JPSS Program

7th NASA Supply Chain Quality Assurance Conference

Preston M. Burch
NASA JPSS Program Manager
October 2014

Dr. James Gleason
JPSS Senior Project Scientist

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JPSS Flight Project Deputy Manager

JPSS Topics

- Program Overview / Burch
  - What is it?
  - Why is it needed?
  - How did we get here? (some history)
  - What's the plan?
  - What have we accomplished?
- Program Science / Gleason
  - Provide Data for Weather Forecast Models
  - Short term Environmental Observations (Events)
  - Long term Environmental Observations (Climate Change Detection)
- Flight Project / Grady
  - JPSS Flight Project Overview
  - Instruments
  - JPSS-1 Mission Overview - Space Segment Perspective
  - JPSS-2 Mission Overview - Space Segment Perspective
  - JPSS Space Segment Challenges / Risk Management
- Wrap-up / Questions

JPSS Program Overview

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JPSS Topics

- What is it?
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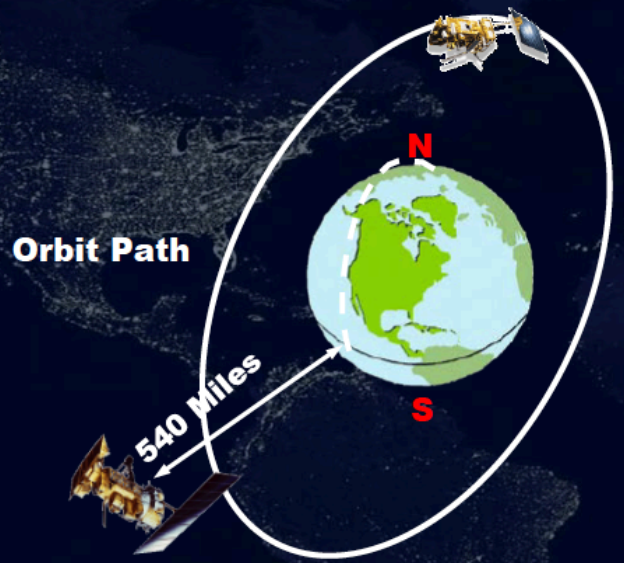
Two Orbits, One Mission

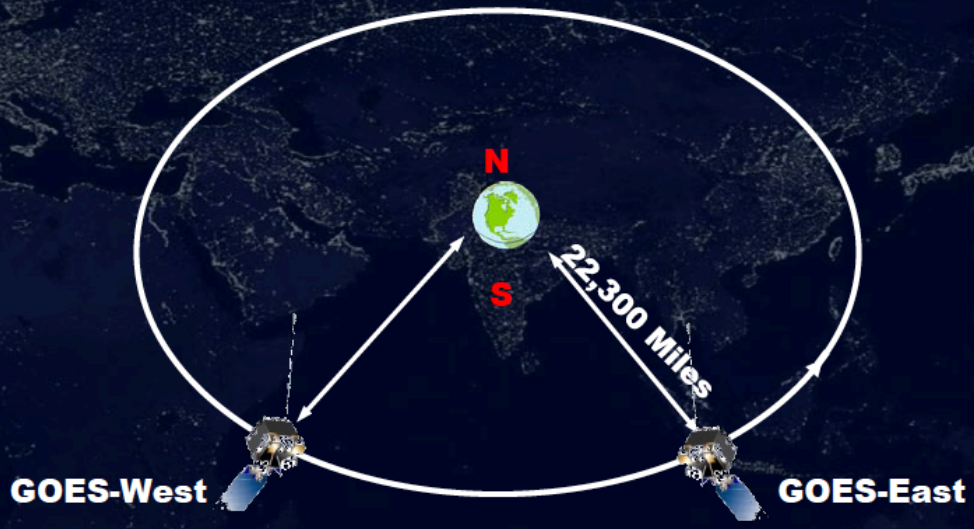
Polar-orbiting Operational Environmental Satellites



Each satellite covers the Earth twice per day

- Each orbit is 102 minutes, pole-to-pole orbit views each location same time of day
- Global coverage every 12 hours with 1 satellite
- Information is used for mid-range 3-7 day ahead warnings of severe weather; and environmental imaging and monitoring for short term polar weather and global ocean / atmosphere forecasting/monitoring

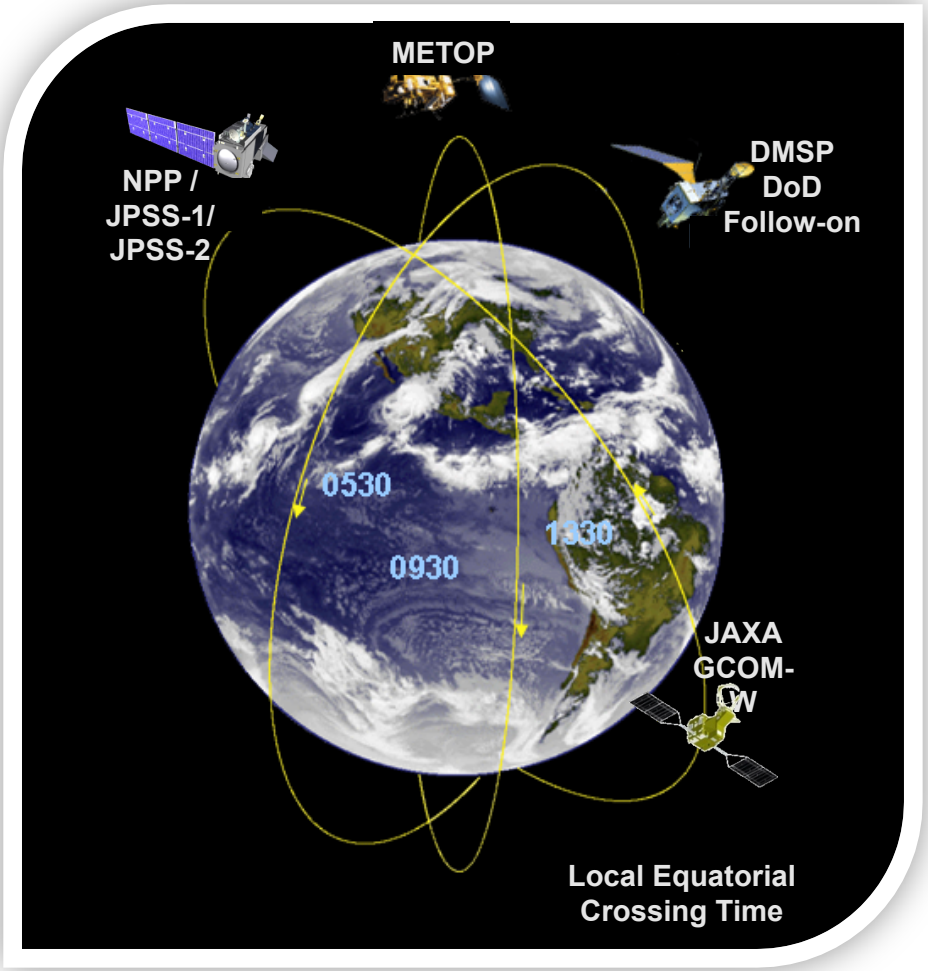
Geostationary Operational Environmental Satellites



Continuously monitors the Western Hemisphere

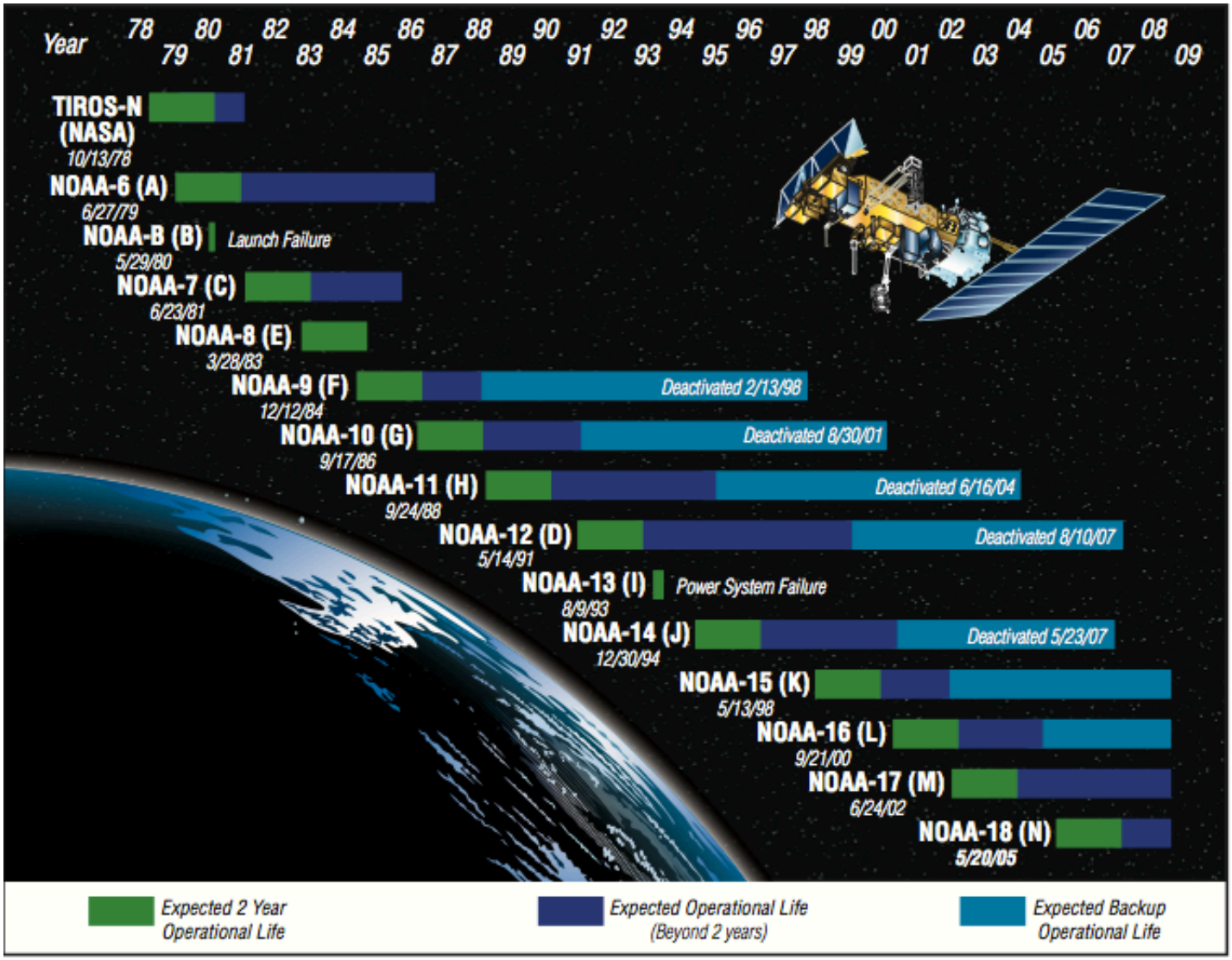
- Same geographic image over time
- Full image every 30 minutes
- Northern Hemisphere images every 15 minutes
- Usable images between 60ºN and 60ºS
- Information is used for short-term weather forecasting and severe storm warning/tracking

