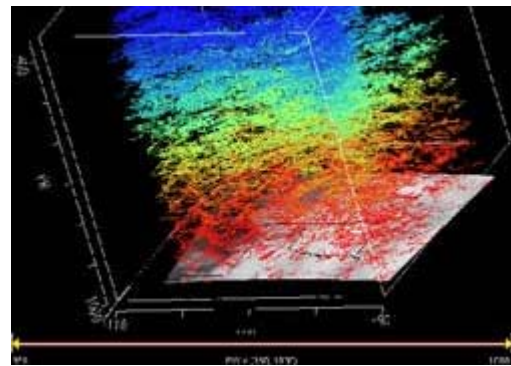
IAPP (CIMSS) and ICI (Meteo France) retrieval packages were tested for NOAA-17 satellite data.

Service and Honors

[longer version with names and details](#)

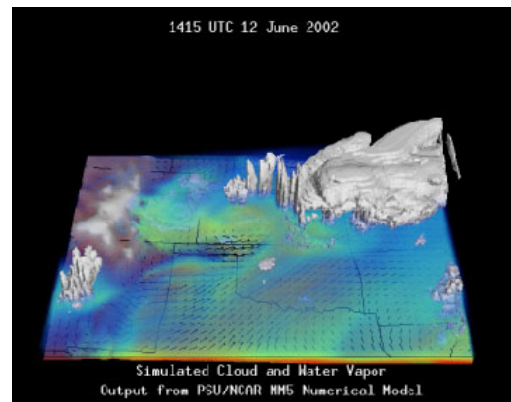
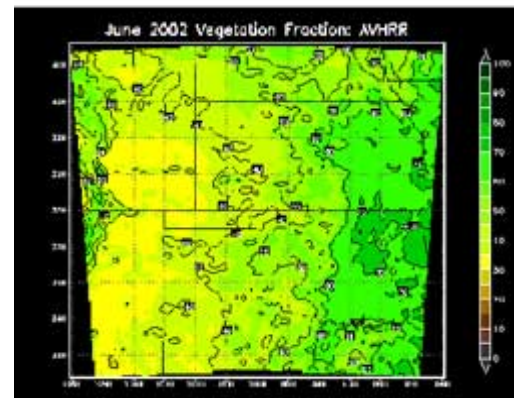
CIMSS scientists appointed chairs of influential committees:

- National Academies' Committee on Environmental Satellite Data Utilization



Using a VisAD display utility to visualize winds illustrates the vertical distribution and density of data.

June Vegetation: AVHRR



The associated animation shows simulated clouds (white), water vapor (colored haze), and wind vectors at an altitude of 2 km, from 14:15 to 22:00 UTC on 12 June 2002.

[original version](#)

- AMS Satellite Conference
- International TOVS (TIROS Operational Vertical Sounder) Working Group (ITWG)

Scientific Achievement Award in Remote Sensing presented by SPIE for developing state-of-the-art lidar instruments.



Arctic High Spectral Resolution Lidar tested at SSEC.

Chancellor's Award granted for Excellence in Service to the University.

NOAA David Johnson Award presented for "outstanding innovative use of Earth observation satellite data."

NOAA/NESDIS names CIMSS researcher Team Member of the Month for June 2002 for GOES cloud product development.

CIMSS researcher to serve as *BAMS* Subject Matter Editor for Satellite Meteorology.

China's Nanjing Institute of Meteorology awards adjunct professorship to senior scientist.

First Suomi-Simpson Graduate Fellowship granted CIMSS graduate student for [EOS](#) work with NASA Goddard scientists.

Raytheon Polar Services grants service patches to Antarctica's researchers for help with weather forecasts.

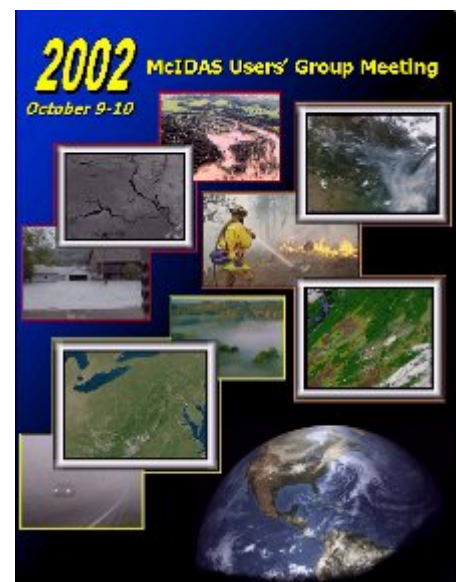
Two dozen manuscripts edited for *Journal of Applied Meteorology*.

