Pacific Northwest Weather Workshop

Satellite Data Capabilities and Their Application to Coastal and Marine Forecast Challenges

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1 March 08

Presentation Outline

- **Role of HQ NWS Office of Science and Technology (OST); Office of Climate Weather and Water services (OCWWS)**
- **Environmental Satellites' Current Status**
- **Satellite Data – Being Put to Use**
- **The Future of Environmental Satellites**
  - **NPOESS**
  - **GOES-R**
- **Satellite Training Resources**
- **NWS Satellite Requirements and Solution Steering Team (SRSST)**

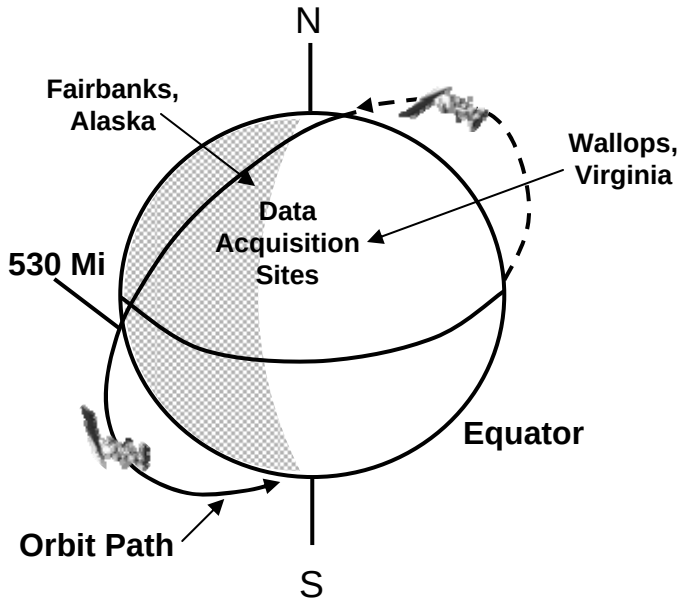
HQ NWS Role

- Office of Science and Technology (OS&T)
  - Systems, Science, Solutions
- Office of Climate Weather and Water services (OCWWS)
  - Requirements
- What We Do
  - Inform HQ NWS management of satellite issues
  - Ensure effective access/use of satellite data
- Mike Bonadonna (OS&T)
  - JARG rep
  - GORWG rep
  - W&W liaison to Satellite Subgoal
- Kevin Schrab
  - Observing System Requirements
- Bill Sjoberg
  - SUAG Exec Sec
  - Facilitates various satellite related activities

Environmental Satellites' Current Status

POES Constellation

Polar Orbiting Satellites

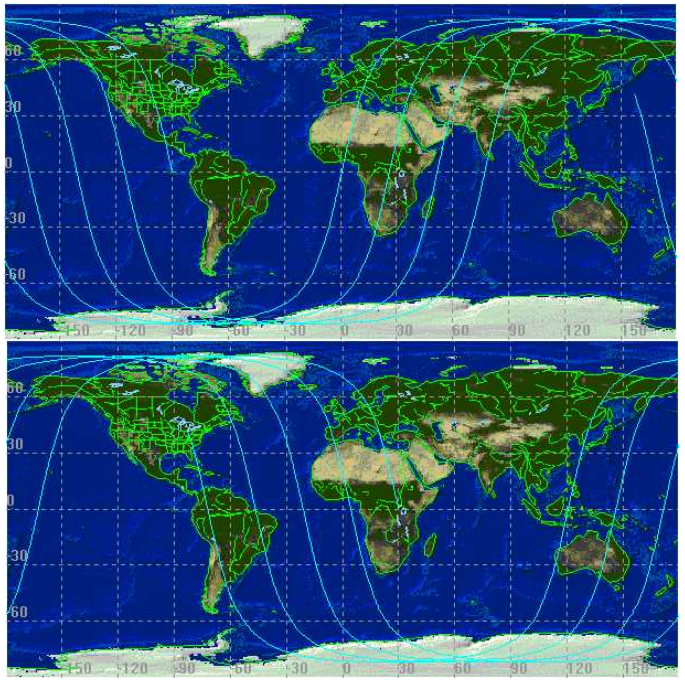


Each satellite covers the Earth twice per day

- Each orbit 102 minutes
- Global coverage every 12 hours with 1 satellite
- Images are global, includes the poles