JPSS Integral to 3-Orbit Global Polar Coverage



JPSS implements US civil commitment interagency and international agreements to afford 3-orbit global coverage

NOAA Polar Weather Satellites, 1978 to 2009

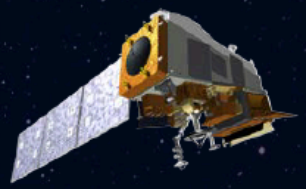


Background

- Since the 1960's the United States has operated two separate polar-orbiting environmental satellite programs
  - NOAA's Polar-orbiting Operational Environmental Satellite (POES) series
  - USAF's Defense Metrological Satellite Program (DMSP)
- The NPOESS program was created with the expectation that combining the civil (POES) and military (DMSP) programs would reduce duplication and result in cost savings
  - Established under a Presidential Decision Directive in 1994
- A tri-Agency Integrated Program Office (IPO) was formed to manage the program
  - NOAA responsible for overall program management of the converged system and satellite operations
  - USAF responsible for acquisition
  - NASA responsible for technology insertion
- Program was to launch NPOESS Preparatory Project (NPP) to reduce risk
- First NPOESS contract awarded in 2002
  - Program estimated to cost $7 billion through 2018
  - Scope of program included six satellites (three orbits) each hosting up to 13 instruments, and a ground system

Restructure

- In 2009 EOP/OSTP led task force to investigate management and acquisition options that would improve NPOESS
- In February 2010, with the release of the FY2011 President's Budget, OSTP announced the restructure of the NPOESS program – specifically, NOAA and DoD would be responsible for different orbits
  - NOAA responsible for the afternoon orbit - JPSS
  - DoD responsible for the early morning orbit - DWSS
  - Partnership with EUMETSAT would continue for mid-morning orbit
  - Both agencies would share a common ground system
- Restructure codified and executed through:
  - National Space Policy
  - Administration's Implementation Plan for Polar-orbiting Environmental Satellites
  - NPOESS Deputies Meeting Summary
  - Series of DoD Acquisition Decision Memorandums
    - Continued support to NPP
    - Transfer of sensors and ground system from DoD to NOAA/NASA



JPSS Supports National Priorities

Providing Global Observations to Predict and Monitor:

Weather and Disasters

Environment and climate

Information Products for Weather and Environment Sensitive Sectors

Public Safety

National Defense

Transportation

Agriculture and Forestry

Ocean and Coastal Resources

Water Resources

Energy and Earth Resources

Biodiversity

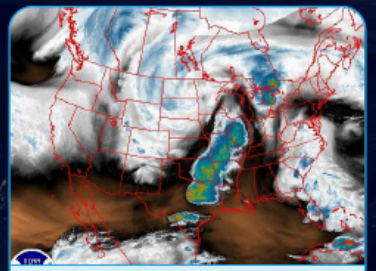
Ecosystems

Human Health

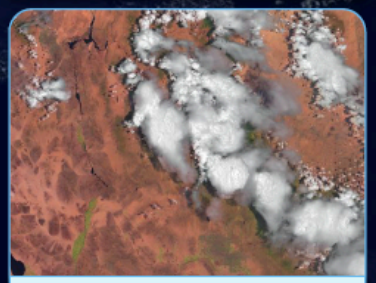
How JPSS Supports National Priorities

- JPSS provides:
  - Continuous data for civil and military weather forecasting
  - Global coverage
  - Advanced weather observations
  - Unique Day and Night Imaging capabilities
- The two most important uses:
  - The most critical data for numerical weather prediction to enable accurate 3-7 day ahead forecasts, giving high confidence to emergency managers in advance of severe weather events
  - Operational weather and environment satellite observations for Alaska and Polar Regions Operational Forecasting

Without JPSS, the Nation will experience an immediate degradation in weather forecasting capability

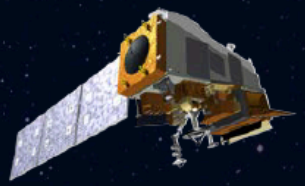


EF-5 tornado in Moore, Okla. (2013)



Yarnell Hill fire in Prescott, Ariz. (2013)

Hurricane Sandy in Atlantic City, N.J. (2012)



Key Customers and Partners

- NOAA Offices and Programs
- Federal Agencies
  - Department of Defense (all Services)
  - Department of State and US Agency for International Development
  - Department of Transportation
    - Federal Aviation Administration
  - Department of Agriculture
  - Environmental Protection Agency
  - Department of the Interior
  - National Aeronautics and Space Administration
  - Department of Homeland Security
    - US Coast Guard
    - Federal Emergency Management Agency
- State and Local Governments
  - Mayors, City Managers, Councils, State Legislatures
  - Agriculture, Transportation, Public Safety, Emergency Management
- Academia
- Commercial Sector
  - Networks (ABC, NBC, CBS) and cable news outlets (CNN, Weather Channel)
  - Utility and energy sector
  - Agriculture
- Non-Profit Sector
  - Red Cross
  - Conservation
- International Community
  - Space and Weather agencies
  - UN System
  - Non-Governmental Organizations

JPSS Program

JPSS consists of:

- Suomi NPP*, JPSS-1, JPSS-2
- Four primary instruments
- Global ground system (Alaska, Colorado, Maryland, West Virginia, Norway, Antarctica)

NOAA Responsibilities:

- End-to-end responsibility, requirements, funding, delivering to National Weather Service
- Operations, Data product science, enterprise ground services

NASA Goddard Space Flight Center Responsibilities:

- Systems Engineering lead
- Procurement and acquisition
- Safety and Mission Assurance