Sharing Information

Meetings

Annual [MUG Meeting](#) drew 44 attendees from U.S. sites, Australian Bureau of Meteorology, Eumetsat (Darmstadt, Germany) and Kwajalein Island.

[longer version](#)



[Annual meeting](#) for Antarctic projects held May 21–22 in Madison with 30 attendees including participants in NSF’s research program and users of AWS data.

Directors of UW–Madison special libraries begin meeting to discuss roles following UW–Madison’s [Chancellor’s Strategic Plan](#).

[longer version](#)

Many scientists presented at China’s satellite meteorology meeting.

SSEC technical experts and research participated in NOAA international direct readout satellite conference.

Provided weather forecasting support for University football games, per Chancellor’s request.

Papers

[longer version with authors, other details](#)

Published:

[CIMSS Publications](#)

- *Monthly Weather Review*, September 2002—“Daily hurricane variability inferred from GOES infrared imagery” (*BAMS* paper of note)
- *Monthly Weather Review*, December 2002—“Vortical swirls in hurricane eye clouds”
- *Journal of Applied Meteorology*, Vol. 42 No.2—A paper on surface and cloud-type classification using MODIS multispectral band radiance measurements
- *Weather and Forecasting*—“Monitoring high-temporal-resolution convective stability indices using the ground-based atmospheric Emitted Radiance Interferometer (AERI) during the 3 May 1999 Oklahoma-Kansas tornado outbreak.”

[The Schwerdtfeger Library](#)

Accepted for publication:

- *Journal of Applied Meteorology*—the CIMSS MODIS algorithm
- *Journal of Applied Meteorology*—“Near continuous profiling of temperature, moisture, and atmospheric stability using the Atmospheric Emitted Radiance Interferometer (AERI)”

In Print and On Line

[longer version](#)

English/Spanish IceCube brochure, AMANDA and IceCube bookmarks produced.

[WINNERSS](#) poster shows multiple cosmic Wisconsin images.

[WINNERSS poster](#)

[GET-WISE](#) course streams onto the Internet in 3 video formats.

[IceCube Web](#) site features Education and Outreach.

[A3RI](#) Web site redesigned, [GOES U.S. Full Resolution Visible Image Browser](#) created.

The Schwerdtfeger Library templates unify their Web site.

[Winter weather retrospective for 2001-2](#) showed snow depth, geographic extent, images, much, much more.

[AniS](#) Java applet used all over the world, in several languages, in NWS [radar images](#) and to fuel SSEC's GOES [Image Browser](#)'s animation.

Museums

“Playing With Time” at Science Museum of Minnesota opens with SSEC imagery.

[AMANDA featured](#) in San Francisco's Exploratorium's Origins Project and in magazine.

Technological Advances

Drilling Services

SSEC's Ice Coring and Drilling Services (ICDS) supported five projects with drilling components in Antarctica with 14 people altogether.

- Shot-hole drill demonstration
- SPRESO
- The U.S. ITASE
- Queen Maud Land, collaboration with German group
- Dome C, collaboration with Danes

[ICDS completed the design](#) of the Enhanced Hot Water Drill, which will be used to drill 80 holes at the South Pole for the IceCube neutrino telescope.

[more detail](#)



EHWD Hose Reel fabricated at UW–Madison's Physical Sciences Laboratory

[The Shot Hole Drill](#) is completed, to drill as many as 600 30-meter deep “shot holes” for seismic studies.

[more detail](#)





Shot Hole Drill being tested near McMurdo
October 2002

[McIDAS Software Updates](#)

[McIDAS-X, -XCD and -XRD](#) were upgraded to version 2002 in May. The -X upgrade includes an updated country code database, a new configuration GUI and new MODIS HDF servers. The -XRD upgrade includes 22 new commands.

