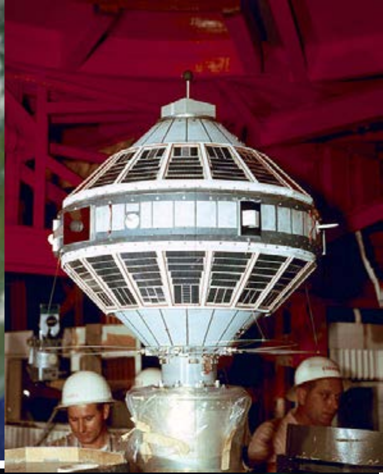
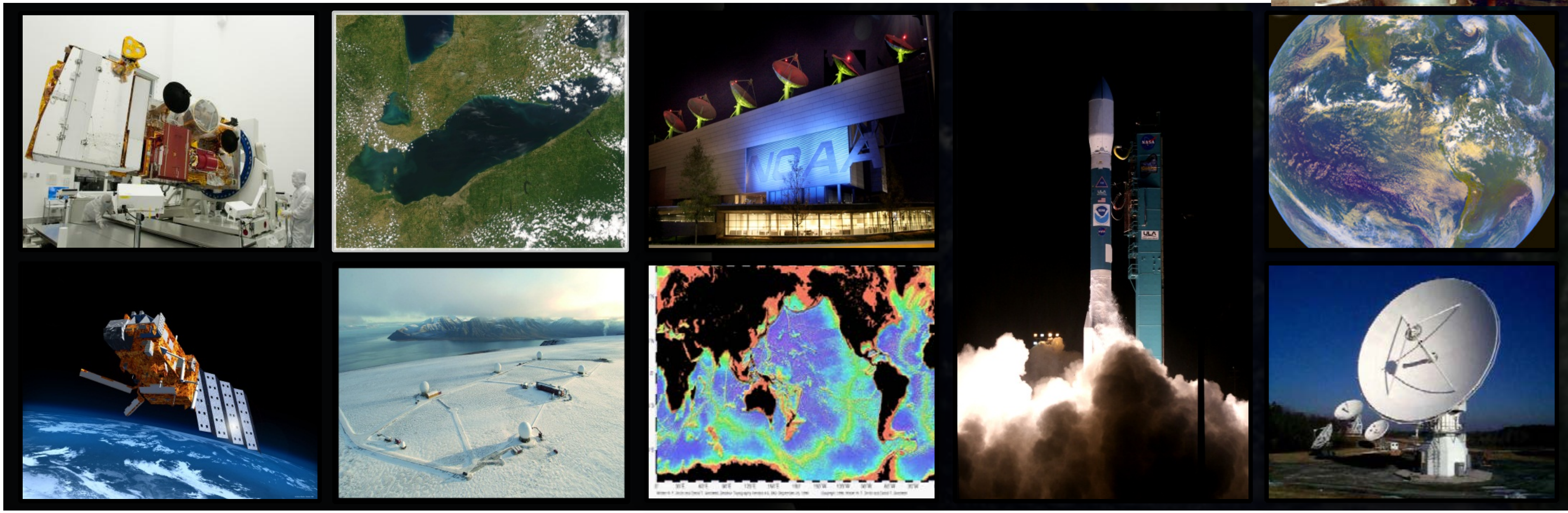
SUOMI National Polar-orbiting Program Status and Instrument Performance





Mitchell D. Goldberg, NOAA JPSS Program Scientist

and the NPP SDR and EDR Team

The Team

- NOAA, NASA, NRL, FNMOC, NAVO, AFWA
- Cooperative Institutes (CIMSS, CIRA, CICS)
- UMBC, HU, UTAH SDL, MIT-LL, AEROSPACE, NGAS, Miami, ……
- Raytheon
- External users: UKMO, ECMWF

TOPICS

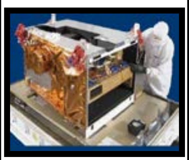
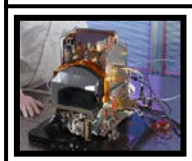
Overview of the NPP Instruments, Products, Processing System

Initial Results from VIIRS, ATMS, CrIS, OMPS and CERES

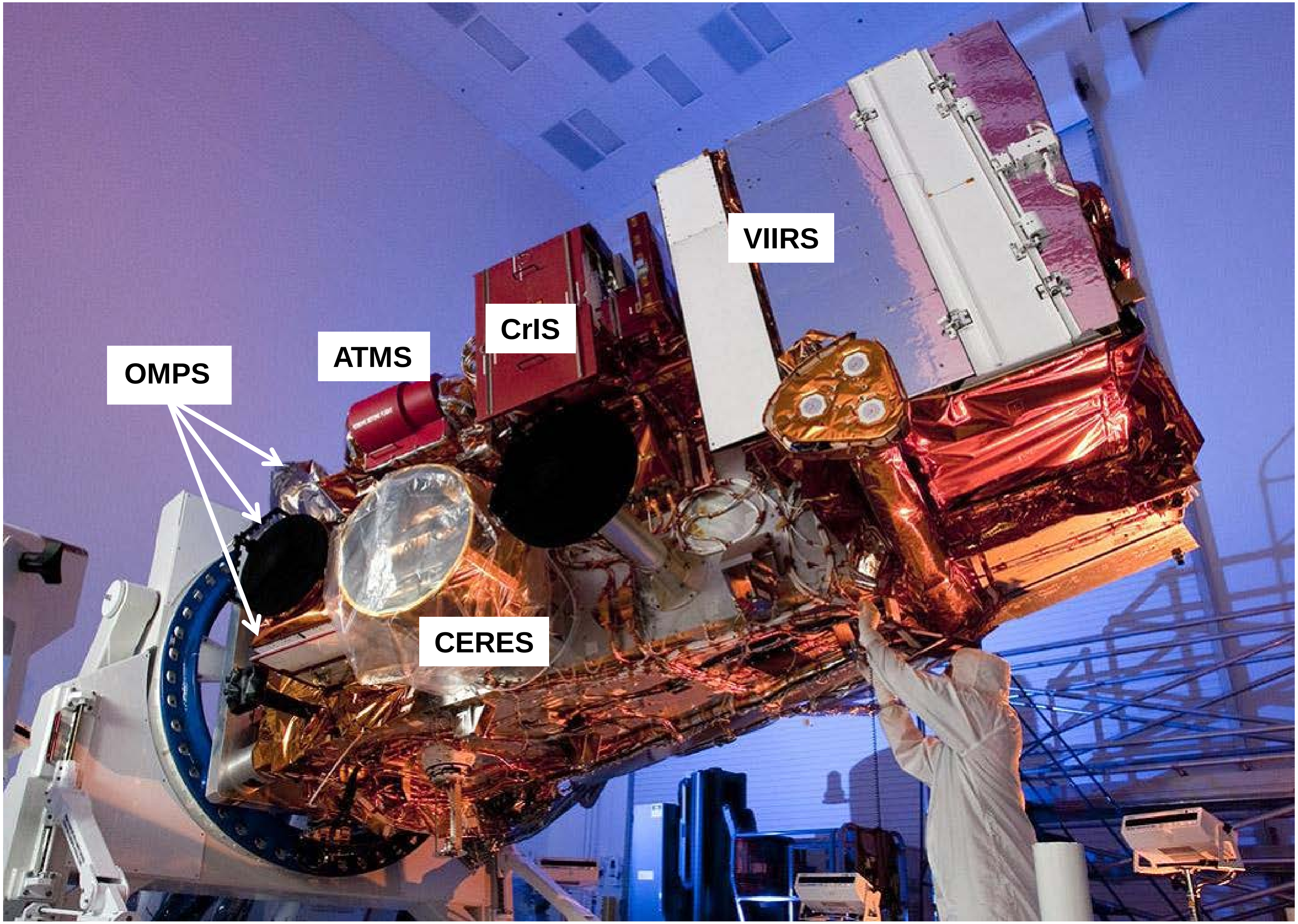
Courtesy of Ben Cooper

SUCCESSFUL LAUNCH October 28, 2011!!!!

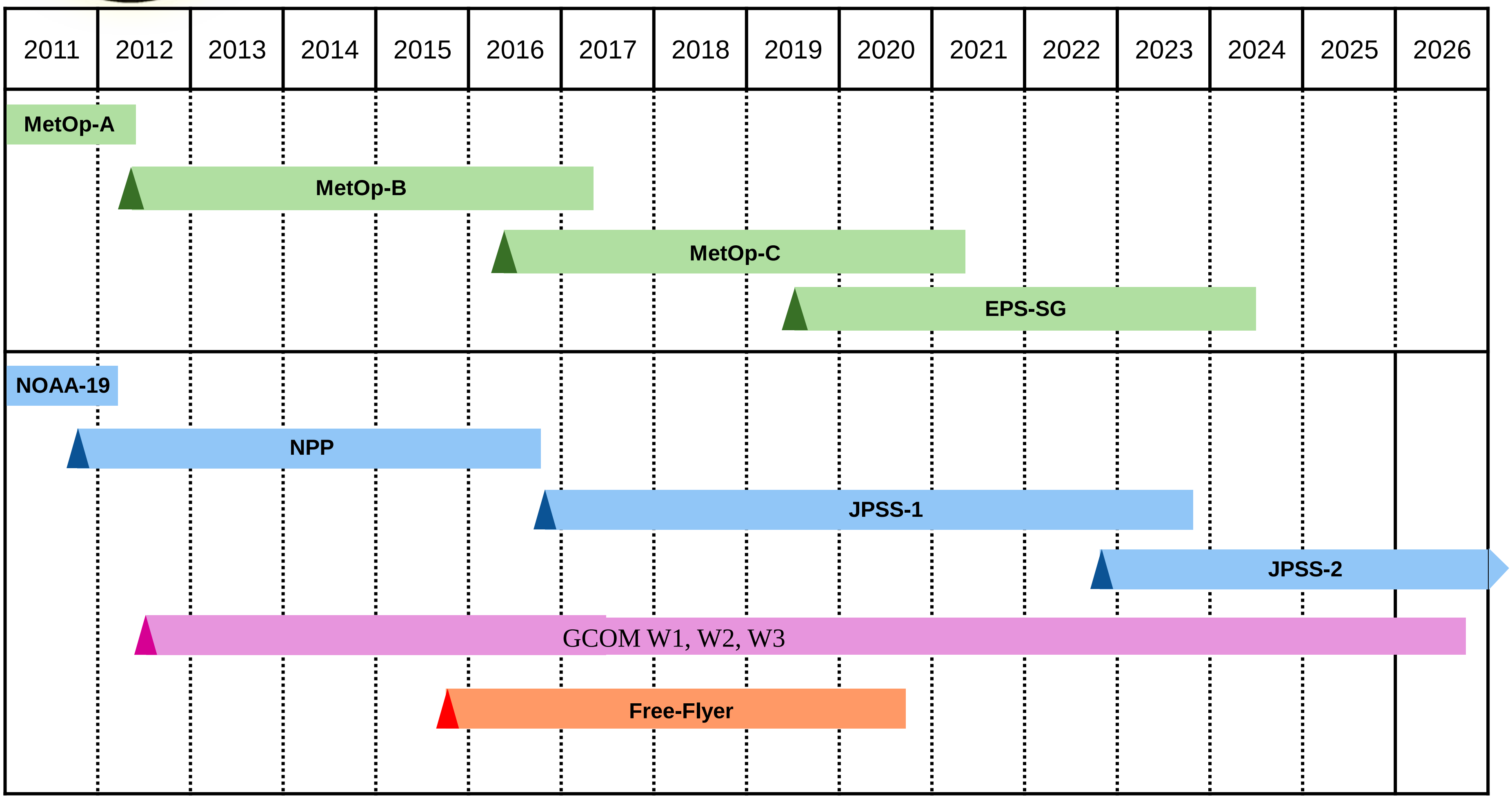
NPP/JPSS Instruments

JPSS Instrument		Measurement	NOAA Heritage	NASA Heritage
	ATMS	ATMS and CrIS together provide profiles of high vertical resolution atmospheric temperature and water vapor information	AMSU	AMSU
	CrIS		HIRS	AIRS
	VIIRS	Provides daily high-resolution imagery and radiometry across the visible to long-wave infrared spectrum for a multitude of environmental assessments	AVHRR	MODIS
	OMPS	Spectrometers with UV bands for ozone total column measurements	SBUV-2	OMI
	CERES	Scanning radiometer which supports studies of Earth Radiation Budget		CERES

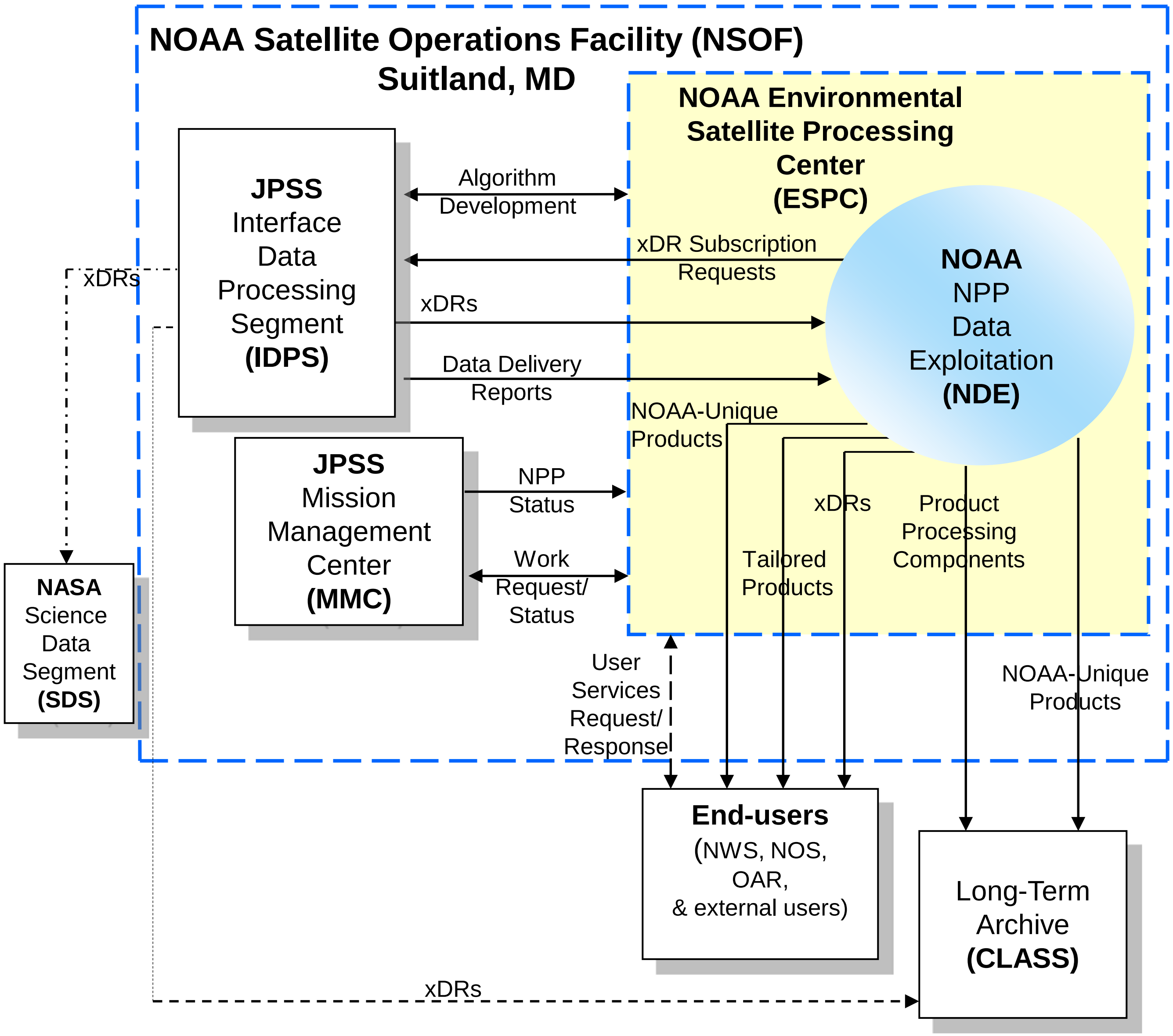
NPP Spacecraft
(JPSS-1 Concept)



JPSS Constellation



Functional Scope: The NESDIS Central



Office of Satellite & Product Operations (OSPO) will provide common services:

- Data Center Operations
- Telecommunications
- User Services (Help Desk)
- Config. Management
- Security Controls
- Distribution

Center for Satellite Applications and Research (STAR) and partners provides:

- Validation of sensor and environmental data records
- Algorithm development and improvements
- Supports both JPSS IDPS and NDE

Derived Products

VIIRS (22)

- ALBEDO (SURFACE)
- CLOUD BASE HEIGHT
- CLOUD COVER/LAYERS
- CLOUD EFFECTIVE PART SIZE
- CLOUD OPTICAL THICKNESS
- CLOUD TOP HEIGHT
- CLOUD TOP PRESSURE
- CLOUD TOP TEMPERATURE
- ICE SURFACE TEMPERATURE
- NET HEAT FLUX
- OCEAN COLOR/CHLOROPHYLL
- SUSPENDED MATTER
- VEGETATION INDEX
- AEROSOL OPTICAL THICKNESS
- AEROSOL PARTICLE SIZE
- ACTIVE FIRES
- ● IMAGERY
- SEA ICE CHARACTERIZATION
- SNOW COVER
- ● SEA SURFACE TEMPERATURE
- LAND SURFACE TEMP
- SURFACE TYPE

ESPC GCOM AMSR-2 (11)

- CLOUD LIQUID WATER
- PRECIPITATION TYPE/RATE
- PRECIPITABLE WATER
- SEA SURFACE WINDS SPEED
- SOIL MOISTURE
- SNOW WATER EQUIVALENT
- IMAGERY
- SEA ICE CHARACTERIZATION
- SNOW COVER/DEPTH
- SEA SURFACE TEMPERATURE
- SURFACE TYPE

OMPS (2)

- O_3 TOTAL COLUMN
- O_3 NADIR PROFILE

CERES (4)

- DOWN LW RADIATION (SFC)
- DOWN SW RADIATION (SFC)
- NET SOLAR RADIATION (TOA)
- OUTGOING LW RADIATION (TOA)

CrIS/ATMS (3)

- ● ATM VERT MOIST PROFILE
- ● ATM VERT TEMP PROFILE
- PRESSURE (SURFACE/PROFILE)

A-DCS

TSIS (1)

SOLAR IRRADIANCE

SARR & SARP

CrIS Thinned Radiances	Land Surface Temperature (ATMS)	Trace Gases (Carbon)
CrIS Cloud Cleared Radiances	Temperature Profiles (ATMS)	SST (AVHRR-like)
Total Precipitable Water (ATMS)	Moisture Profiles (ATMS)	Aerosol (AVHRR-like)
Snow Cover (ATMS)	Rain Water Path (ATMS)	Cloud Top Fraction (CrIS)
Precipitation Rate (ATMS)	Blended SST	Cloud Top Pressure (CrIS)
Land Surface Emissivity (ATMS)	SST Anomalies	Stability Products (CrIS)
Cloud Liquid Water (ATMS)	SST Degree Heating Weeks	Polar Winds (VIIRS)
Sea Ice Concentration (ATMS)	SST Hot Spots	Green Vegetation Fraction
Snow Water Equivalent (ATMS)	Coral Reef Bleaching Indices/Alerts	Blended Total Precipitable Water
Ice Water Path (ATMS)	Total Ozone (CrIS)	

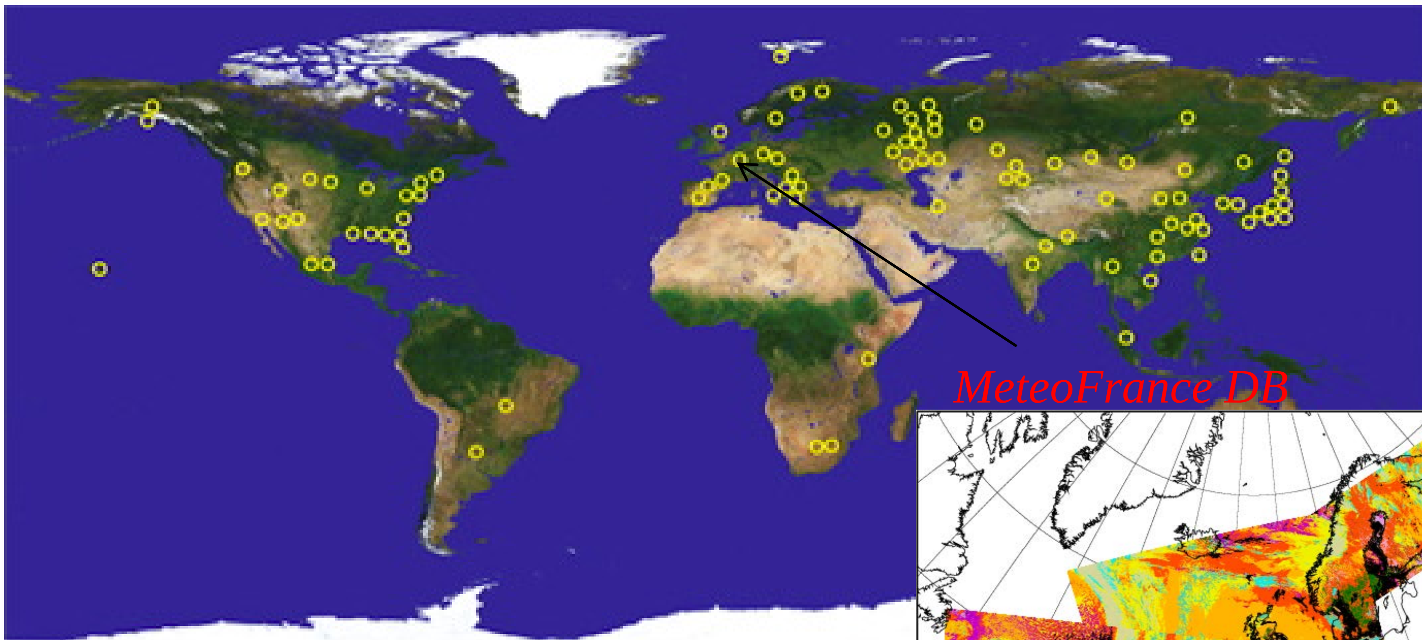
NOAA Unique Products (NUPs)

KEY

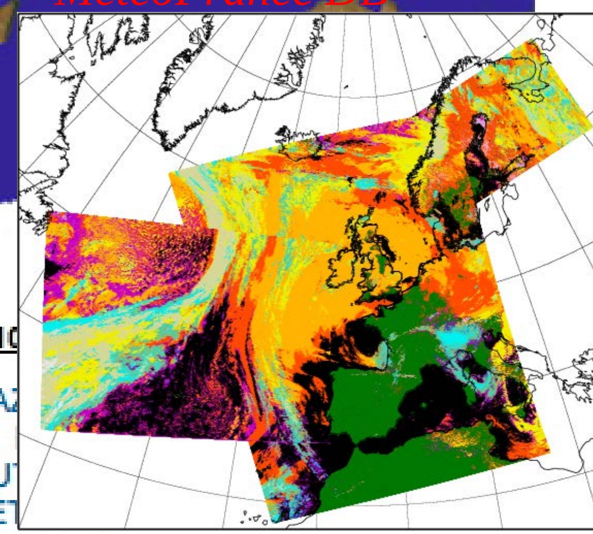
- ● EDRs with Key Performance Parameters
- JPSS-1
- GCOM
- JPSS Program (Host TBD)

Direct Readout Stations using Xband

Terra/Aqua DB Sites



MeteoFrance DB



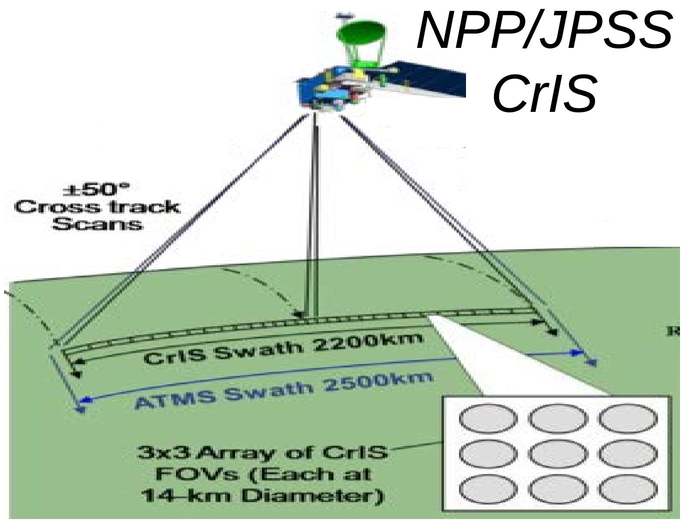
EOS Direct Broadcast Sites Worldwide – Updated January 25, 2010

ANTARCTICA ARGENTINA AUSTRALIA BELARUS BRAZ
GERMANY INDIA IRAN ITALY JAPAN KAZAKHSTAN
RUSSIA SCOTLAND SINGAPORE SOUTH AFRICA SOU
TAIWAN THAILAND UNITED ARAB EMIRATES USA VIET

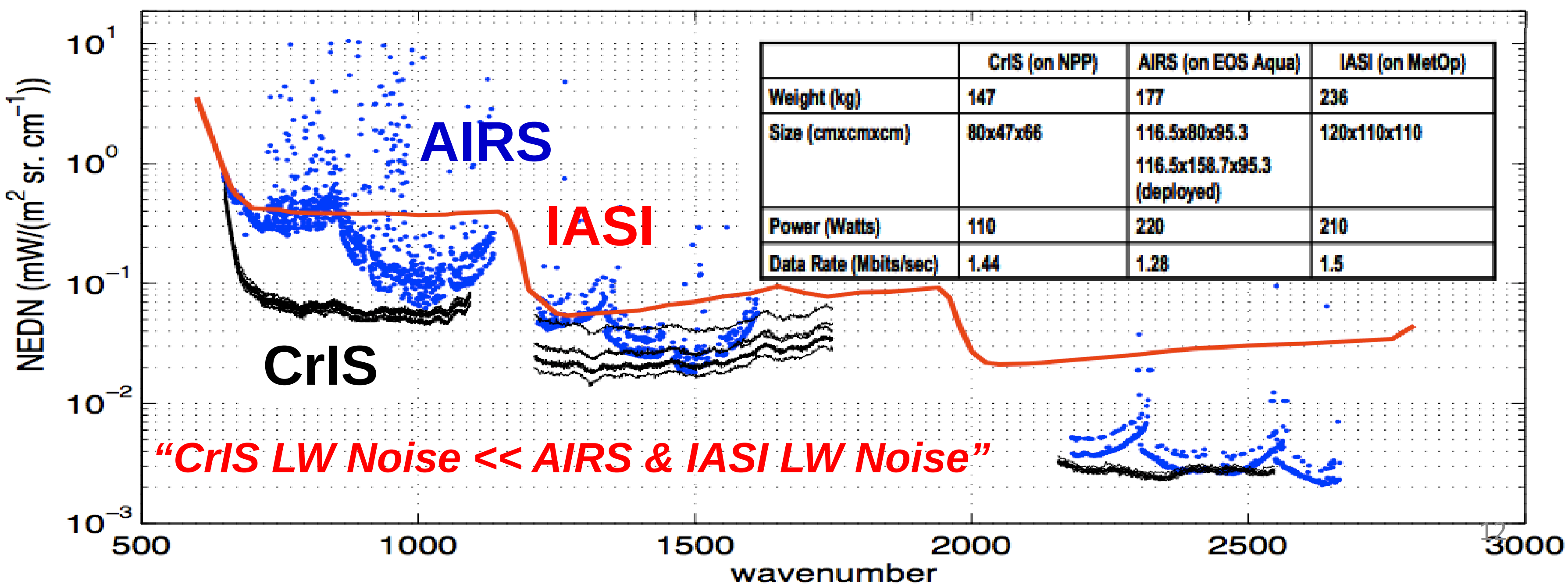
UW CIMSS providing the Community Satellite Processing Package

Cross-Track Infrared Sounder (CrIS)

