



# **An Introduction UW- Madison SSEC/CIMSS Research and Facilities**

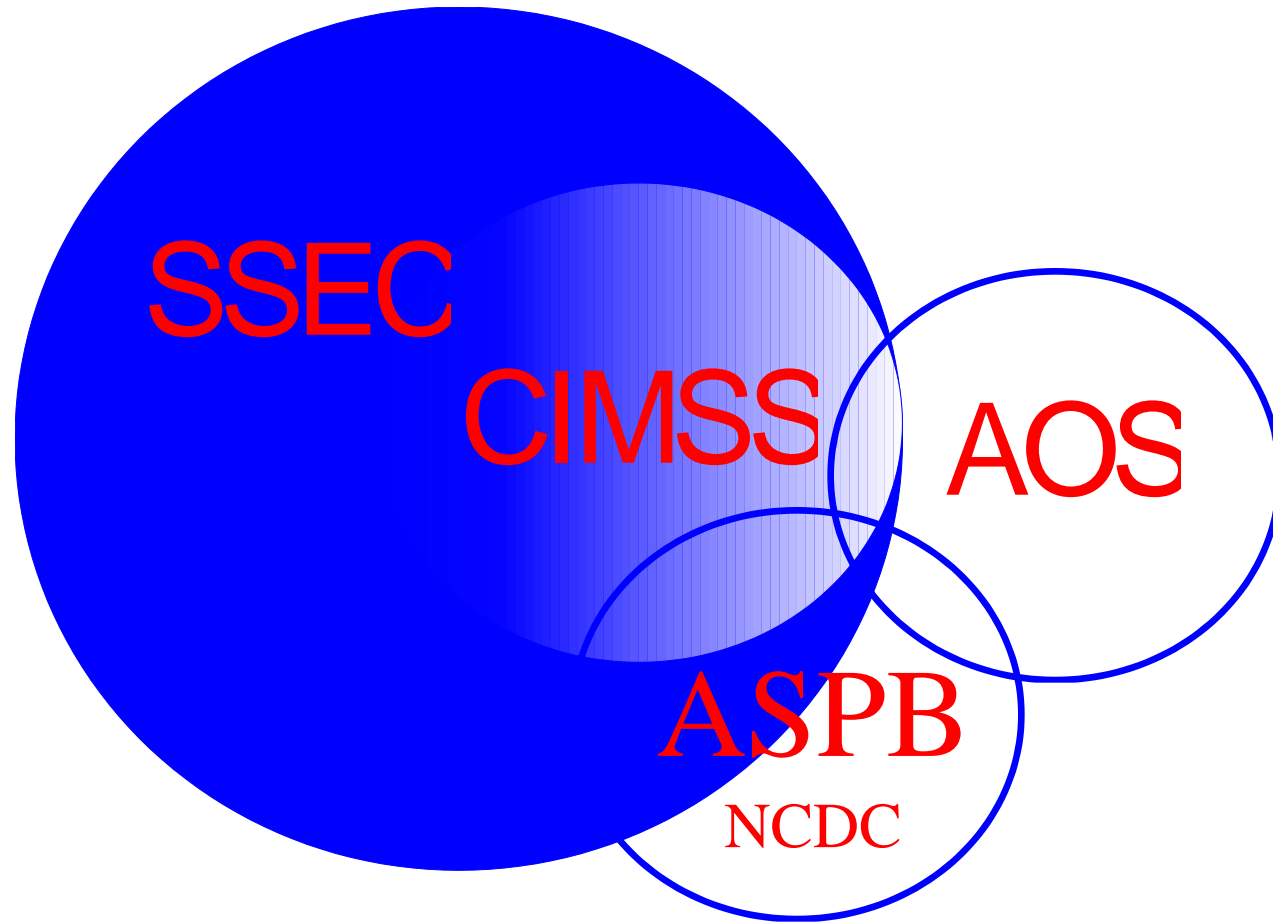
**Wayne Feltz  
Associate Director  
Cooperative Institute for Meteorological  
Satellite Studies (CIMSS)**

**Executive Director – Science  
Space Science and  
Engineering Center (SSEC)**



# CIMSS/SSEC/AOS/NOAA

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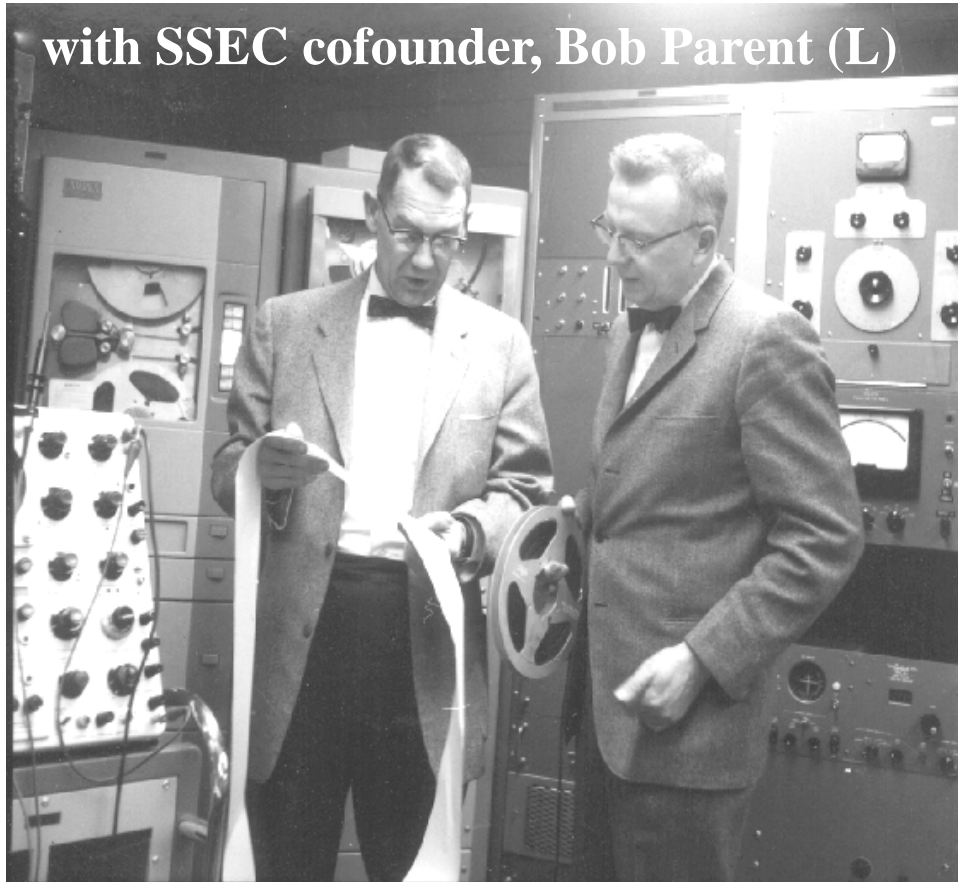


Symbiotic relationship between CIMSS, SSEC, AOS, and NOAA/NESDIS

# Verner E. Suomi (1915-1995)

## “Father of Satellite Meteorology”

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**1959: 1st Meteorological  
Satellite Experiment**

**Earth Radiation Balance  
Observations on Explorer VII**

**1966: 1st Earth Imaging  
from GEO**

**Spin-scan Camera on 1st  
Advanced Technology Satellite  
(ATS 1)**

28 October 2011

# “Suomi NPP!”

Announced at AMS



NASA's Grunsfeld at AMS



*Verner E. Suomi*  
1915-1995



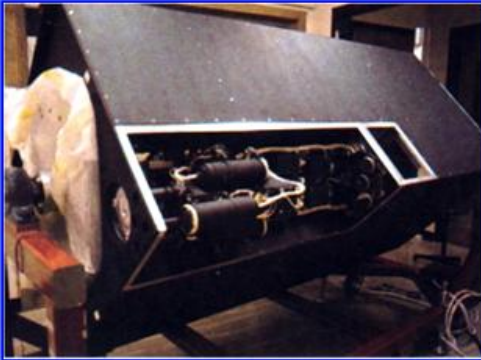
NPP VIIRS Image, GSFC

# SSEC areas of technical expertise

- u **Observational Science** (spacecraft system/mission design, instrumentation, field programs, spaceflight instrument fabrication,
- u **Computational & Visualization Science** (hardware and software systems for information generation, data management, and communication)
- u **Analytical Science & Applications** (satellite & conventional data analysis, technical development & analysis)