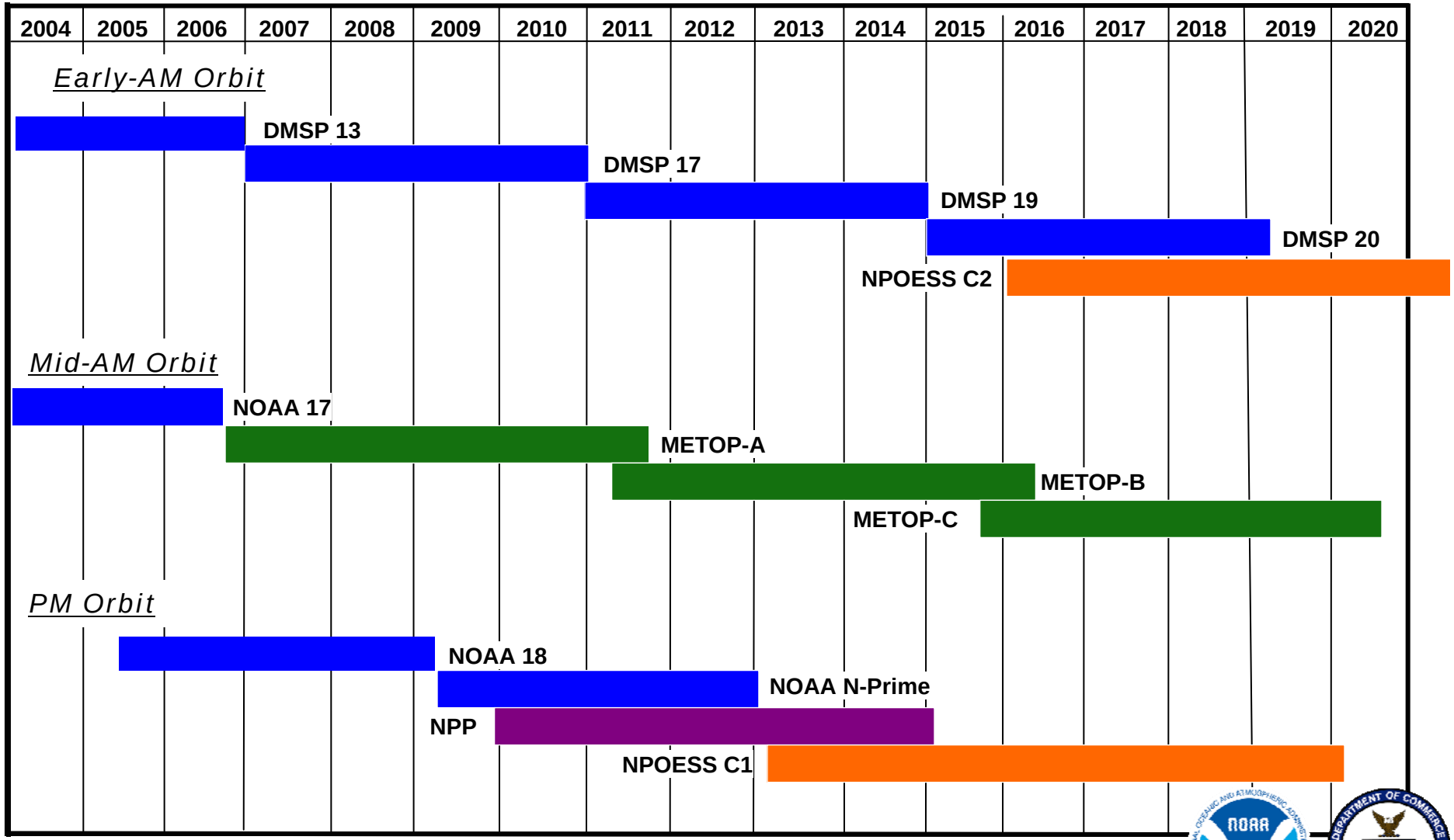
2 P.M. Orbit for 6 hours

10 A.M. Orbit for 6 hours



- 2 polar operational satellites; one in morning and one in afternoon orbit, yielding 6-hour global sampling
  - NOAA-18 Primary afternoon satellite
  - MetOp-A Primary mid-morning satellite
- EUMETSAT in partnership for mid morning orbit after 2006
- Launch upon failure of imager or sounder
- Continuity of operations since early 1960s

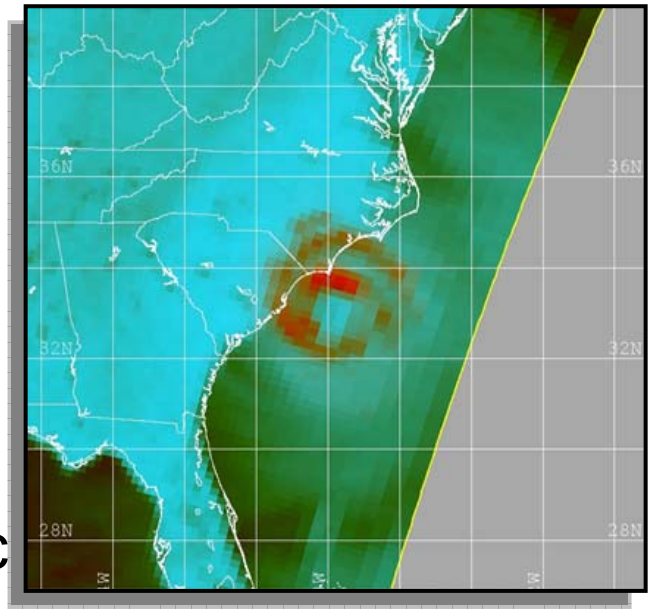
NOAA Planned Missions - Polar



Polar Orbiting Satellites

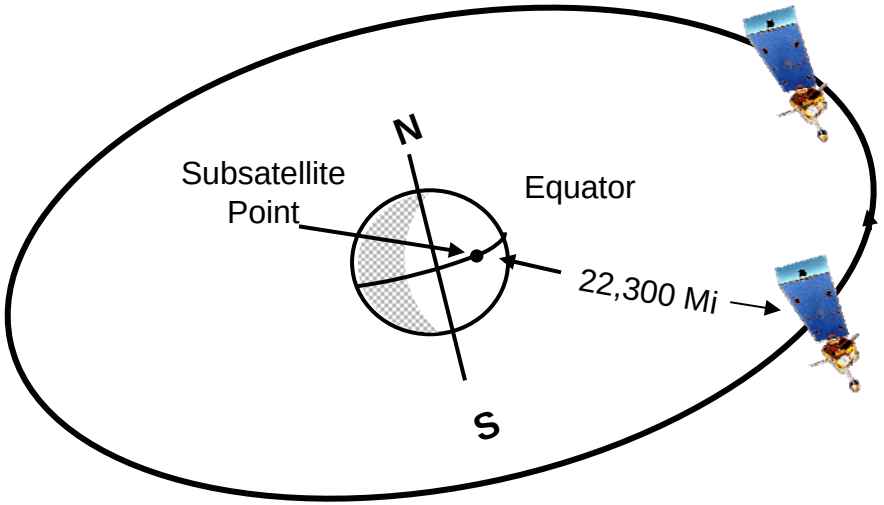
NOAA Polar Orbiter

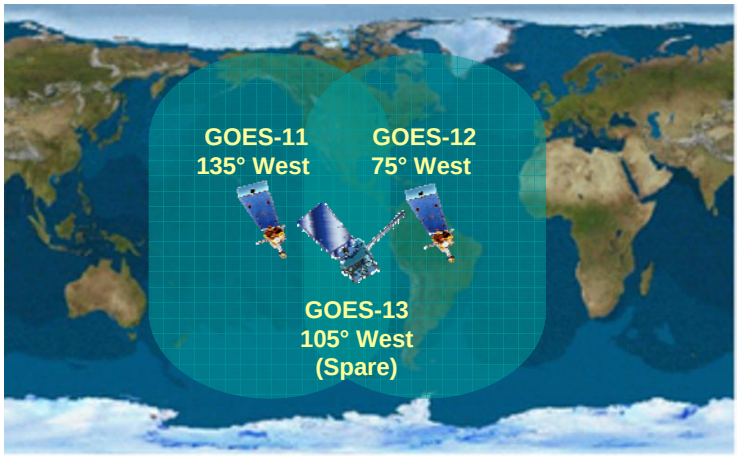
- AMSU (Advanced Microwave Sounding Unit)
- AVHRR (Advanced Very High Radiometer
- HIRS (High Resolution Infrared Radiation Sounder)
- NWS obtains:
  - Precipitation estimates
  - Precipitation Intensity
  - Sea surface temperatures
  - Center position for tropical cyc
  - Convective structure
  - Atmospheric temperature/humidity profiles