NPOESS Preparatory Satellite – Launch: October 2011



- **Michelson Interferometer: 0.625,1.25, 2.5cm^{-1} (resolving power of 1000)**
- **Spectral range: 660-2600 cm^{-1}**
- **3 x 3 HdCdTe focal plane passively cooled (4-stages) to 85K**
- **Focal plane 27 detectors, 1305 spectral channels**
- **310 K Blackbody and space view provides radiometric calibration**
- **NEDT ranges from 0.05 K to 0. 5 K**



	CrIS (on NPP)	AIRS (on EOS Aqua)	IASI (on MetOp)
Weight (kg)	147	177	236
Size (cmxcmxcm)	80x47x66	116.5x80x95.3 116.5x158.7x95.3 (deployed)	120x110x110
Power (Watts)	110	220	210
Data Rate (Mbits/sec)	1.44	1.28	1.5

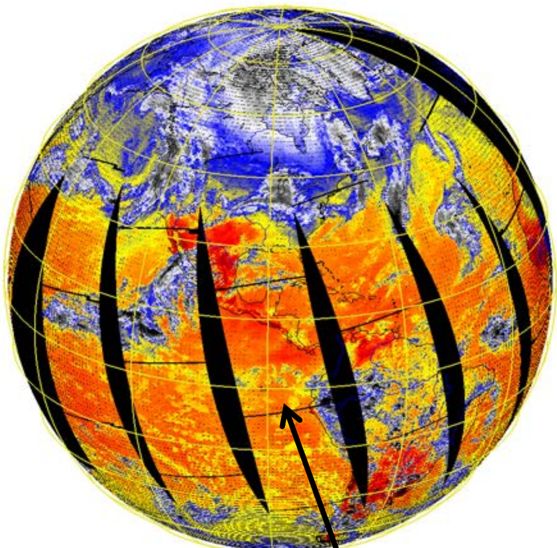
AIRS
Atmospheric InfraRed Sounder
Grating spectrometer
166 kg, 256 W
13.5 km FOV at nadir, contiguous
Launched on Aqua in 2002

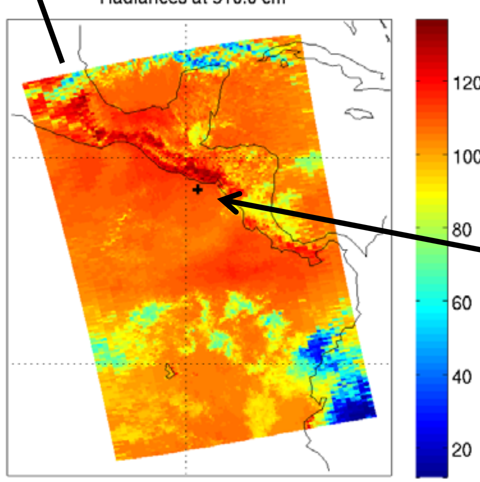
IASI
Infrared Atmospheric Sounding Interferometer
Michelson interferometer
236 kg, 210 W
2x2 12 km FOVs at nadir, non-contiguous
Launched on Metop-A in 2006

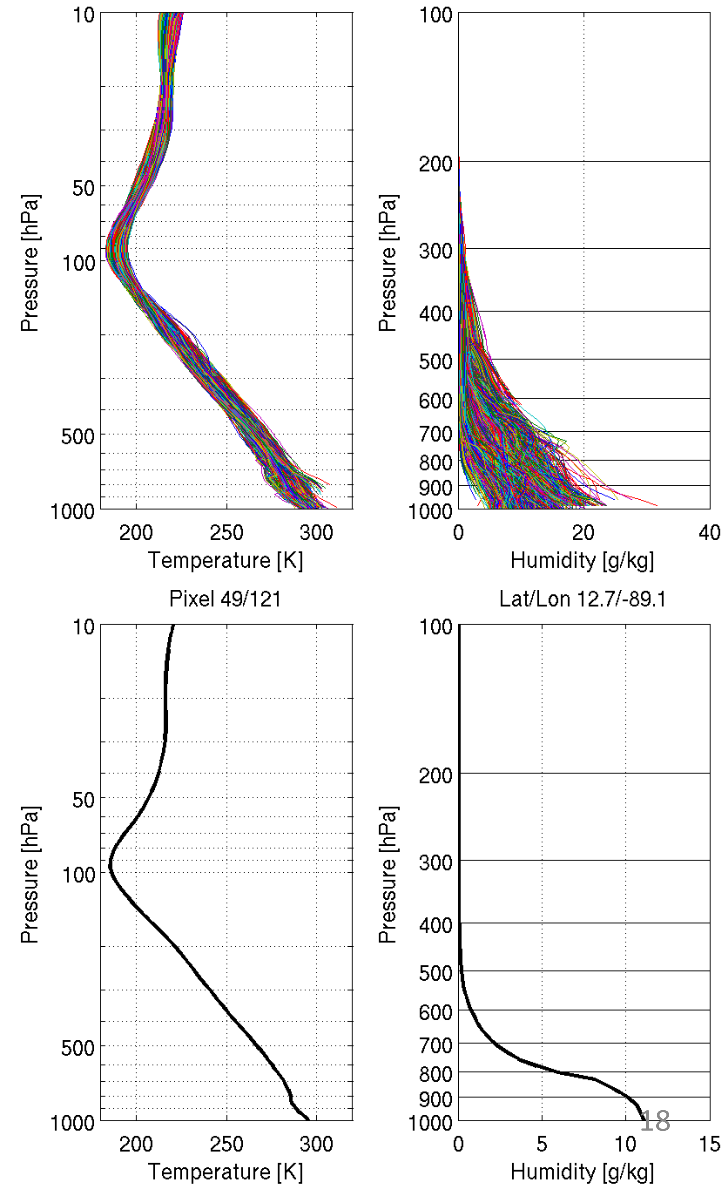
CrIS
Cross-track Infrared Sounder
Michelson interferometer
146 kg, 110 W
3x3 14 km FOVs at nadir, contiguous
To be launched on NPP

CrIS RTV for 20 Jan 2012, t1910005

Single profiles



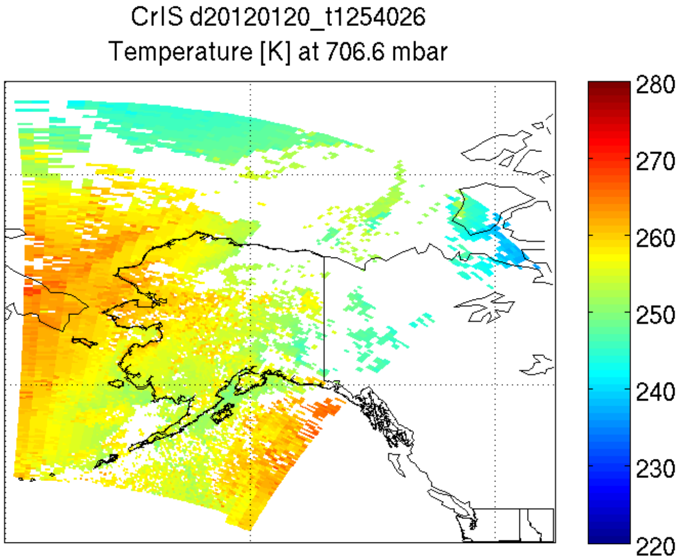


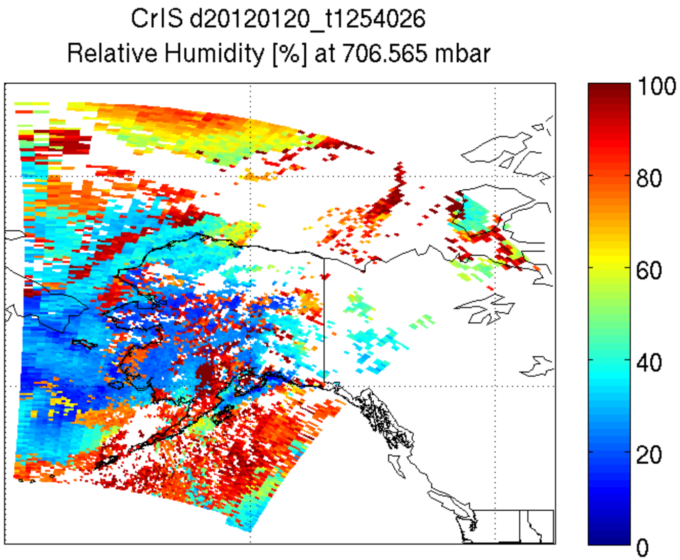


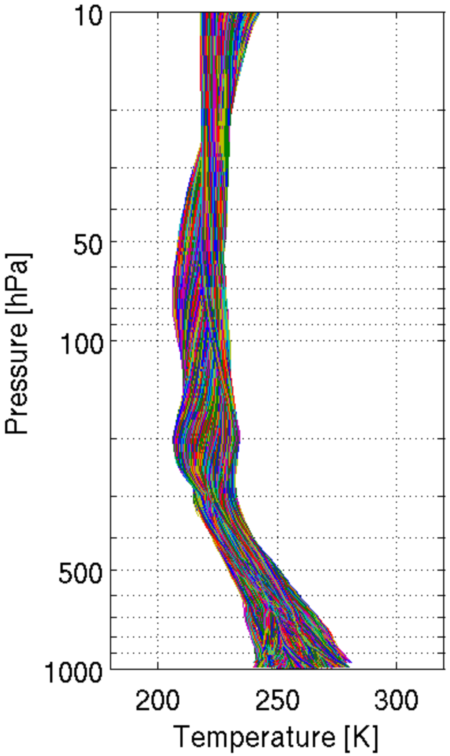
Courtesy: Dave Tobin, Bill Smith
Elisabeth Weisz

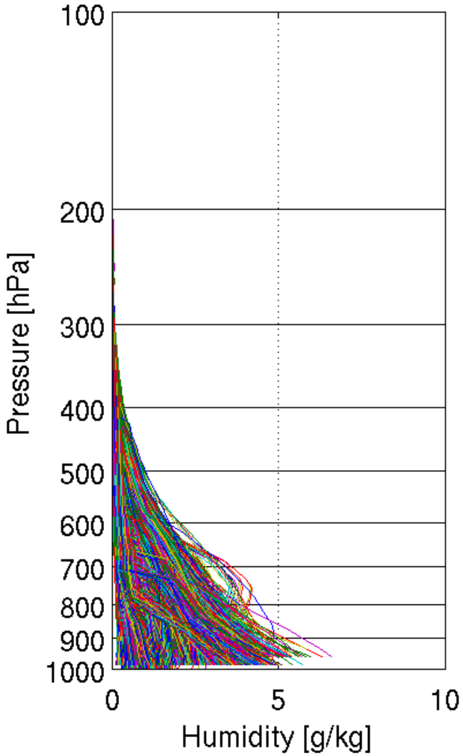
CrIS RTV for 20 Jan 2012, t1254026

Temperature and Humidity



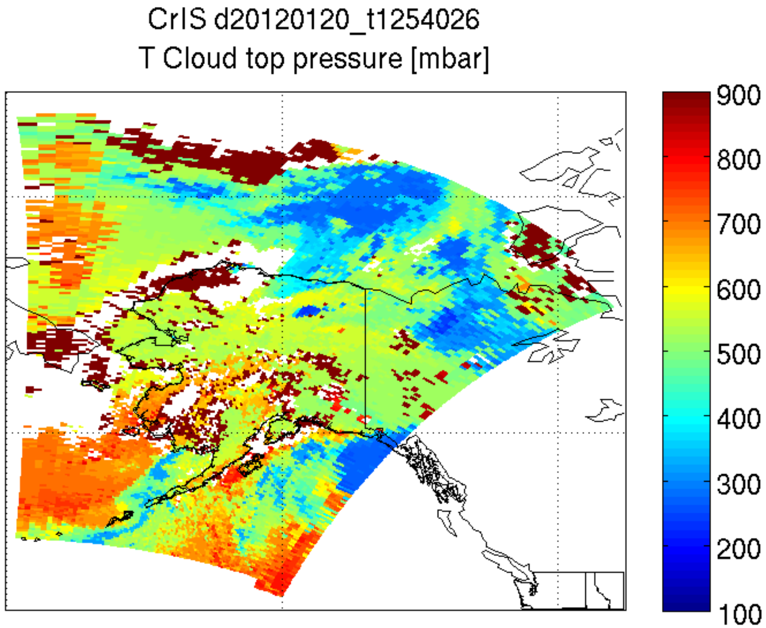


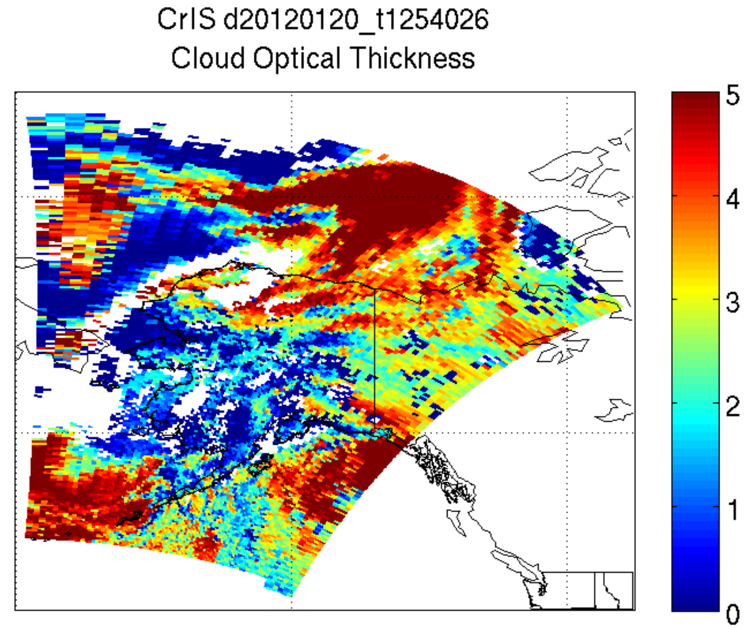




CrIS 20 Jan 2012, t1254026

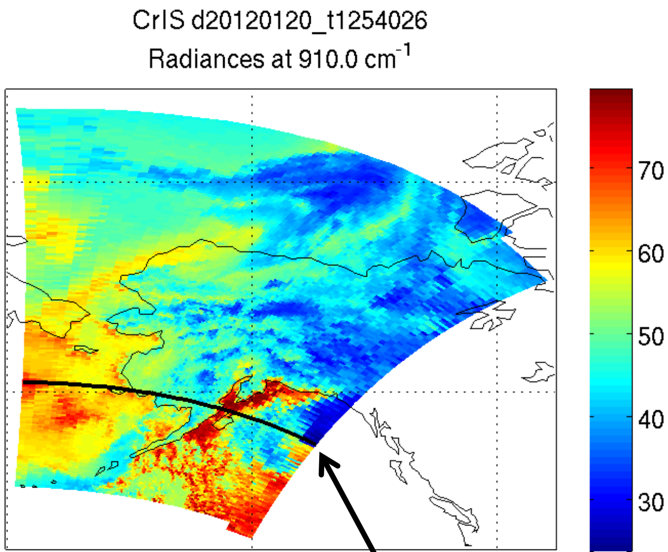
Cloud Top pressure and Cloud Optical Thickness



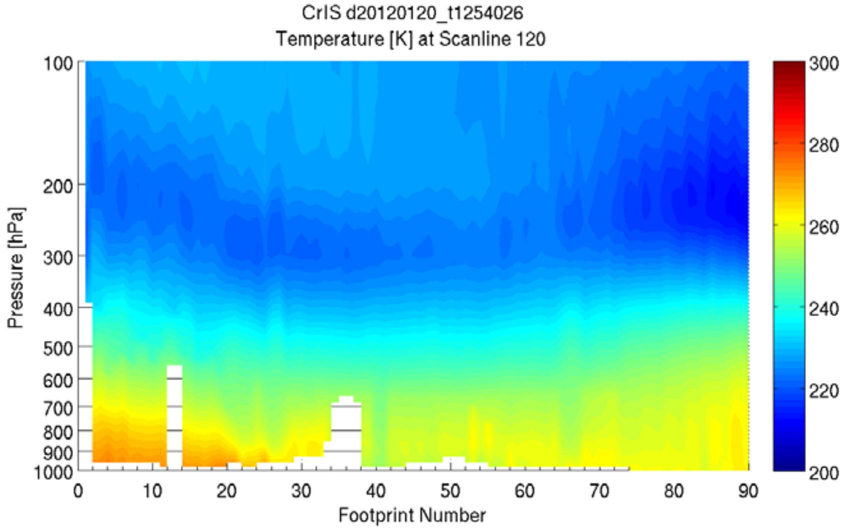


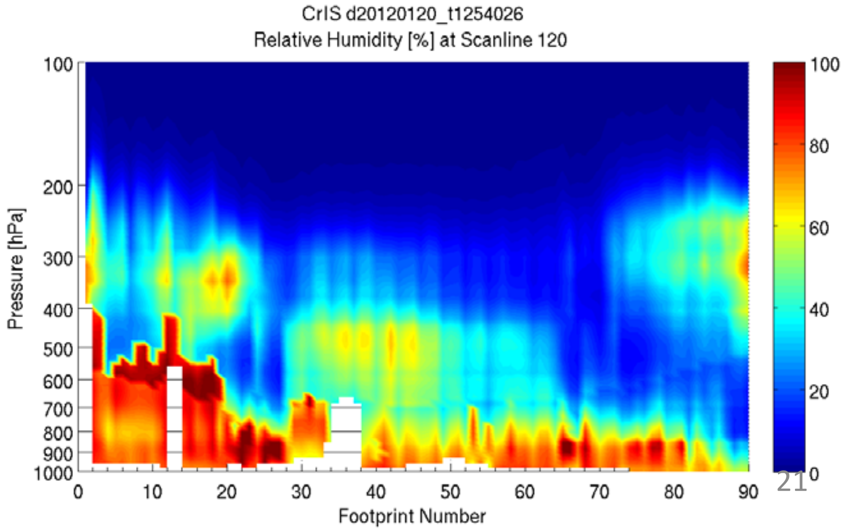
CrIS RTV for 20 Jan 2012, t1254026

Temperature and Relative Humidity Cross-sections



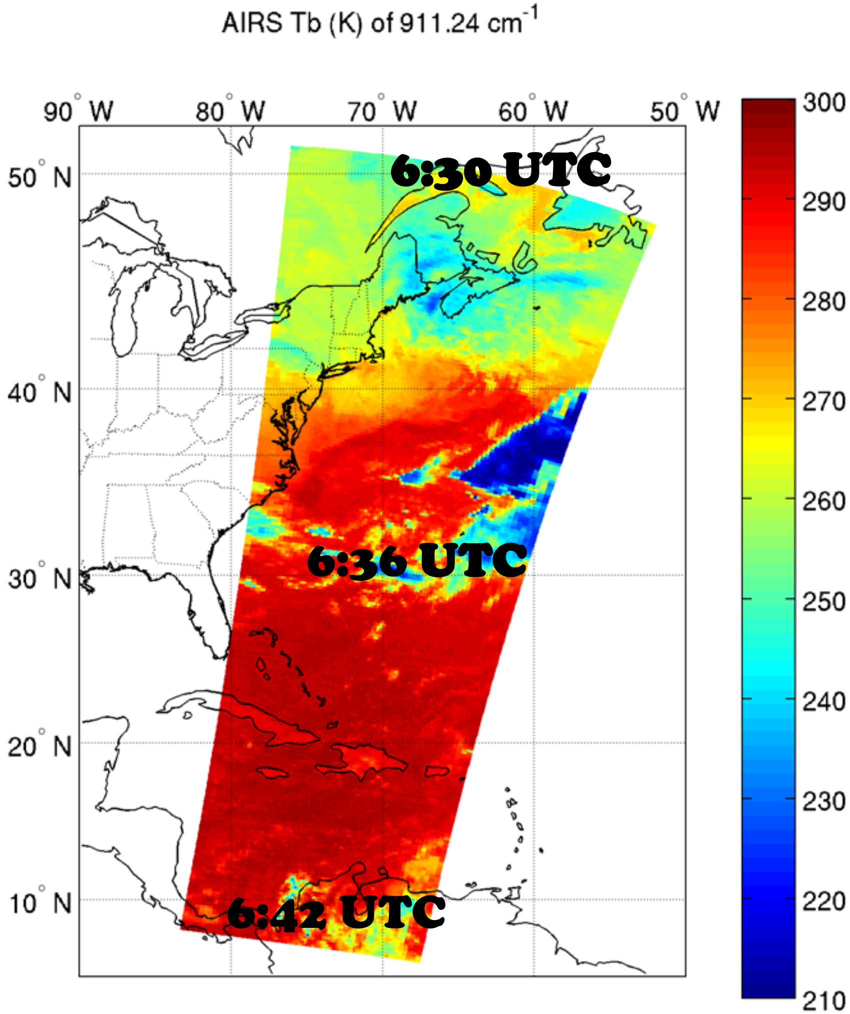
Scanline 120



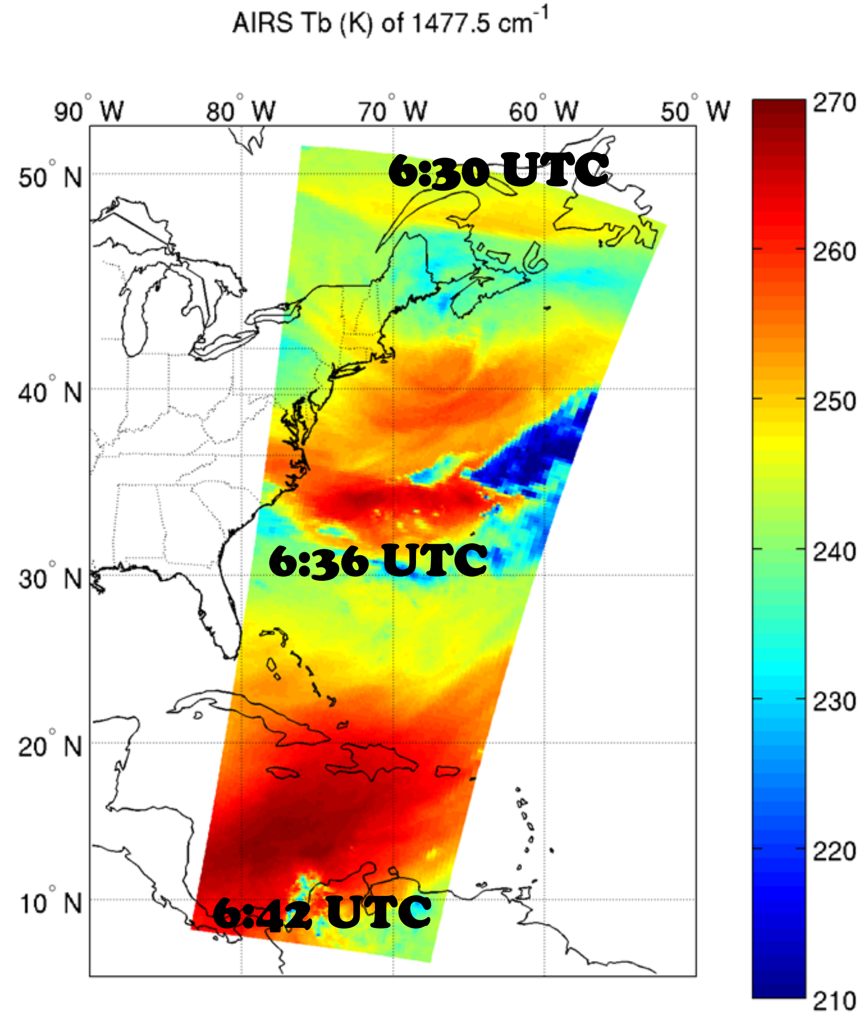


CrIS/AIRS BT Comparison

AIRS **Window** Channel Tb (K)



AIRS **Water Vapor** Channel Tb (K)

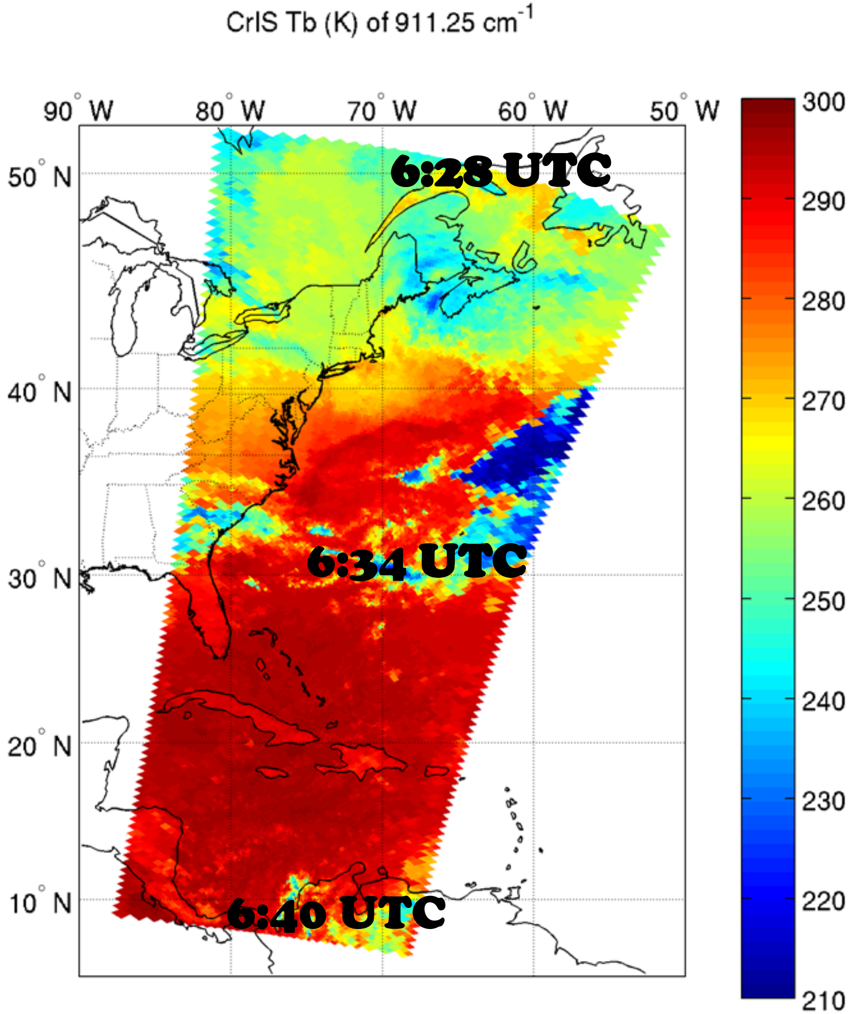


03/12/2012

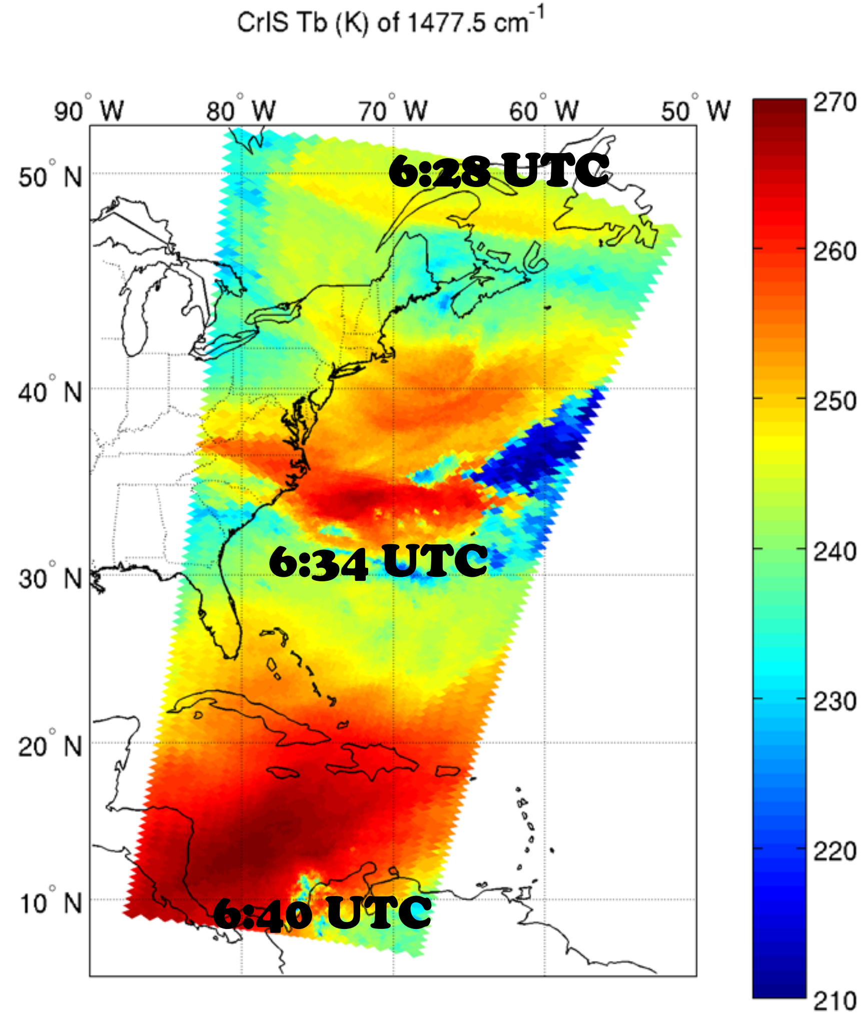
Two Granules

CrIS/AIRS BT Comparison

CrIS **Window** Channel Tb (K)