# SSEC Major Space Flight Programs

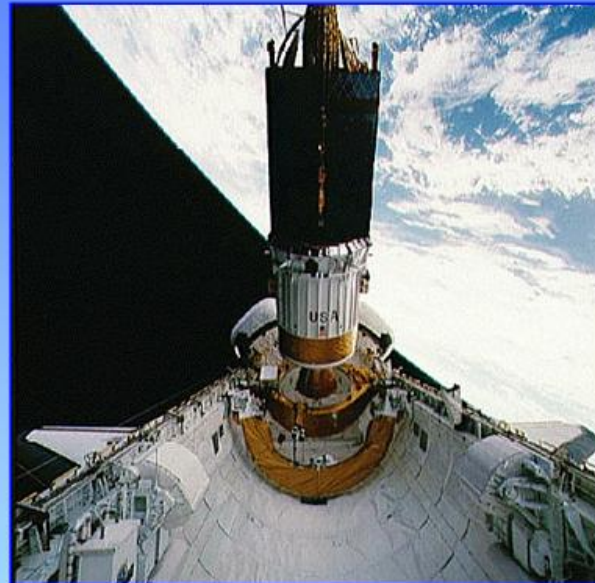
## High Speed Photometer



**Hubble**  
**1990-93**

*Bob Bless, PI*  
*Astronomy*

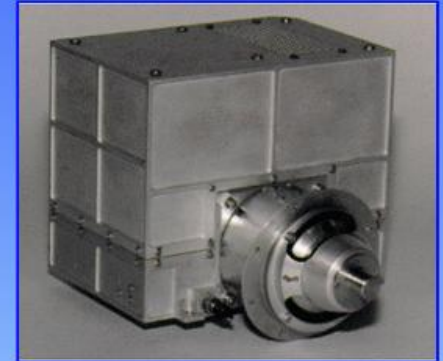
## Diffuse X-ray Spectrometer



**STS-54**  
**1993**

*Bill Kraushaar, Physics*  
*Wilt Sanders, PIs*

## Net Flux Radiometer



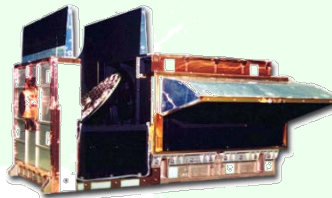
**Galileo Entry Probe**  
**7 December 1995**

*Larry Sromovski, PI*

# Cross-track IR Sounder (CrIS) Heritage

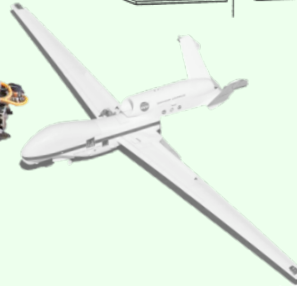
1978-

**HIRS**  
(20 ch)



1986-

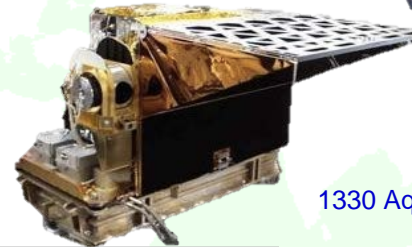
**HIS,  
S-HIS,  
NAST-I**



1990/91  
**ITS**  
(~CrIS)  
Design Study

2002-

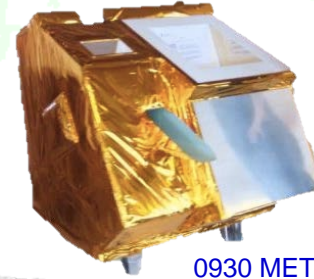
**AIRS**  
(2378 ch)



1330 Aqua

2006-

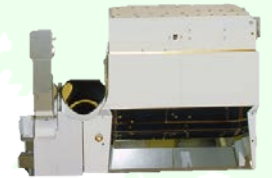
**IASI**  
(8461 ch)



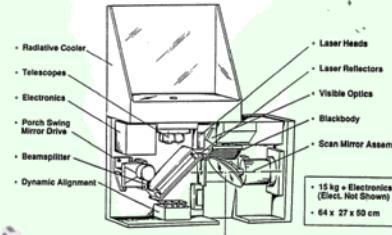
0930 METOP

2011-

**CrIS**  
(2211 ch)



1330 Suomi-NPP

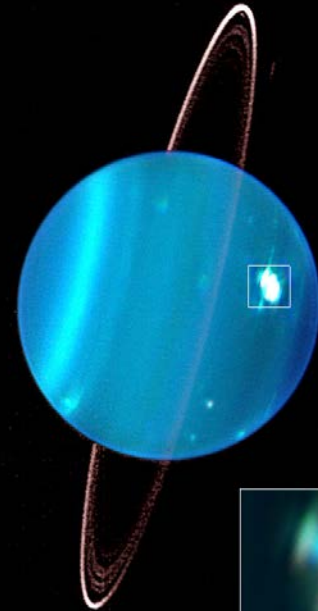
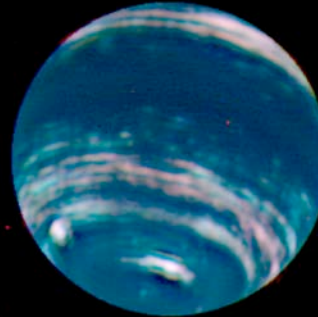
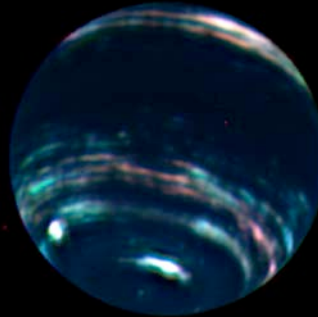


**It took a while!**

# Research on Outer-Planet Atmospheres at SSEC

Science Team: Larry Sromovsky and Pat Fry

Planets: Jupiter, Neptune, Uranus



**Research:** Atmospheric circulation  
Seasonal response  
Dynamics of circulation features  
Vertical cloud structure and composition

**Techniques:** Spectroscopy, Imaging, in situ observations, cloud tracking, radiation transfer modeling

**Sources** Hubble Space Telescope, Cassini, New Horizons  
Ground based telescopes (Keck and IRTF).  
Archived data from Voyager & Galileo missions.