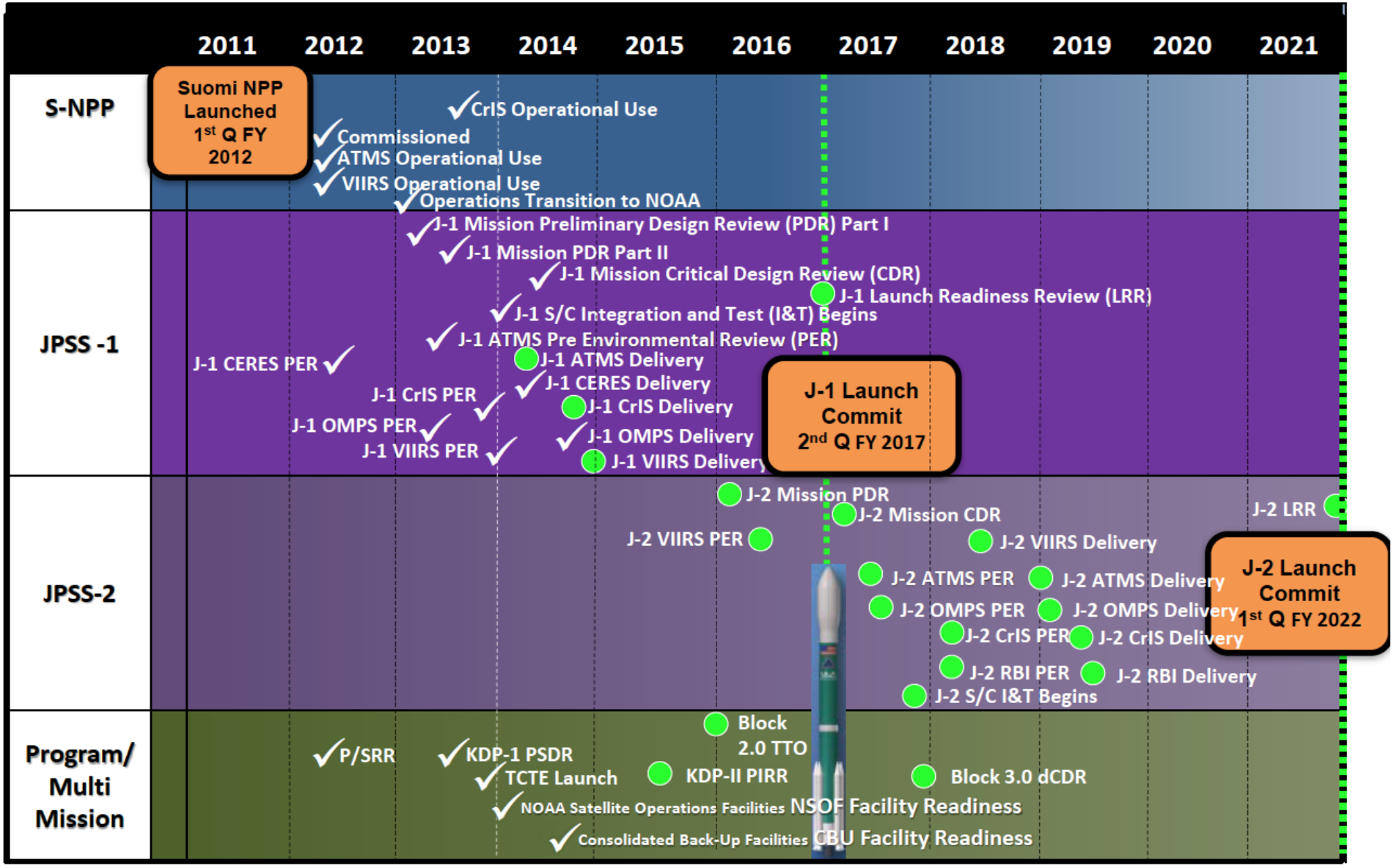
JPSS Schedule	
Launch Dates*	No later than 2nd Quarter FY 2017 (JPSS-1); 1st Quarter FY 2022 (JPSS-2)
Program Architecture	3 Satellites (Suomi NPP, JPSS-1, JPSS-2) Suomi NPP: 5-year operational design life; JPSS-1: 7-year operational design life
Program Operational Life	FY 2012 - FY 2025
Program Life-cycle (FY 2014 President's Budget)	$11.349 billion

*Suomi-NPP is a joint NASA / NOAA mission

*Launch Date based on FY 2014 President's Budget Request

JPSS System Architecture

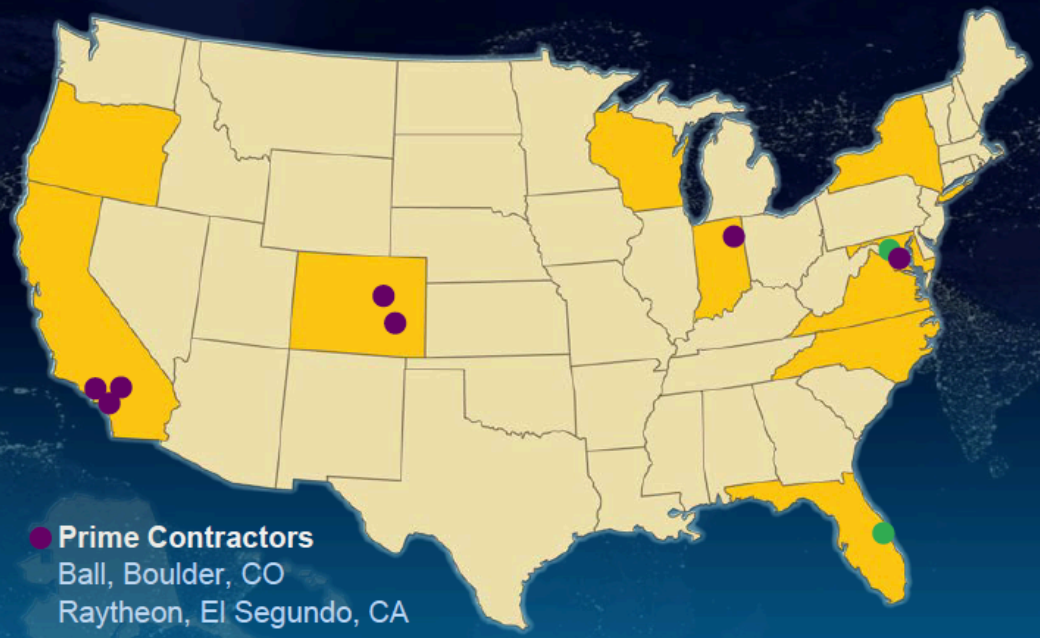
JPSS Milestones



*Milestones are reflected in the calendar year unless otherwise noted

JPSS Across the Country

Prime Contractors and Federal Partners



Prime Contractors
Ball, Boulder, CO
Raytheon, El Segundo, CA
ITT Space Systems, Ft. Wayne, IN
Northrop Grumman Electronic Systems, Azusa, CA
Northrop Grumman Aerospace Systems, Redondo Beach, CA
Aerospace Corporation, El Segundo CA, Washington D.C.
Raytheon, Aurora, CO

Government Partners/Locations
NASA, Cocoa Beach, FL
NASA, Greenbelt, MD
NOAA, Greenbelt, Suitland, Silver Spring, College Park, MD
Naval Research Laboratory, MD

JPSS Science

Dr. James Gleason
JPSS Senior Project Scientist
October 2014

JPSS Mission:
Make Environmental Observations

- Provide Data for Weather Forecast Models
- Short term Environmental Observations (Events)
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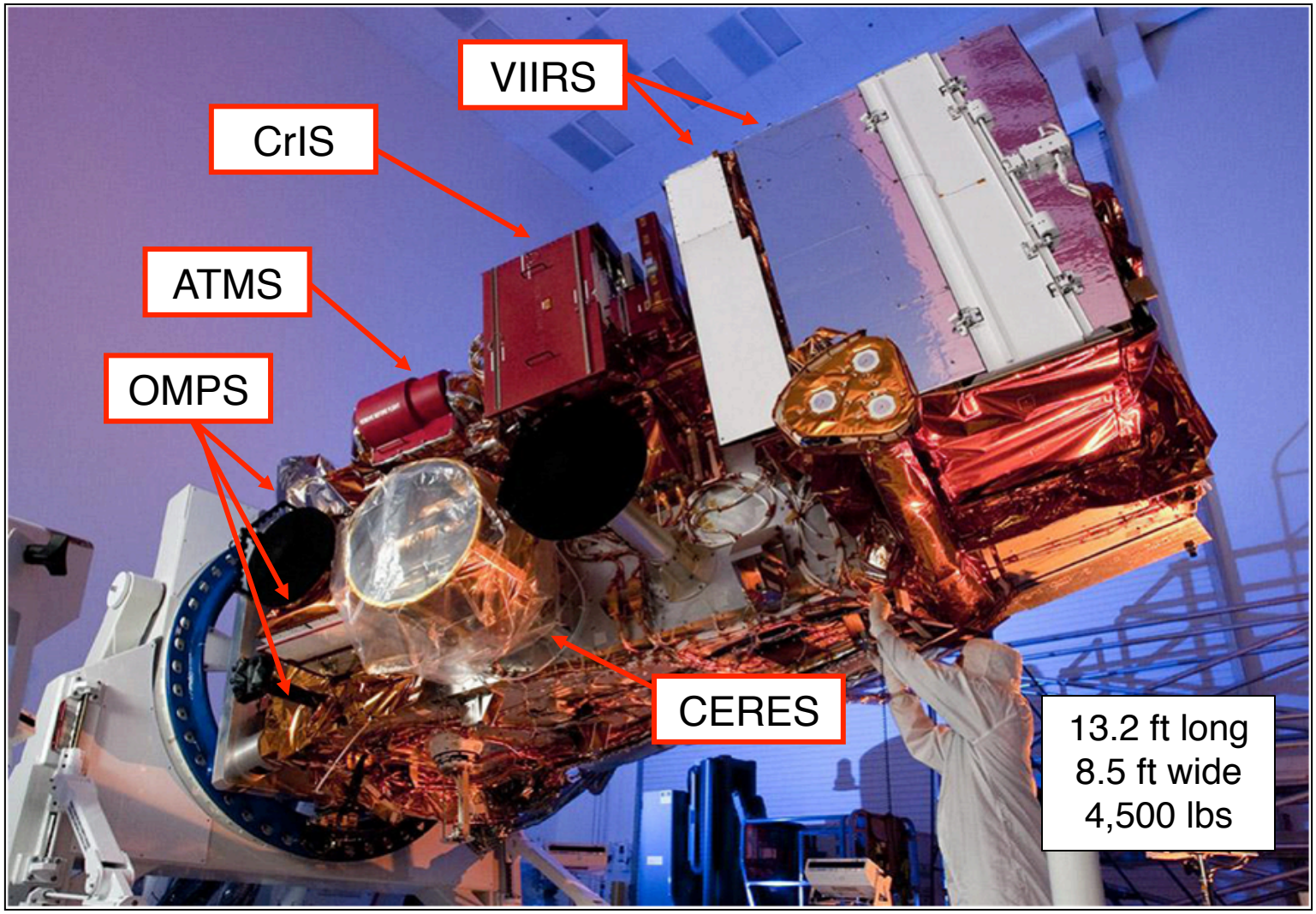
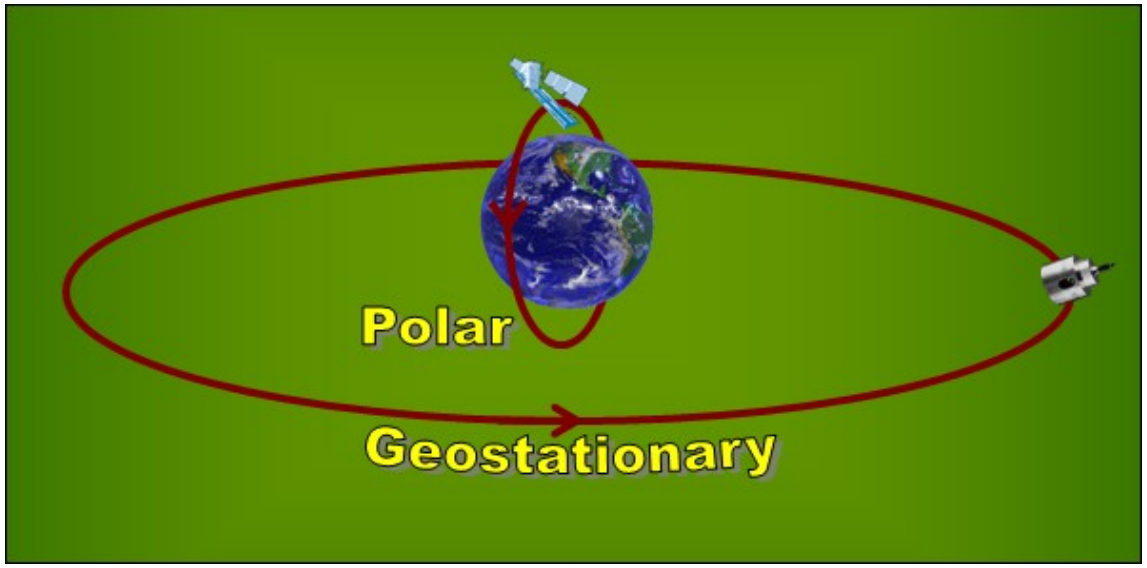
S-NPP & JPSS-1 with 5 instruments