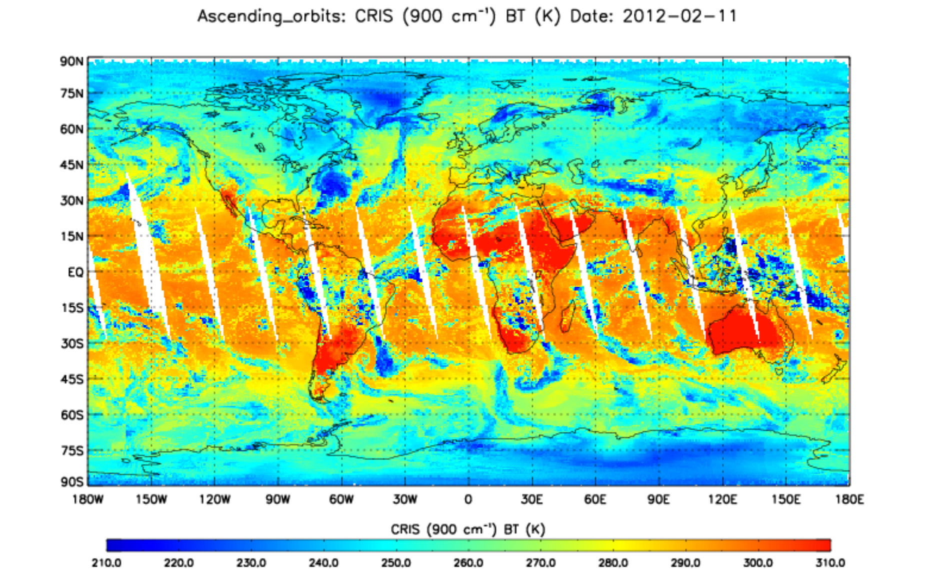


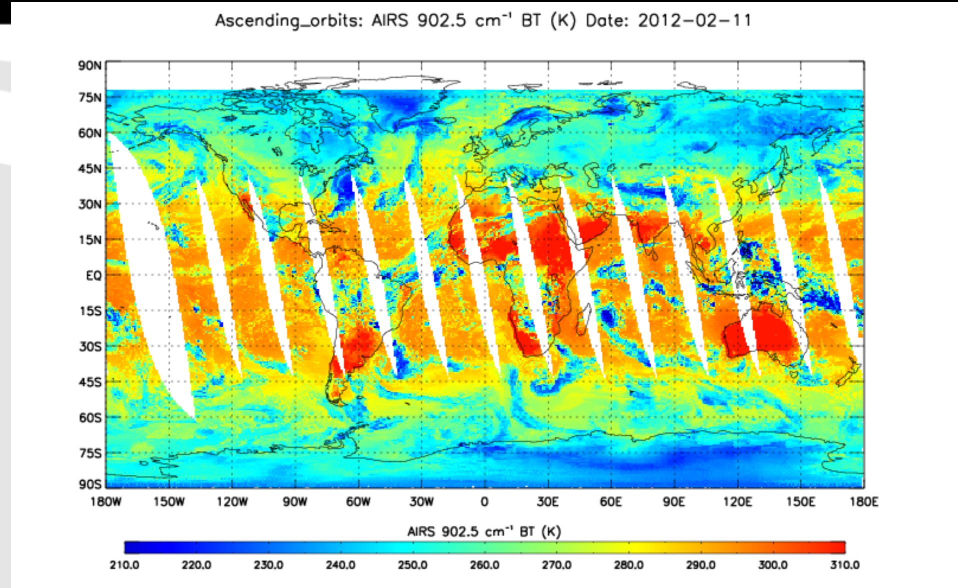
CrIS **Water Vapor** Channel Tb (K)

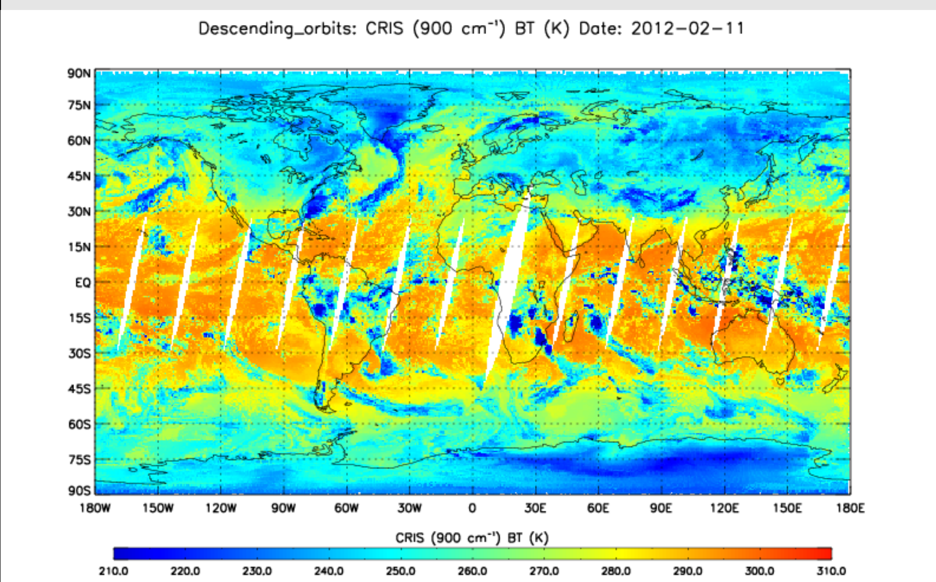


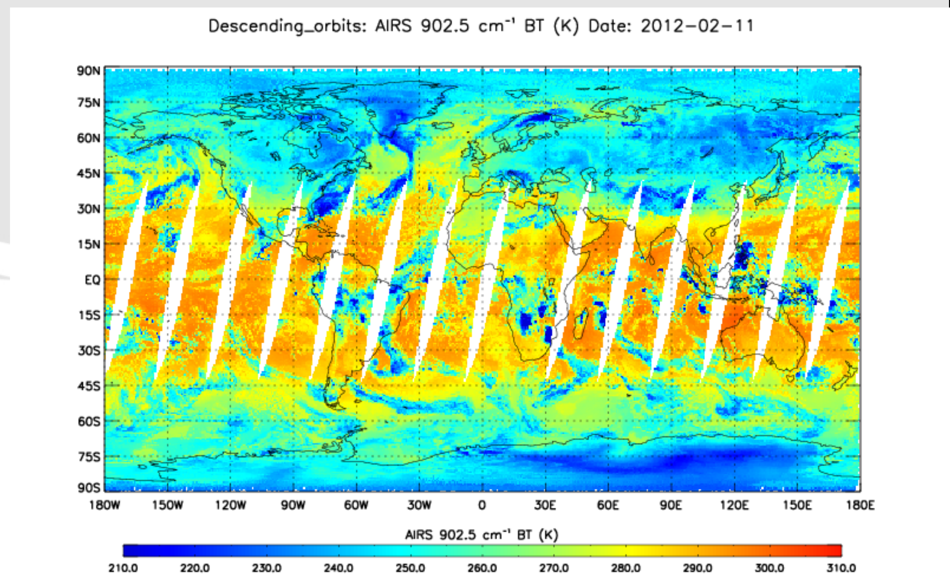
03/12/2012

Comparison of CriS and AIRS for LW Window



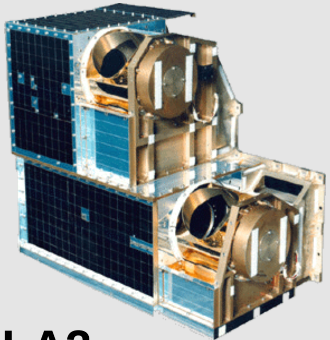






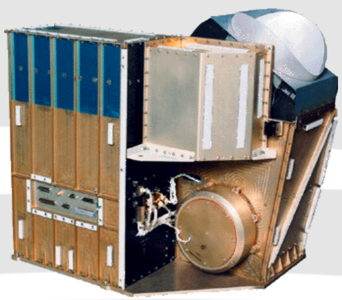
ATMS Design Challenge

AMSU-A1



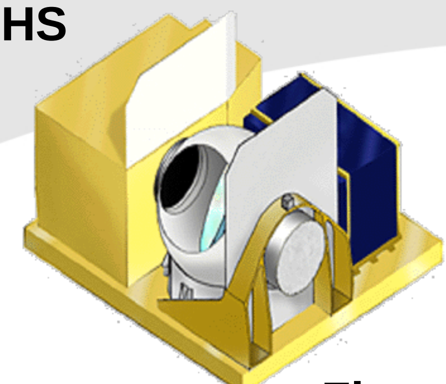
- 73x30x61 cm
- 67 W
- 54 kg
- 3-yr life

AMSU-A2



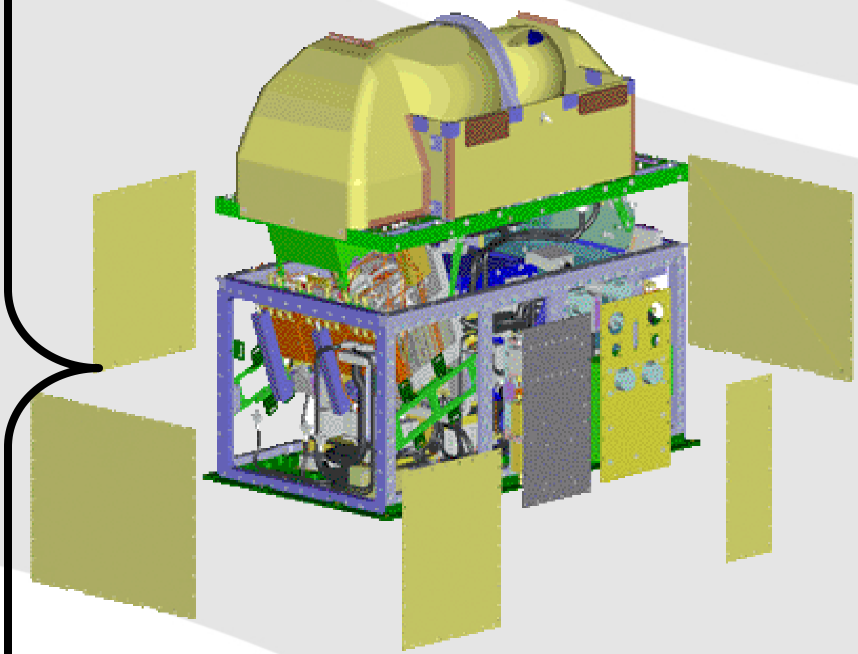
- 75x70x64 cm
- 24 W
- 50 kg
- 3-yr life

MHS



- 75x56x69 cm
- 61 W
- 50 kg
- 4-yr life

Reduce the volume by 3x



– 70x40x60 cm
– 110 W
– 85 kg
– 8 year life

Figure courtesy NGES, Azusa, CA

Spectral Differences: ATMS vs. AMSU/MHS

AMSU-A (AMSU/MHS channels 1–14)

MHS (AMSU/MHS channels 15–20)

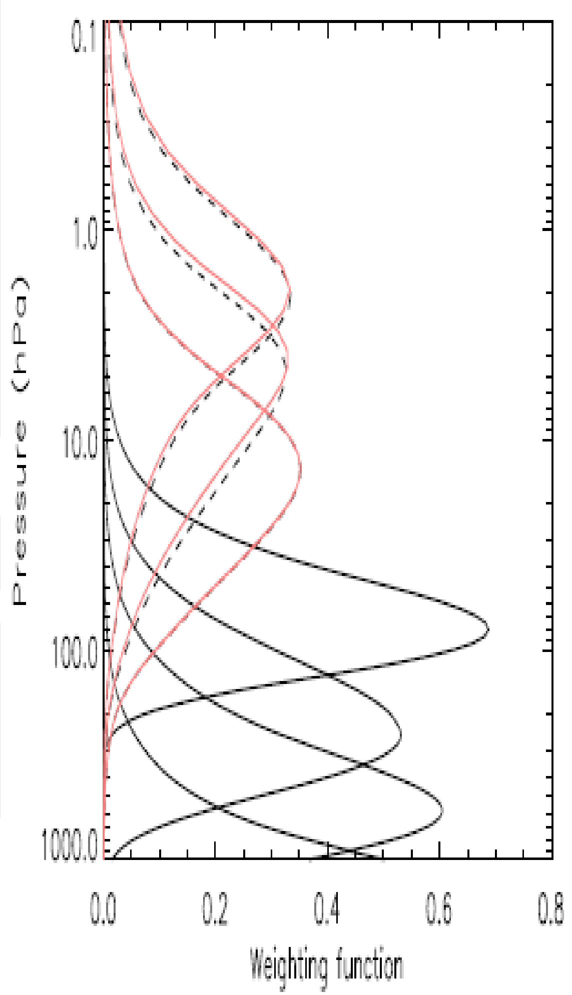
AMSU/MHS Ch	AMSU/MHS GHz	AMSU/MHS Pol	ATMS Ch	ATMS GHz	ATMS Pol
1	23.8	QV	1	23.8	QV
2	31.399	QV	2	31.4	QV
3	50.299	QV	3	50.3	QH
			4	51.76	QH
4	52.8	QV	5	52.8	QH
5	53.595 ± 0.115	QH	6	53.596 ± 0.115	QH
6	54.4	QH	7	54.4	QH
7	54.94	QV	8	54.94	QH
8	55.5	QH	9	55.5	QH
9	fo = 57.29	QH	10	fo = 57.29	QH
10	fo ± 0.217	QH	11	fo±0.3222±0.217	QH
11	fo±0.3222±0.048	QH	12	fo± 0.3222±0.048	QH
12	fo ±0.3222±0.022	QH	13	fo±0.3222±0.022	QH
13	fo± 0.3222±0.010	QH	14	fo±0.3222 ±0.010	QH
14	fo±0.3222±0.004 5	QH	15	fo± 0.3222±0.0045	QH
15	89.0	QV			
16	89.0	QV	16	88.2	QV
17	157.0	QV	17	165.5	QH
18	183.31 ± 1	QH	18	183.31 ± 7	QH
19	183.31 ± 3	QH	19	183.31 ± 4.5	QH
20	191.31	QV	20	183.31 ± 3	QH
			21	183.31 ± 1.8	QH
			22	183.31 ± 1	QH

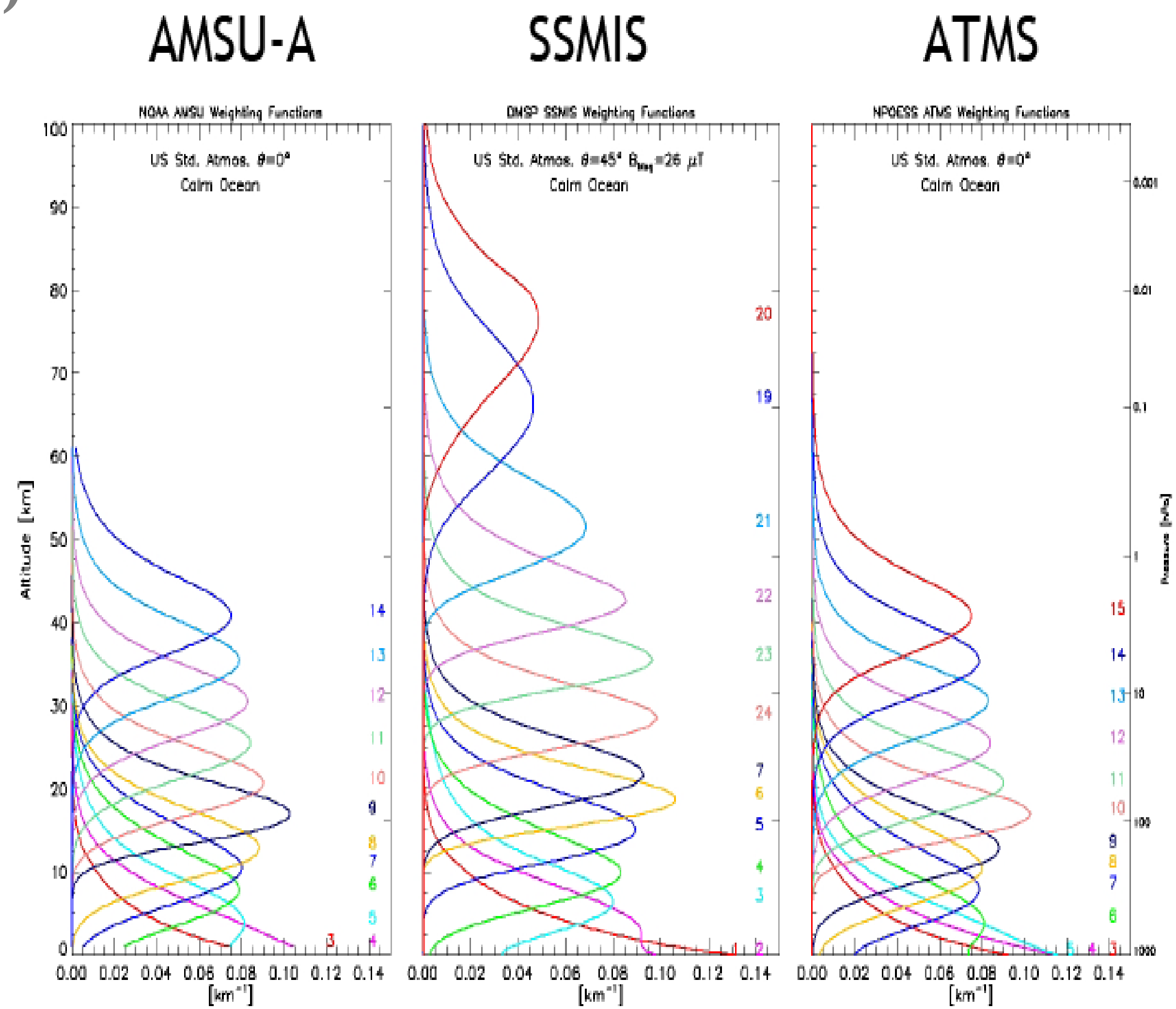
- **ATMS has 22 channels and AMSU/MHS have 20, with polarization differences between some channels**
  - **QV = Quasi-vertical; polarization vector is parallel to the scan plane at nadir**
  - **QH = Quasi-horizontal; polarization vector is perpendicular to the scan plane at nadir**

Legend:
- Green: Exact match to AMSU/MHS
- Yellow: Only Polarization different
- Orange: Unique Passband
- Red: Unique Passband, and Pol. different from closest AMSU/MHS channels

Microwave Temperature Sounding Vertical Resolution

MSU+SSU (1978-2007)





Spatial Differences: ATMS vs. AMSU/MHS

Beamwidth (degrees)

	ATMS	AMSU/MHS
23/31 GHz	5.2	3.3
50-60 GHz	2.2	3.3
89-GHz	2.2	1.1
160-183 GHz	1.1	1.1

Spatial sampling

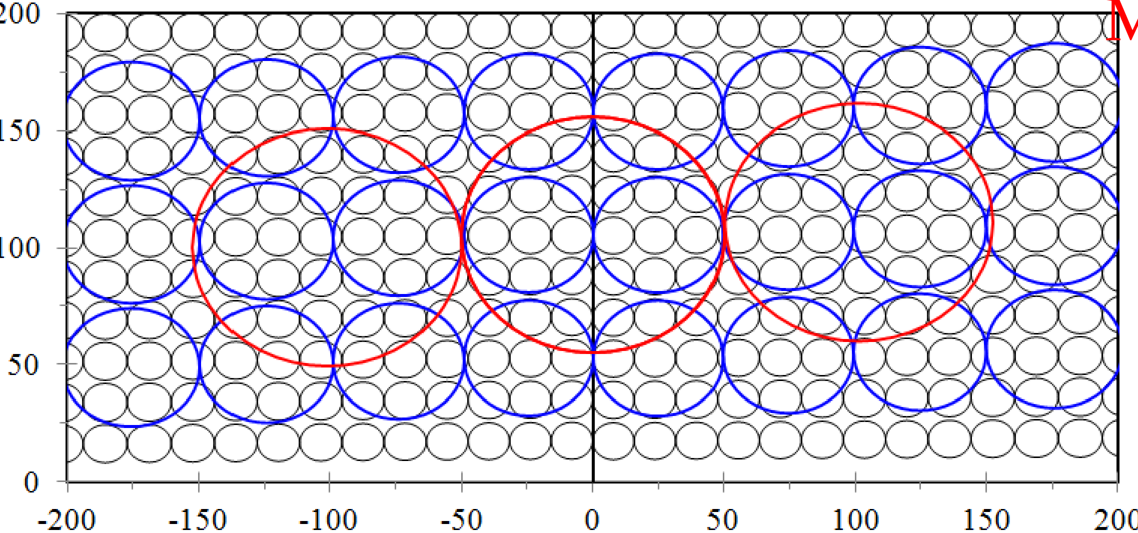
	ATMS	AMSU/MHS
23/31 GHz	1.11	3.33
50-60 GHz	1.11	3.33
89-GHz	1.11	1.11
160-183 GHz	1.11	1.11
Swath (km)	~2600	~2200

ATMS scan period: 8/3 sec; AMSU-A scan period: 8 sec
ATMS measures 96 footprints per scan (30/90 for AMSU-A/B)