# IDDO Ice Drilling & Operations

Charlie Bentley, Don Lebar, and their large, impressively talented team

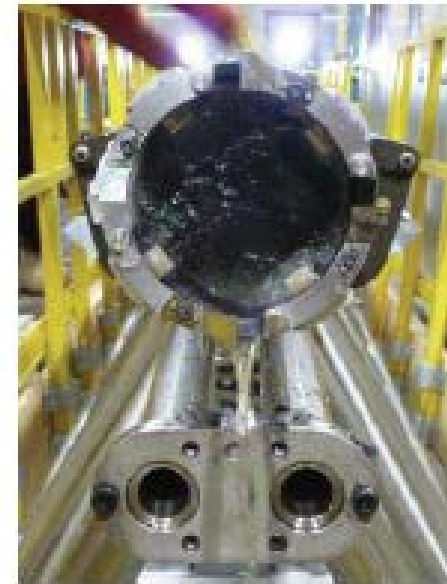
- WAIS Divide Ice Main Core Completed 12/31/11, Culmination of 10 yr effort
- Excellent quality core over 3,405 m depth, even in technically challenging warm ice
- 1<sup>st</sup> high-resolution southern hemisphere record of greenhouse gases and climate comparable to the Greenland records
- Will contribute significantly to improved understanding of climate variability over the last ~ 65,000 years



Drilling team



Spooling on the new 4,200 m cable



Ice core in DISC Drill

# SSEC areas of technical expertise

u **Observational Science** (spacecraft system/mission design, instrumentation, field programs, spaceflight instrument fabrication, including **CAMPUS SCIENCE SUPPORT to PHYSICS, ASTRONOMY, BOTANY, GEOLOGY**)

➔ u **Computational & Visualization Science** (hardware and software systems for information generation, data management, and communication)

u **Analytical Science & Applications** (satellite & conventional data analysis, technical development & analysis)

## SSEC Data Center



## National GOES Archive 1978-2003



# SSEC

## Satellite / Meteorological Data Access Facilities



**Now have >1 PB of raid storage for "online archive" of all GOES data, giving rapid access to ~ 30 years of satellite data!**

# SSEC Data Center - Activities

- Assist Satellite Operations Control Center and other agencies in satellite checkout and troubleshooting of related problems
- Support to field experiments
  - Special archiving
  - Extended staffing, either on-call or on-site
- Provide large dataset backups for users
  - Read, write, and copy tapes
  - Provide specialized archives of user data
- Provide Help Desk support to users of the SSEC SDI, and assist in the generation of SDI user documentation
- Assist McIDAS User Services team with McIDAS testing for system upgrades
- Provide archive data to in-house and external users

# Data Center Antennas

- C-Band
  - 11 meter heated (87° West - SES-2, POES Wallops Relay, MSG)
  - 7.3 meter (101° West - SES-1, POES Fairbanks Relay, MTSAT, Noaaport)
  - 6.3 meter heated backup (101° West - SES-1, POES Fairbanks Relay, MTSAT, Noaaport)
- L-Band
  - 7.3 meter (75° West -GOES-East Primary)
  - 4.6 meter (135° West -GOES-West Primary)
  - 4.5 meter (60° West -GOES-SA auto tracking)
  - 4.5 meter (90° West -GOES-test/spare)
  - 3.7 meter (offline spare)
- X-Band
  - 4.4 meter (Tracking - EOS)
- X/L Band
  - 2.4 meter (Tracking - Suomi NPP, EOS, metop, FY1 and FY3)



# SSEC Data Center Incoming Data

170+ GB/day  
via Satellite  
(C-band, L-band, X-band)



2,000+ GB/day  
via Internet  
(ftp, LDM, ADDE, http)

GOES satellites	~96 GB/day
International Geo Satellites	~60 GB/day
NOAA Polar	~27 GB/day
Landsat-8	~ 50 GB/day
Miscellaneous Polar and Non satellite	~85 GB/day
MODIS polar from NASA archive	~150 GB/day
NPP (VIIRS CrIS ATMS)	~1,800 GB/day

# SSEC Data Center Outgoing Data

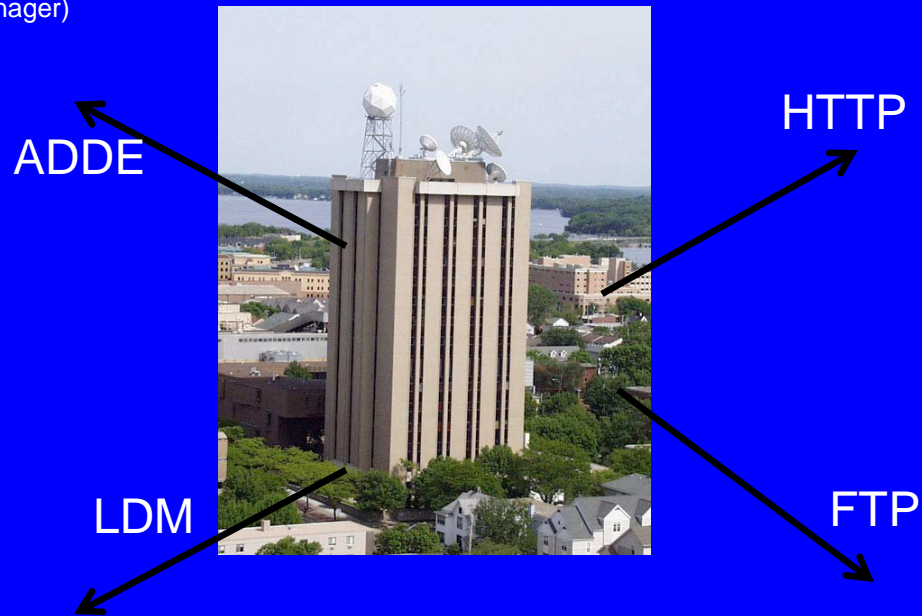
Four primary methods of Data delivery

1.ADDE

2.HTTP

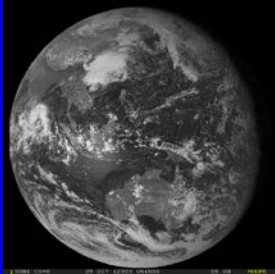
3.FTP

4.LDM (Unidata local data manager)

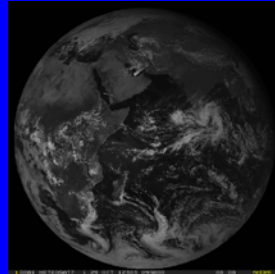


# 11 simultaneous GEO satellites!

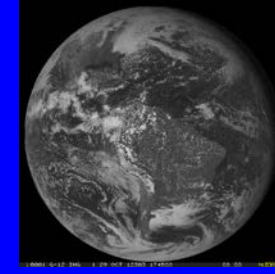
A first: received, served ~real time & archived



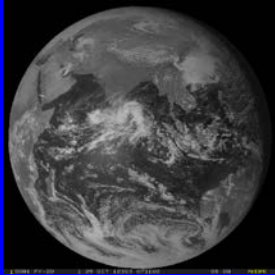
COMS  
(S. Korea)



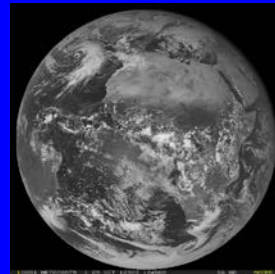
Meteosat-7  
(Europe)



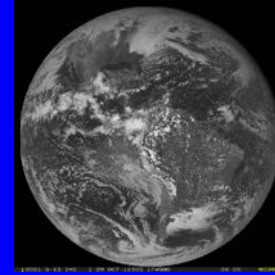
GOES-12



AFY2D  
(China)



Meteosat-9  
(Europe)



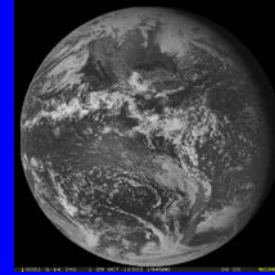
GOES-13



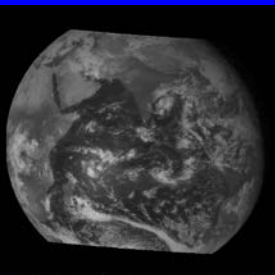
AFY2E  
(China)



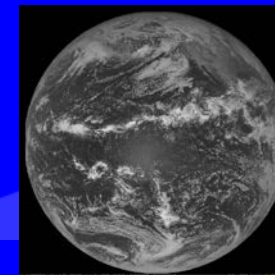
MTSAT-1R  
(Japan)



GOES-14



Kalpana  
(India)



GOES-15



# Archive Data

As of March 2013, over 740 TBs online.