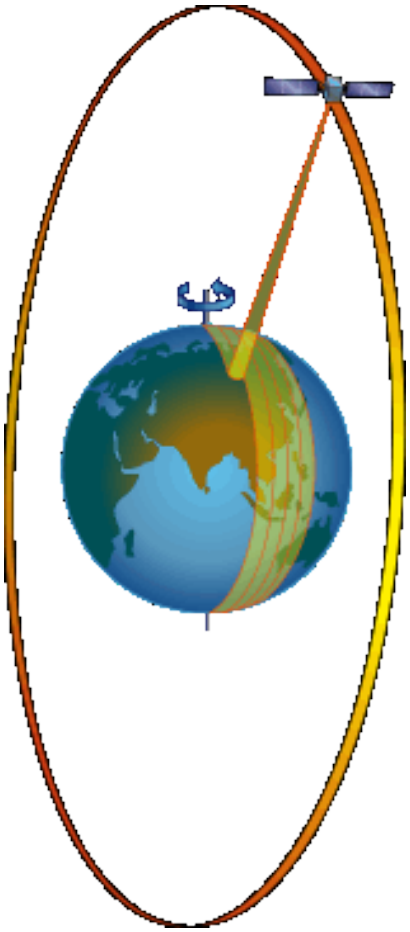


Suomi-NPP Satellite shown, but JPSS-1 is a near-clone

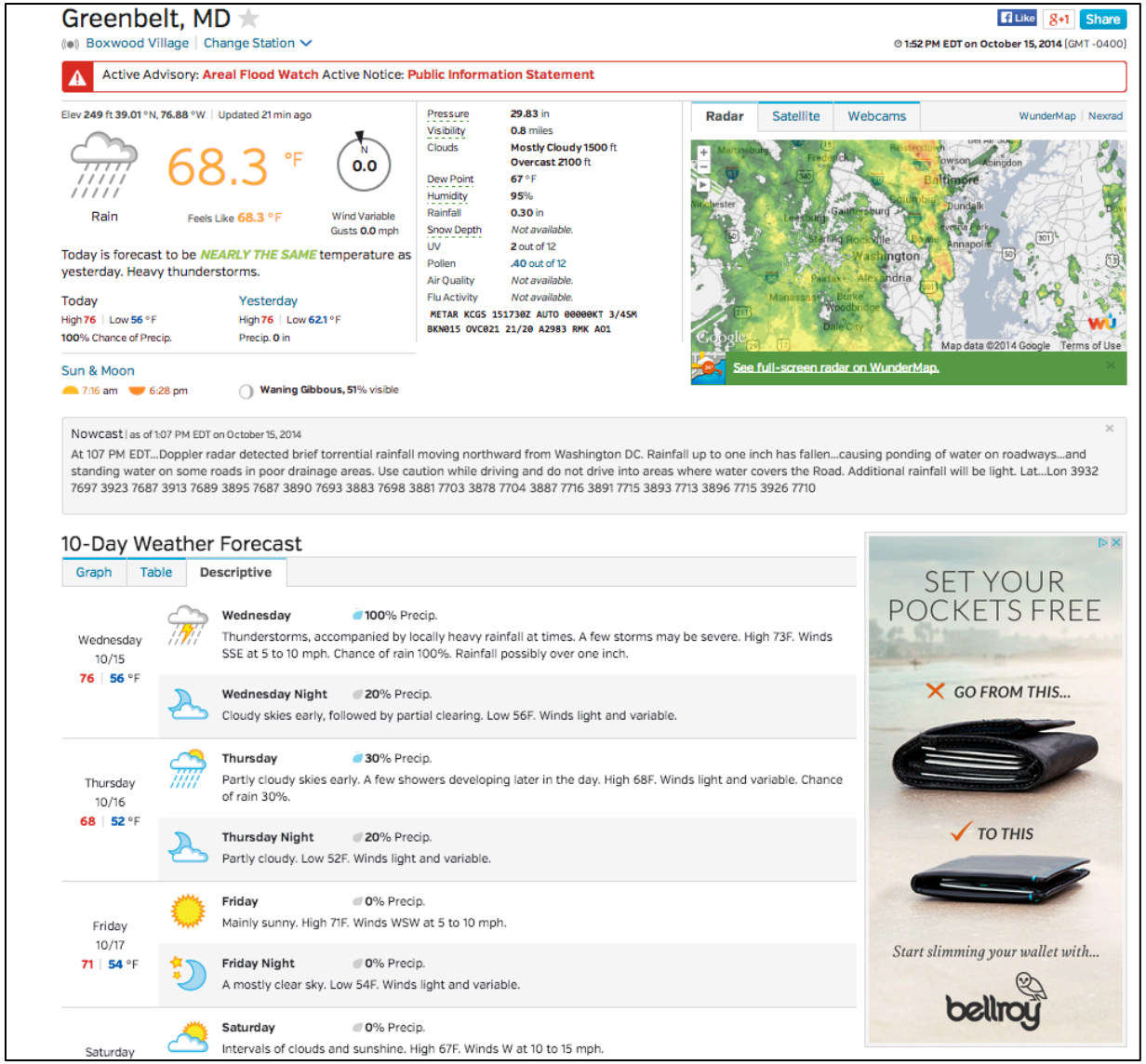
S-NPP & JPSS-1 are in Polar orbit

- Orbit is sun-synchronous
- Observes at the same local time everyday
- S-NPP will pass over Greenbelt about 1:40 pm