GOES Constellation

Primary Requirement: Continuity of Capability



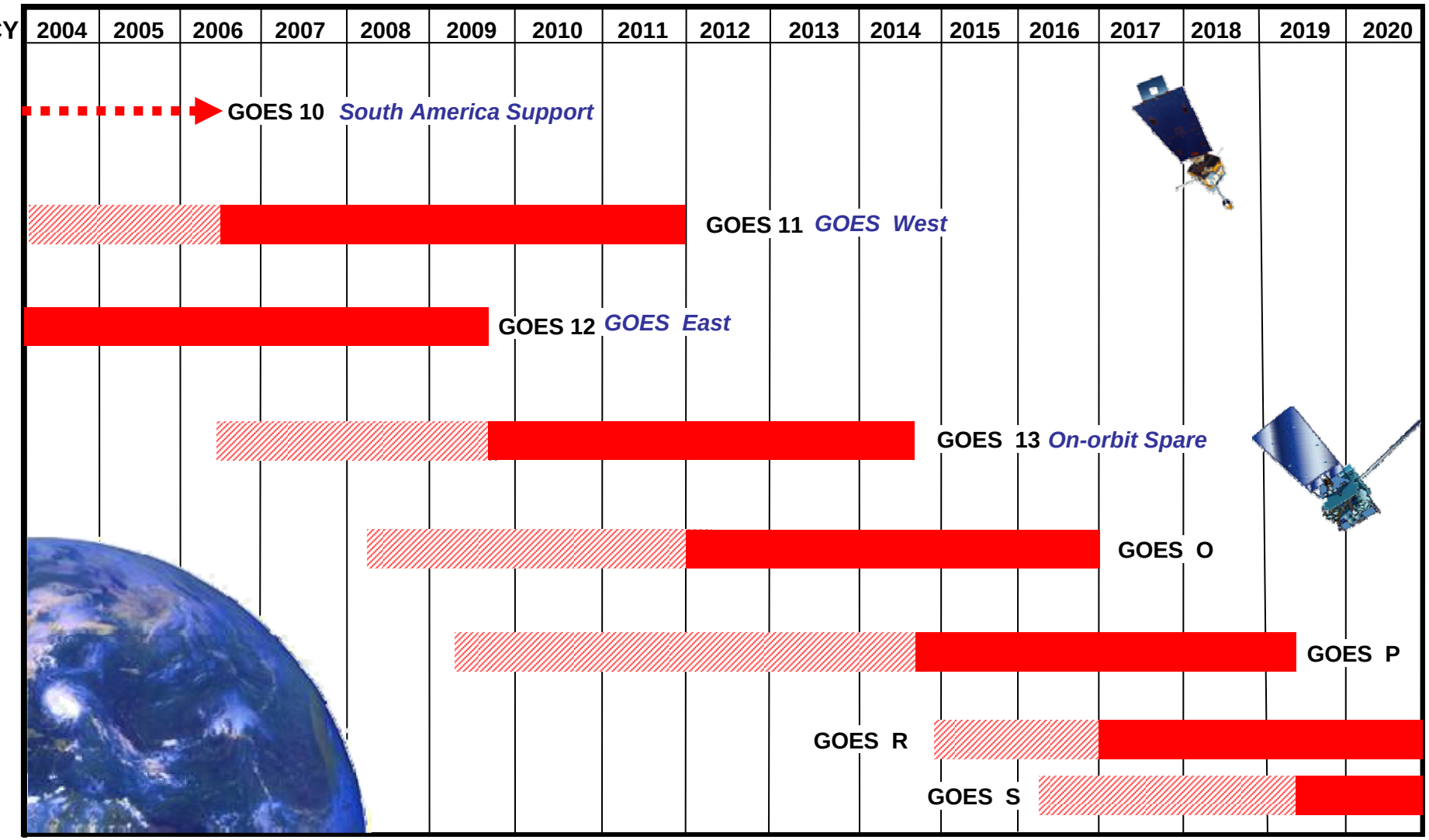


Two operational satellites and on-orbit spare

- **GOES I-M (8-12)* series operational since 1994**
  - GOES-10 operational at 60º W in support of South America beginning December 2, 2006
  - GOES-11 operational as GOES West beginning June 21, 2006
  - GOES-12 operational as GOES East beginning April 1, 2003
- **GOES N-P**
  - GOES-13 launched May 24, 2006, storage at 105º W, on-orbit spare as of January 5, 2007
  - GOES-O in ground storage
  - GOES-P in factory testing phase
- **GOES-R series will replace the GOES-N series no earlier than 2014**

* Note: Satellites are labeled with letters on the ground and changed to numbers on-orbit