Grows approximately about 55 TB/year

## US Geostationary Satellites

- GOES-8 through GOES-15 (**1994-Present**) (East, West , South America and test)
- GOES-1 through GOES-7 (**1978-1996**)
- SMS-1&2 (**1978-1981**)





# Community Satellite Processing Package offers World-wide Access

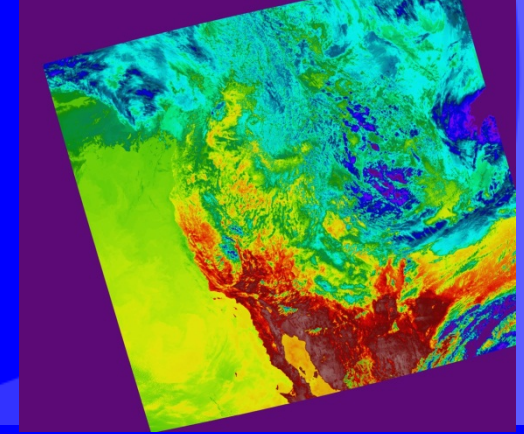
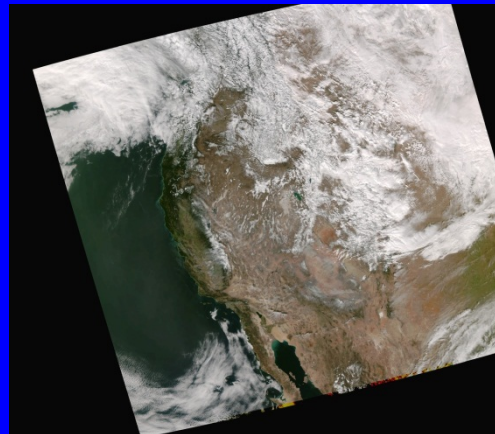


- A software package for processing Suomi NPP, JPSS, POES, Metop, and FY-3 direct broadcast data.
- Have released multiple versions of the VIIRS, CrIS, and ATMS SDR software.
- CSPP is now used operationally by EUMETSAT, UK Met Office, MeteoFrance, and national agencies in Sweden, Norway, Mexico, South Africa, Australia, Japan, China, Russia...

SSEC DB Antenna



First Suomi NPP DB received data on 2012/02/23





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u **Computational & Visualization Science** (hardware and software systems for information generation, data management, and communication)

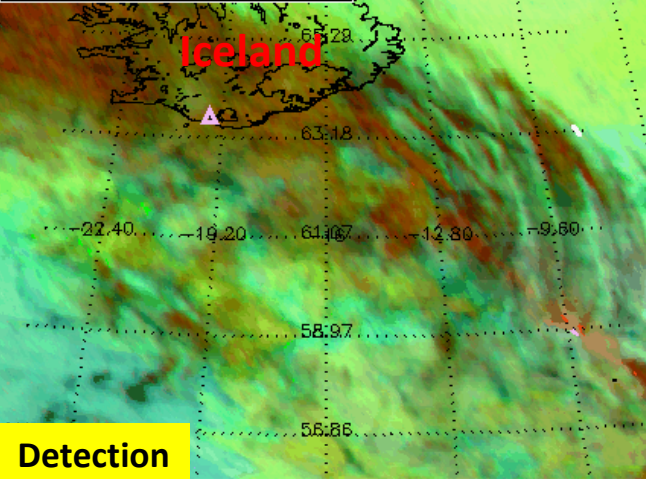
➔ u **Analytical Science & Applications** (satellite & conventional data analysis, technical development & analysis)

# Tracking Iceland's Eyjafjallajökull Volcanic Ash



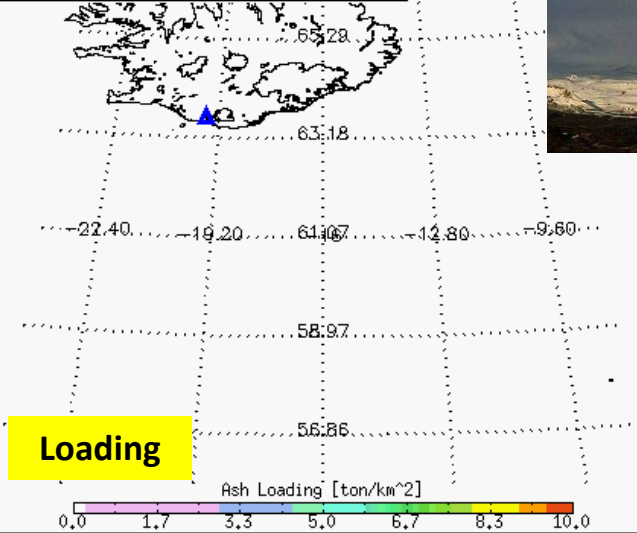
False Color Imagery (12–11 $\mu$ m, 11–8.5 $\mu$ m, 11 $\mu$ m)

Met-9 (05/05/2010 - 00:00 UTC)