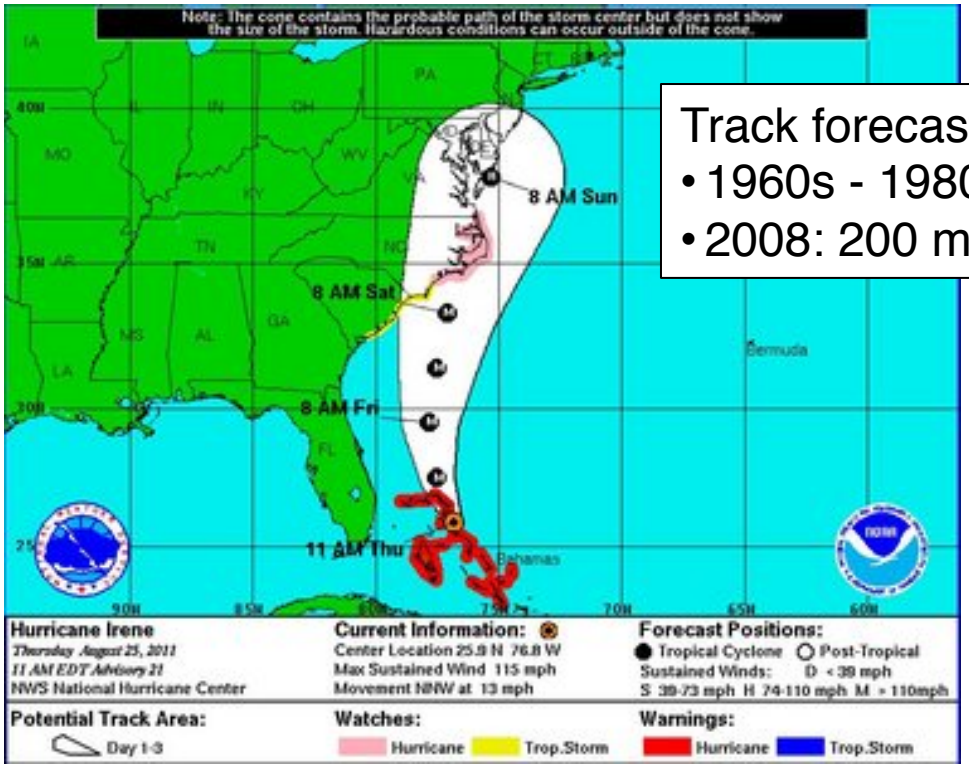


Typical Weather Forecast



Hurricane Track Forecast

3-Day Forecast Track for Hurricane Irene August 2011

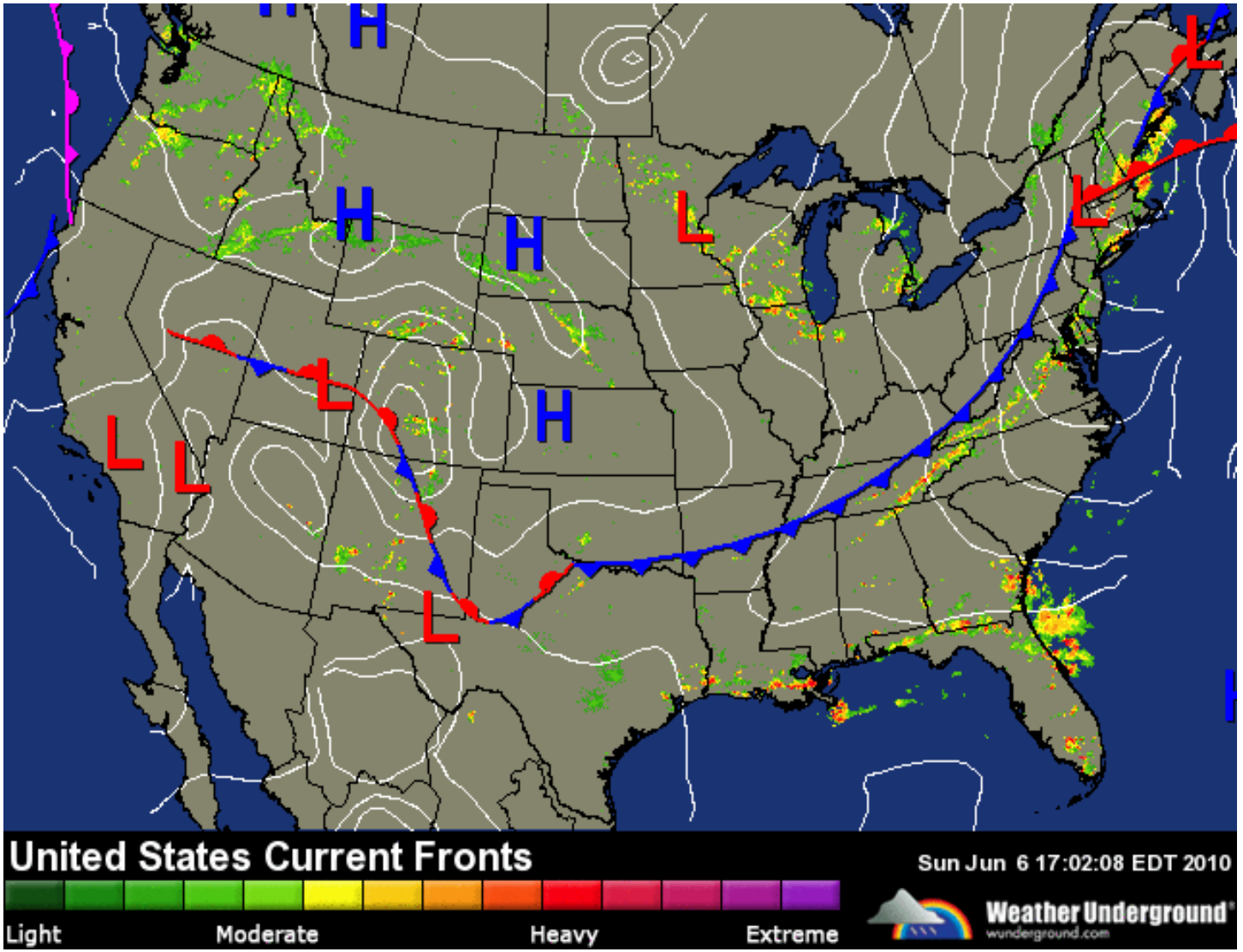


Track forecast error:

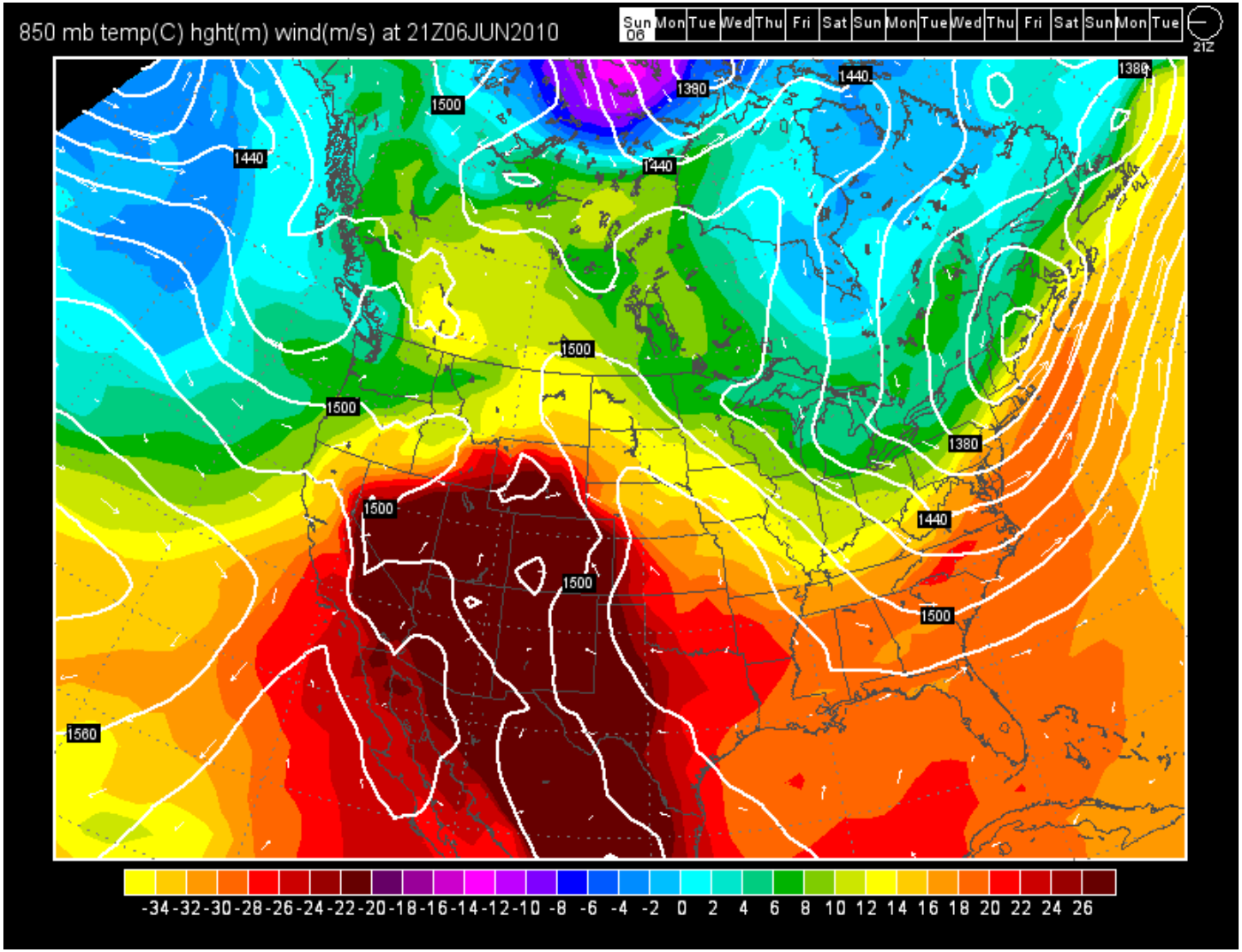
- 1960s - 1980s: 400 miles / 3days
- 2008: 200 miles / 3 days (< 100 miles/2days)

"A forecast for five days from now is as accurate as forecasts for three days away were a decade ago" Bill Read NOAA/NHC