Continuity of GOES Operational Satellite Program



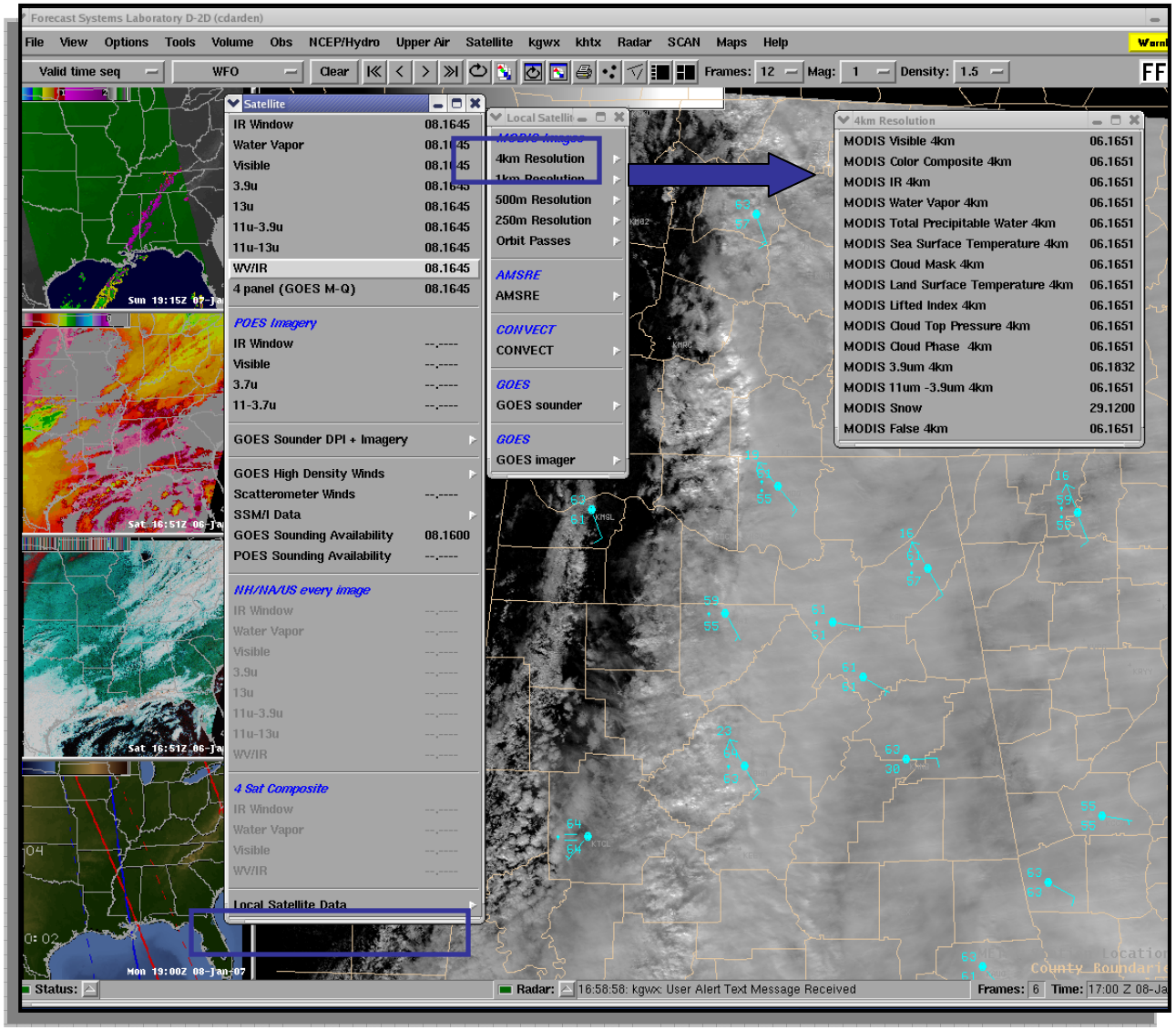
Satellite Data on AWIPS

GOES Products	POES Products	MODIS
GOES Imagery	Polar Imagery*	Color Composite (500m, 1km, 4km)*
GOES BUFR Soundings	POES BUFR Soundings	TPW (4 km)*
GOES Sounder Imagery	Blended Total Precip Water (TPW)	SST (4km and 1km)*
GOES High Density Winds	QuikSCAT Marine Sfc Winds	Cloud Mask (4km)*
GOES Lifted Index	Four Satellite Composite	LST (1km and 4km)*
GOES Precipitable Water	AMSU TPW	Lifted Index (4km)*
GOES Skin Temp	AMSU Rainfall Rate (RR)	Cloud Top Pressure (4 km)*
GOES Cloud Top Height	SSMI TPW	Cloud Phase Product (4 km)*
GOES Effective Cloud Amount	SSMI RR	False Color Composite (500m, 1km, 4km)*
GOES Aviation (Icing, Icing Height, Low Cloud Base, Fog Depth)		Fog Product/Diff. Channel 11-3.9 micron (1km, 4km)*

* Not in baseline AWIPS

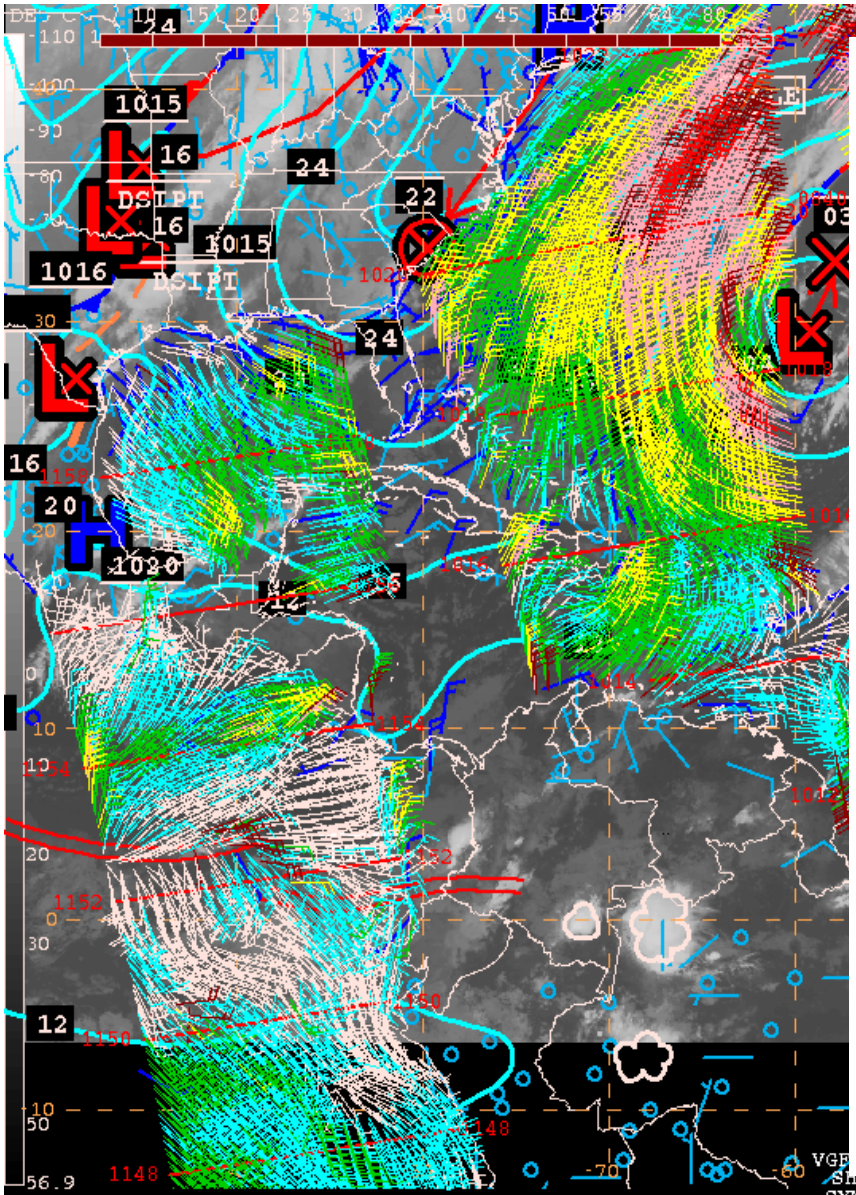
MODIS Data Access in AWIPS

- **MODIS data is provided at 4 different resolutions (4km, 1km, 500m, 250m) corresponding to CONUS, Regional, State, and WFO coverage areas**
- **Overlay, manipulate, and interact as with any other satellite data**
- **Orbital track maps show coverage of recent past and upcoming orbits**
- **(+/- 5 days)**



Darden

Surface Analysis with QuikSCAT



High Seas Forecast

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000
FZNT02 KNHC 071549
HSFAT2

HIGH SEAS FORECAST
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
1630 UTC MON FEB 07 2005
SUPERSEDED BY NEXT ISSUANCE IN 6 HOURS

SECURITE

ATLANTIC FROM 7N TO 31N W OF 35W INCLUDING CARIBBEAN SEA AND
GULF OF MEXICO

SYNOPSIS VALID 1200 UTC MON FEB 07
24 HOUR FORECAST VALID 1200 UTC TUE FEB 08
48 HOUR FORECAST VALID 1200 UTC WED FEB 09

WARNINGS
NONE.