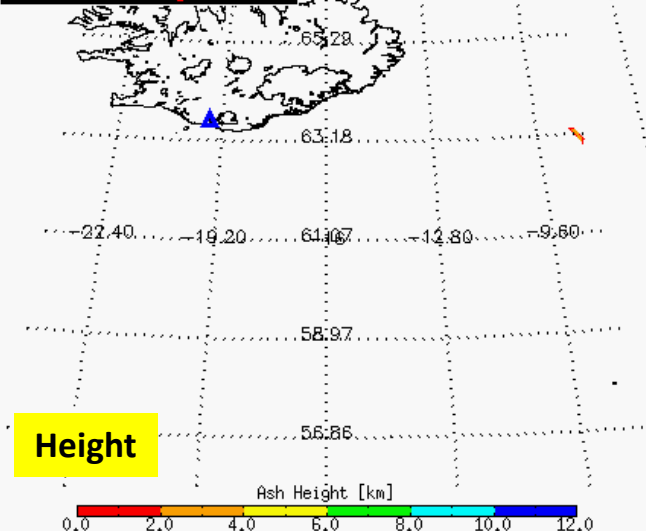
Ash Loading

Total Mass: 0.40 kton; Max: 5.95 ton/km<sup>2</sup>



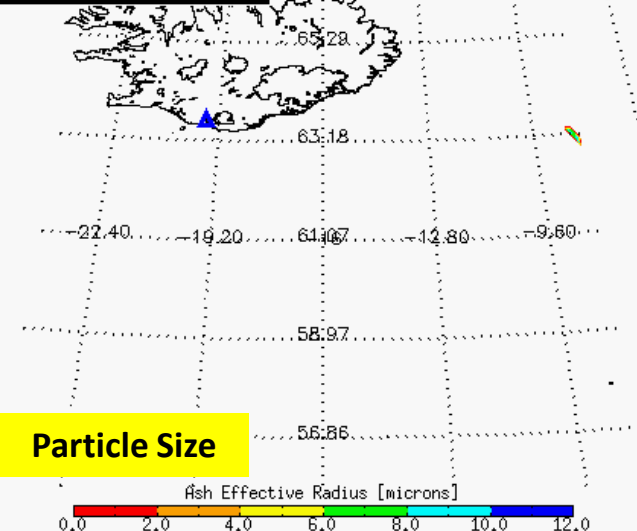
Ash Cloud Height

Maximum Ash Height: 3.72 km



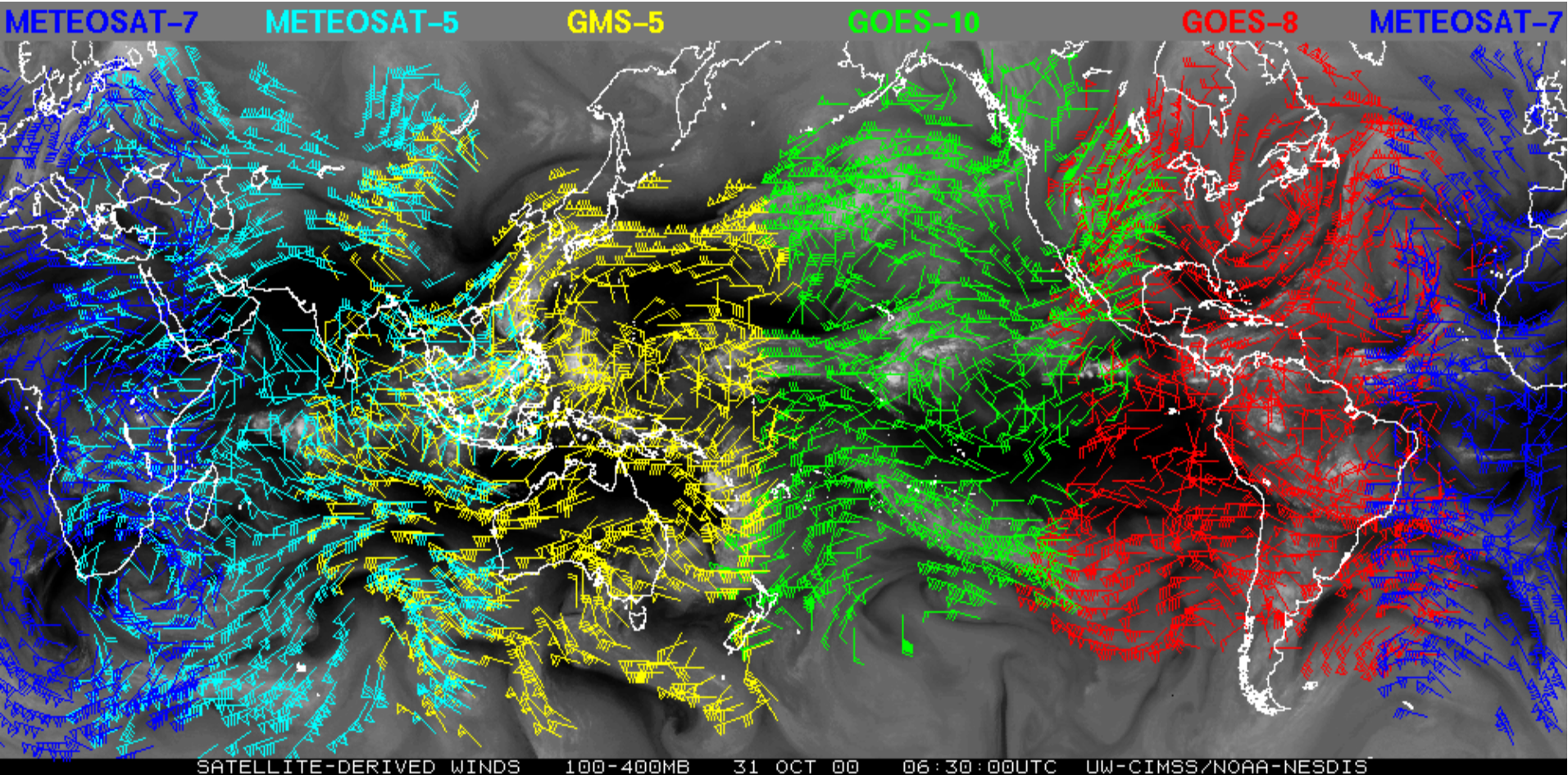
Ash Cloud Microphysics

Mean Ash Refft: 8.98 micron



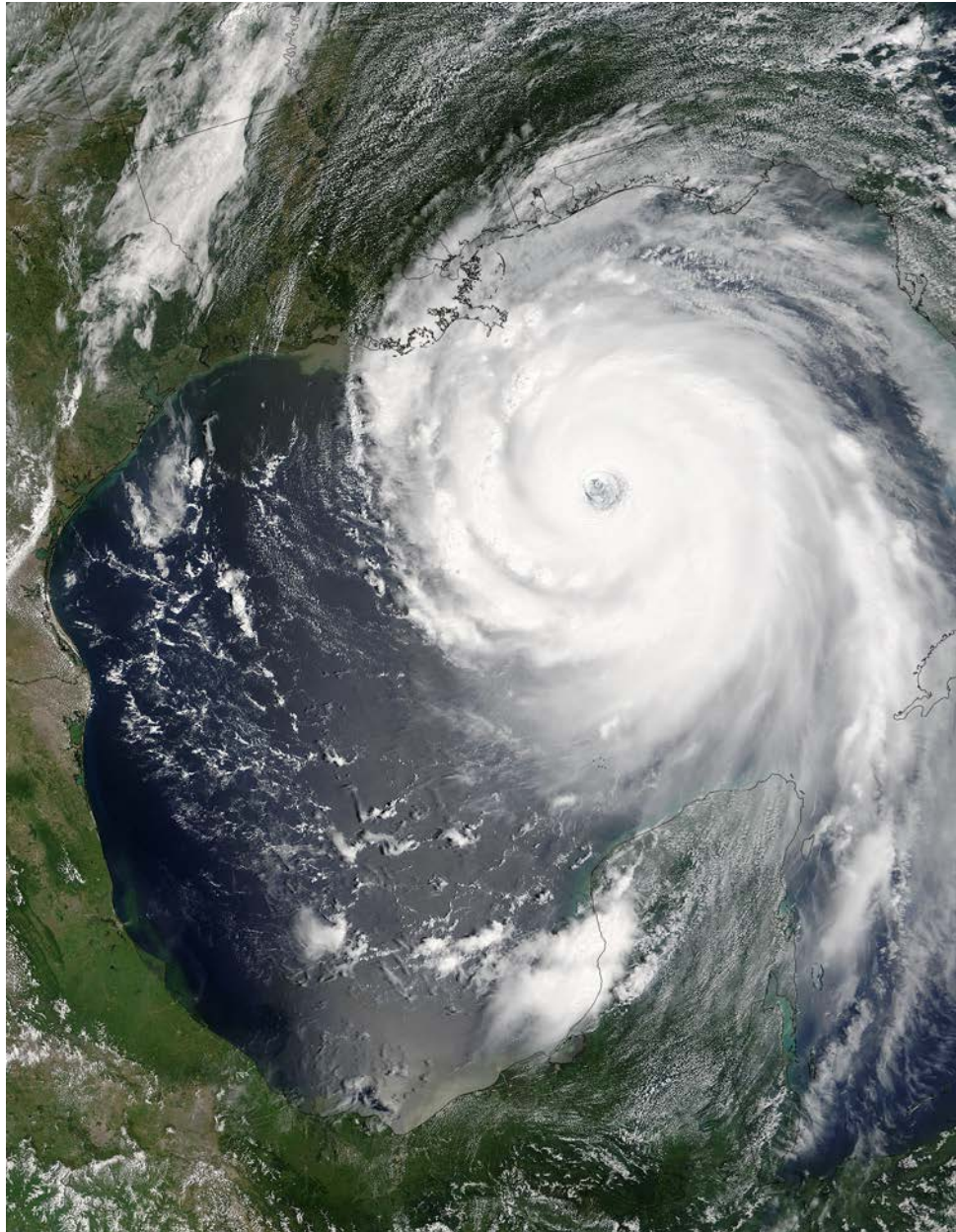
The GOES-R volcanic ash products were provided to the UK Met Office in real-time to assist with decision making