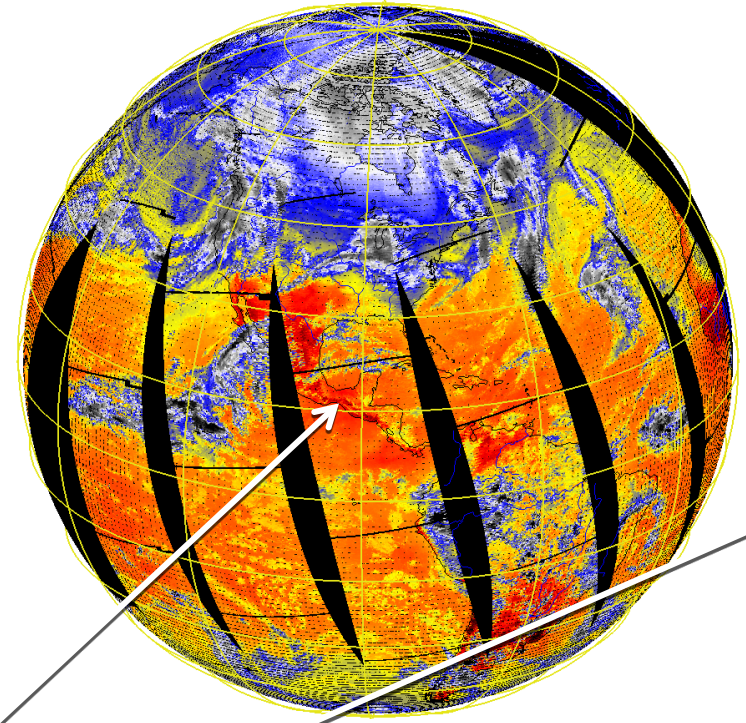
Weather Maps
Frontal Map with Radar June 6, 2010

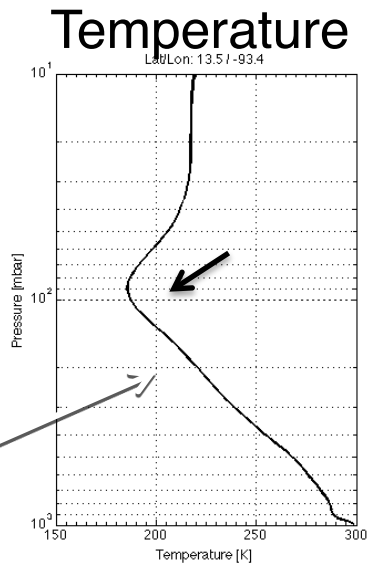


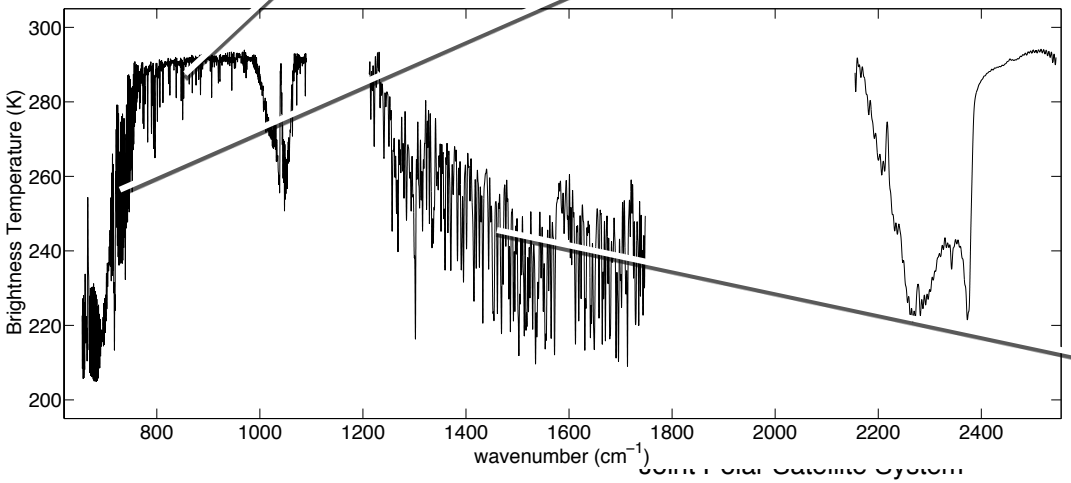
Weather Model and Forecast
Temperature at 850mb (5000ft) June 6, 2010

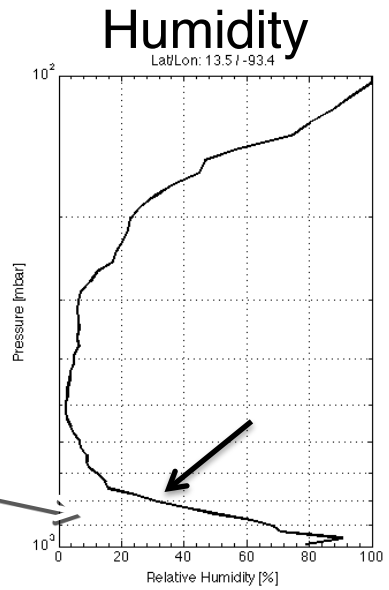


CrIS Data and Retrievals for January 20, 2012









JPSS Mission:
Make Environmental Observations

- Provide Data for Weather Forecast Models
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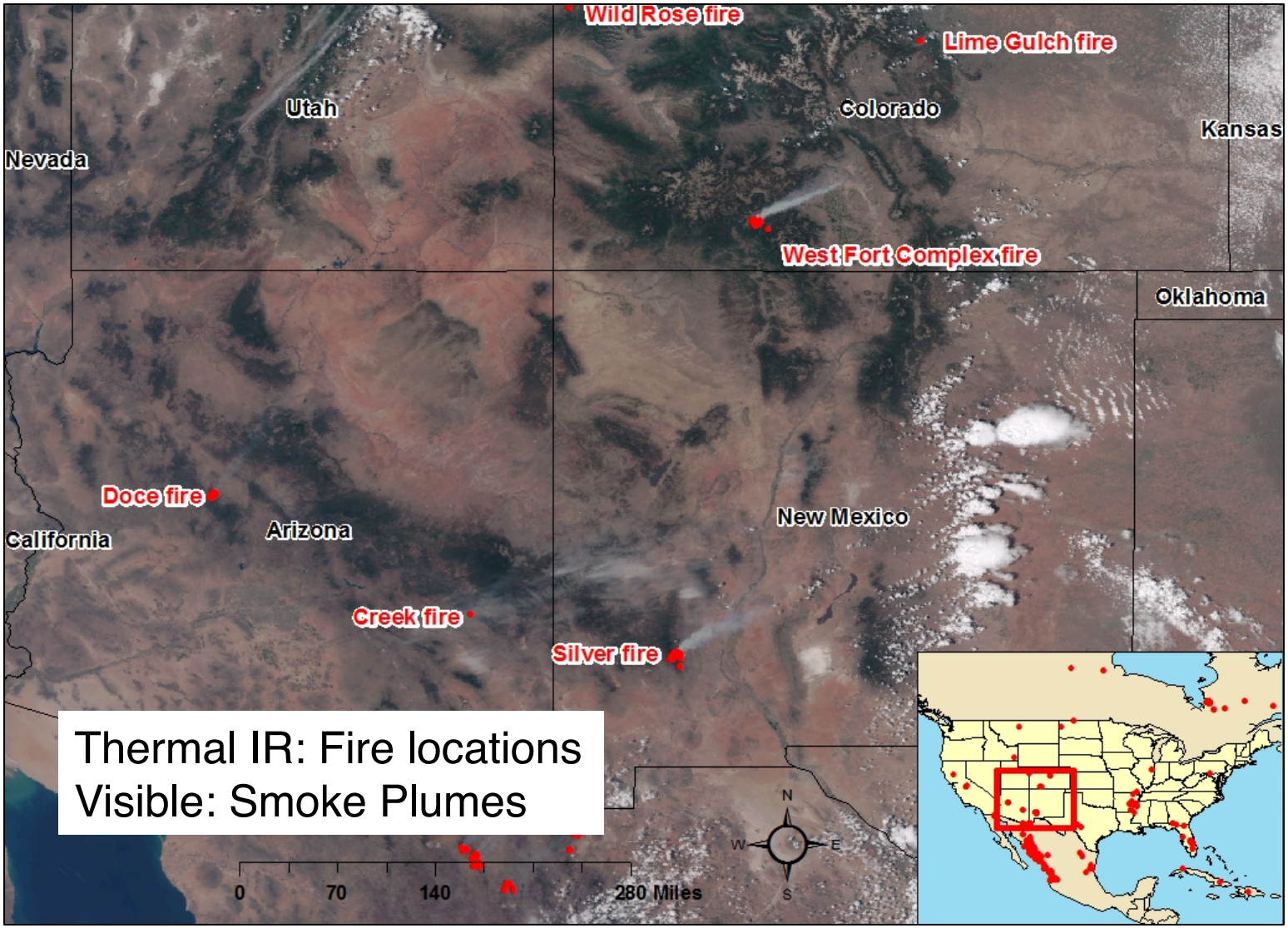
Deepwater Horizon Oil Slick
April 29, 2010