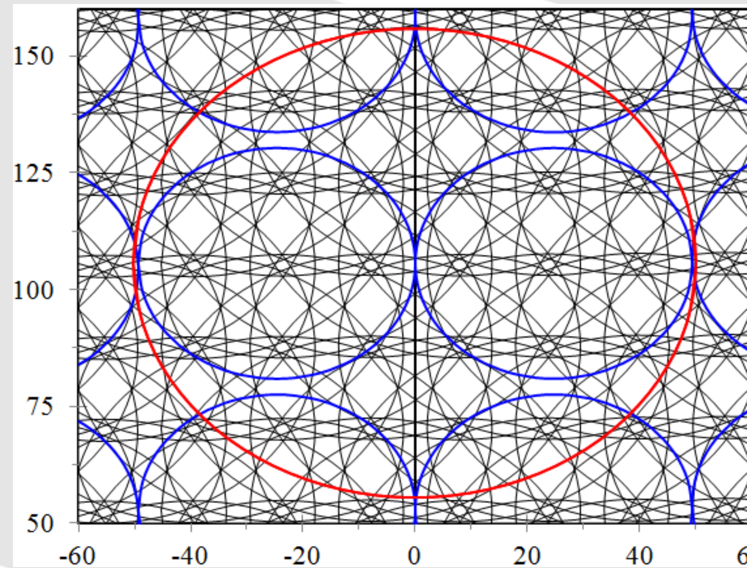
NOAA, NPP and FY-3 MW Sounder FOV

ATMS AMSU-A
MWTS

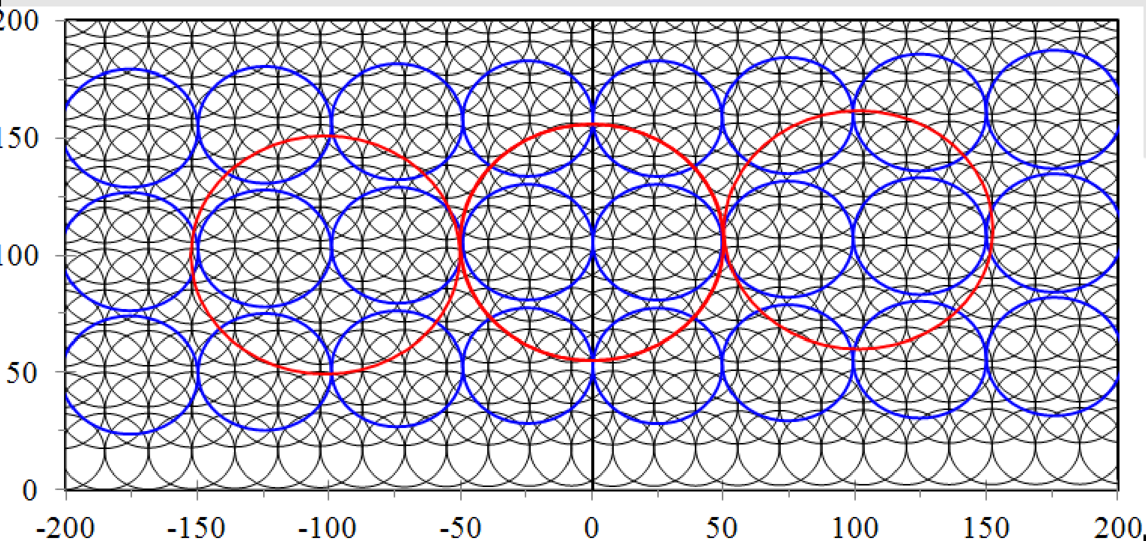
ATMS beam width 1.1°



ATMS beam width 5.2°



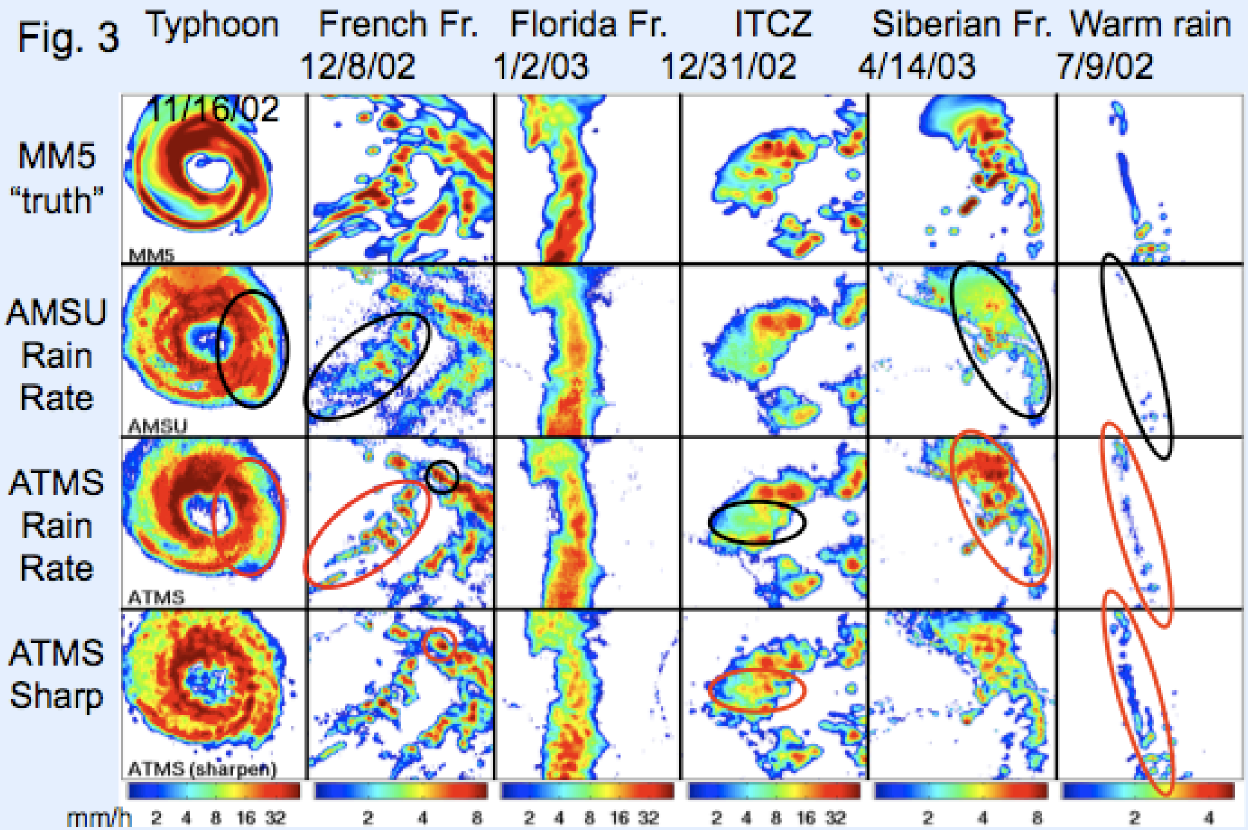
ATMS beam width 2.2°



ATMS Storm Mapping: Improvements Relative to AMSU

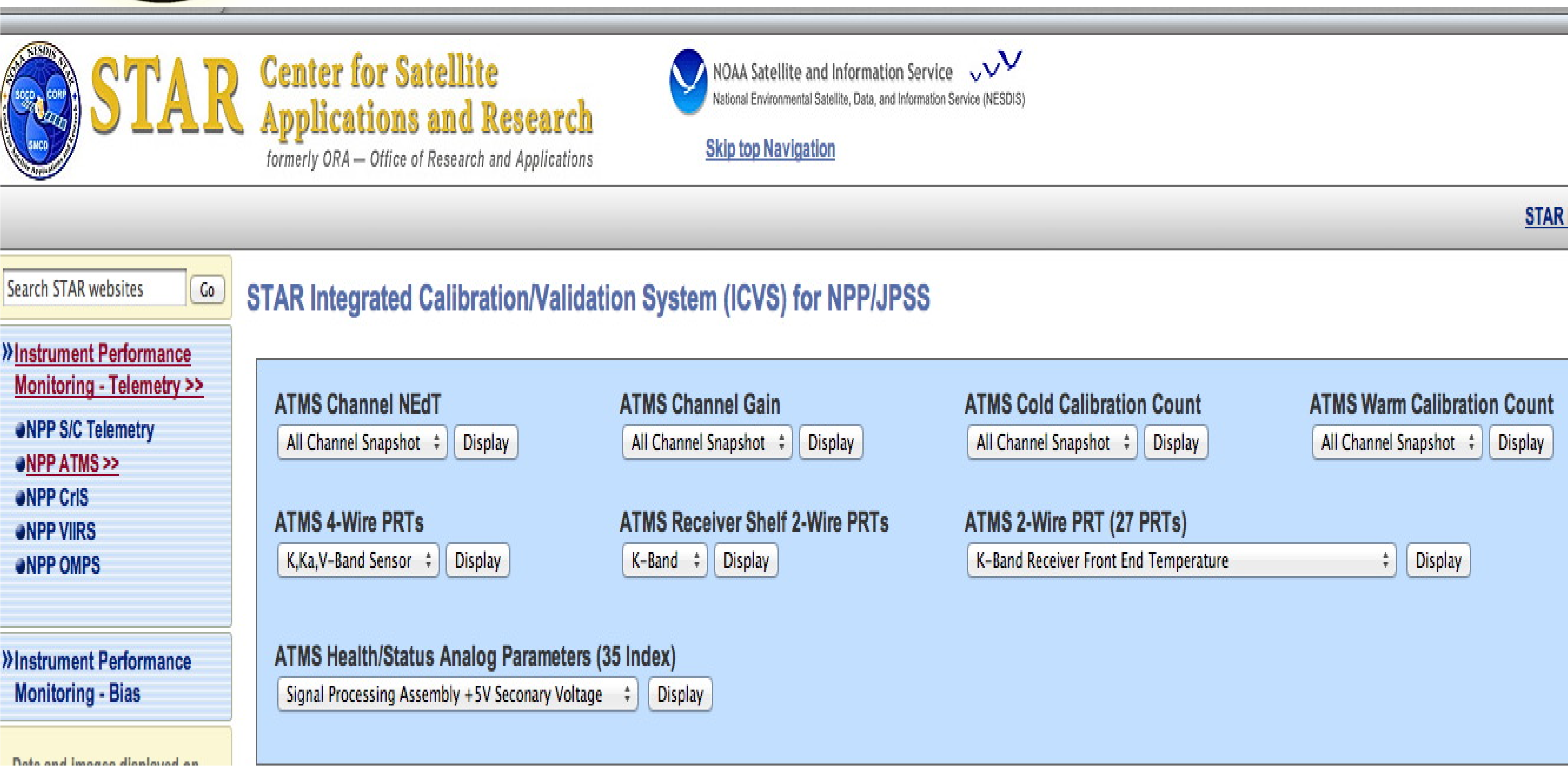
Black and red circles highlight “before” and “after” differences between AMSU and ATMS, and between ATMS and ATMS-sharpened, for six simulated storms validated with AMSU. Note the better definition of strong convective cells with ATMS due to its 33-km resolution and Nyquist sampling, and the better recovery of the warm rain with sharpening

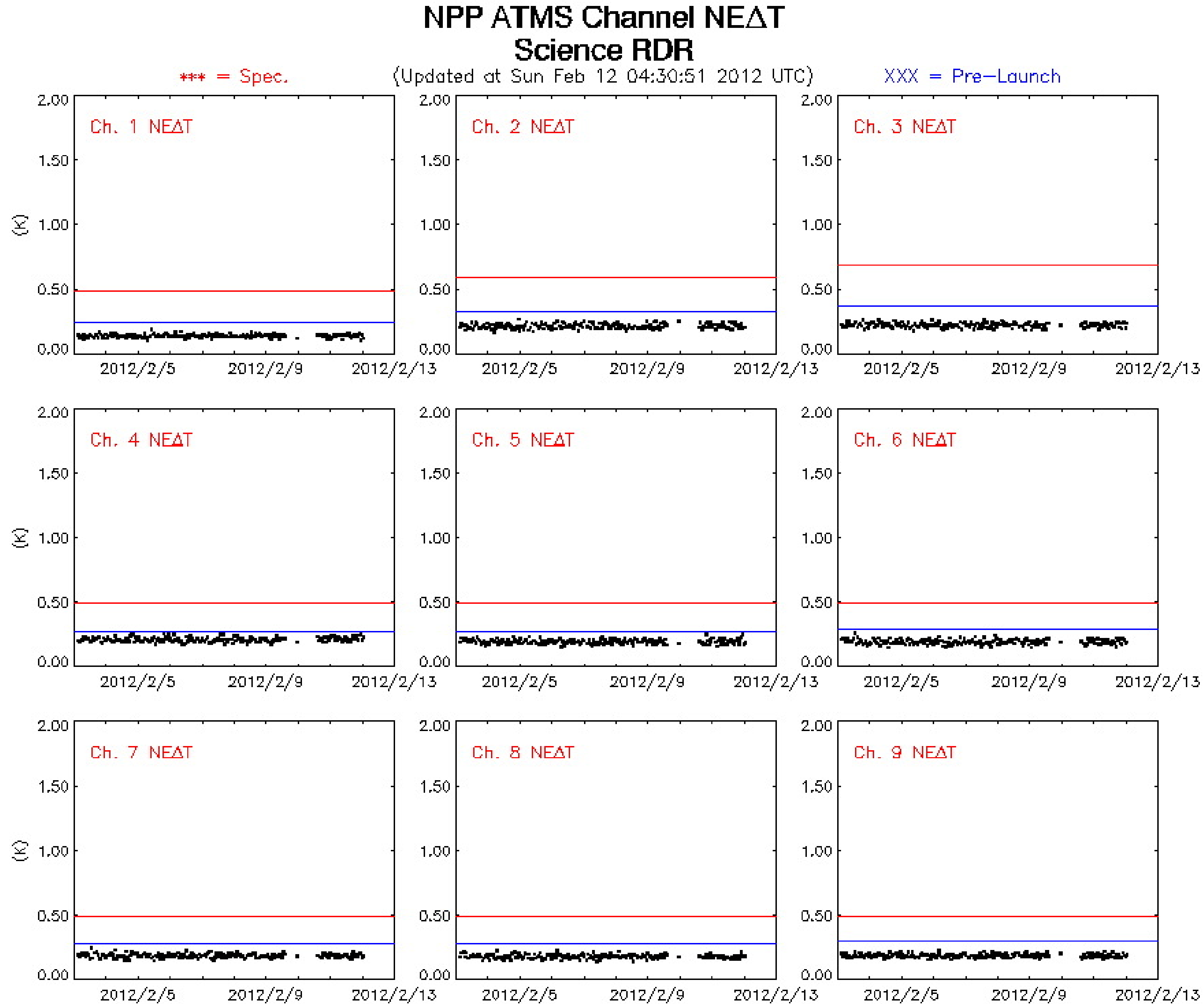
Fig. 3



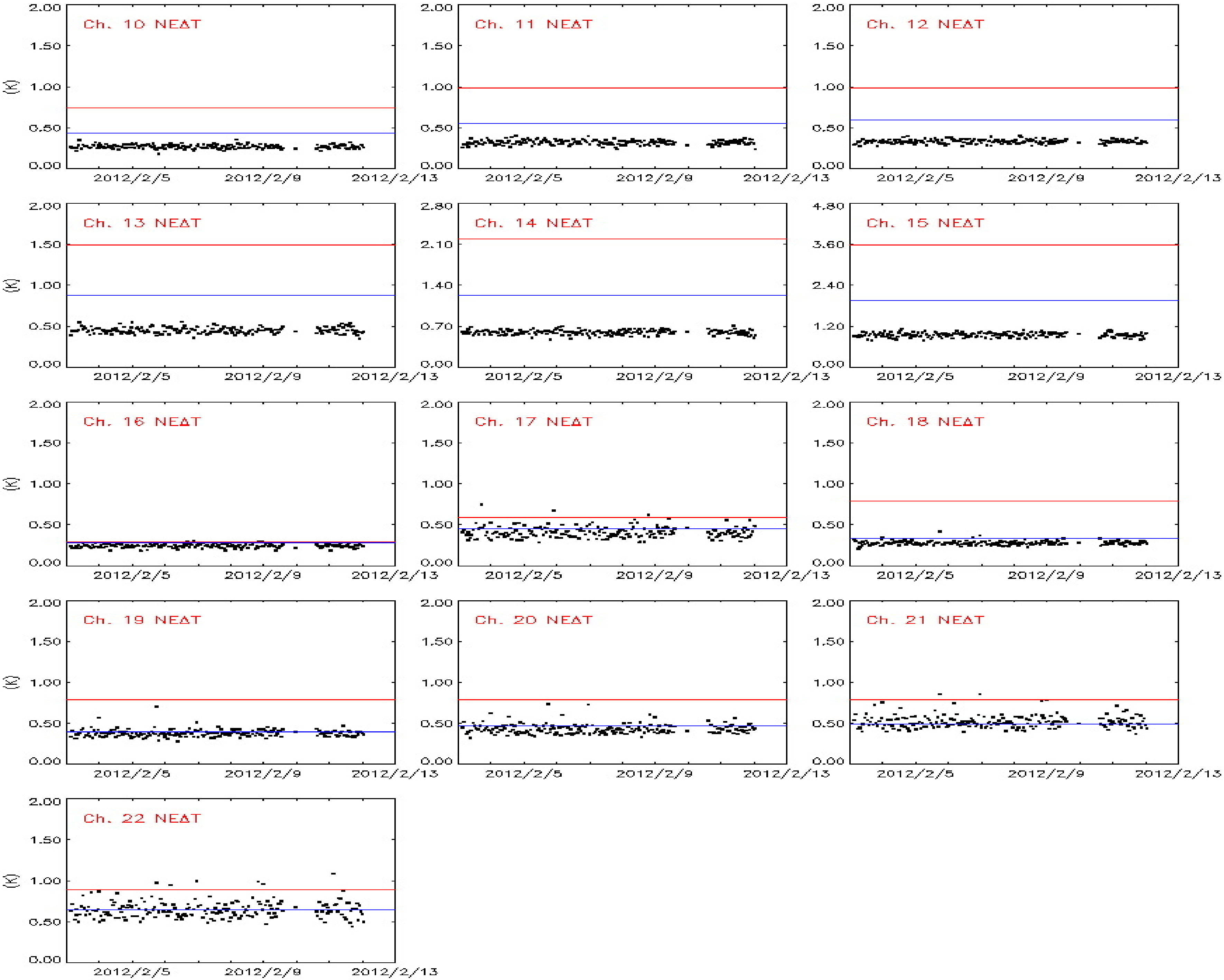
Source: Surussavadee and Staelin, NASA PMM Presentation, 7/08

STAR ICVS Website

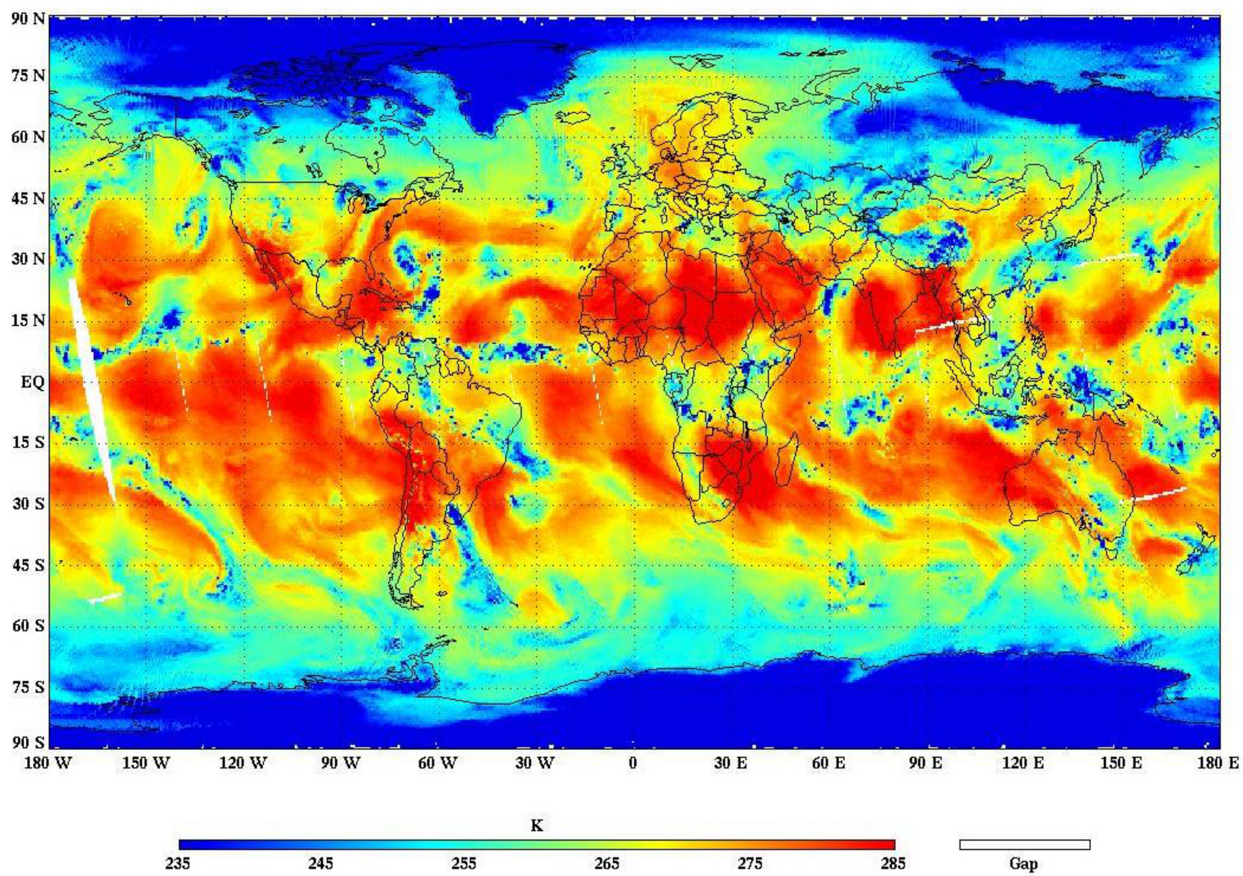




NPP ATMS Channel NEΔT
Science RDR
*** = Spec.
(Updated at Sun Feb 12 04:30:51 2012 UTC)
XXX = Pre-Launch
Ch. 1 NEΔT
Ch. 2 NEΔT
Ch. 3 NEΔT
Ch. 4 NEΔT
Ch. 5 NEΔT
Ch. 6 NEΔT
Ch. 7 NEΔT
Ch. 8 NEΔT
Ch. 9 NEΔT
(K)
2.00
1.50
1.00
0.50
0.00
2012/2/5
2012/2/9
2012/2/13


Ch. 10 NEΔT
Ch. 11 NEΔT
Ch. 12 NEΔT
Ch. 13 NEΔT
Ch. 14 NEΔT
Ch. 15 NEΔT
Ch. 16 NEΔT
Ch. 17 NEΔT
Ch. 18 NEΔT
Ch. 19 NEΔT
Ch. 20 NEΔT
Ch. 21 NEΔT
Ch. 22 NEΔT
(K)
0.00
0.50
1.00
1.50
2.00
0.70
1.40
2.10
2.80
1.20
2.40
3.60
4.80
2012/2/5
2012/2/9
2012/2/13

First global ATMS image showing the channel 18- microwave antenna temperature at 183.3 GHz on November 8, 2011



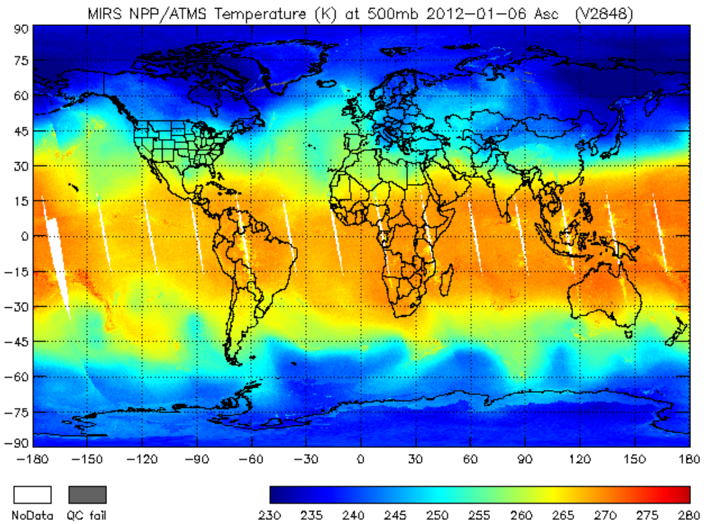
The ATMS data were processed at the NOAA Satellite Operations Facility (NSOF) in Suitland, MD and the image was generated by STAR

Quality of the image is superb, no indication of instrument artifacts, and by design no orbital gaps

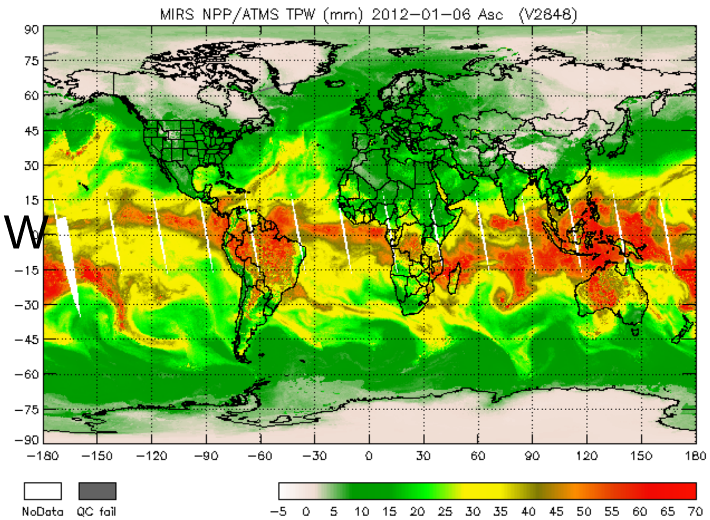
This channel measures atmospheric water vapor; note that Tropical Storm Sean is visible in the data, as the blue patch due to heavy precipitation, in the Atlantic off the coast of the Southeastern United States. *ATMS provides critical water vapor information for weather forecasting and storm intensity assessments*