# Multiple Geostationary Satellite Wind Data Automatically Produced



SATELLITE-DERIVED WINDS 100-400MB 31 OCT 00 06:30:00UTC UW-CIMSS/NOAA-NESDIS

# Tropical Cyclones



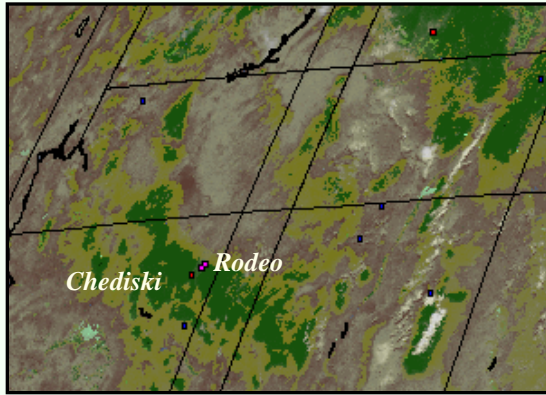
Katrina, 28 August 2005



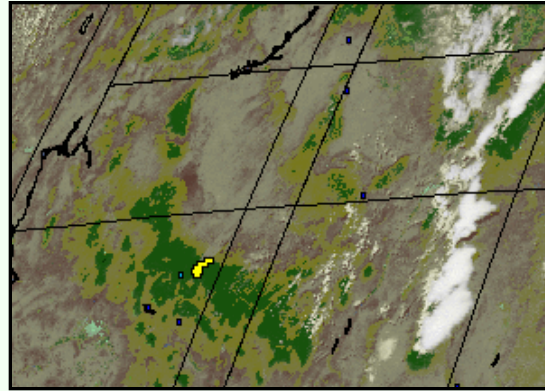
Wilma, 21 October 2005

# GOES WFABBA - Rapid Intensification of Wildfires

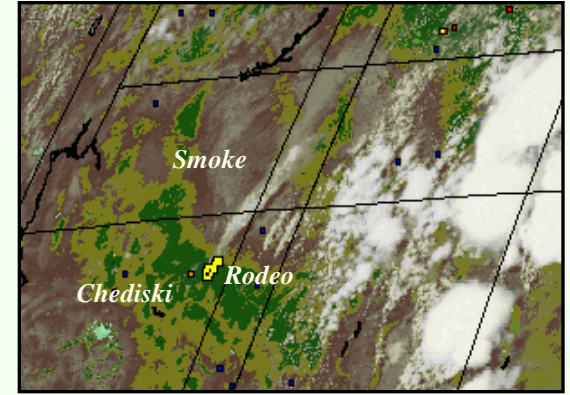
## Arizona



20 June 2002 16:15 UTC

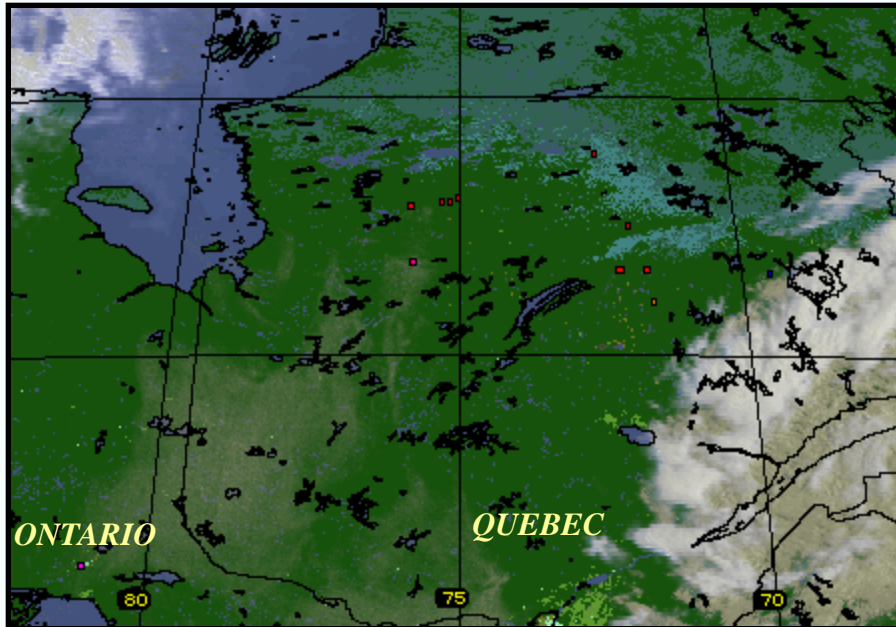


18:15 UTC

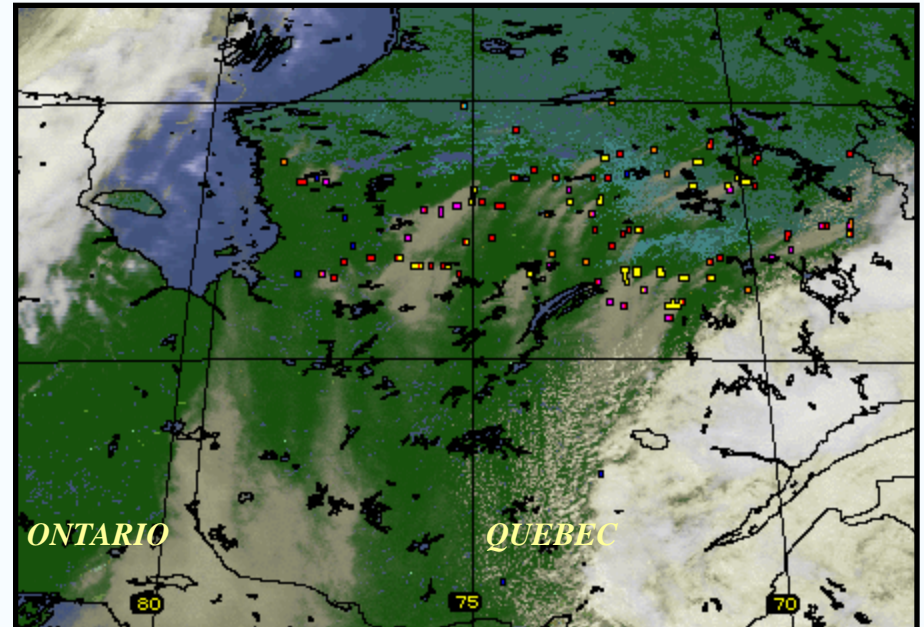


21:15 UTC

## Quebec



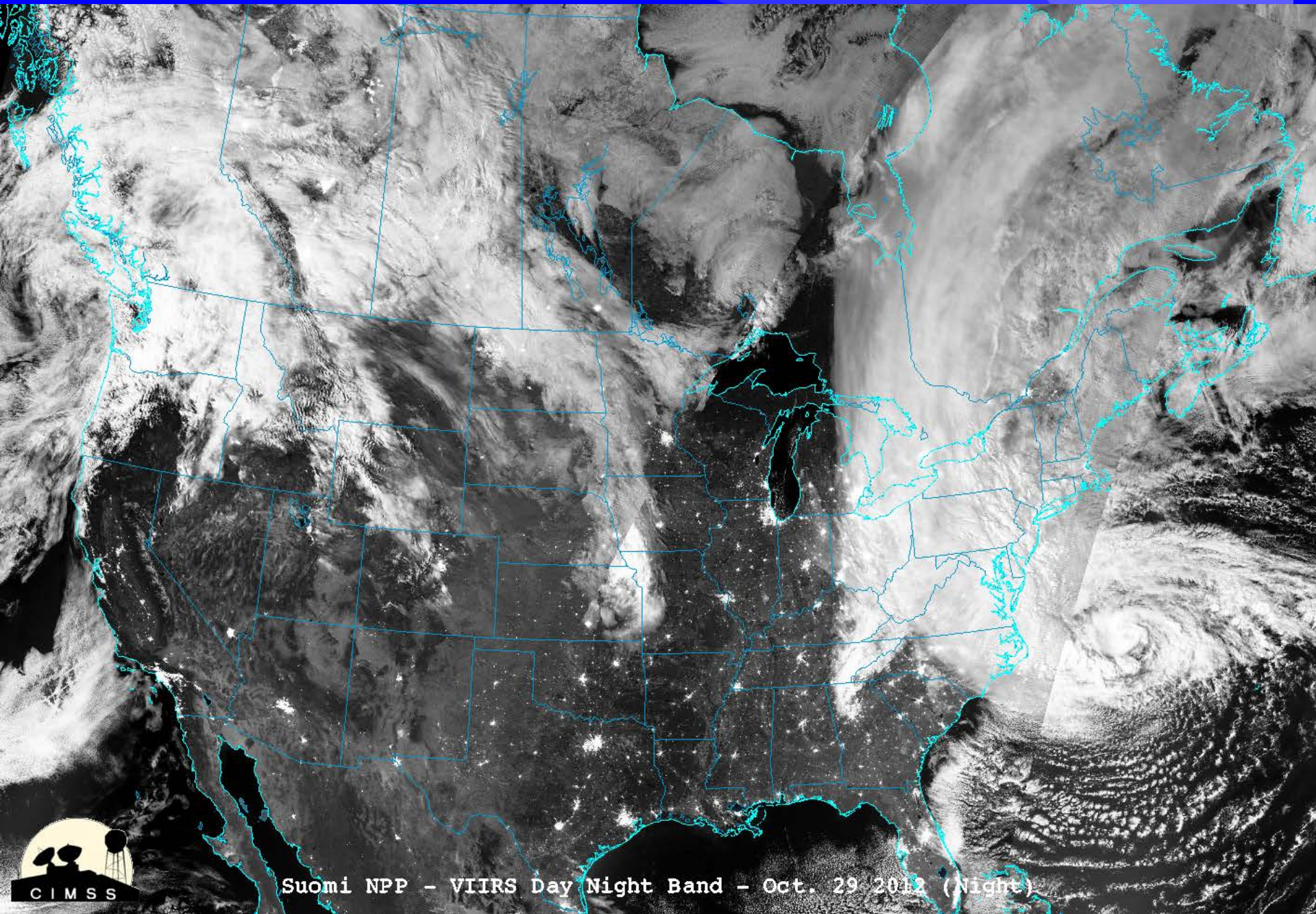