Southwest U.S. Fires
June 19, 2013



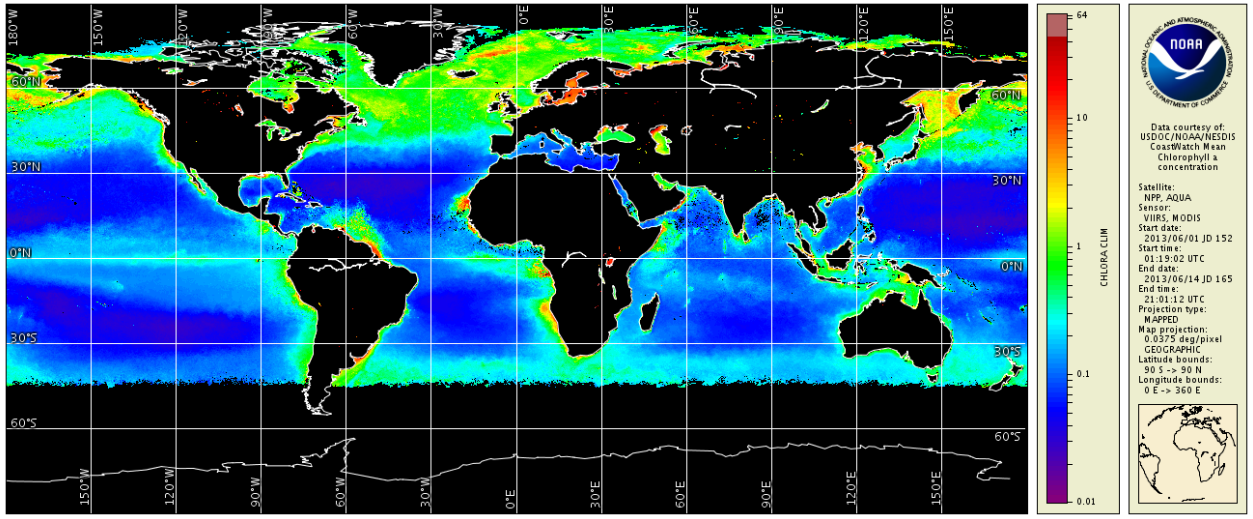
NOAA Hazard Mapping System

The Fire and Smoke Analysis is performed daily for the Continental US, Hawaii, Puerto Rico and Central America year round

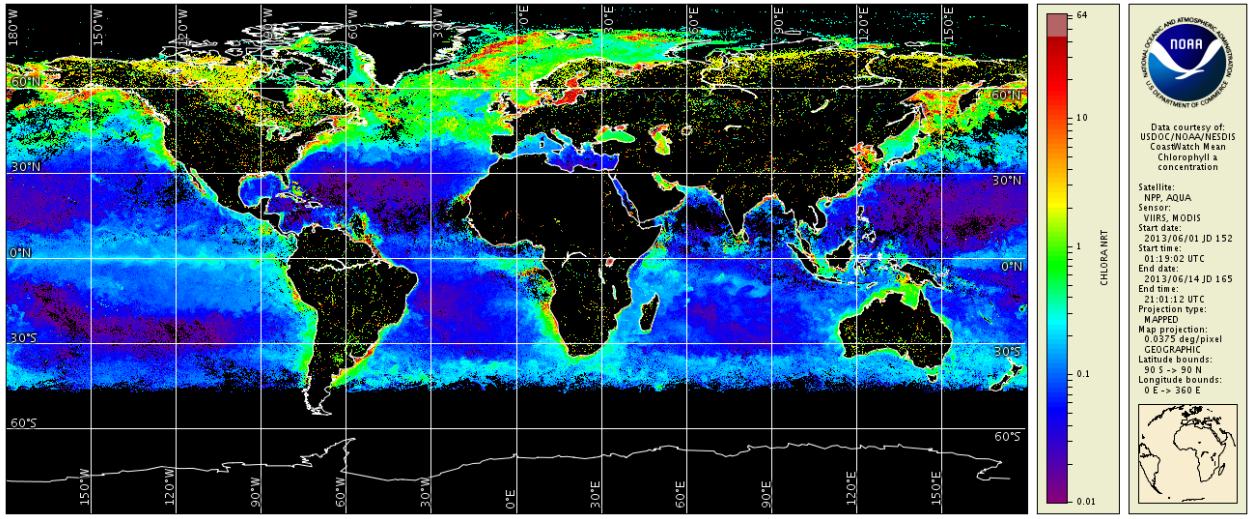
Seasonal analysis performed for Alaska and Canada from May through November