SYNOPSIS AND FORECAST
.ATLC LOW 29.5N59W 1001 MB NEARLY STATIONARY...WILL MOVE N 10 KT
IN 12 TO 24 HOURS. OVER FORECAST WATERS WITHIN 300 NM W
SEMICIRCLE WIND NW 25 TO 30 KT SEAS 10 TO 15 FT. N OF 28N
BETWEEN 64W AND 70W WIND N 25 KT SEAS 12 TO 15 FT IN N SWELL.
ELSEWHERE N OF 20N W OF 59W WIND NLY 20 KT SEAS 9 TO 14 FT IN
NLY SWELL. N OF 20N BETWEEN 52W AND 59W WIND S TO SW 20 KT SEAS
8 TO 10 FT IN W AND NW SWELL...SCATTERED SHOWERS AND TSTMS.
.24 HOUR FORECAST LOW N OF AREA 32N58W 1003 MB. N OF 27N BETWEEN
62W AND 70W WIND NW TO N 20 KT SEAS 10 TO 15 FT IN NE SWELL.
ELSEWHERE N OF 19N W OF 58W WIND LESS THAN 20 KT SEAS 8 TO 12 FT
IN N AND NE SWELL. N OF 26N BETWEEN 50W AND 58W WIND S TO SW 20
KT SEAS 9 TO 12 FT IN SW SWELL.
.48 HOUR FORECAST N OF 16N BETWEEN 50W AND 75W WIND LESS THAN 20
KT SEAS 8 TO 10 FT PRIMARILY IN N AND NE SWELL.
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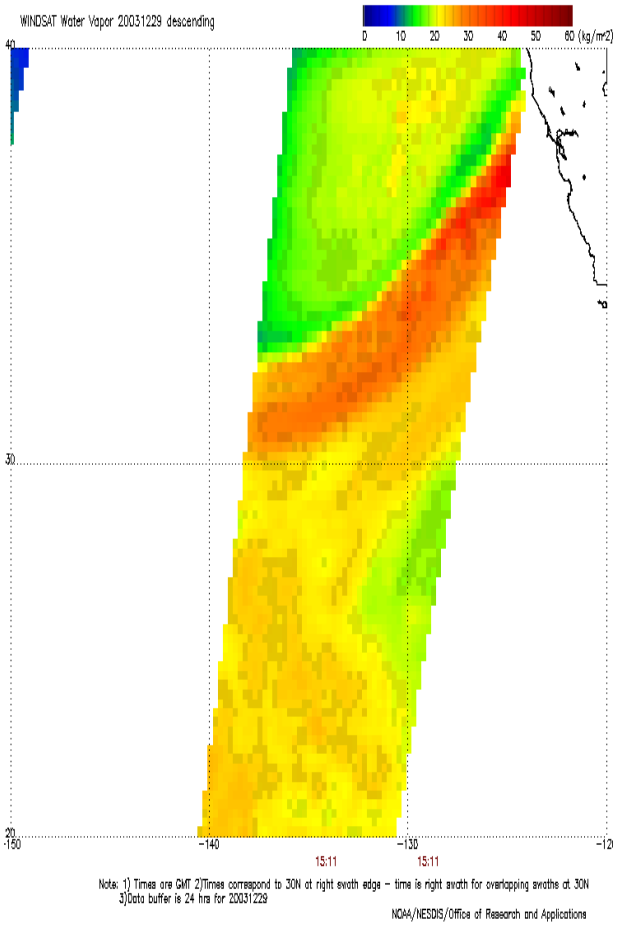
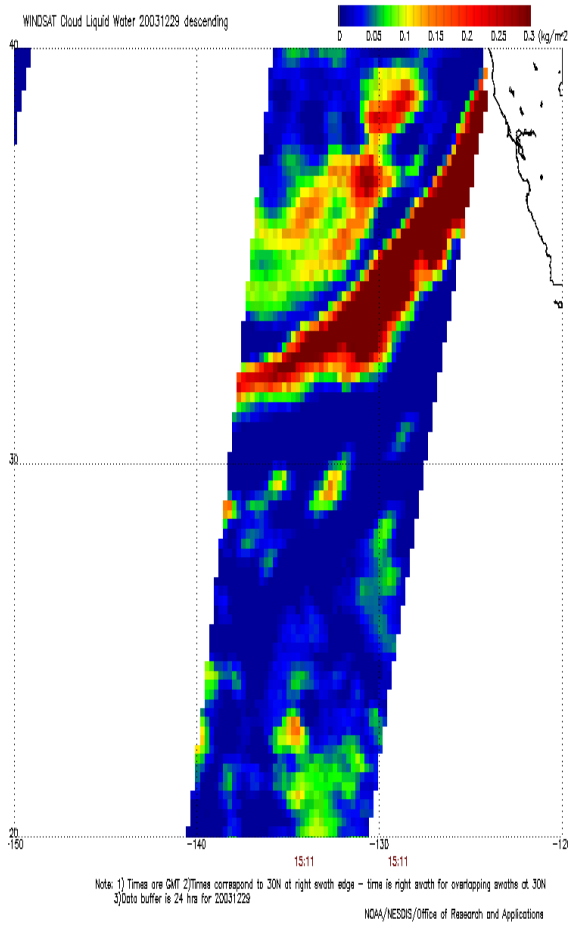
Satellites Tell a More Complete Story