NOAA ATMS MIRS Products

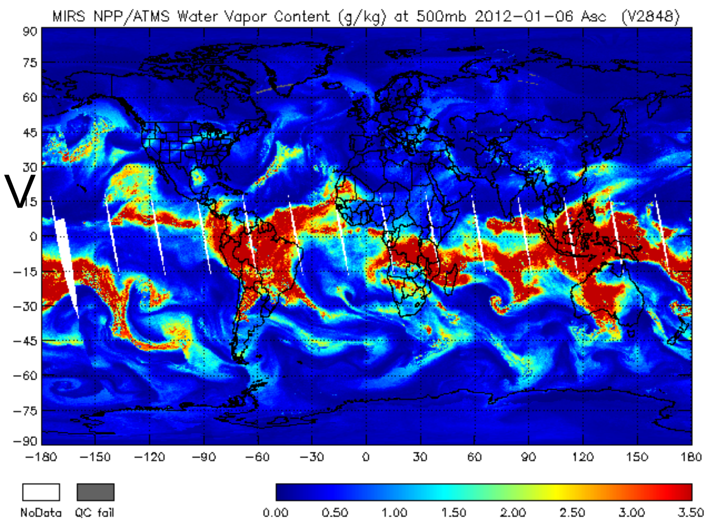
T



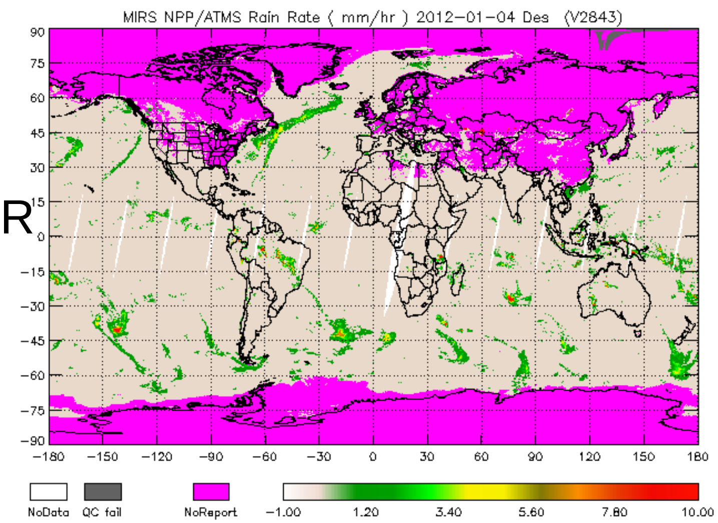
TPW



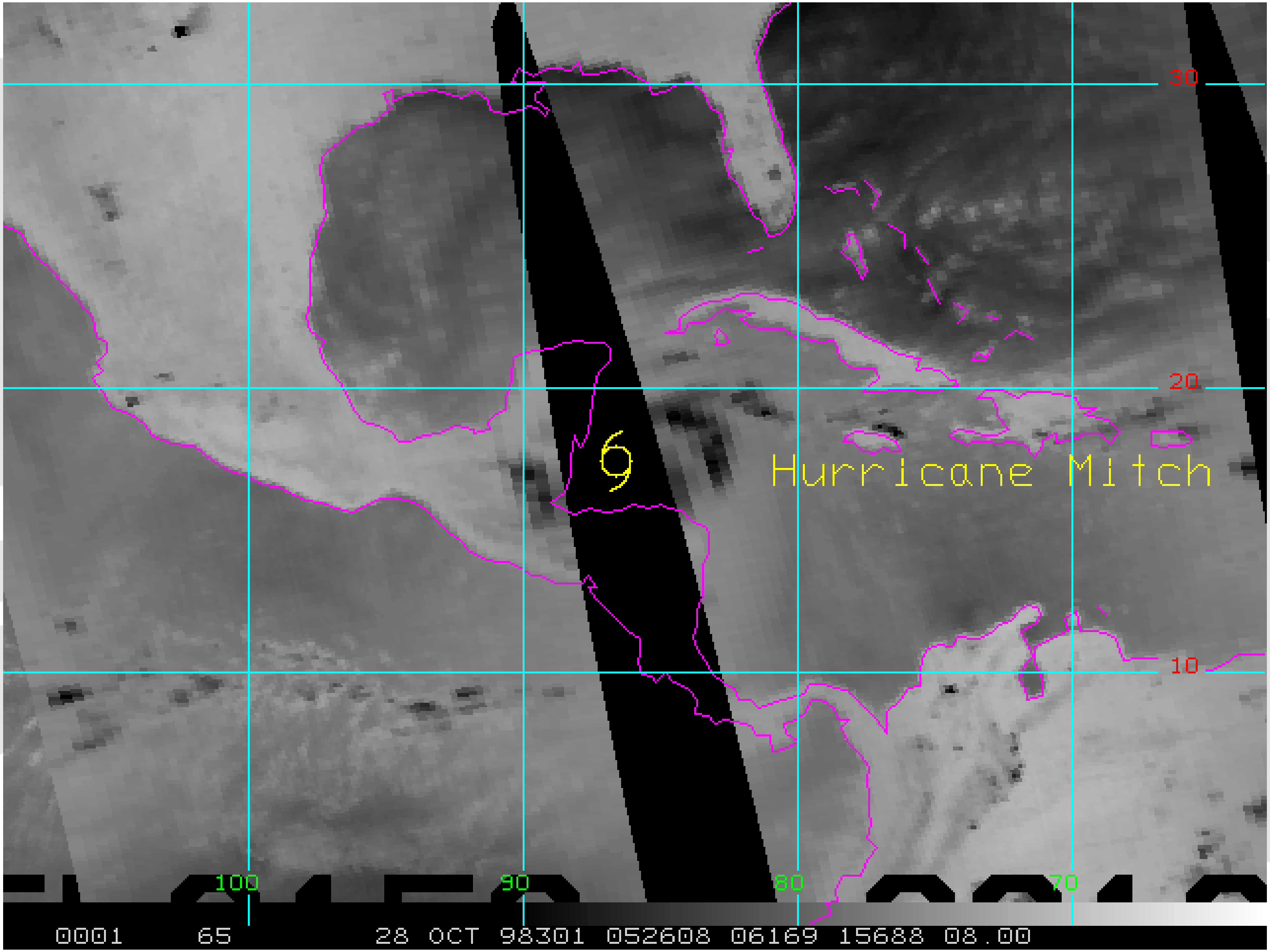
WV



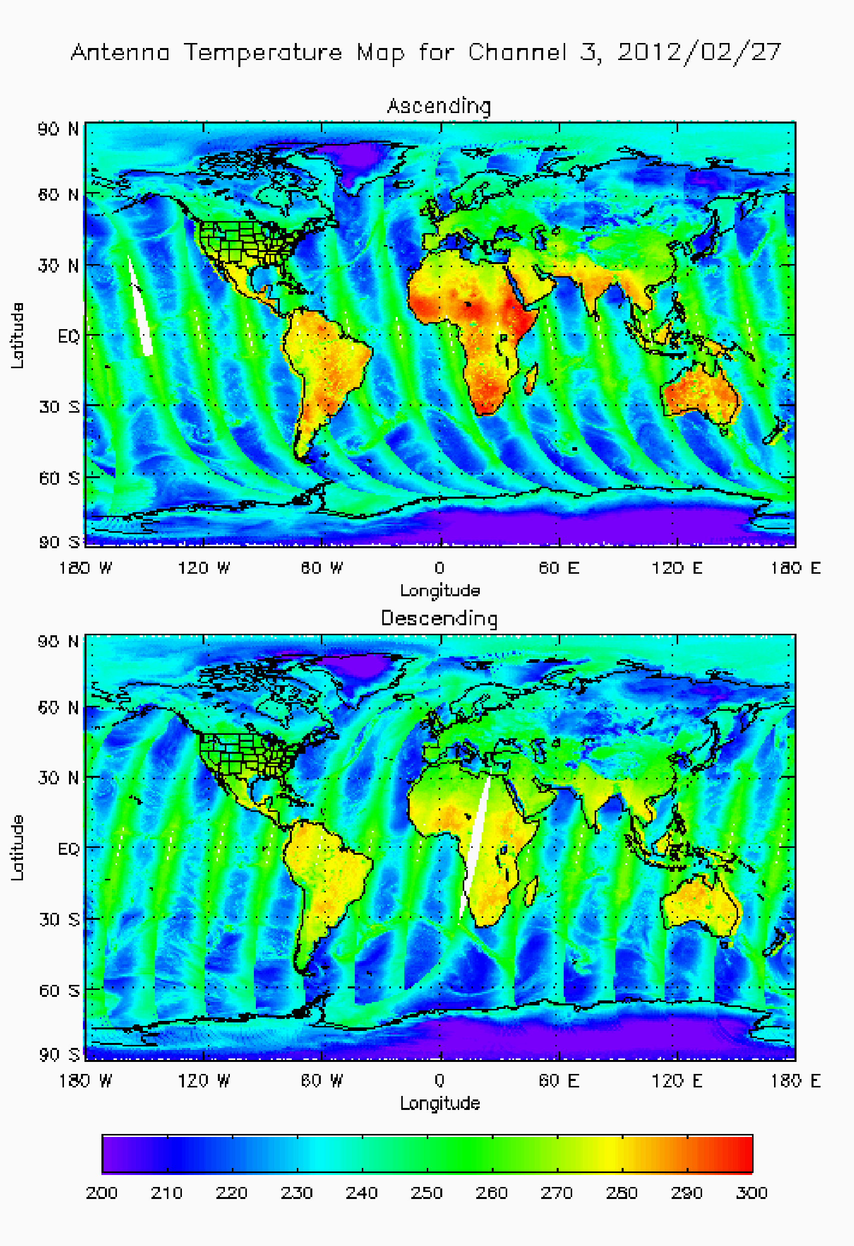
RR

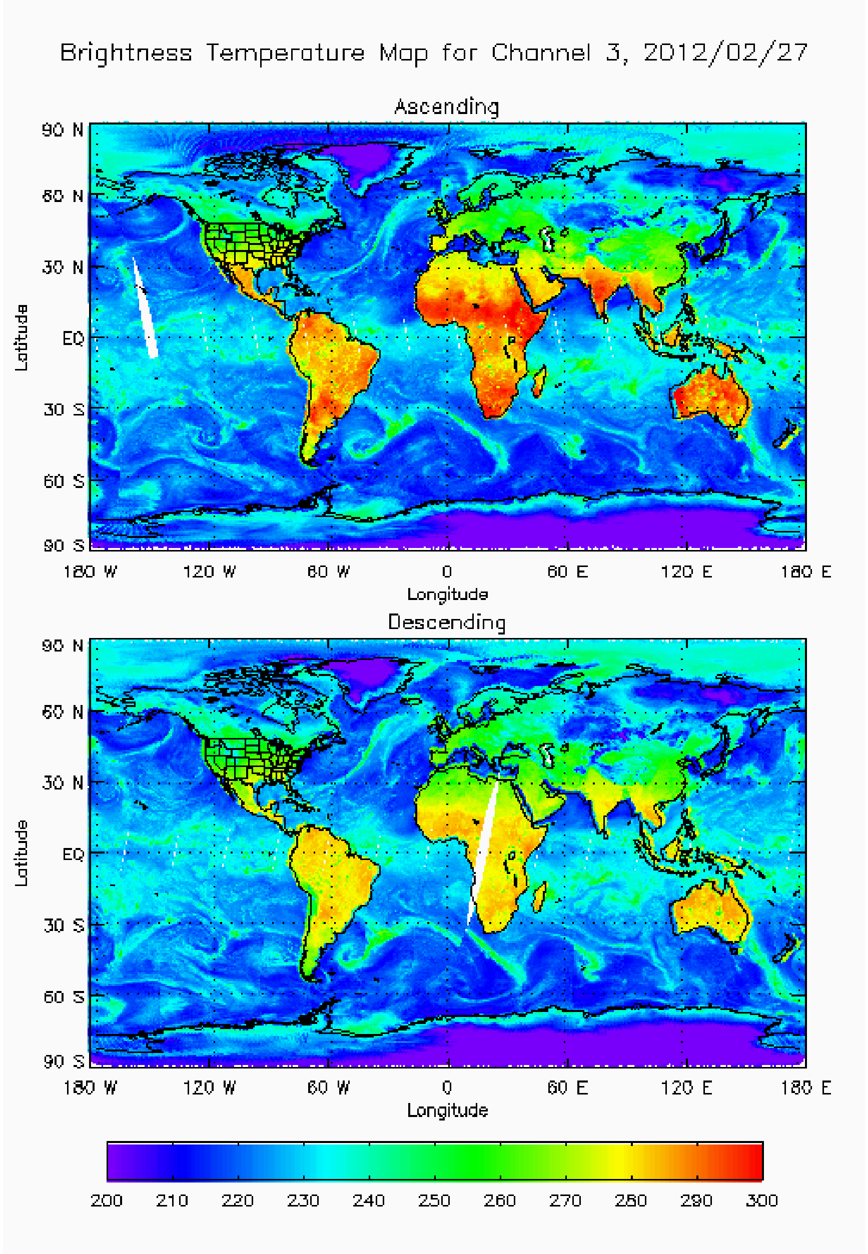


ATMS has better spatial resolution and no gaps



LIMB ADJUSTMENT - TRANSFORMING A CROSS TRACK SENSOR TO AN IMAGER





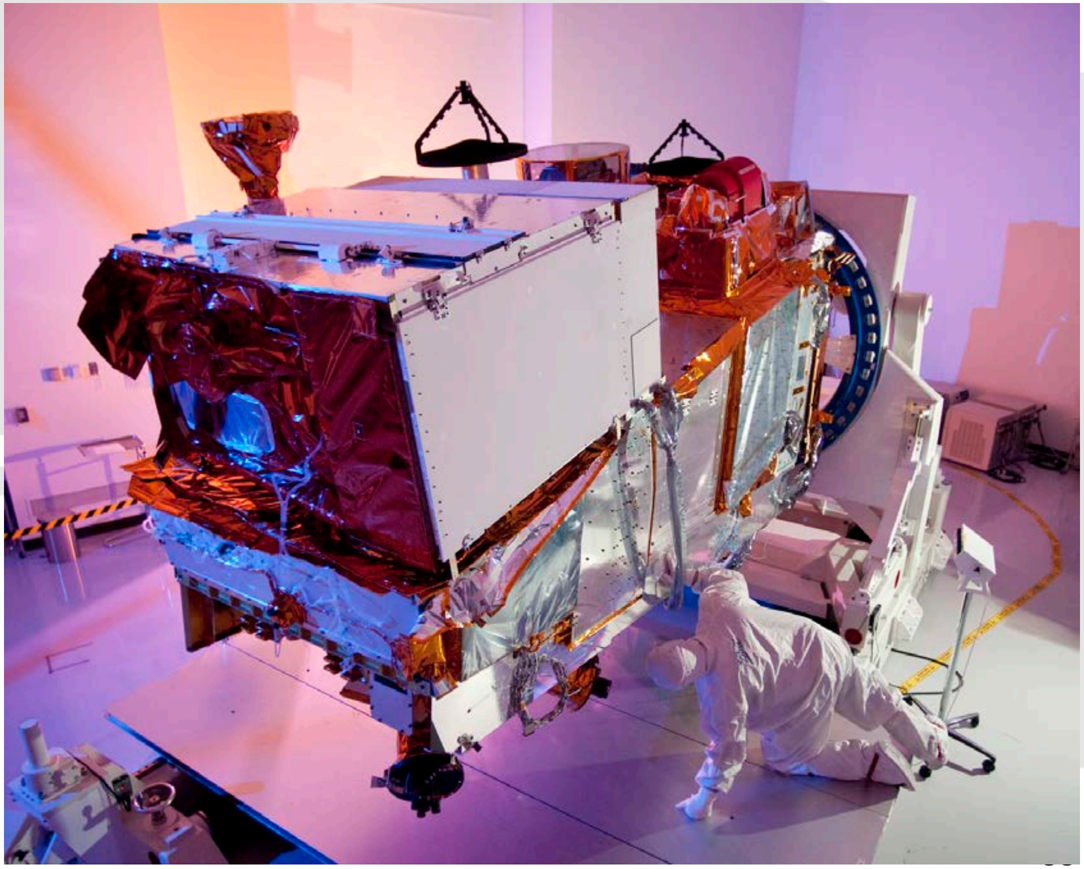
Visible Infrared Imaging Radiometer Suite
Raytheon SAS El Segundo, Ca

Description

- **Purpose:** Global observations of land, ocean, & atmosphere parameters at high temporal resolution (~ daily)
- **Predecessor Instruments:** AVHRR, OLS, MODIS, SeaWiFS
- **Approach:** Multi-spectral scanning radiometer (22 bands between 0.4 µm and 12 µm) 12-bit quantization
- **Swath width:** 3000 km

Spatial Resolution

- 16 bands at 750m
- 5 bands at 325m
- DNB



VIIRS on NPP

VIIRS Prelaunch Performance

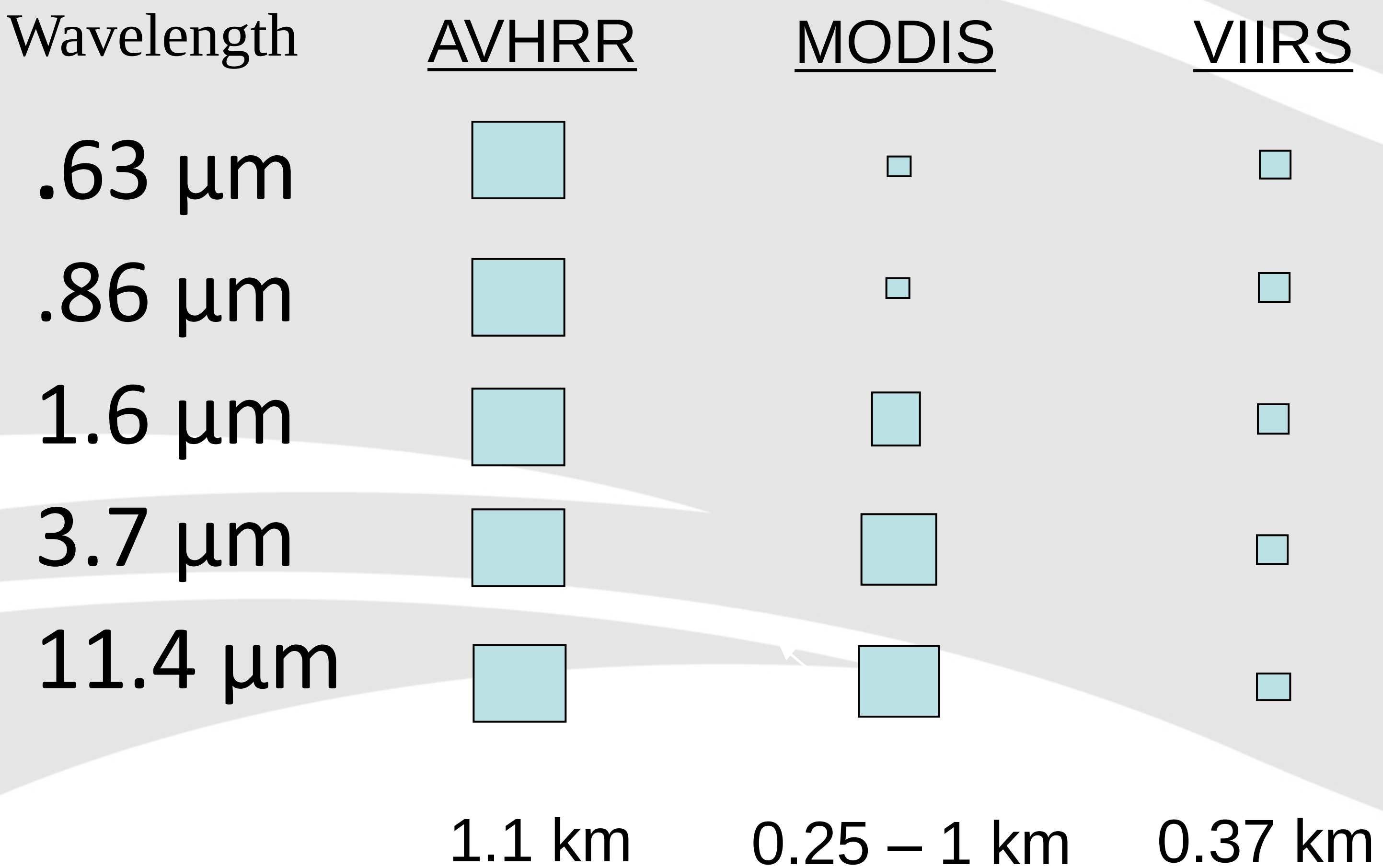
(NPP F1 Bands and SNR/NEDT)

					Specification							
		Band No.	Driving EDR(s)	Spectral Range (um)	Horiz Sample Interval (km) (track x Scan) Nadir	End of Scan	Band Gain	Ltyp or Ttyp (Spec)	Lmax or Tmax	SNR or NEdT (K)	Measured SNR or NEdT (K)	SNR Margin (%)
Reflective Bands	VisNIR	M1	Ocean Color Aerosol	0.402 - 0.422	0.742 x 0.259	1.60 x 1.58	High Low	44.9 155	135 615	352 316	723 1327	105% 320%
Reflective Bands	VisNIR	M2	Ocean Color Aerosol	0.436 - 0.454	0.742 x 0.259	1.60 x 1.58	High Low	40 146	127 687	380 409	576 1076	51.5% 163%
Reflective Bands	VisNIR	M3	Ocean Color Aerosol	0.478 - 0.498	0.742 x 0.259	1.60 x 1.58	High Low	32 123	107 702	416 414	658 1055	58.2% 155%
Reflective Bands	VisNIR	M4	Ocean Color Aerosol	0.545 - 0.565	0.742 x 0.259	1.60 x 1.58	High Low	21 90	78 667	362 315	558 882	54.1% 180%
Reflective Bands	VisNIR	I1	Imagery EDR	0.600 - 0.680	0.371 x 0.387	0.80 x 0.789	Single	22	718	119	265	122.7%
Reflective Bands	VisNIR	M5	Ocean Color Aerosol	0.662 - 0.682	0.742 x 0.259	1.60 x 1.58	High Low	10 68	59 651	242 360	360 847	49% 135%
Reflective Bands	VisNIR	M6	Atmosph. Correct.	0.739 - 0.754	0.742 x 0.776	1.60 x 1.58	Single	9.6	41	199	394	98.0%
Reflective Bands	VisNIR	I2	NDVI	0.846 - 0.885	0.371 x 0.387	0.80 x 0.789	Single	25	349	150	299	99.3%
Reflective Bands	VisNIR	M7	Ocean Color Aerosol	0.846 - 0.885	0.742 x 0.259	1.60 x 1.58	High Low	6.4 33.4	29 349	215 340	545 899	154% 164%
Reflective Bands	S/MWIR	M8	Cloud Particle Size	1.230 - 1.250	0.742 x 0.776	1.60 x 1.58	Single	5.4	165	74	349	371.6%
Reflective Bands	S/MWIR	M9	Cirrius/Cloud Cover	1.371 - 1.386	0.742 x 0.776	1.60 x 1.58	Single	6	77.1	83	247	197.6%
Reflective Bands	S/MWIR	I3	Binary Snow Map	1.580 - 1.640	0.371 x 0.387	0.80 x 0.789	Single	7.3	72.5	6	165	2650.0%
Reflective Bands	S/MWIR	M10	Snow Fraction	1.580 - 1.640	0.742 x 0.776	1.60 x 1.58	Single	7.3	71.2	342	695	103.2%
Reflective Bands	S/MWIR	M11	Clouds	2.225 - 2.275	0.742 x 0.776	1.60 x 1.58	Single	0.12	31.8	10	18	80.0%
Emissive Bands	S/MWIR	I4	Imagery Clouds	3.550 - 3.930	0.371 x 0.387	0.80 x 0.789	Single	270	353	2.5	0.4	84.0%
Emissive Bands	S/MWIR	M12	SST	3.660 - 3.840	0.742 x 0.776	1.60 x 1.58	Single	270	353	0.396	0.12	69.7%
Emissive Bands	S/MWIR	M13	SST Fires	3.973 - 4.128	0.742 x 0.259	1.60 x 1.58	High Low	300 380	343 634	0.107 0.423	0.044 --	59% --
Emissive Bands	LWIR	M14	Cloud Top Properties	8.400 - 8.700	0.742 x 0.776	1.60 x 1.58	Single	270	336	0.091	0.054	40.7%
Emissive Bands	LWIR	M15	SST	10.263 - 11.263	0.742 x 0.776	1.60 x 1.58	Single	300	343	0.07	0.028	60.0%
Emissive Bands	LWIR	I5	Cloud Imagery	10.500 - 12.400	0.371 x 0.387	0.80 x 0.789	Single	210	340	1.5	0.41	72.7%
Emissive Bands	LWIR	M16	SST	11.538 - 12.488	0.742 x 0.776	1.60 x 1.58	Single	300	340	0.072	0.036	50.0%

HSI uses 3 in-scan pixels aggregation at Nadir

Courtesy of H. Oudrari

Comparison of “Imagery” Bands at Nadir



VIIRS has a very large cross track and near constant spatial resolution

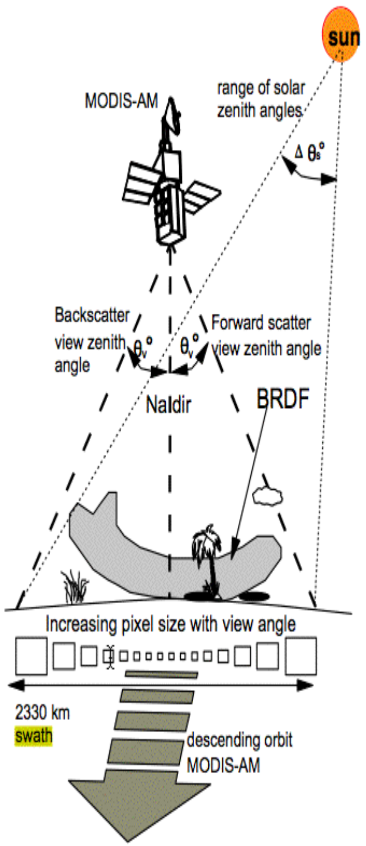
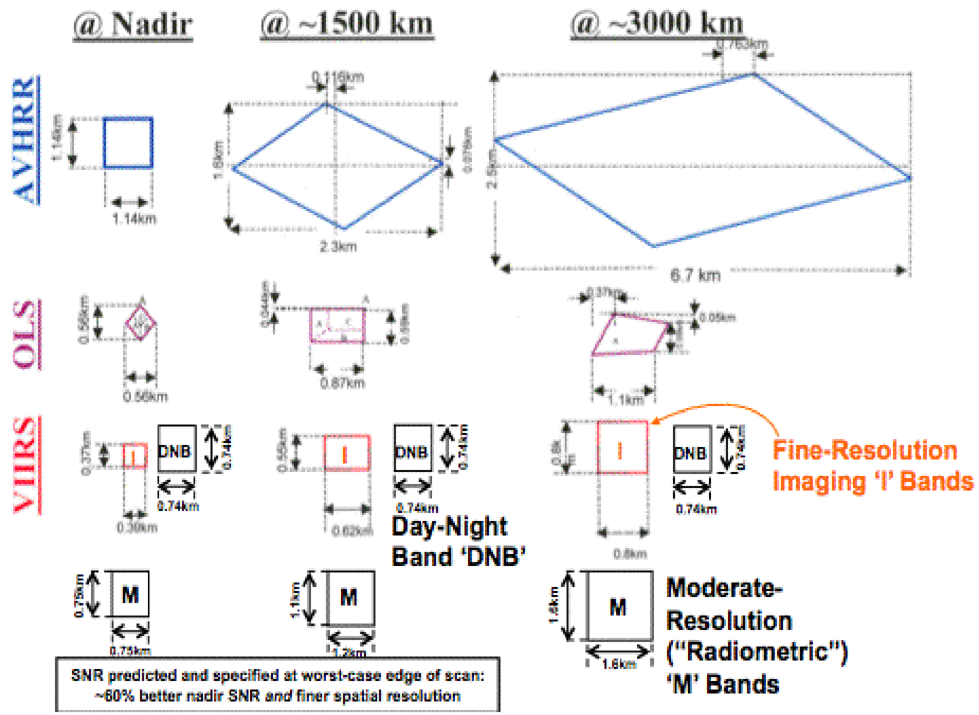
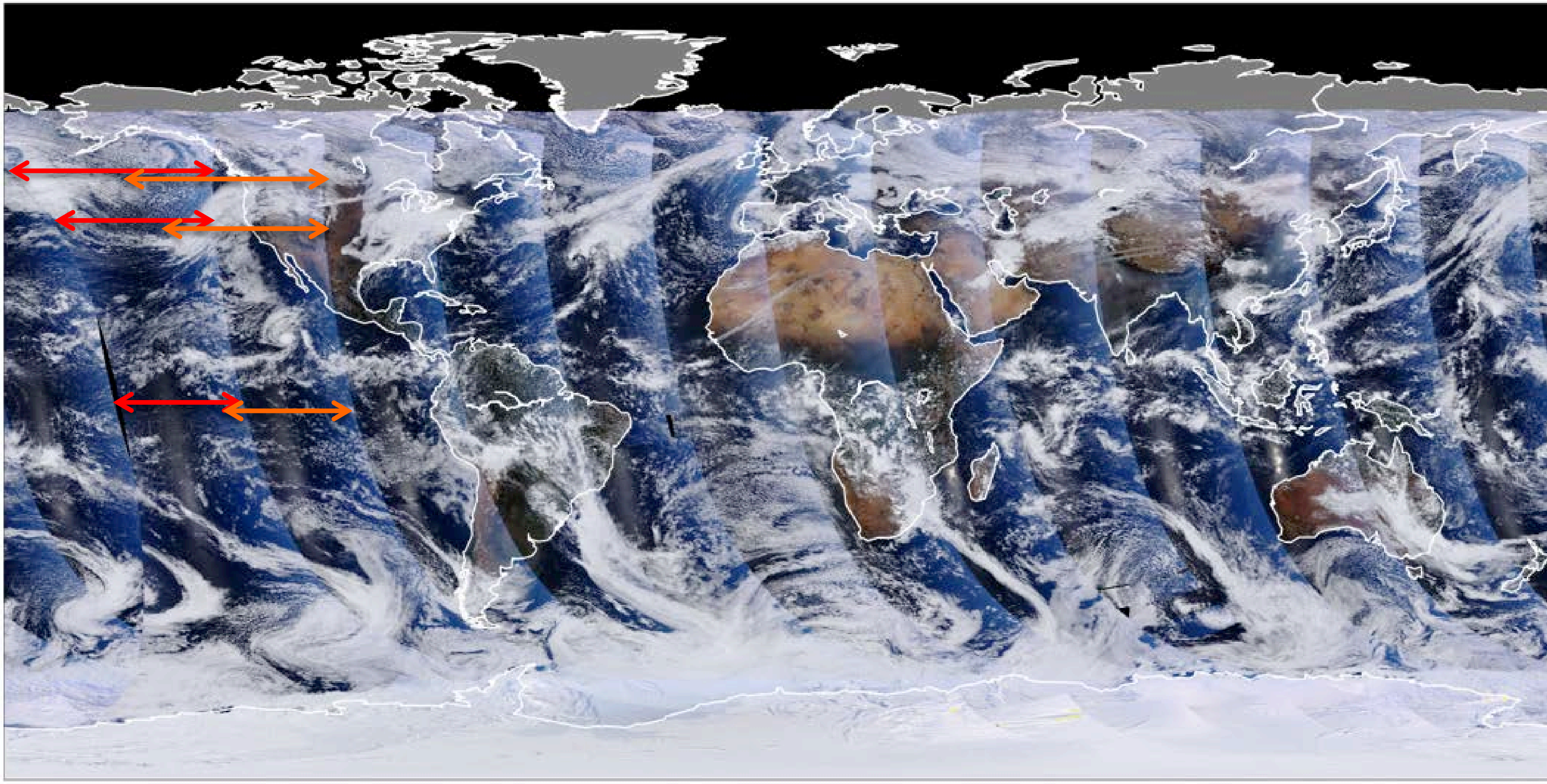


Figure 3.2.3: Illustration of MODIS data acquisition on the EOS-AM platform (not to scale). The bidirectional reflectance distribution function (BRDF) changes with view and sun geometry. Notice the shadow caused by clouds and canopy. MODIS pixel dimensions, cross-track and along-track, change with scan angles: 0° - 250 x 250 m; 15° - 270 x 260 m; 30° - 350 x 285 m; 45° - 610 x 380 m



First Global VIIRS Image



VIIRS RGB (True Color), 20111122

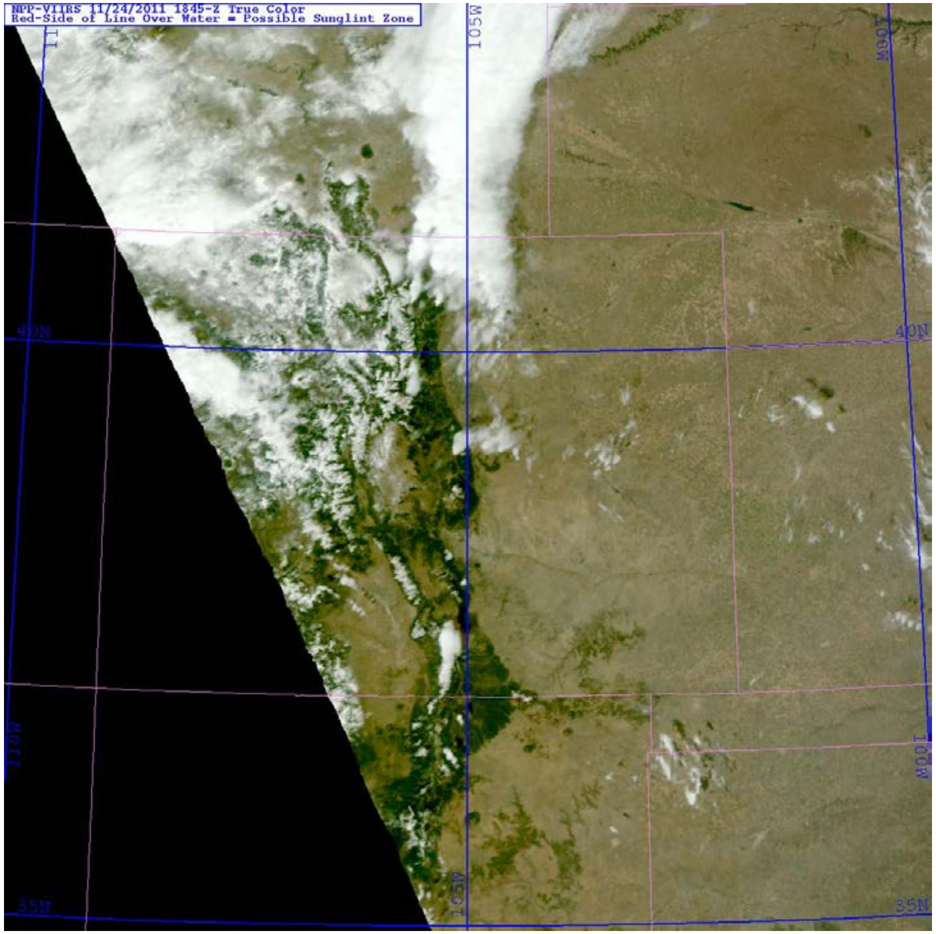
R : M05 (0.672 μm); G : M04 (0.555 μm); B : M02 (0.445 μm)