6 July 2002 11:45 UTC



17:45 UTC



# Hurricane Sandy Environment from VIIRS Day/Night Band, 29 Oct



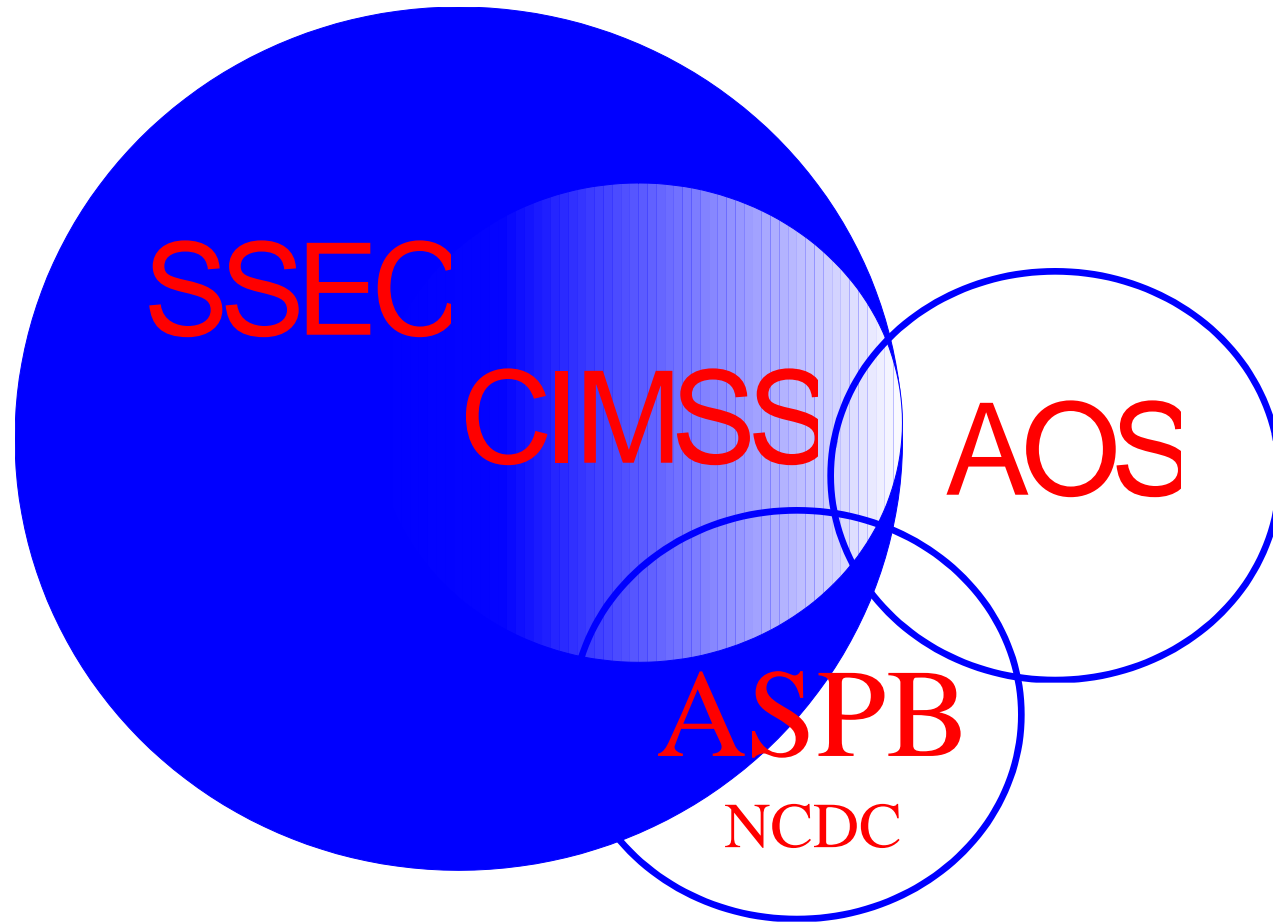
Suomi NPP - VIIRS Day Night Band - Oct. 29 2012 (Night)

# London Lights from VIIRS Day/Night Band



# CIMSS/SSEC/AOS/NOAA

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Symbiotic relationship between CIMSS, SSEC, AOS,  
and NOAA/NESDIS



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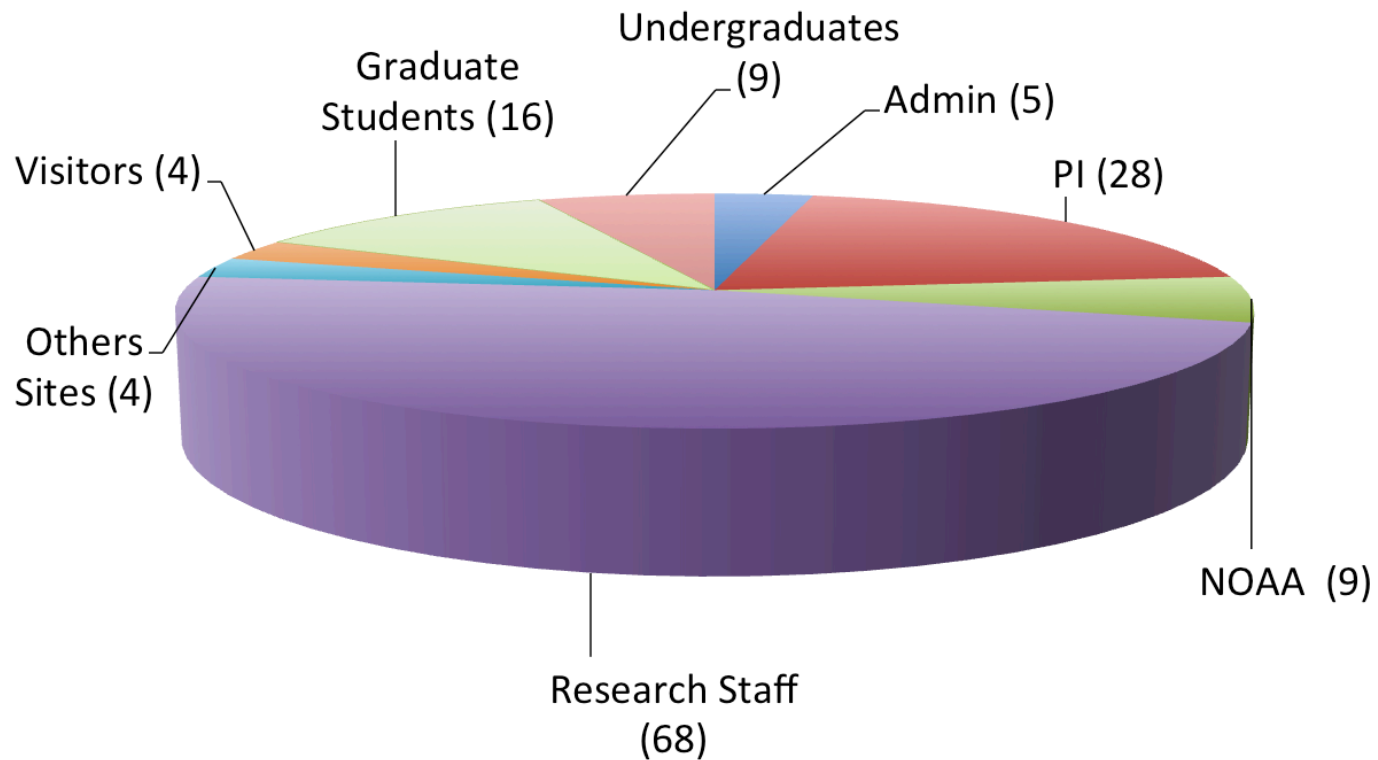
# **Cooperative Institute for Meteorological Satellite Studies (CIMSS)**