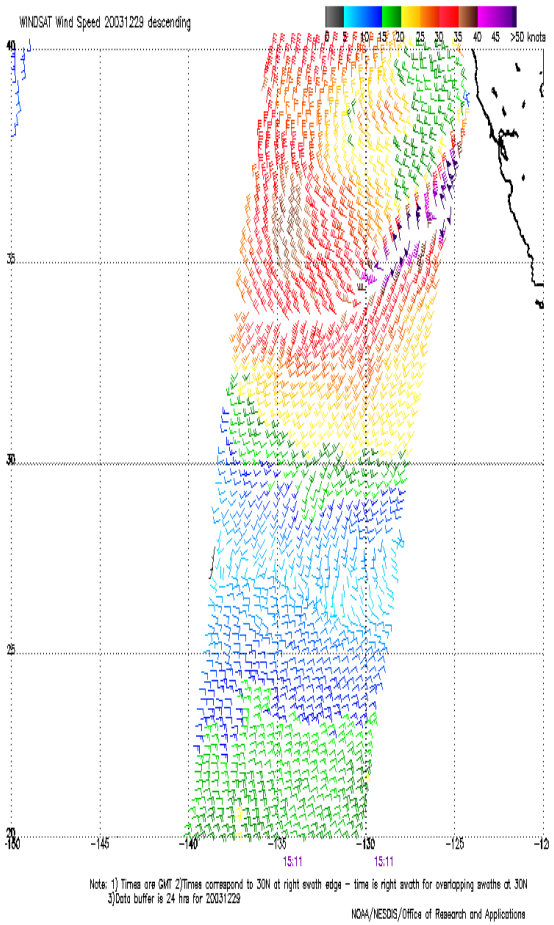
Total Precipatable Water



Cloud Liquid Water



Surface Wind Field



The Future of Environmental Satellites

NPOESS

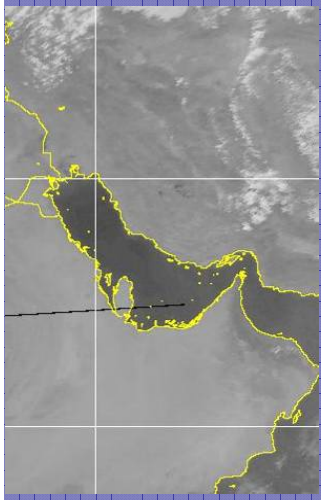
NPOESS Certified Program

- 2 EMD Satellites plus 2 production
- Bus sized to carry all sensors
- VIIRS, CrIS, ATMS, CERES, OMPS-N, SEM, ADCS,
  SARSAT remain
- APS, TSIS, OMPS-L,
  ERBS, Alt, SuS, SESS
  de-manifested from C1
  & C2 [accommodation
  remains]
- CMIS deleted from C1, MIS planned for C2
  and beyond
- Ground architecture
  essentially unchanged