Creation date: 2011-11-26 07:19:26 Z

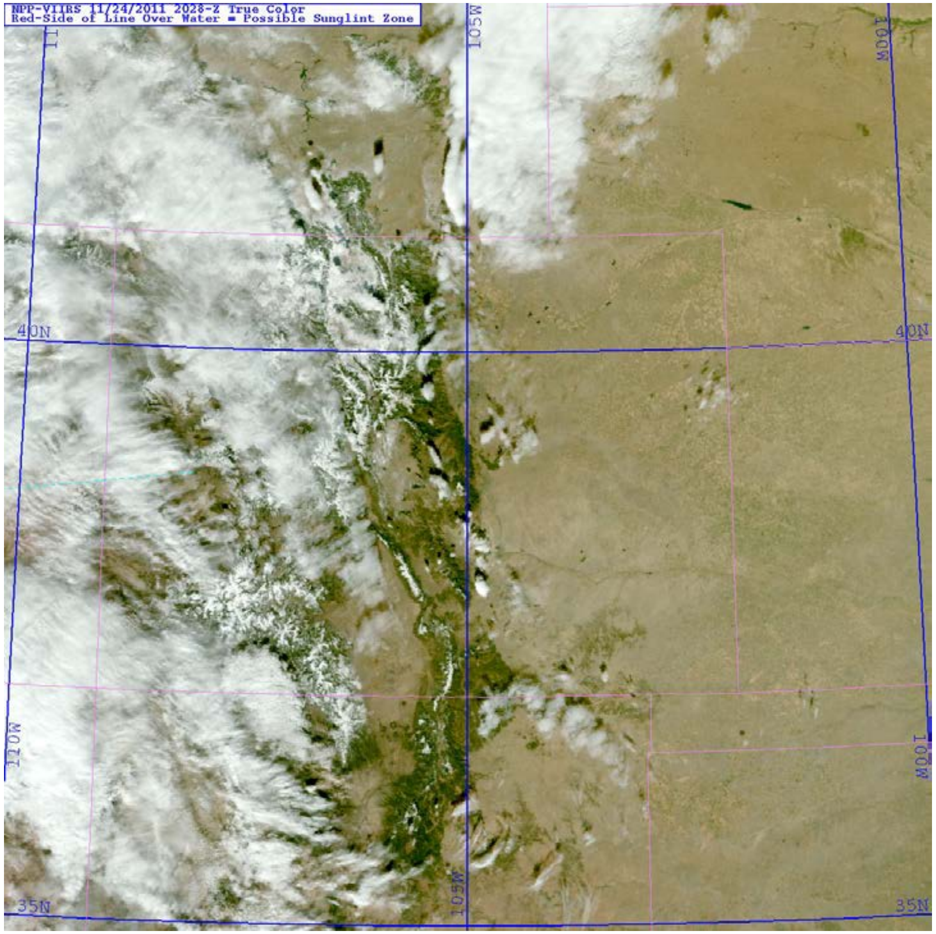
NPP VIIRS True Color Examples

Colorado

11.24.2011 1845 Z, Near Edge of Scan



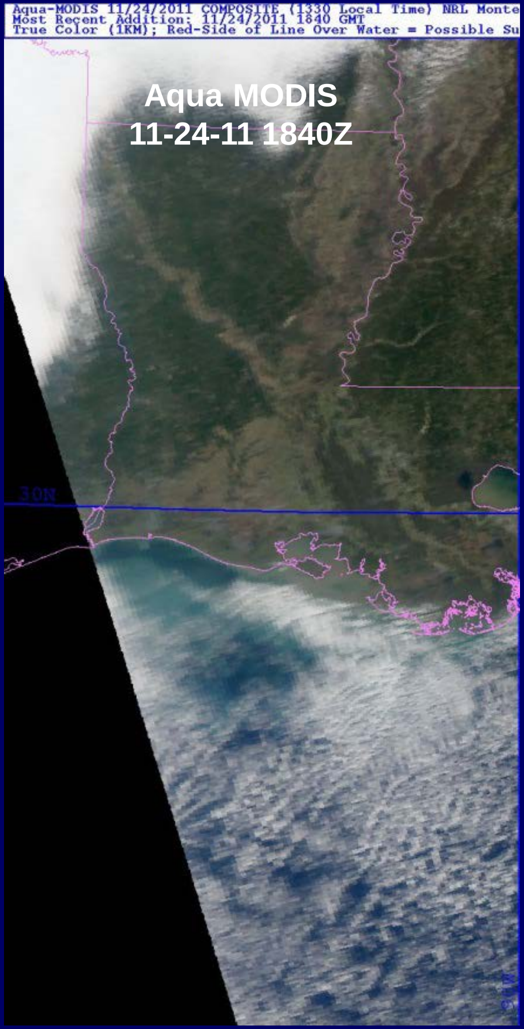
11.24.2011 2028 UTC, Near Nadir

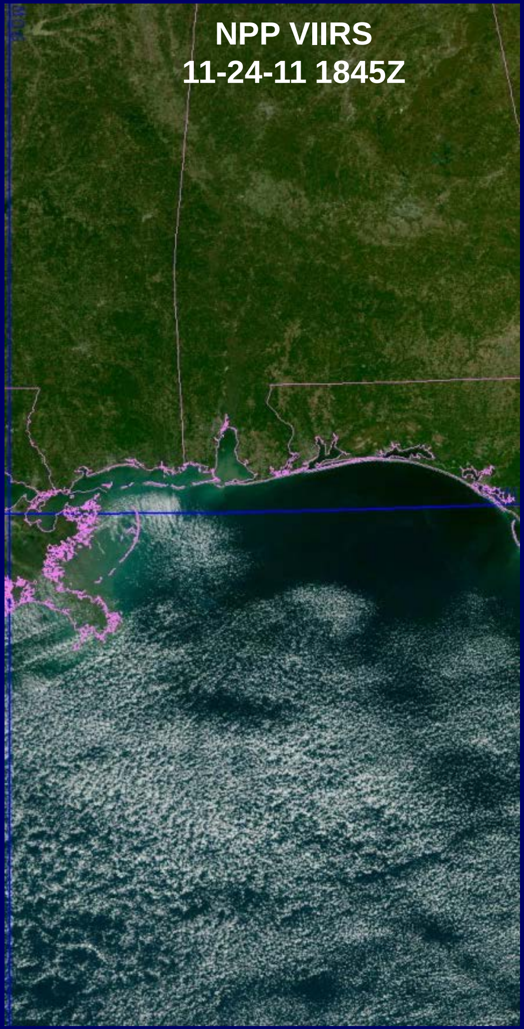


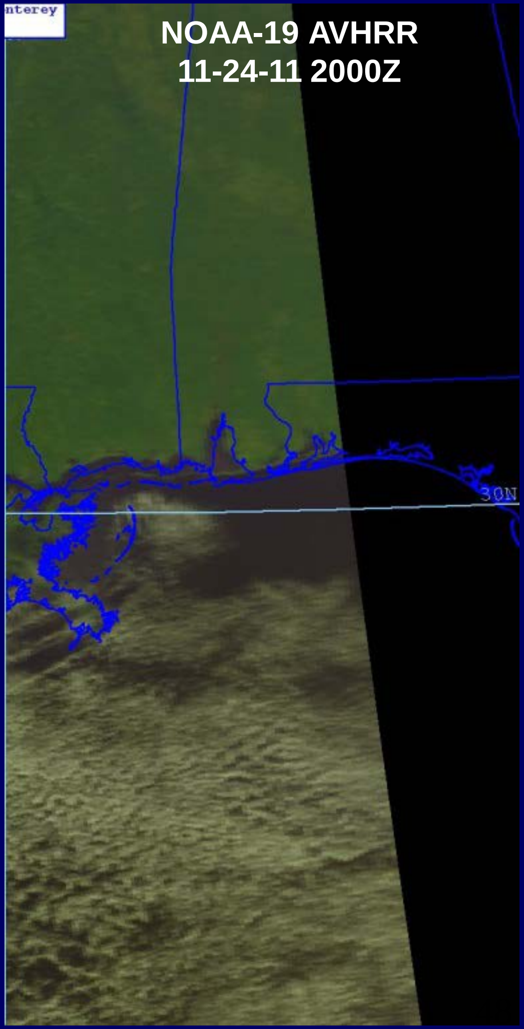
→ VIIRS maintains similar spatial resolution quality at edge of 3000 km swath

NPP VIIRS True Color Examples

Edge of Scan Intercomparisons

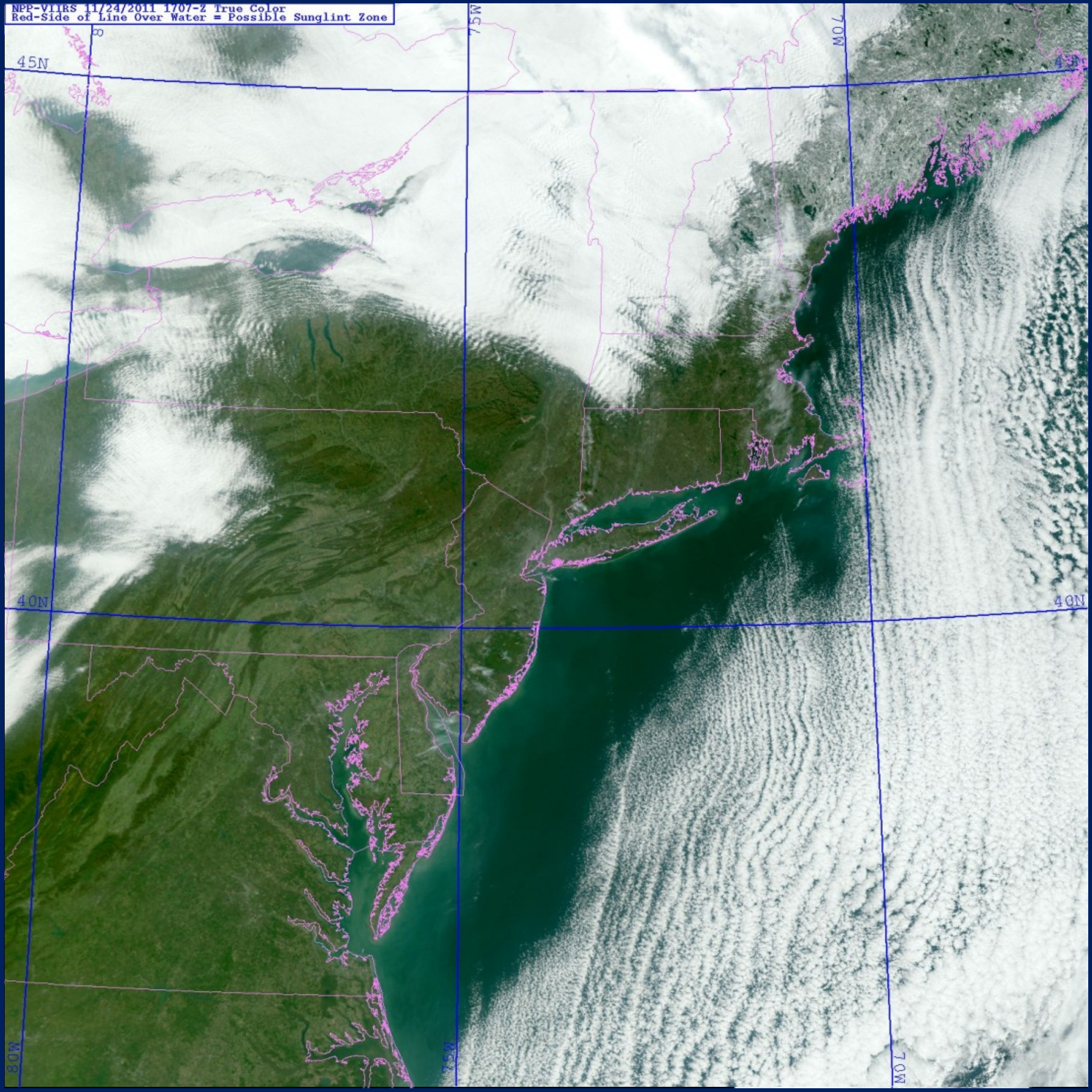






Multi-spectral Comparisons

True color - Northeast US

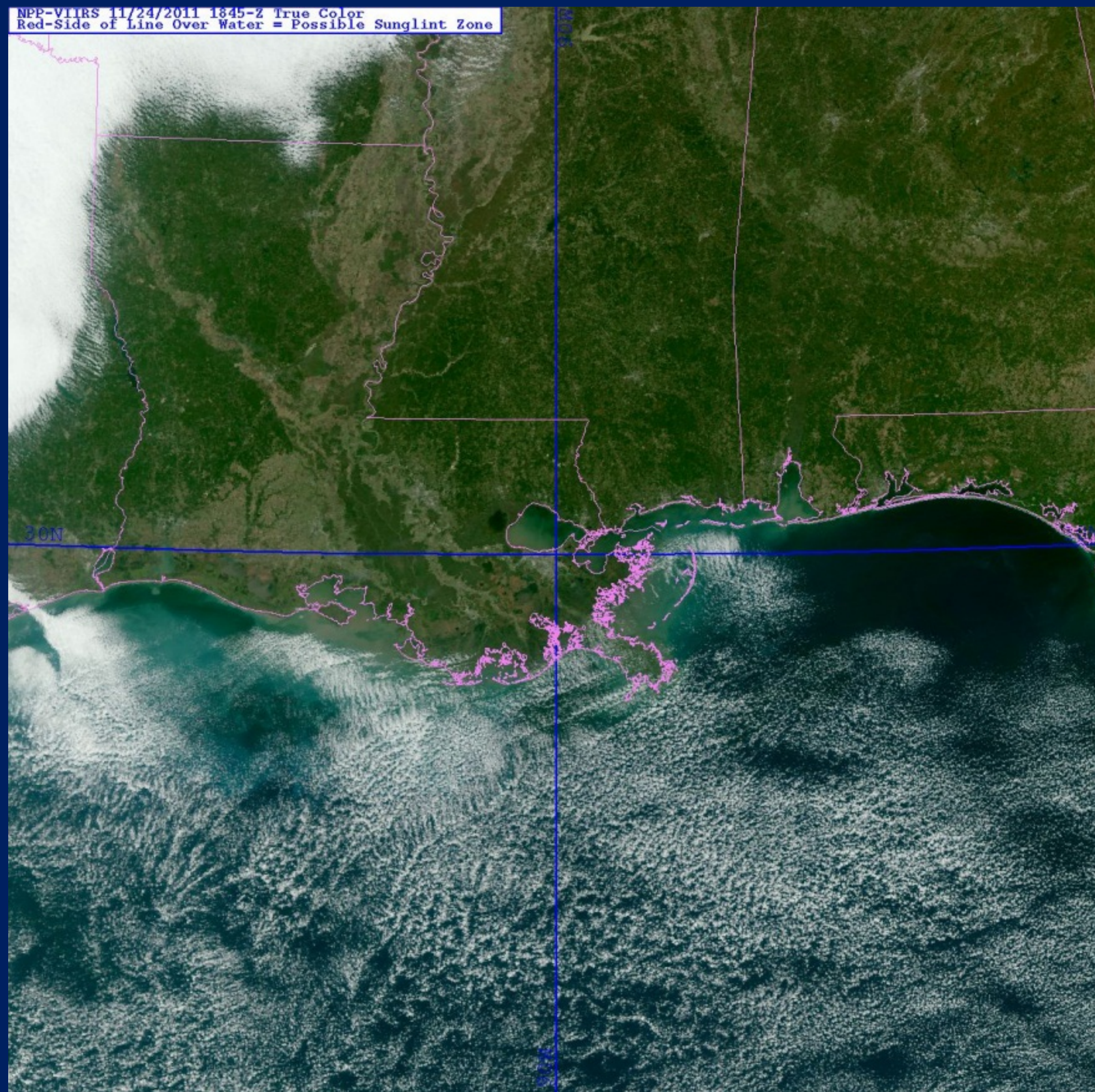


Multi-spectral Comparisons

True color – New Orleans

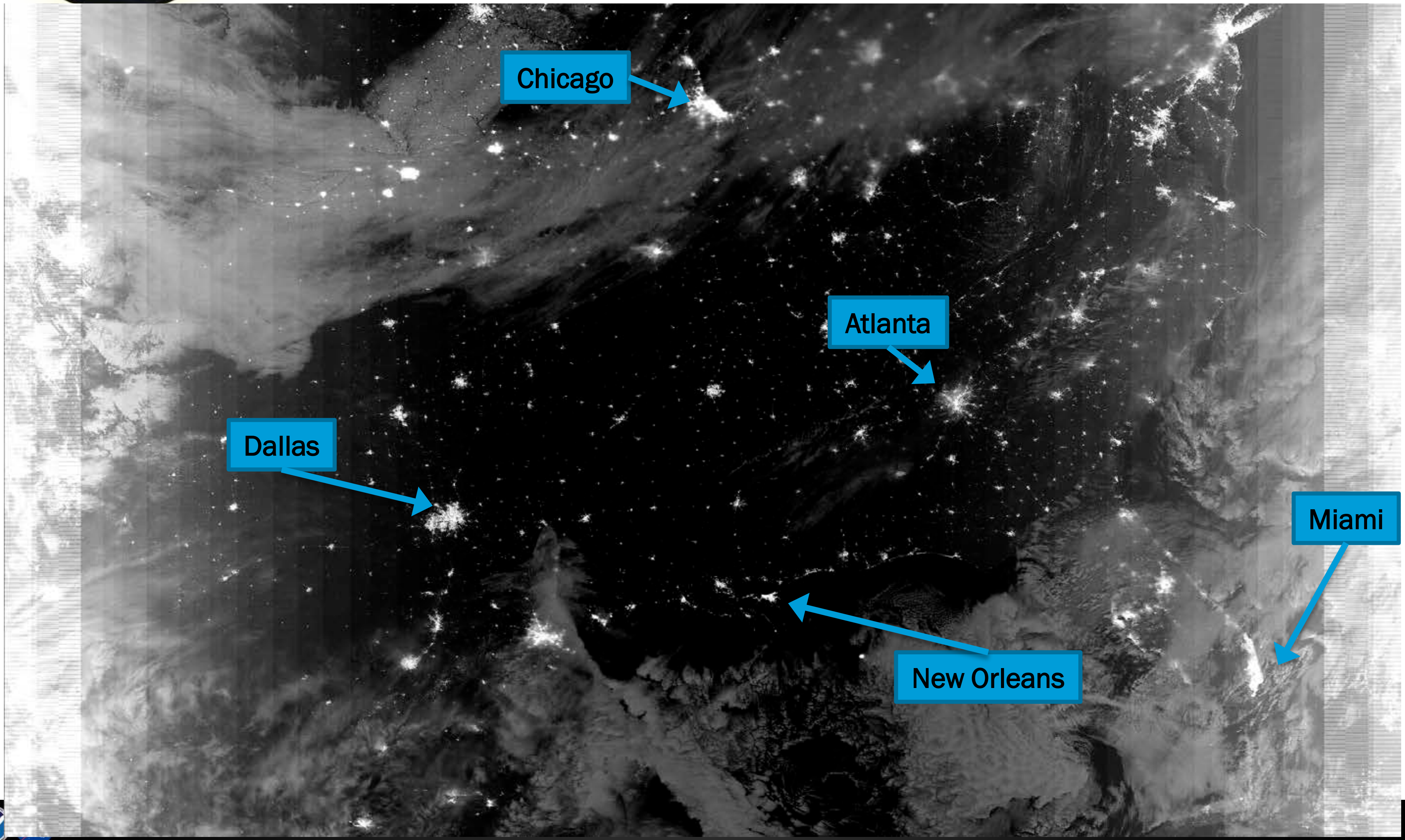
MODIS
1840z

VIIRS
1845Z



Resolution consistency across swath bodes well for AMV fidelity

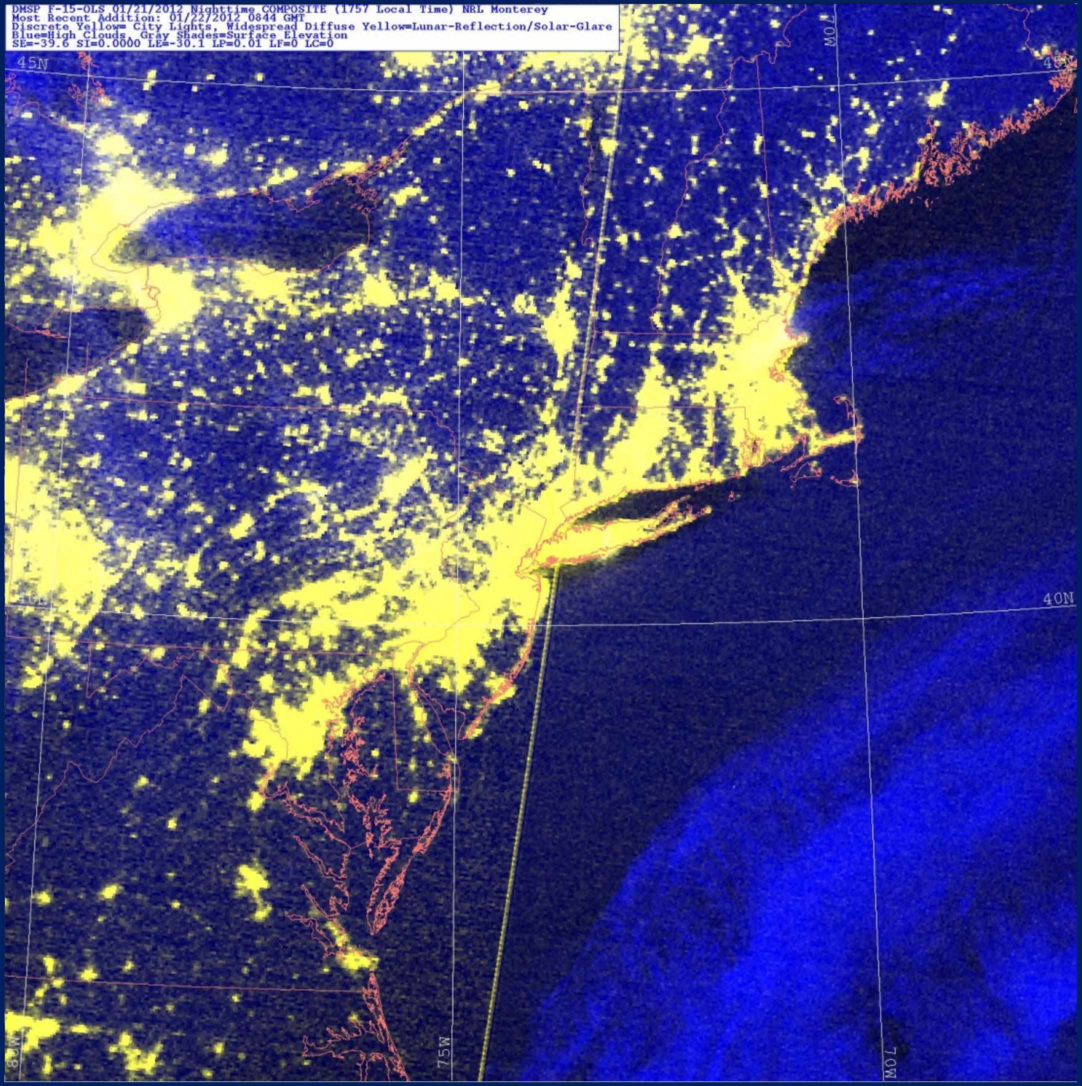
VIIRS Day Night Band



VIIRS Nighttime Visible - DNB

OLS 08:44Z
DNB 0718Z

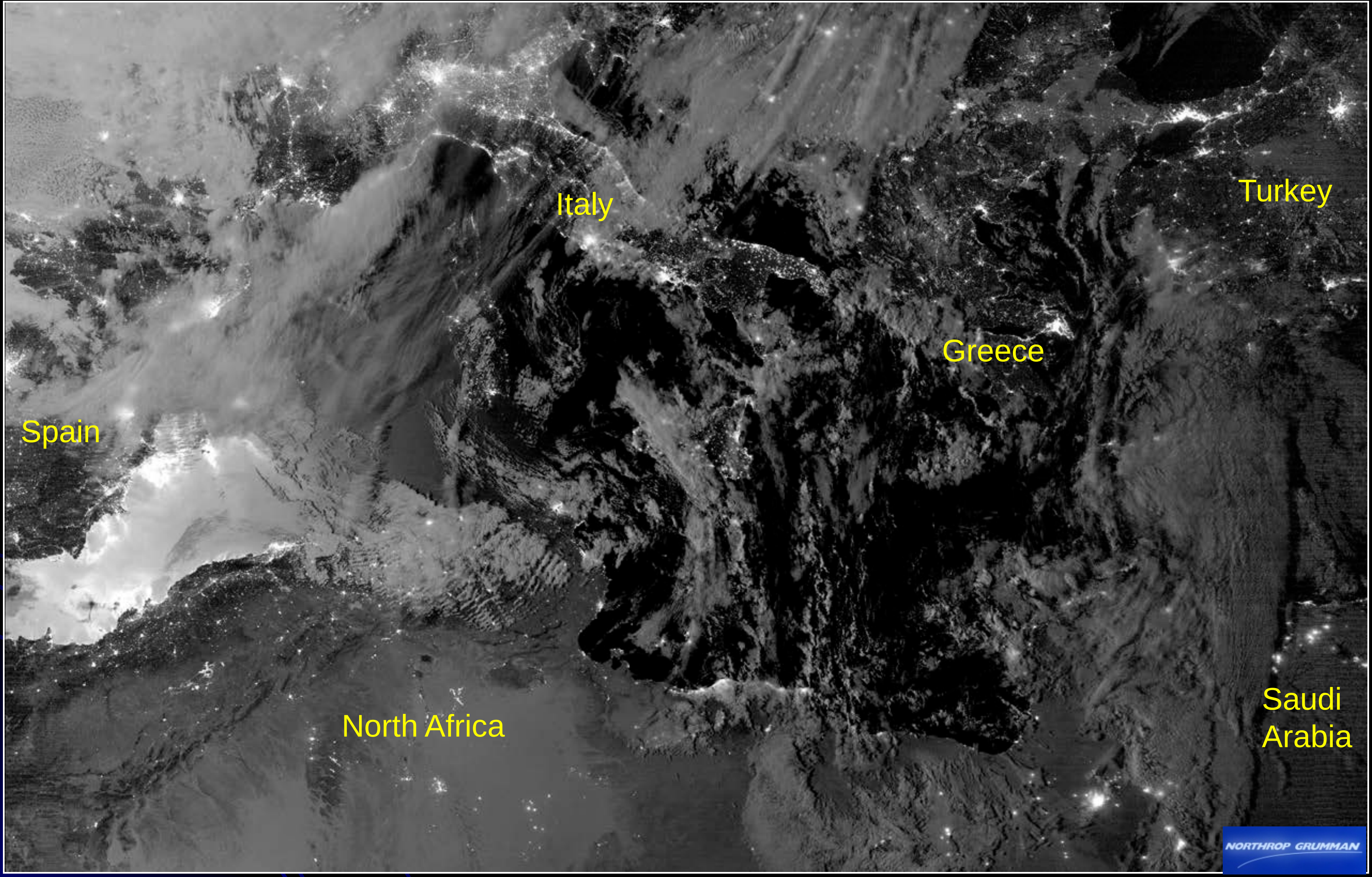
Geolocation not corrected



Enhanced city light definition due to spatial resolution and quantization

Moonlight Imagery

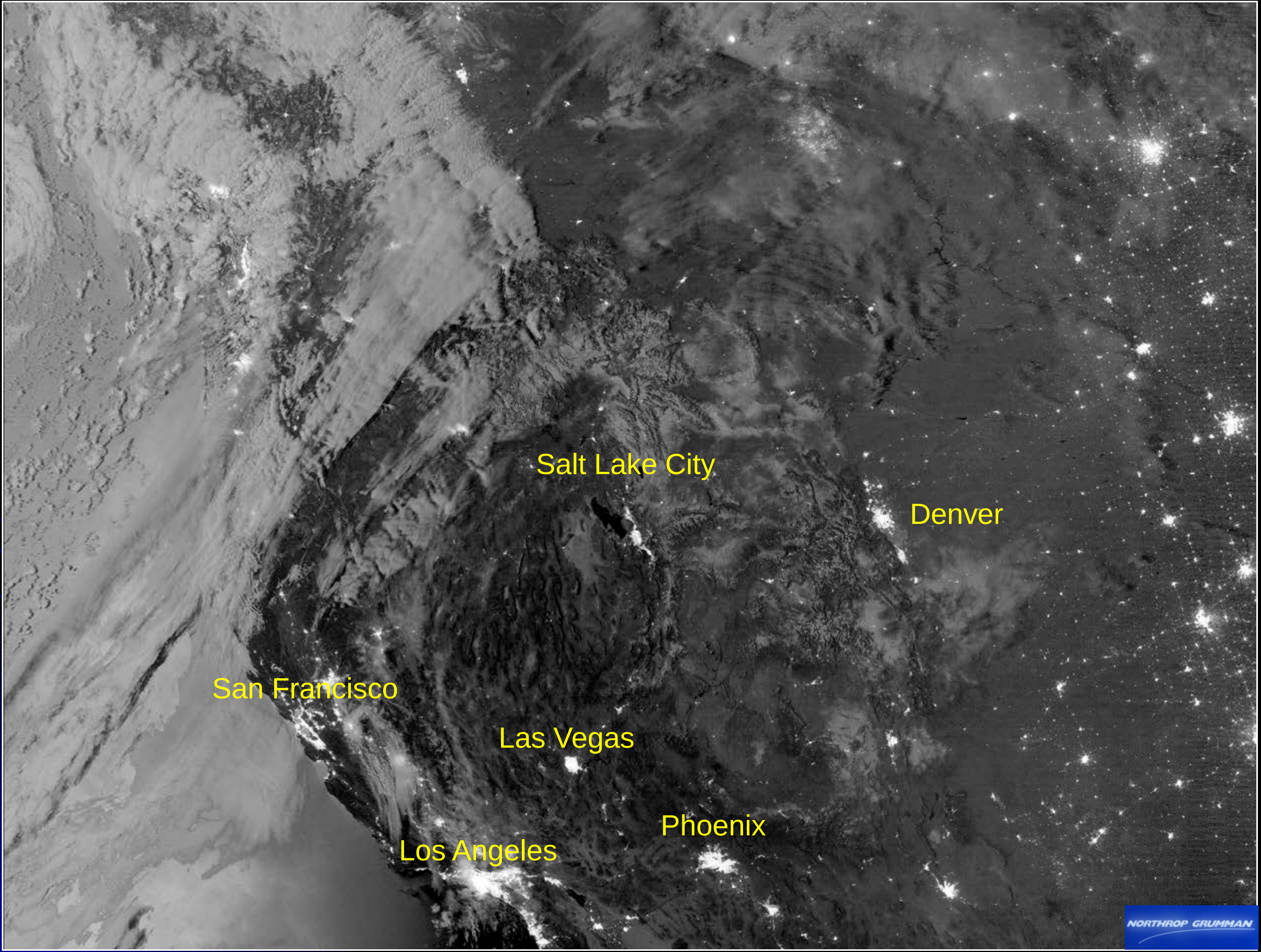
Nighttime Imagery: 1/5/2012 0053 UTC, Mediterranean Region



→ Moonglint scenes showcase the tremendous dynamic range and radiometric resolution of the new DNB sensor.