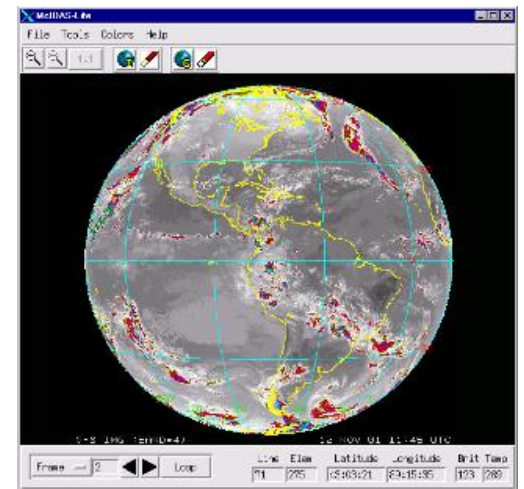
[Four software updates](#) were issued for the SDI, including modifications for GOES-12 and NOAA-17 satellites.

[McIDAS-Lite](#), popular free McIDAS subset, was released with 200 downloads over the summer.

It was also added to GSFC's HDF-EOS [Tools page](#).

Java applet written to control color selection.

[Data Center](#)



McIDAS-Lite is a simple tool for working with image files.

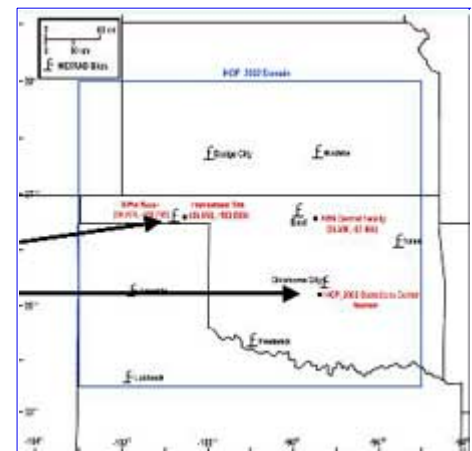
[SSEC Instruments in IHOP](#)

A grid of six AERI systems worked continuously to provide detailed nowcasting information, a first.

The AERIbago was deployed in the western Oklahoma panhandle operating a fully automated AERI system.

S-HIS detected atmospheric moisture and temperature variation before thunderstorm development.

[more detail](#)



Locations of AERI locations in IHOP. Click for more explanation.

[Scanning-HIS was reconfigured](#) and successfully integrated onto the Proteus Aircraft and flew the first leg of the DOE ARM CART Site Grand Tour.

[longer version](#)

Breadboard produced for [Planetary Imaging Fourier Transform Spectrometer](#) (PIFTS).

Excellent radiance agreement of AERI and PIFTS with clear-sky data.

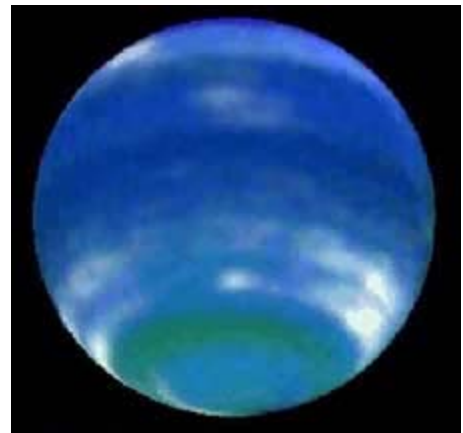


PIFTS and AERI instruments tested side by side.

Viewing the Earth and Planets

[long version](#)

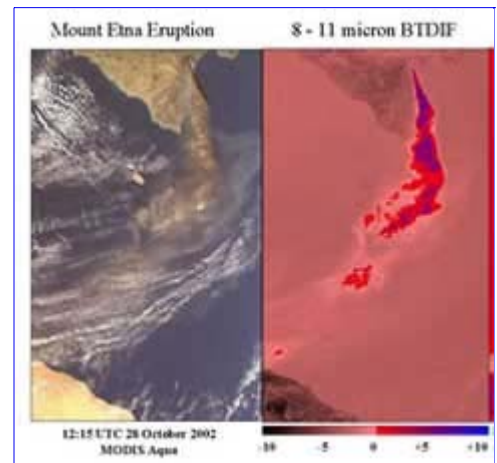
Neptune studies continue with Space Telescope. The planet is brightening over time.



A new, brighter Neptune

[MODIS imagery](#) used to show fires raging.

[The eruption](#) of Italy’s Mt. Etna was captured by MODIS on October 28 and ash plume analyzed.



MODIS “true color” image of Etna and one indicating presence of ice particles

More highlights can be found in the director’s State of the Center [presentation](#).