Continuity, Flexibility, Most Capability within budget

Advanced Cloud Imagery Improves Interpretation

Current Cloud Imagery

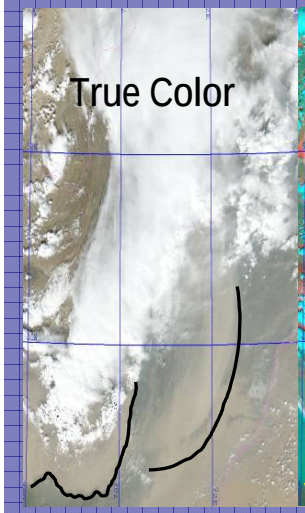


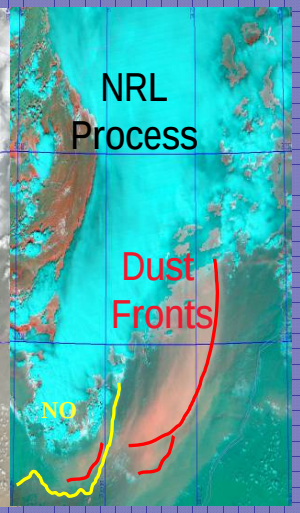
Black & White Visible

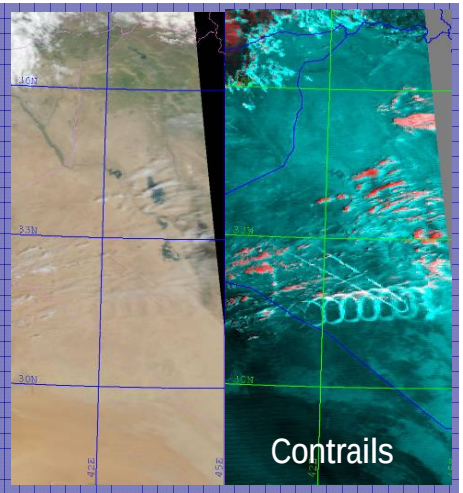
NPOESS Cloud Imagery

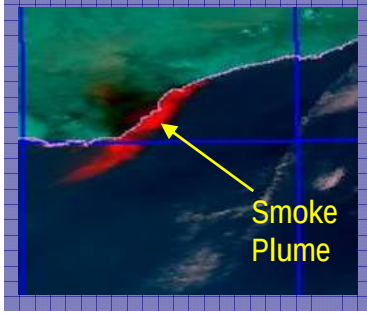
True Color

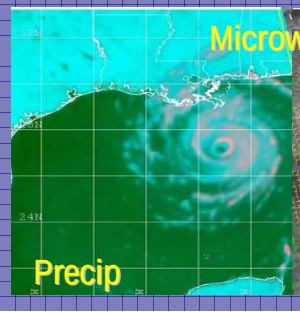
Tough Problems Solved

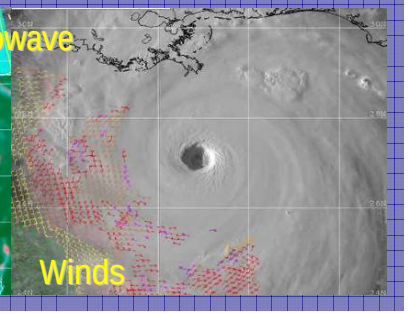








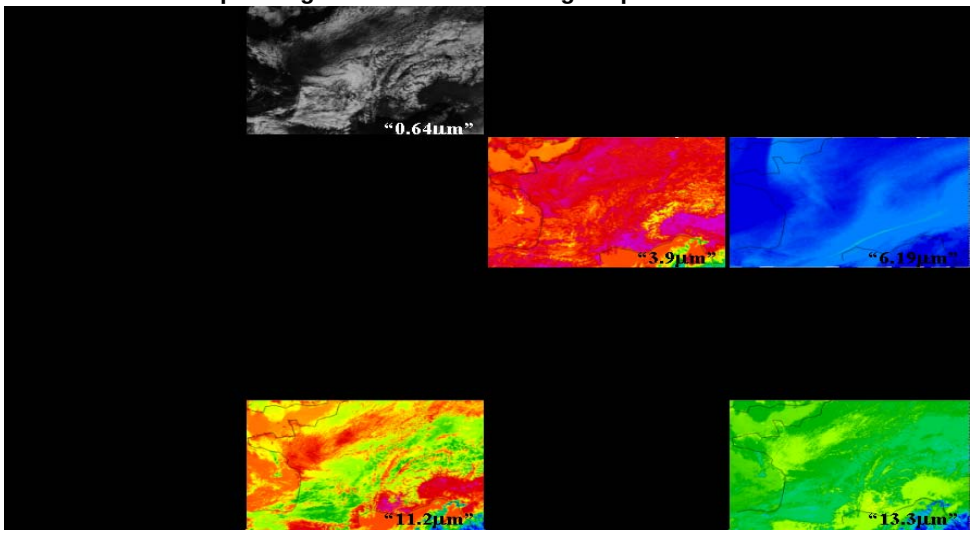




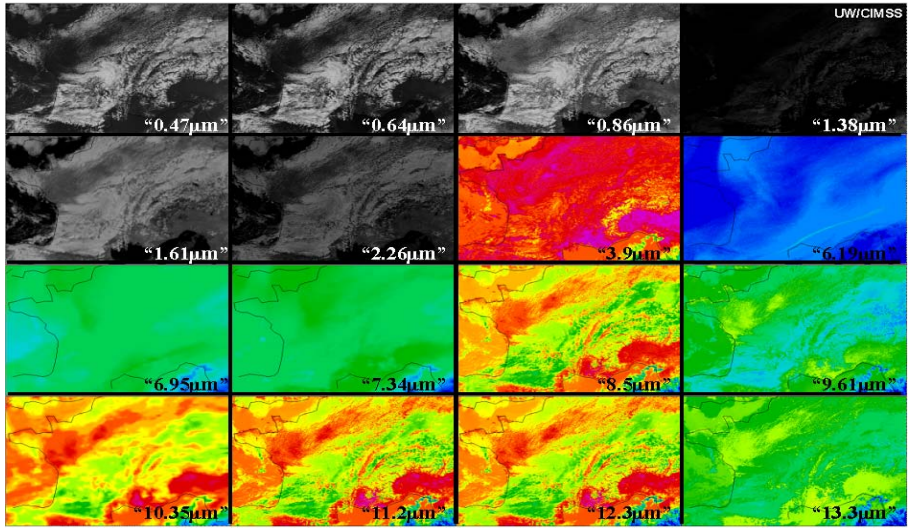
GOES - R

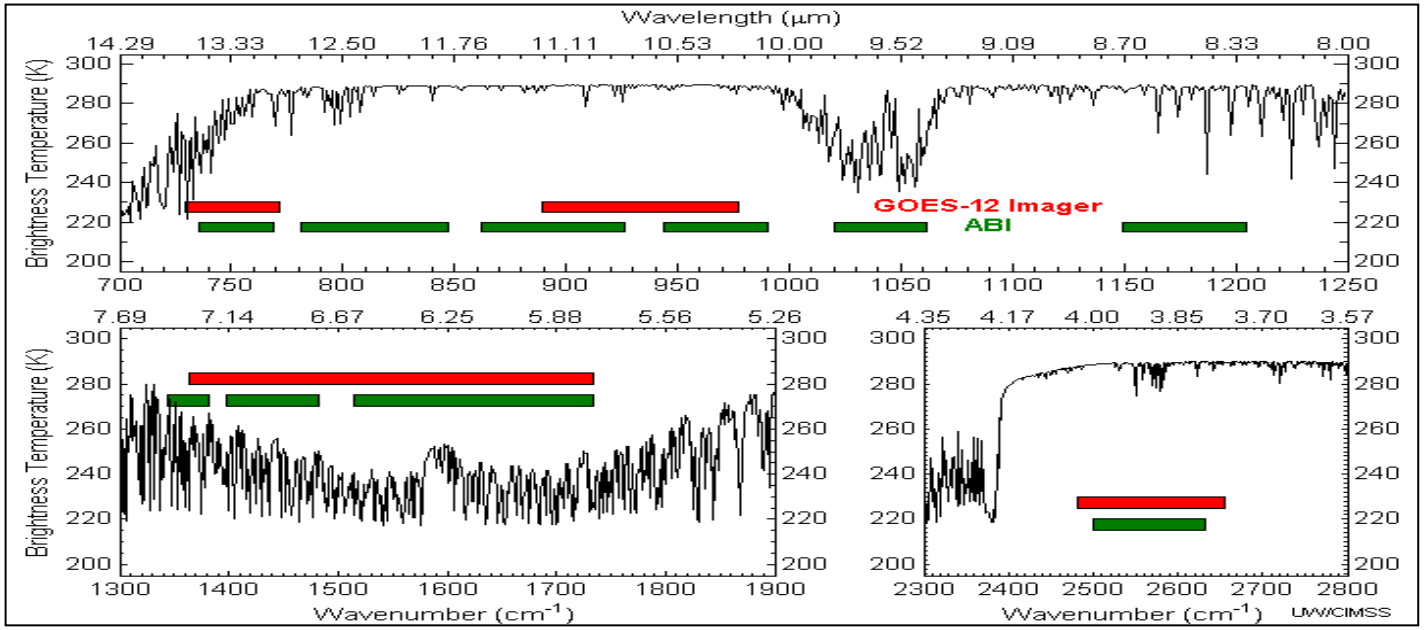
ABI: Improved Resolution . . .

Corresponding Simulated GOES Imager Spectral Bands:



Simulated "ABI" Spectral Bands:





. . . over a wider spectrum

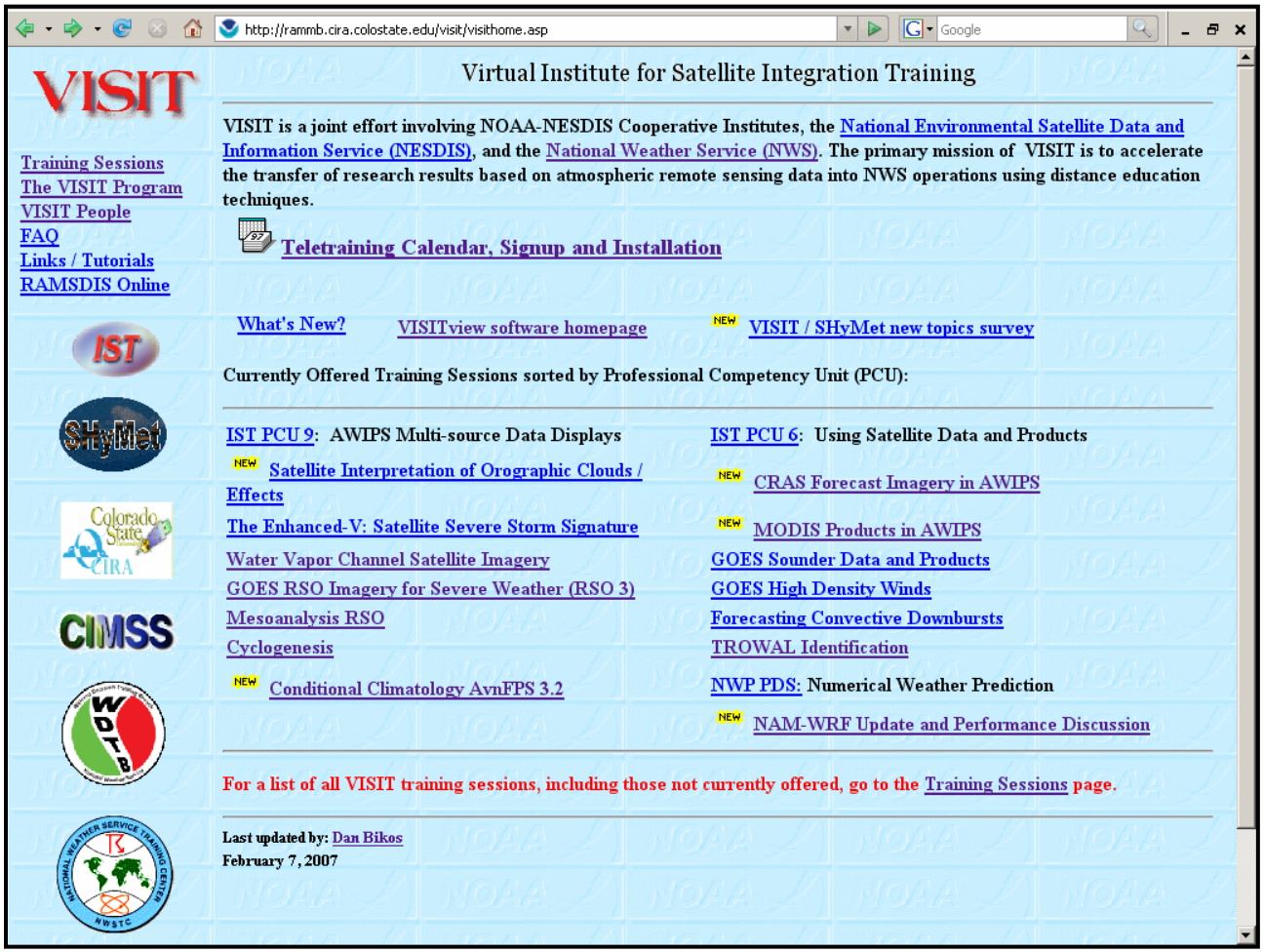
Satellite Training Resources

Training Resources

- National Weather Service
  - NWS Training Center (Kansas City)
  - Forecast Decision Training Branch (Boulder)
  - Warning Decision Training Branch (Norman)
- Cooperative Program for Operational Meteorology, Education, and Training (COMET)
- Virtual Institute for Satellite Integration Training (VISIT) at CIRA/Ft. Collins and CIMSS/Madison supported by both NWS and NESDIS

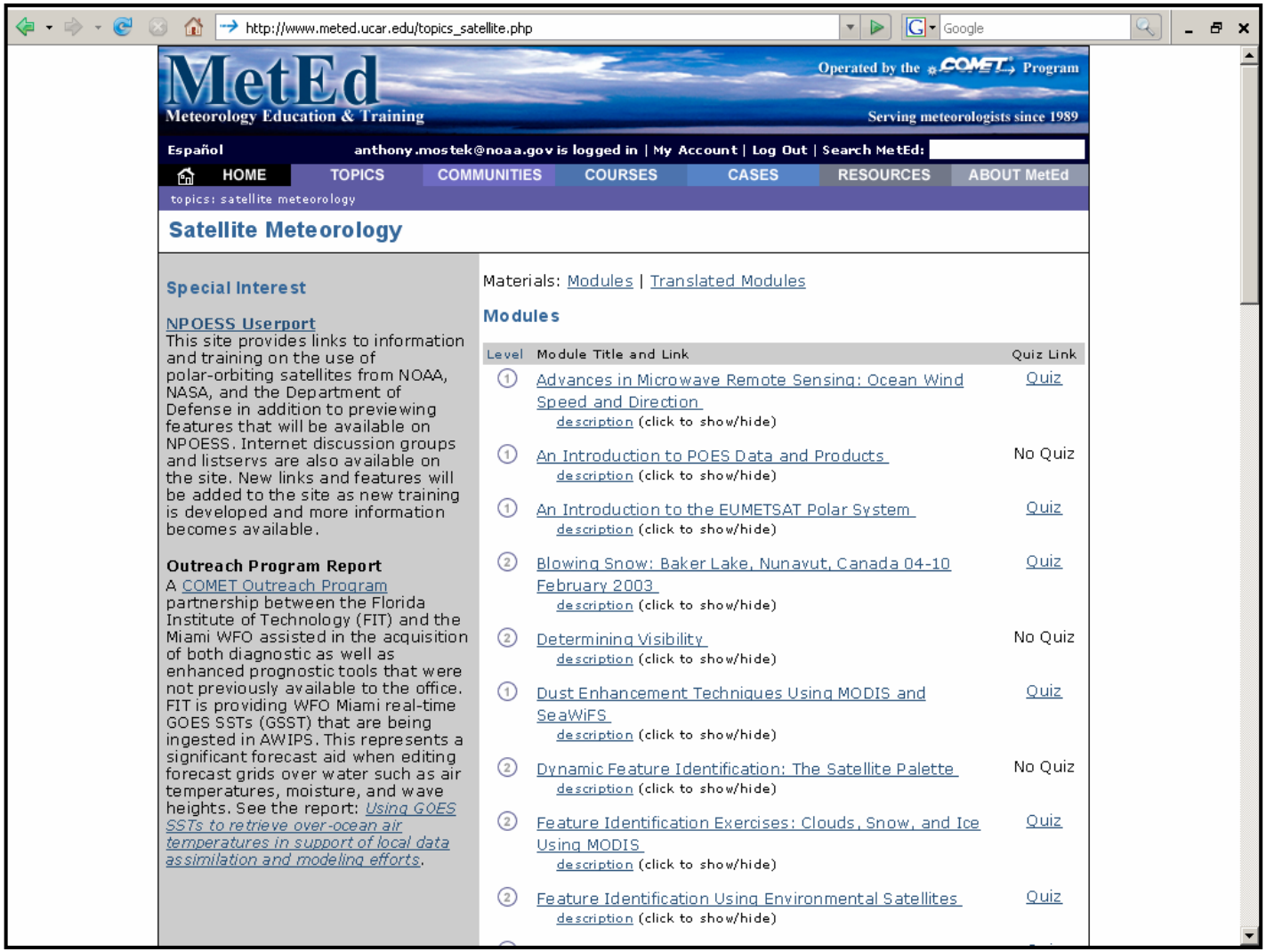
VISIT Satellite Modules & Teletraining

Sessions are found at:
rammb.cira.colostate.edu/visit/visithome.asp



COMET Satellite Training Modules

meted.ucar.edu/topics_satellite.php



Conclusions

- **Access** satellite data – if you don't know it is there, or how to get it, you can't use it
- **Understand** data use – whether by models or direct broadcast satellite data has to fit into the big data picture
- **Prepare** for the future – more effective use today data and education about tomorrow's capabilities will ensure continued outstanding weather support