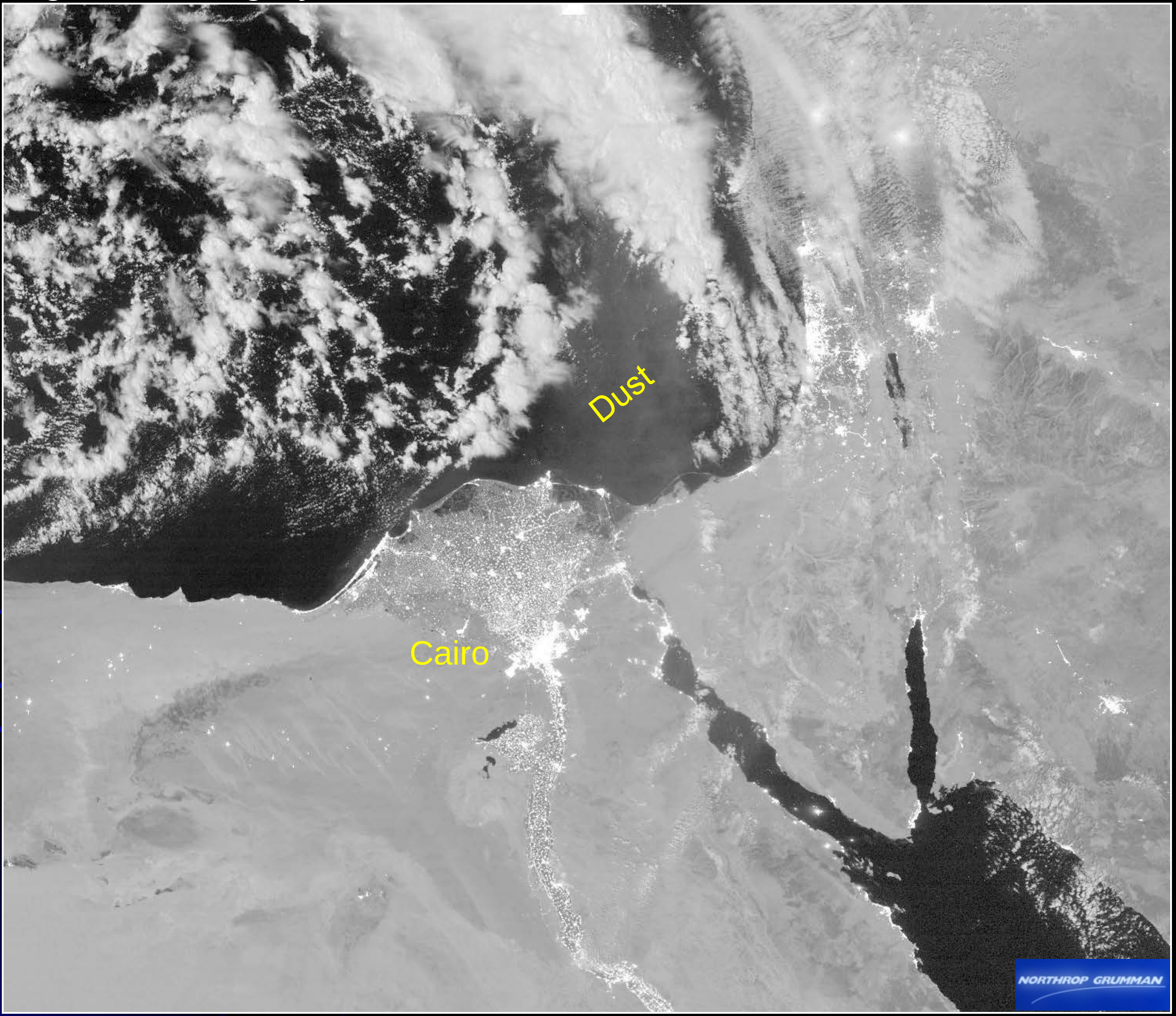
Moonlight Imagery

Nighttime Imagery: 1/5/2012 0920 UTC, Western U.S.



Dust Storm

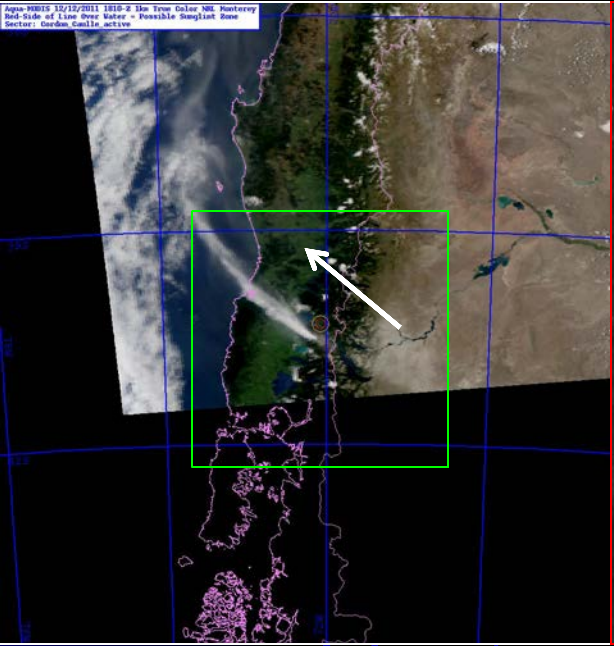
Nighttime Imagery: 1/7/2012 2359 UTC, Eastern Mediterranean



Volcanic Ash

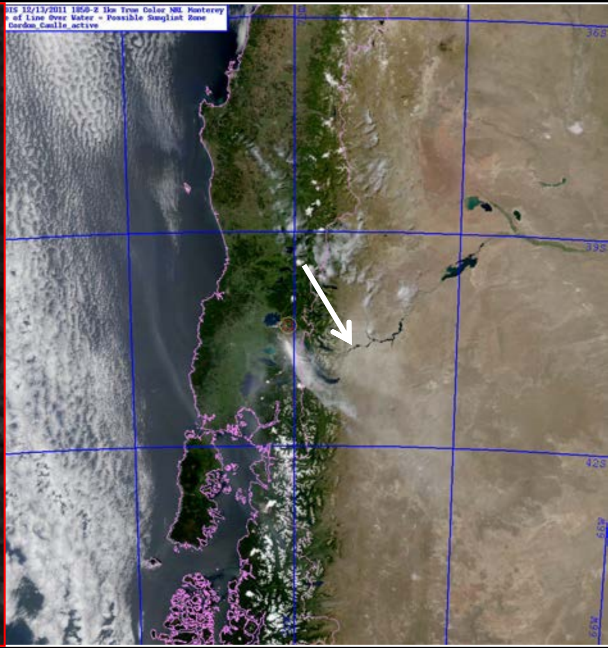
Puyehue-Cordon Caulle Volcanic Chain
12-13 Dec 2011

Afternoon



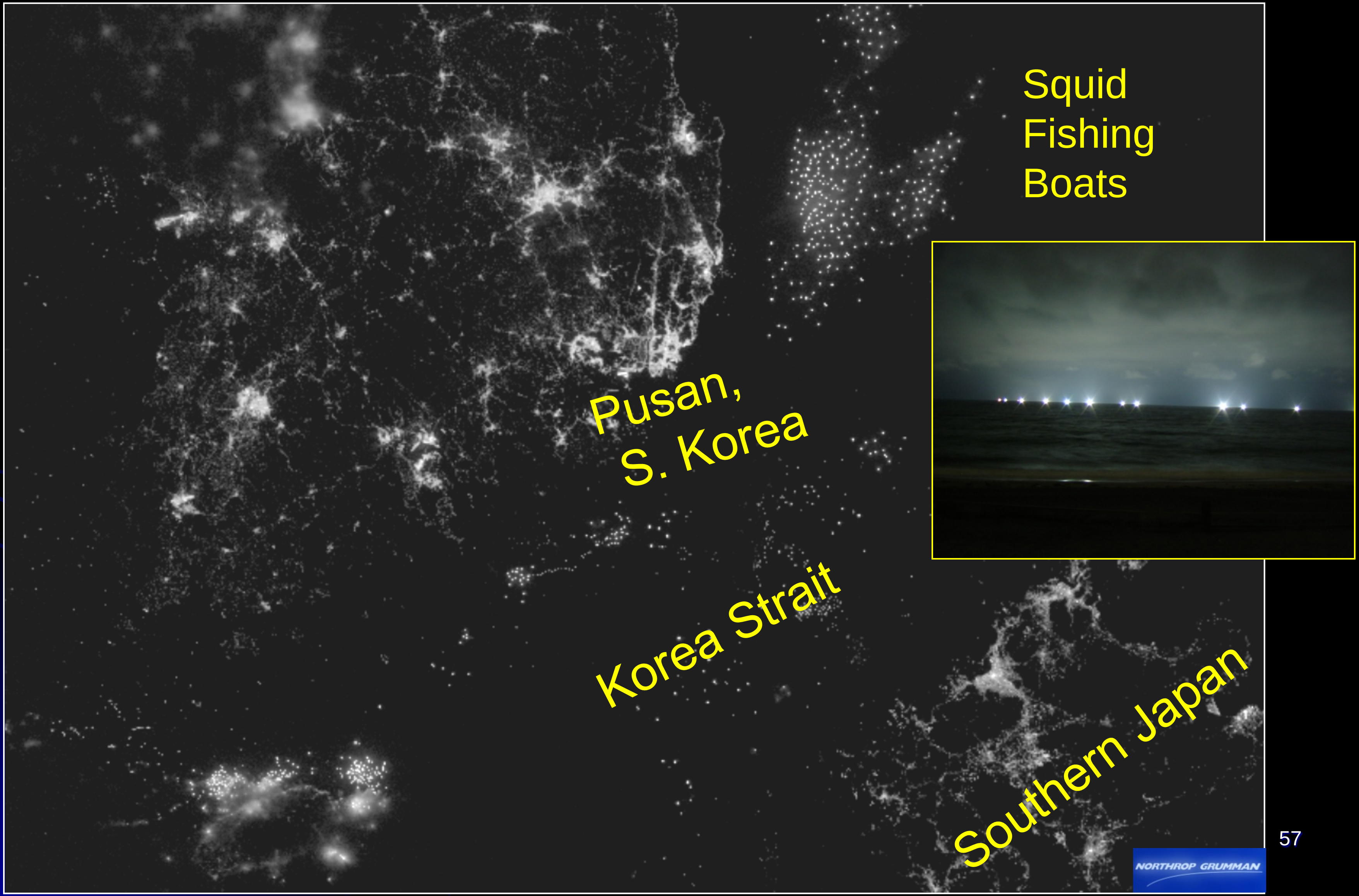
Night

Morning



→ Nighttime pass fills in the temporal gap between last PM and first available AM visible-light observations.

The Korean Strait

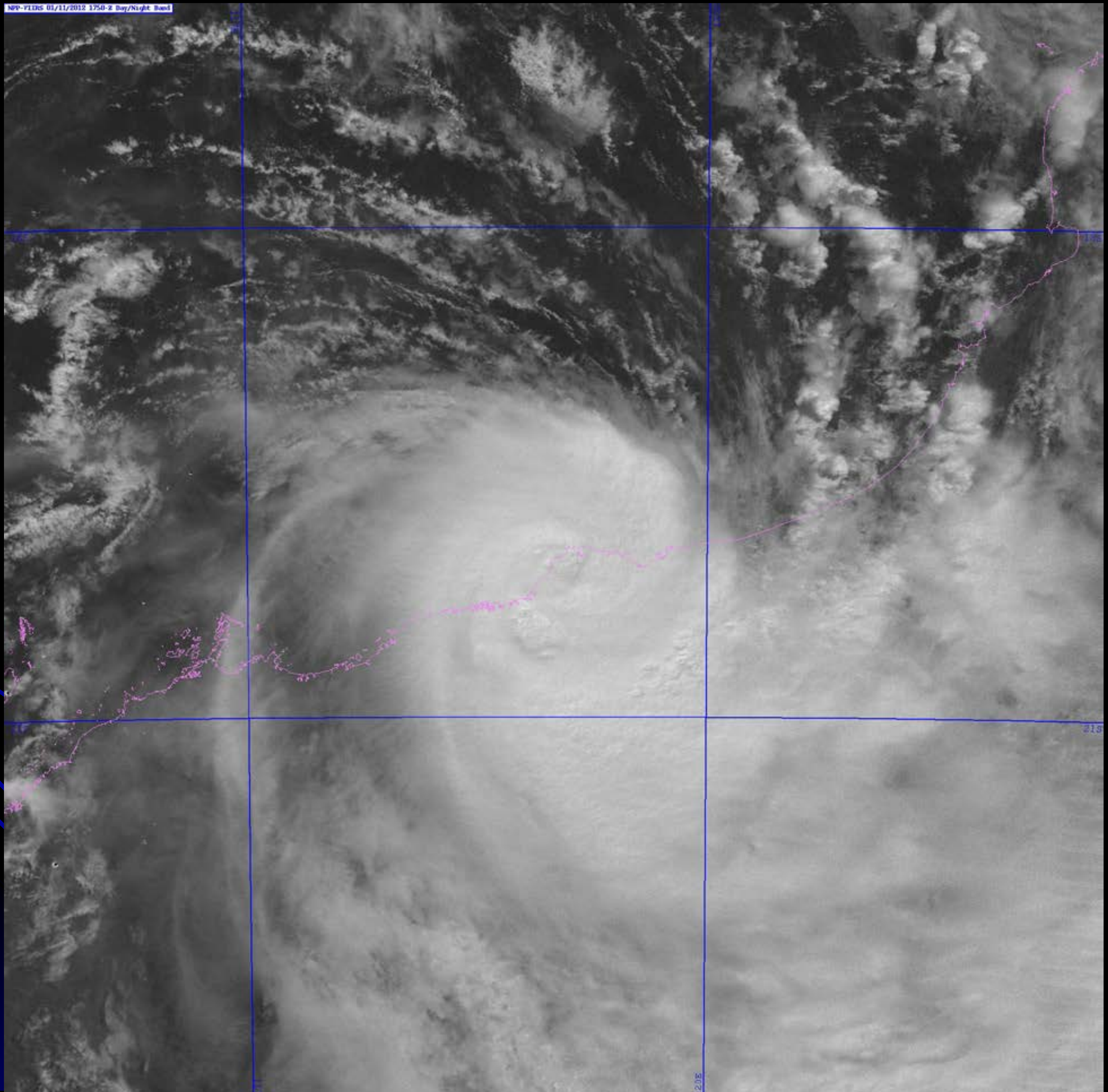


NORTHROP GRUMMAN

VIIRS Nighttime Visible - DNB

Tropical
Cyclone
06S
Heidi

VIIRS 1750
OLS 2005
OLS 2129



OMPS Instrument Design

Nadir Mapper

UV Backscatter, grating spectrometer, 2-D CCD

TOMS, SBUV(/2), GOME(-2), OMI

110 deg. cross track, 300 to 380 nm spectral, 1.1nm FWHM bandpass

Total Column Ozone, UV Effective Reflectivity, and Aerosol Index Daily Maps

Nadir Profiler

UV Backscatter, grating spectrometer, 2-D CCD

SBUV(/2), GOME(-2), OMI

Nadir view, 250 km cross track, 270 to 310 nm spectral, 1.1 nm FWHM bandpass

Ozone Vertical Profile, 7 to 10 KM resolution

Limb Profiler

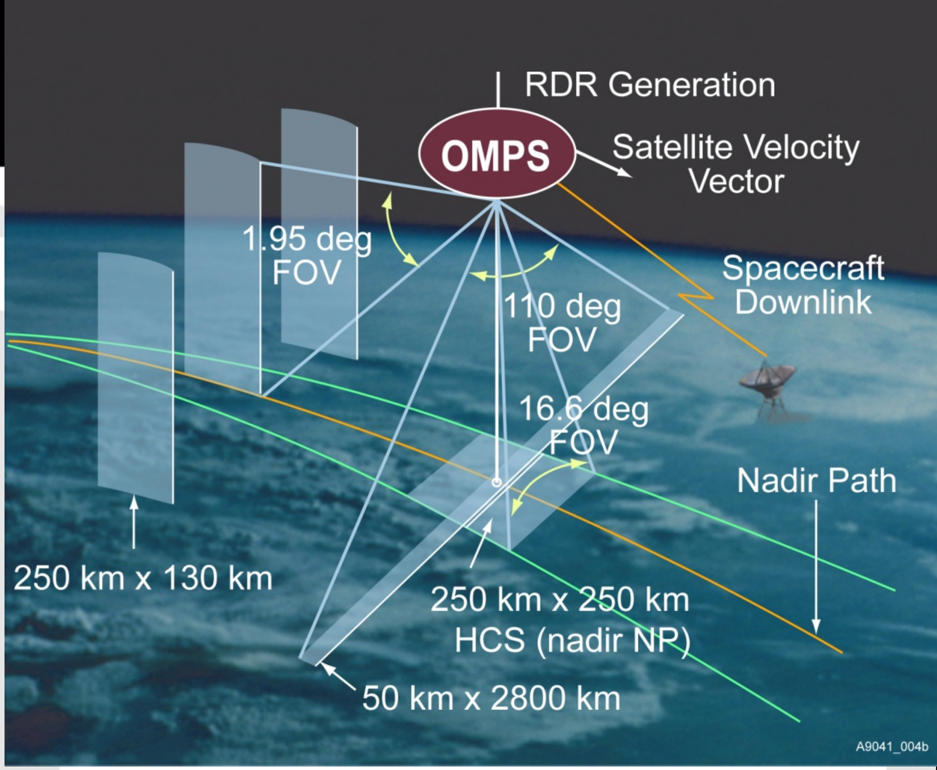
UV/Visible Limb Scatter, prism, 2-D CCD array

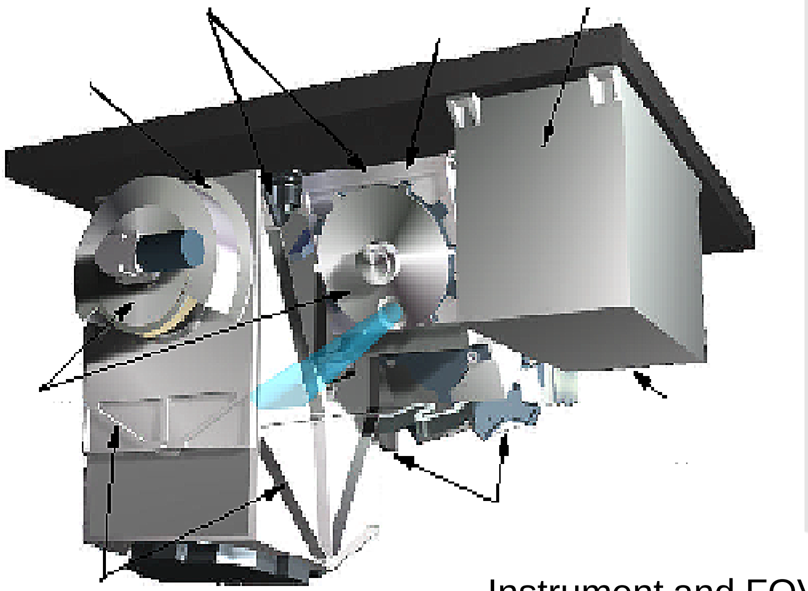
SOLSE/LORE, OSIRIS, SAGE III, SCIAMACHY

Three 100-KM vertical slits, 290 to 1000 nm spectral

Ozone Vertical Profile, 3 KM vertical resolution

The calibration concepts use working and reference solar diffusers.

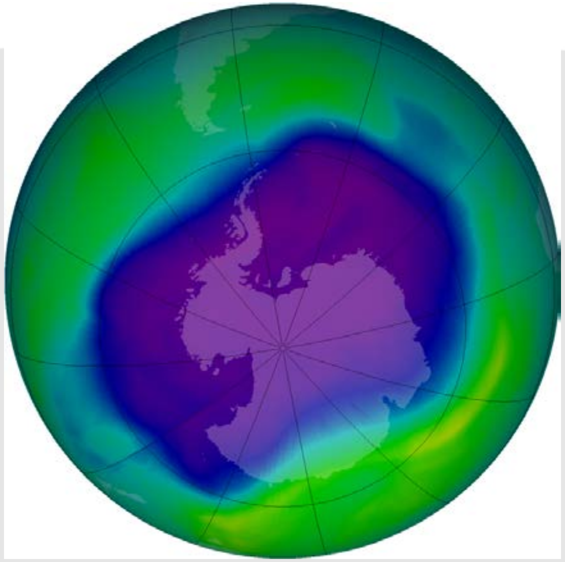


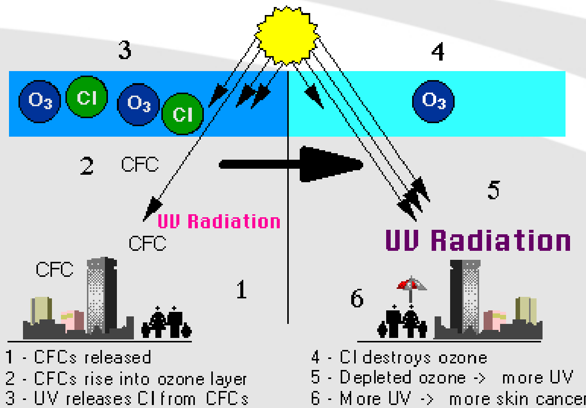


Instrument and FOV Graphics from BATC

59

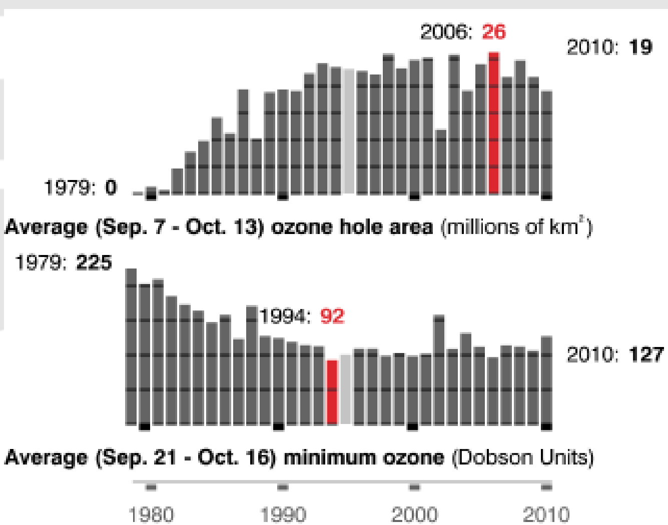
OMPS provides continuity of essential ozone products and applications



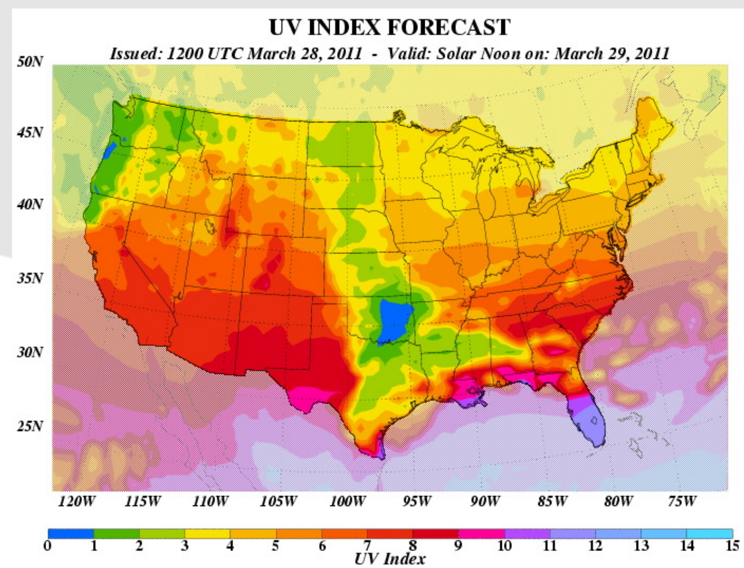


Monitoring ozone hole and recovering of ozone due to the Montreal Protocol for eliminating Chlorofluorocarbons (CFCs)

Used in NWS UV Index forecast to allow public to avoi overexposure to UV radiation