## **Steve Ackerman Director**

- Foster collaborative research among NOAA, NASA, and the University in those aspects of atmospheric and earth system science which exploit the use of satellite technology**
- Serve as a center at which scientists and engineers working on problems of mutual interest may focus on satellite related research in atmospheric studies and earth system science.**
- Stimulate the training of scientists and engineers in the disciplines involved in the atmospheric and earth sciences.**

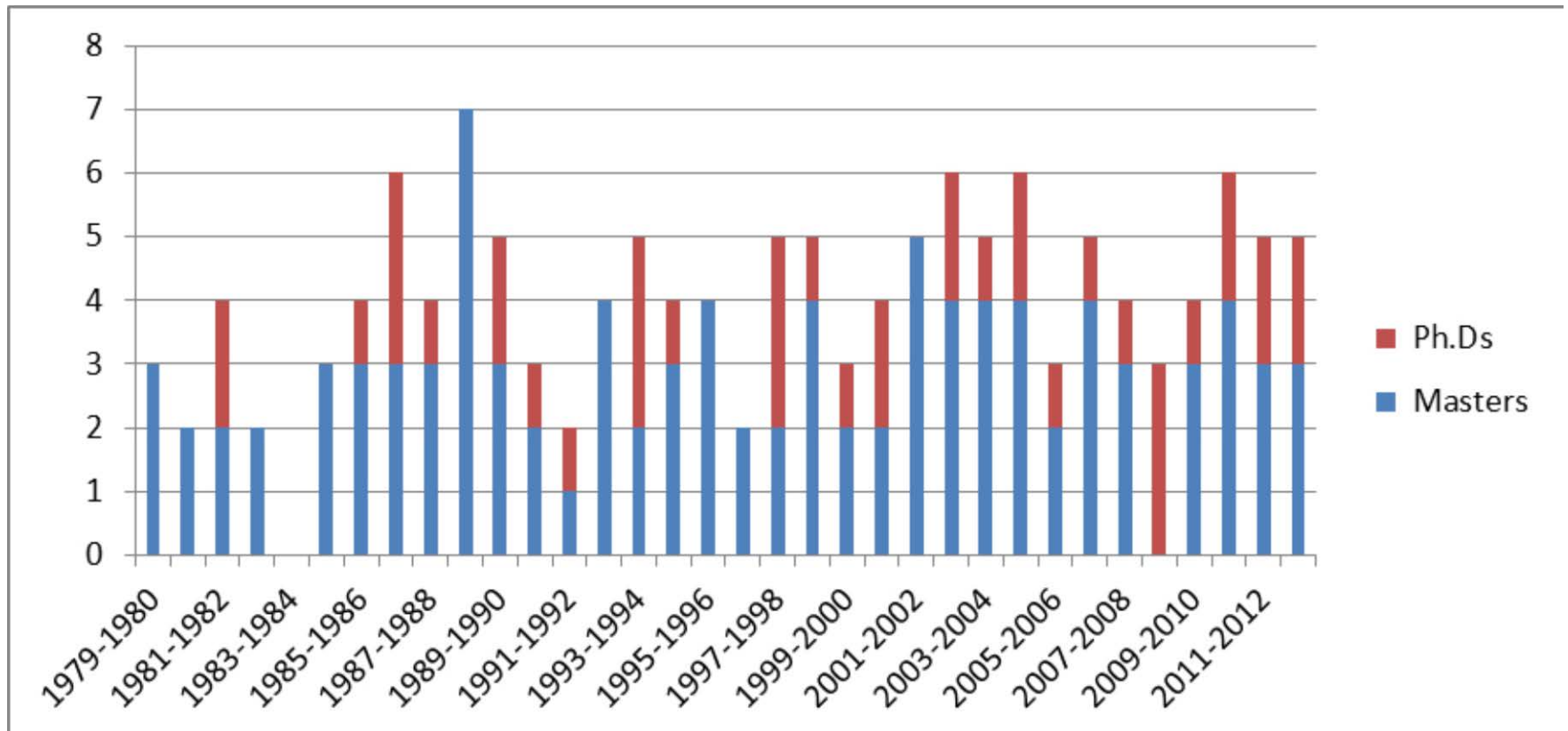
# CIMSS Staff

**2013 CIMSS Personnel (143 Associates)**



# Graduation History of CIMSS Supported Graduate students

Graduated: 93 M.S and 37 Ph.D.  
Currently Supporting 23 students



# **New Satellites: GOES-R+/JPSS Programs**

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## **Algorithm Development Group (AWG)**

- **CIMSS and ASPB scientists are involved in 2/3 of the 64 operational algorithms under development**
- **15 funded tasks for AWG at CIMSS**

## **Risk Reduction**

- **10 funded tasks for Risk Reduction at CIMSS, investigating novel ideas and approaches**

## **Proving Ground**

- **Evaluating baseline products, testing advanced products, and training future users of the data**

## **High Impact Weather**

- **Investigating the impact of a high spatial and spectral resolution sounder in geo orbit**

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Welcome to Madison, WI  
and the  
University of Wisconsin-Madison

While you are here...







---

capitol





capitol



Not brats.....





Babcock ice cream – yummmm

Available in the Union



Try em fried too!!





# WI BEER

**Leinenkugel's®  
Creamy Dark**

Available year-round and aged slowly. Leinenkugel's most award-winning beer has received 7 awards in American Dark Lagers (Bronze 2004, Gold 2002, Silver 2000 World Beer Cup®, Gold 2006, 2005, Silver 2002, Bronze 2004 Great American Beer Festival®) and has the full, deep blackish-brown color of a stout, without its bitterness. Don't let the color fool you. This is a tasty, smooth brew with a nutty, crisp finish, handcrafted since 1999 from a rich blend of six malts and Cascade, Cluster and Mt. Hood hops.

*Available on draft or in:*

- Six-pack long-neck bottles or by the case
- 12-pack long-neck bottles







Happy Notes. Photo courtesy of Norm Dombrowski.





means



This is a picture of traditional Norwegian lutefisk with extras (potato, bacon and mashed peas). It was taken in December 2005.

# Staying longer

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## Farmer's Market



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Come back and  
visit again...



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Go forth and enjoy it!



# **An Introduction UW- Madison SSEC/CIMSS Research and Facilities**

**Wayne Feltz  
Associate Director  
Cooperative Institute for Meteorological  
Satellite Studies (CIMSS)**

**Executive Director – Science  
Space Science and  
Engineering Center (SSEC)**