Acronyms List

- A³RI—Antarctic Astronomy and Astrophysics Research Institute
- ABBA—Automated Biomass Burning Algorithm
- ABI—Advanced Baseline Imager
- AERI—Atmospheric Emitted Radiance Interferometer

AGO—Automated Geophysical Observatories
 AIRS—Atmospheric InfraRed Sounder
 ALEXI—Atmospheric Land EXchange Inversion (Model)
 AMANDA—Antarctic Muon and Neutrino Detector Array
 AMRC—Antarctic Meteorological Research Center
 ARM—Atmospheric Radiation Measurement
 AOS—(Department of) Atmospheric and Oceanic Sciences
 AVHRR—Advanced Very High Resolution Radiometer
 AVIRIS—Airborne Visible InfraRed Imaging Spectrometer
 AWS—Automatic Weather Station
BAMS—Bulletin of the American Meteorological Society
 CART—Cloud And Radiation Testbed
 CIMSS—Cooperative Institute for Meteorological Satellite Studies
 CO—carbon monoxide
 CO₂ —carbon dioxide
 CRAS—CIMSS Regional Assimilation System
 DOE—Department of Energy
 DOT—Department of Transportation
 DPI—Derived Product Imagery
 EAA—Experimental Aviation Association
 ECMWF—European Centre for Medium-range Weather Forecasts
 EHWD—Enhanced Hot Water Drill
 EOS—Earth Observing System
 FAA—Federal Aviation Administration
 FLAMBE—Fire Locating And Monitoring of Burning Emissions
 FPDT—Forecast Products Development Team
 GET-WISE—Geoscience Enhancement for Teachers-Wisconsin Initiative for Space Education
 GIFTS—Geostationary Imaging Fourier Transform Spectrometer
 GLOBE—Global Learning and Observations to Benefit the Environment
 GMS—Geostationary Meteorological Satellite
 GOES—Geostationary Operational Environmental Satellite
 GSFC—Goddard Space Flight Center
 GVAR—GOES VARiable
 HDF—Hierarchical Data Format
 HES—Hyperspectral Environmental Suite
 HIS—High-resolution Interferometer Sounder
 HST—Hubble Space Telescope
 IAPP—International ATOVS Processing Package
 ICDS—Ice Coring and Drilling Services
 ICI—Inversion Coupled with Imager (Meteo France)
 IERC—IceCube Education Resource Center
 IHOP—International H₂O Project
 IRTF—Infrared Telescope Facility
 ITWG—International TOVS Working Group
 LARC— Langley Research Center
 Lidar—Light Detection And Ranging
 McIDAS—Man computer Interactive Data Access System
 MM5—5th generation Pennsylvania State-NCAR Mesoscale Modeling system
 MODIS—MODerate-resolution Imaging Spectroradiometer
 MOPITT—Measurements of Pollution In The Troposphere
 MUG—McIDAS Users' Group
 MURI—Multidisciplinary University Research Initiative
 NASA—National Aeronautics and Space Administration
 NAST-I—NPOES Atmospheric Sounder Testbed-Interferometer
 NCAR—National Center for Atmospheric Research

NCEP—National Centers for Environmental Prediction
NESDIS—National Environmental Satellite Data and Information Service
NOAA—National Oceanic and Atmospheric Administration
NPOES—National Polar Orbiter Environmental Satellite
NSF—National Science Foundation
NWS—National Weather Service
OSSE—Office of Space Science Education
PDT—Product Development Team
PEOPLE—Pre-College Enrichment Opportunity Program for Learning Excellence
PFTS—Planetary Imaging Fourier Transform Spectrometer
RAMS—Regional Atmospheric Modeling System
RAOB—Radiosonde OBservation
SDI—SSEC Desktop Ingestor
S-HIS—Scanning High resolution Interferometer Sounder
SMEX—Soil Moisture Field Experiment
SPC—Storm Prediction Center
SPIE—Society of Photo-optical Instrumentation Engineers
TEA—Teacher Exploring Antarctica
THORPEX—The Observing system Research and Prediction EXperiment
TIROS—Television InfraRed Observation Satellite
TOVS—TIROS Operational Vertical Sounder Working Group
TPW—Total Precipitable Water
USAP—United States Antarctic Program
USDA—U.S. Department of Agriculture
UW—University of Wisconsin
VisAD—Visualization for Algorithm Development
VISIT—Virtual Institute for Satellite Integration Training
WF-ABBA—WildFire Automated Biomass Burning Algorithm
WINNERSS—Wisconsin Idea National Network Education and Research in the Space Sciences

18 April 2003, rev. 21 April [Terri Gregory](#)