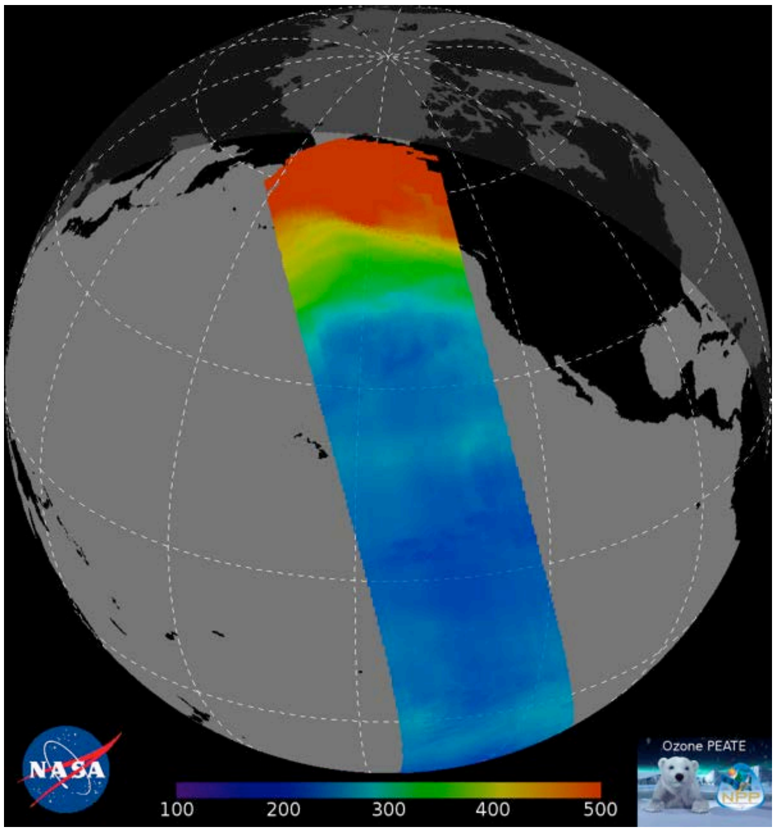


Note: No data were acquired during the 1995 season

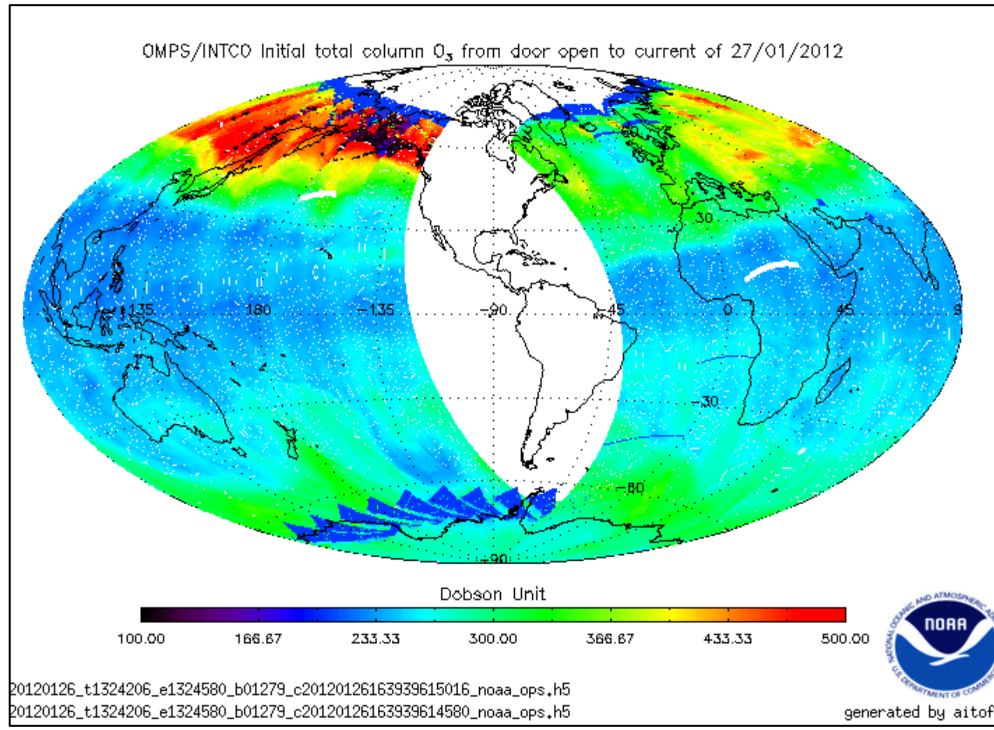


Ozone Monitoring and Profiling Suite
Regular Operations: January 27, 2012

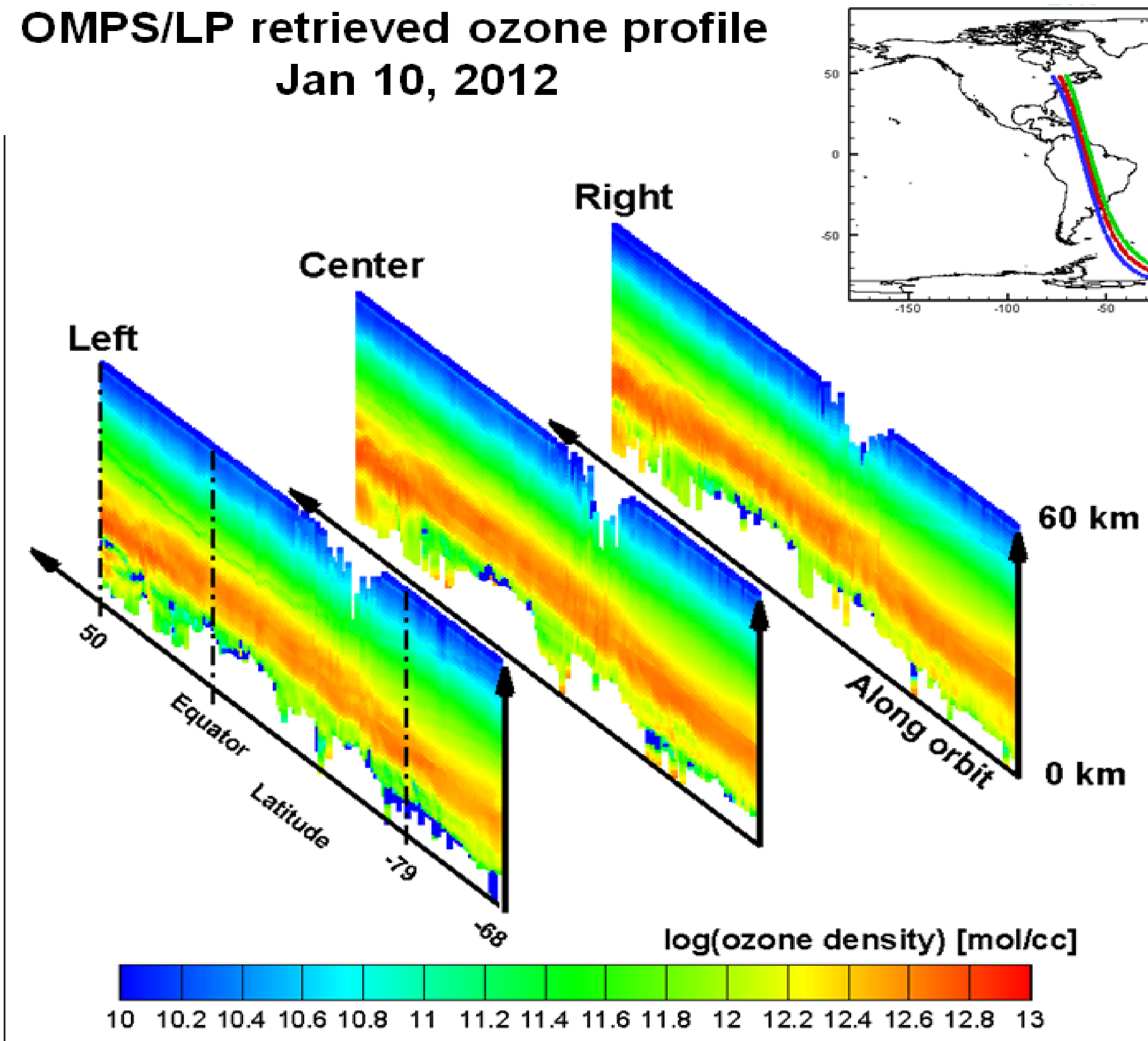
OMPS First Light
Research Algorithms

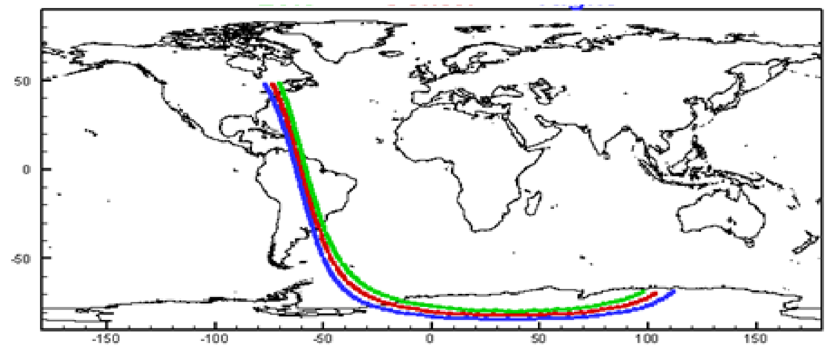


OMPS First Operational Data

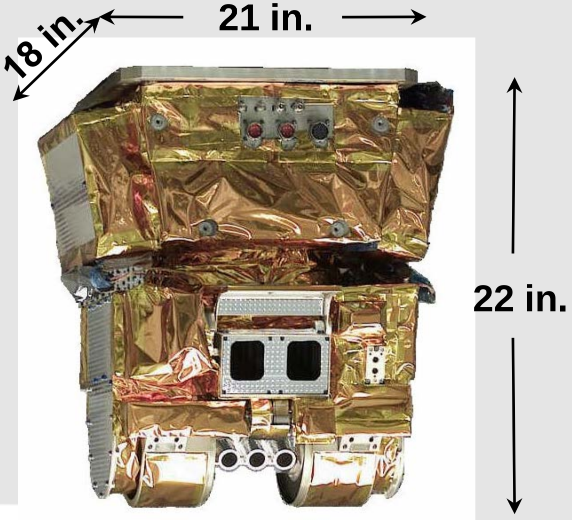


Ozone Profile and OMPS Limb





CERES Instrument Overview



CERES scanning radiometer measuring three spectral bands at TOA

- Total (0.3 to >50 μm)
- Shortwave (0.3 to 5.0 μm)
- Longwave (5 to 50 μm)

Operations, Data Processing, Products, and Science are a continuation of experience developed on

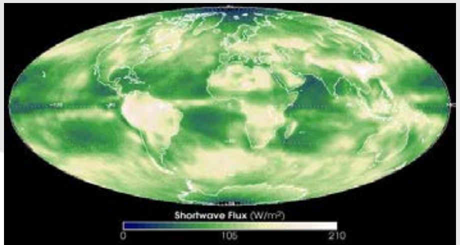
- TRMM (1), EOS Terra (2), EOS Aqua (2), in I&T on NPP

Critical Resource Margins

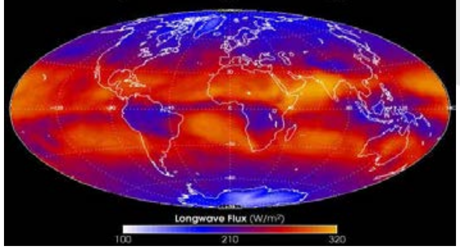
	CERES Value	Allocation	Margin
Mass, kg	46.8	54	13.3%
Power: Operational, Watts	45.85	50	8.3%
Power: Peak, Watts	60	75	20.0%
Power: Survival, Watts	39.5	40	1.3%
Heat Transfer - Hot Case, Watts	4.1	±5 W	18.0%
Heat Transfer - Cold Case, Watts	-1.7	±5 W	66.0%
Data Rate, Kb / sec	10	10	0
Pointing Control, arcsec	< 114	194	41.2%
Pointing Knowledge, arcsec	< 107	180	40.6%

Primary CERES Climate Data Records

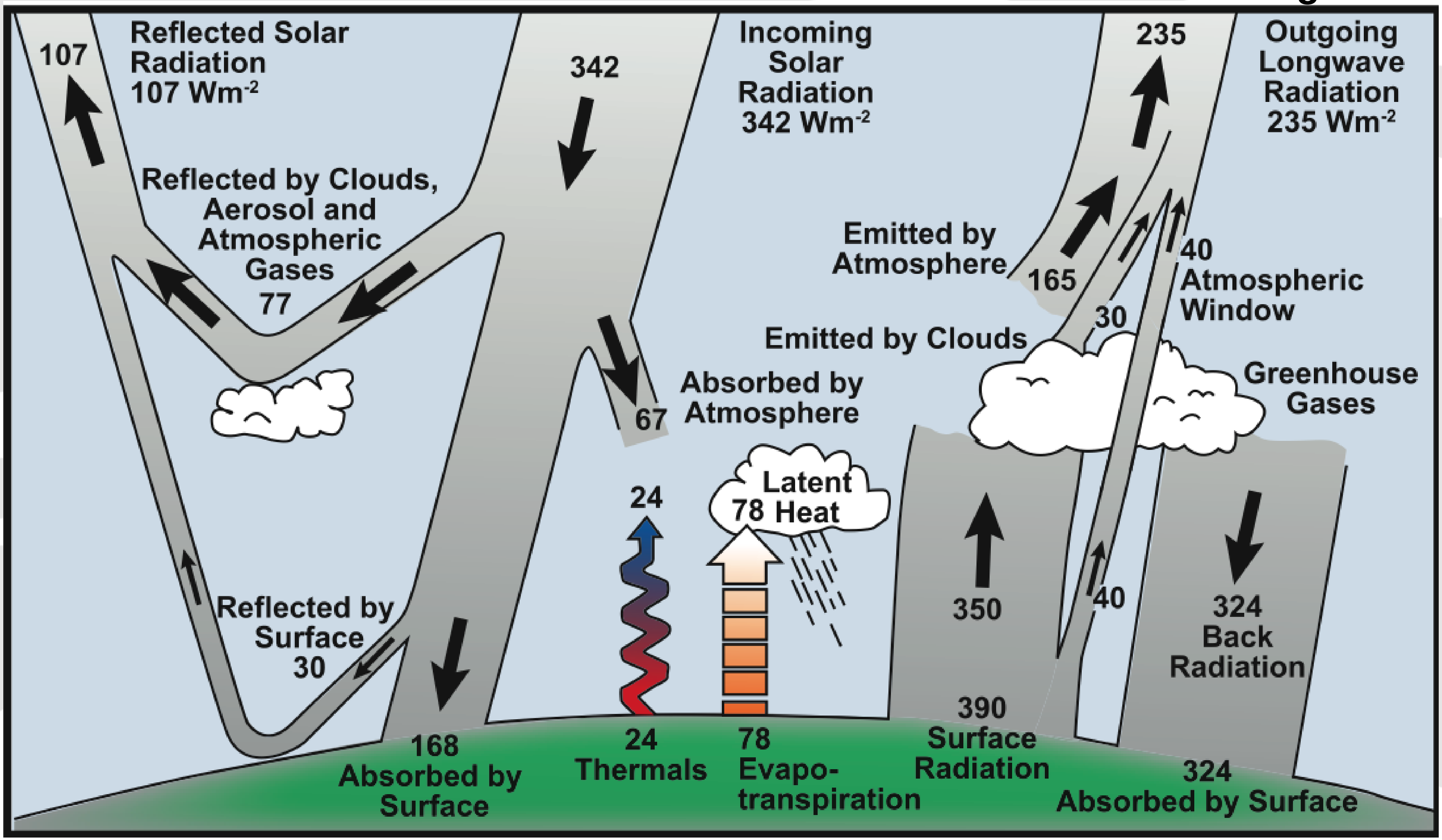
Reflected Solar Energy



Emitted Thermal Energy



Earth Radiation Budget



From IPCC AR4 FAQ

CERES Flight Model 5

First Light Data: January 26, 2012

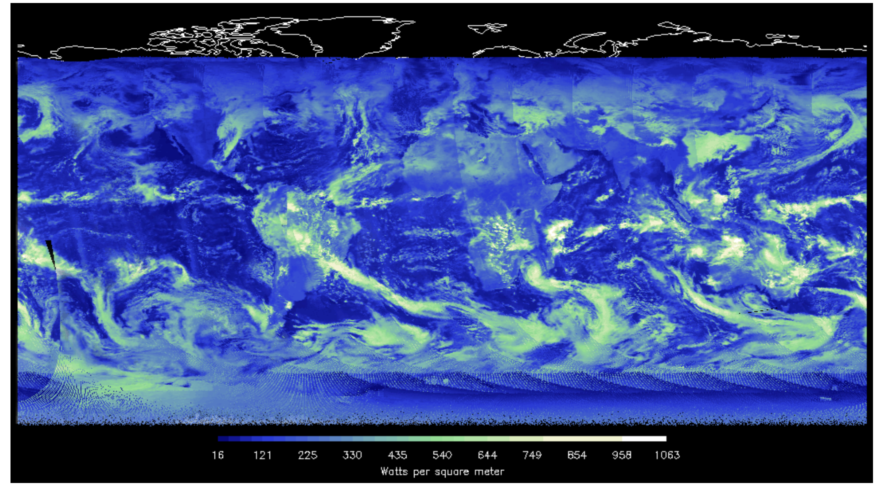
CERES scanning radiometer measuring three spectral bands at TOA

- Total (0.3 to >50 μm)
- Shortwave (0.3 to 5.0 μm)
- Longwave Bandpass (8 to 12 μm)

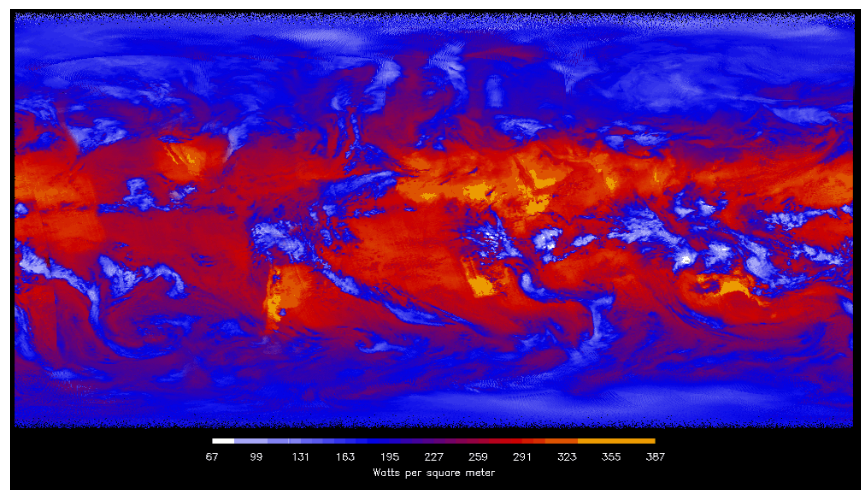
Operations, Data Processing, Products, and Science are a continuation of experience developed on

- TRMM (1), EOS Terra (2), EOS Aqua (2)

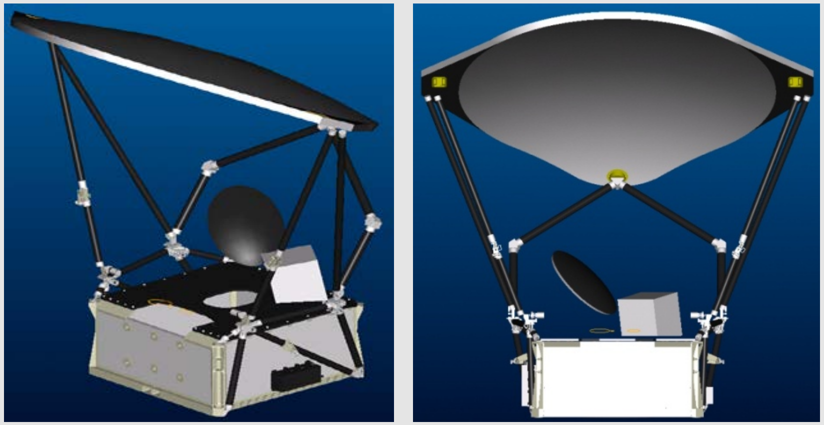
Reflected Solar Energy



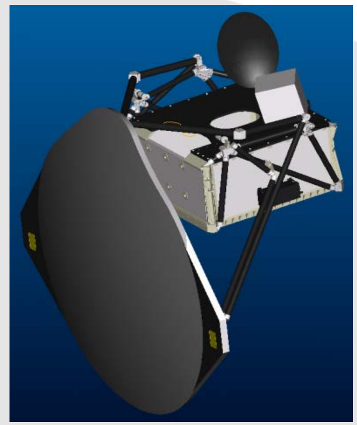
Emitted Thermal Energy



Overview of AMSR2 instrument on GCOM



Deployed



Stowed

- Deployable main reflector system with 2.0m diameter.
- Frequency channel set is identical to that of AMSR-E except 7.3GHz channel for RFI mitigation.
- 2-point external calibration with the improved HTS (hot-load).

AMSR2 characteristics	
Scan	**Conical scan**
Swath width	**1450km**
Antenna	**2.0m offset parabola**
Digitalization	**12bit**
Incidence angle	**nominal 55 degree**
Polarization	**Vertical and Horizontal**
Dynamic range	**2.7-340K**

AMSR2 Channel Set				
Center Freq. [GHz]	**Band width [MHz]**	**Polarization**	**Beam width [deg] (Ground res. [km])**	**Sampling interval [km]**
6.925/ 7.3	**350**	**V and H**	**1.8 (35 x 62)**	**10**
			1.7 (34 x 58)	
10.65	**100**		**1.2 (24 x 42)**	
18.7	**200**		**0.65 (14 x 22)**	
23.8	**400**		**0.75 (15 x 26)**	
36.5	**1000**		**0.35 (7 x 12)**	
89.0	**3000**		**0.15 (3 x 5)**	**5**

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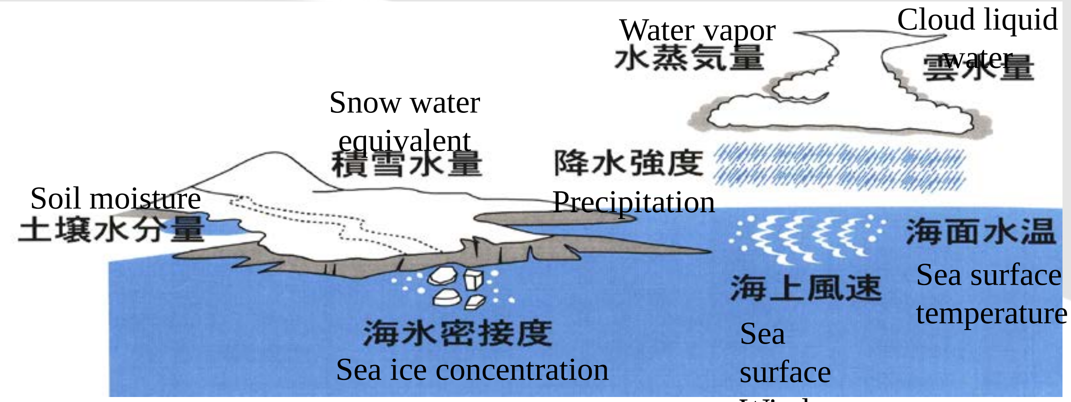
Overview of AMSR2 Products

Geophysical products	Comments
Integrated water vapor	Over global ocean*, columnar integrated value
Integrated cloud liquid water	Over global ocean*, columnar integrated value
Precipitation	Global (except over ice and snow), surface rain rate
Sea surface temperature	Global ocean*
Sea surface wind speed	Global ocean*
Sea ice concentration	High latitude ocean areas
Snow depth	Land surface (except dense forest regions)
Soil moisture	Land surface (except ice sheet and dense forest regions)



Conclusions

JPSS Mission will provide:

Input Observations for Weather Forecast Models
CrIS, ATMS, VIIRS, OMPS & GCOM

Short term Environmental Observations
(Events)
VIIRS, OMPS, CrIS, ATMS & GCOM

Long term Environmental Observations
(Climate Change Detection)
CERES, TSIS, VIIRS, OMPS, CrIS, ATMS & GCOM

User Engagement is critical for ultimate mission success

Backup

User Engagement & Feedback

Sustaining User Engagement is part of the JPSS Program

Demonstrate importance of NPP data to the Nation and to critical operational product and services and for improved research

Established a JPSS Proving Ground to focus on improved utilization of NPP/JPSS data for key application areas

Application Areas

- Tropical Cyclone Applications
- Cryosphere Applications
- Severe Weather/Aviation Applications
- Ocean/Coastal Applications (Coral Bleaching, Harmful Algae Bloom alerts)
- Land Applications (Agriculture, Droughts)
- Hazards Applications (Smoke, Fire, Aerosols, Air Quality, Flash Floods)
- Data Assimilation Applications
- Imagery/Visualization Applications
- Climate Applications

Backup Slides

AVHRR

1	580 - 680
2	840 - 940
3	3.55 - 3.93
4	10.3 - 11.3
5	11.5 - 12.5

MODIS

8	405 - 420
9	438 - 448
10	483 - 493
12	546 - 556
1	620 - 670
13	662 - 672
15	743 - 753
16	862 - 877
2	841 - 877
5	1.23 - 1.25
26	1.36 - 1.39
6	1.63 - 1.65
7	2.11 - 2.16
20	3.66 - 3.84
23	4.02 - 4.08
29	8.40 - 8.70
31	10.78 - 11.28
32	11.77 - 12.27
33	13.2 – 13.5
34	13.5 – 13.8
35	13.8 – 14.1
36	14.1 – 14.4

VIIRS

M1	402 – 422 (750m)
M2	436 - 464
M3	478 - 498
M4	545 - 565
I1	580 – 680 (375m)
M5	662 - 682
M6	744 - 758
M7	845 - 885
I2	845 - 885
M8	1.23 - 1.25
M9	1.371 - 1.385
M10	1.58 - 1.64
I3	1.58 - 1.64
M11	2.235 - 2.285
M12	3.61 - 3.79
I4	3.55 - 3.93
M13	3.97 - 4.13
M14	8.40 - 8.7
M15	10.3 - 11.3
M16	11.5 - 12.5
I5	10.6 - 12.5

ABI

1	450 – 490 (1km)
2	590 – 690 (.5)
3	846 – 885 (1)
4	1.37-1.39 (2)
5	1.58 - 1.64 (1)
6	2.23 – 2.28 (2)
7	3.8 – 4.0
8	5.77 – 6.6
9	6.75 – 7.15
10	7.24 – 7.44
11	8.3 – 8.7
12	9.42 – 9.8
13	10.1 – 10.6
14	10.8 – 11.6
15	11.8 – 12.8
16	13.0 – 13.6

VIIRS Improvements From AVHRR:
Radiometric properties

Greater spectral coverage with increased radiometric quality

VIIRS			MODIS Equivalent			AVHRR-3 Equivalent			OLS Equivalent		
Band	Range (um)	HSR (m)	Band	Range	HSR	Band	Range	HSR	Band	Range	HSR
DNB	0.500 - 0.900	750				Low light capabilities			HRD PMT	0.580 - 0.910 0.510 - 0.860	550 2700
M1	0.402 - 0.422	750	8	0.405 - 0.420	1000						
M2	0.436 - 0.454	750	9	0.438 - 0.448	1000						
M3	0.478 - 0.498	750	3 10	0.459 - 0.479 0.483 - 0.493	500 1000	Ocean Color, Aerosol					
M4	0.545 - 0.565	750	4 12	0.545 - 0.565 0.546 - 0.556	500 1000						
I1	0.600 - 0.680	375	1	0.620 - 0.670	250	1	0.572 - 0.703	1100			
M5	0.662 - 0.682	750	13 14	0.662 - 0.672 0.673 - 0.683	1000 1000	1	0.572 - 0.703	1100			
M6	0.739 - 0.754	750	15	0.743 - 0.753	1000	Atm Correction					
I2	0.846 - 0.885	375	2	0.841 - 0.876	250	2	0.720 - 1.000	1100			
M7	0.846 - 0.885	750	16	0.862 - 0.877	1000	2	0.720 - 1.000	1100			
M8	1.230 - 1.250	750	5	SAME	500	Cloud Particle Size					
M9	1.371 - 1.386	750	26	1.360 - 1.390	1000	Thin Cirrus					
I3	1.580 - 1.640	375	6	1.628 - 1.652	500	Snow Map					
M10	1.580 - 1.640	750	6	1.628 - 1.652	500	3a	SAME	1100			
M11	2.225 - 2.275	750	7	2.105 - 2.155	500	Cloud					
I4	3.550 - 3.930	375	20	3.660 - 3.840	1000	3b	SAME	1100			
M12	3.660 - 3.840	750	20	SAME	1000	3b	3.550 - 3.930	1100			
M13	3.973 - 4.128	750	21 22 23	3.929 - 3.989 3.929 - 3.989 4.020 - 4.080	1000 1000 1000	SST, Fire					
M14	8.400 - 8.700	750	29	SAME	1000	Cloud Top Propoerties					
M15	10.263 - 11.263	750	31	10.780 - 11.280	1000	4	10.300 - 11.300	1100			
I5	10.500 - 12.400	375	31 32	10.780 - 11.280 11.770 - 12.270	1000 1000	4 5	10.300 - 11.300 11.500 - 12.500	1100 1100	HRD	10.300 - 12.900	550
M16	11.538 - 12.488	750	32	11.770 - 12.270	1000	5	11.500 - 12.500	1100			