Ocean Color – Chlorophyll

AQUA MODIS NASA-OBPG multi-year CLIMATOLOGY for June

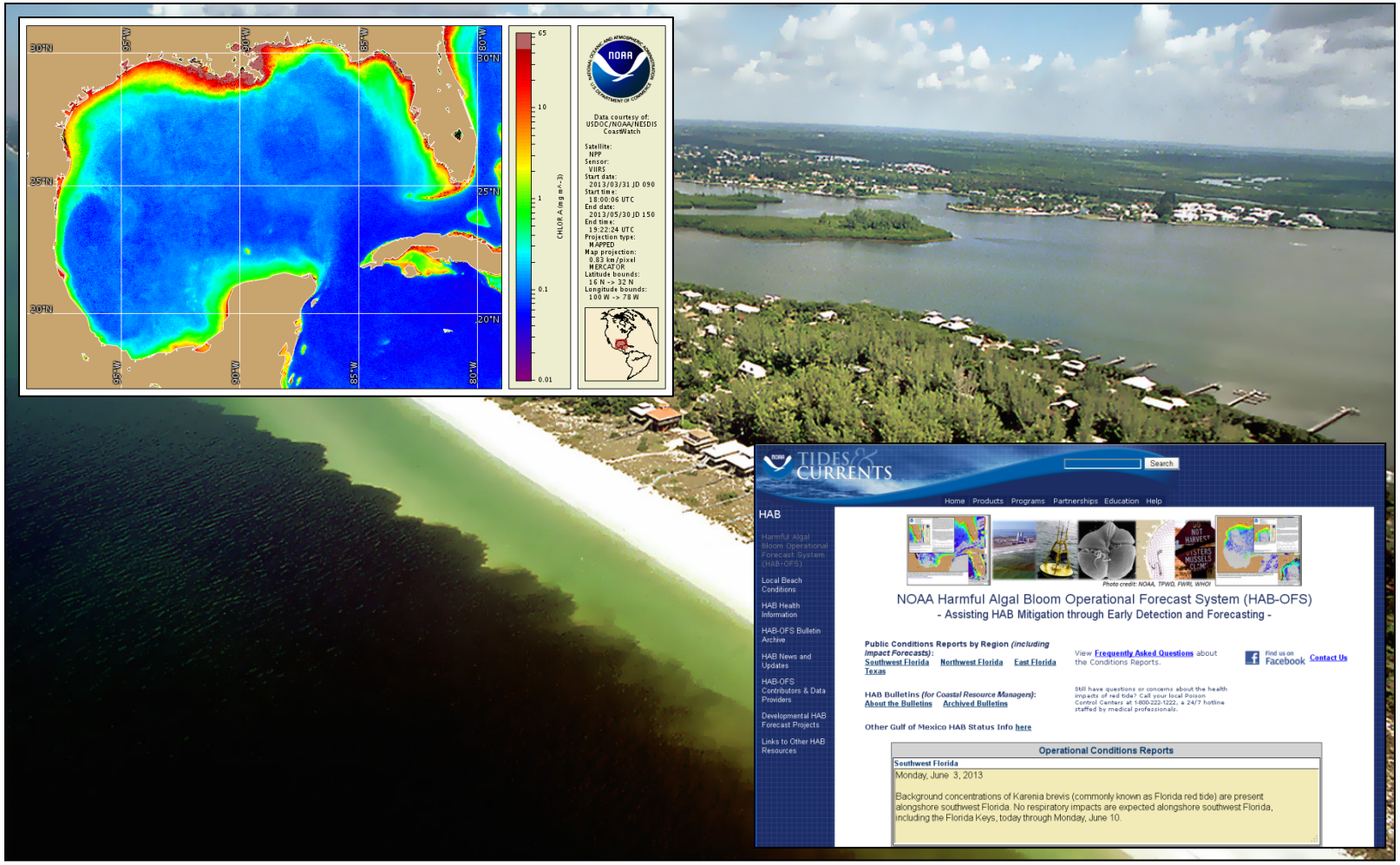


VIIRS IDPS 14-day Median Composite, June 1–14, 2013

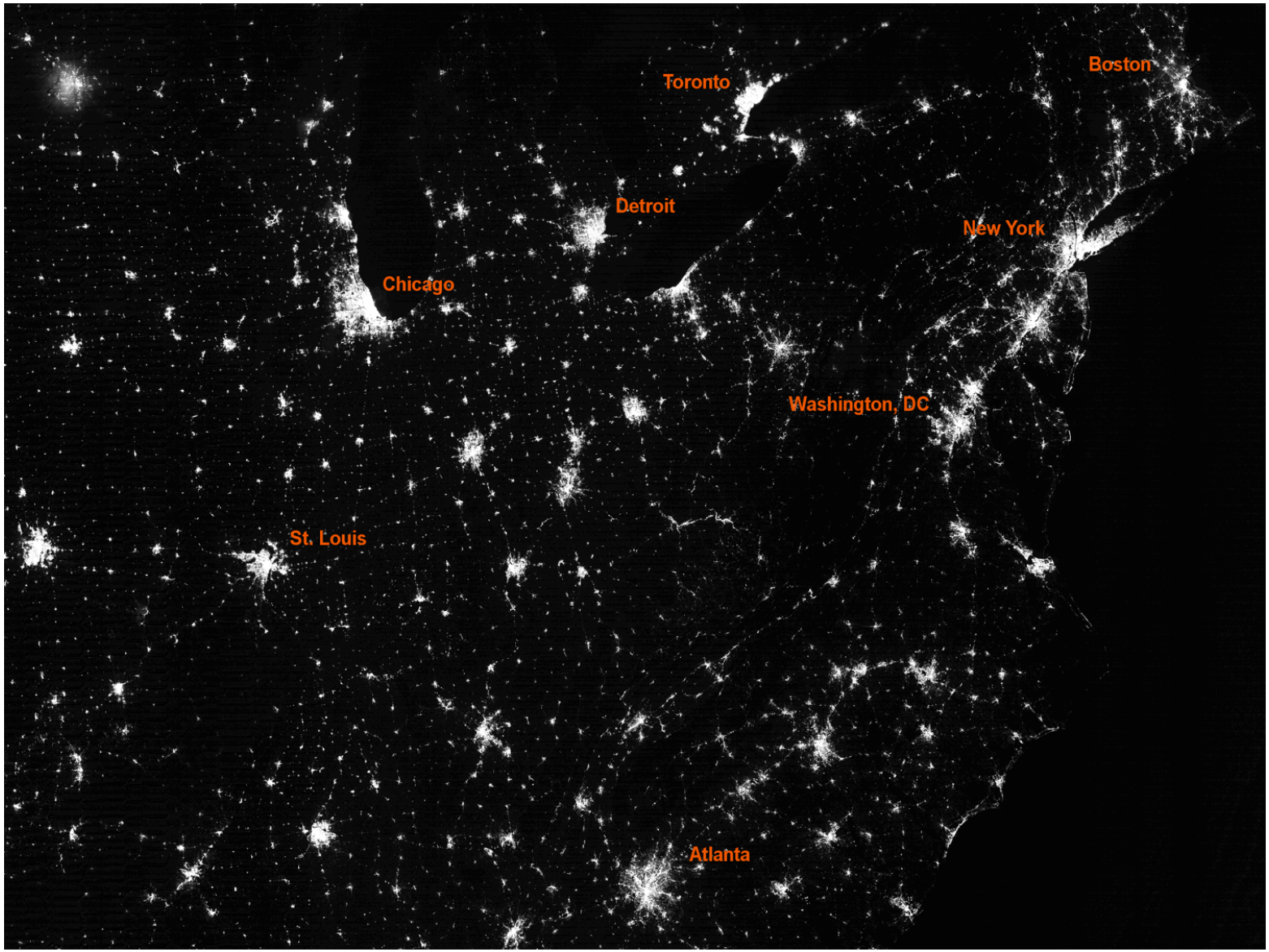


VIIRS Operational Ocean Color

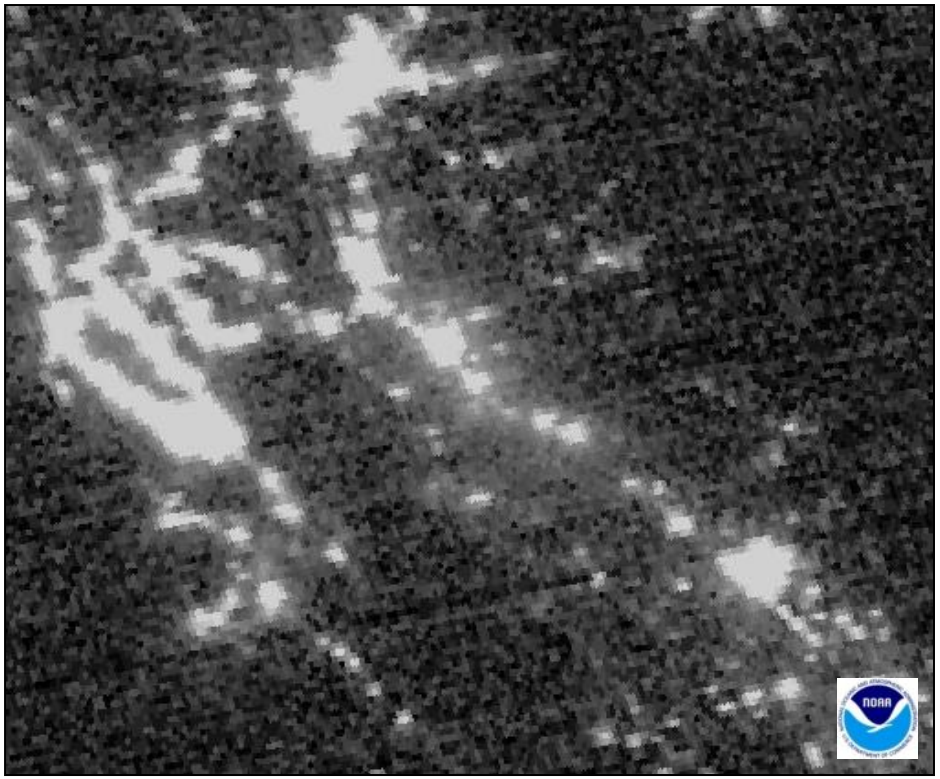
Harmful Algal Bloom Monitoring and Forecasting
NOS issues twice-weekly HAB Bulletins

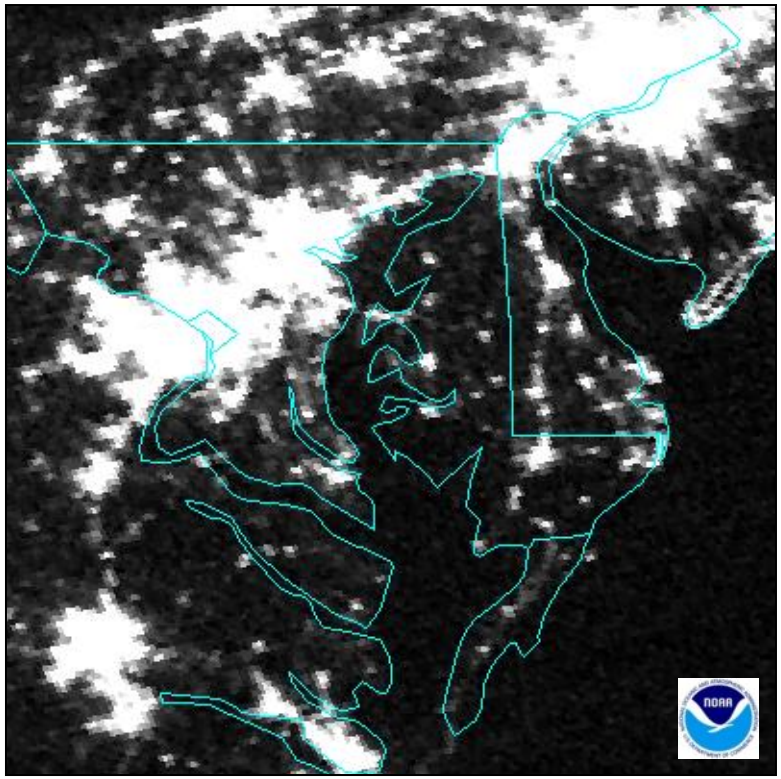


VIIRS Day Night Band



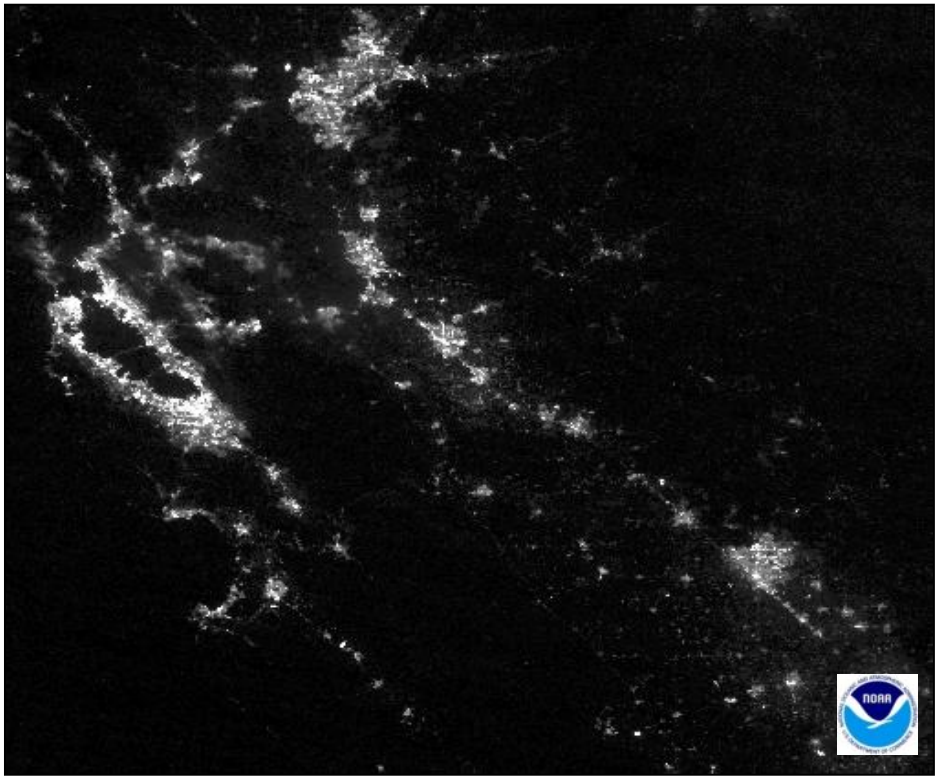
Resolution Improvements: OLS vs. DNB

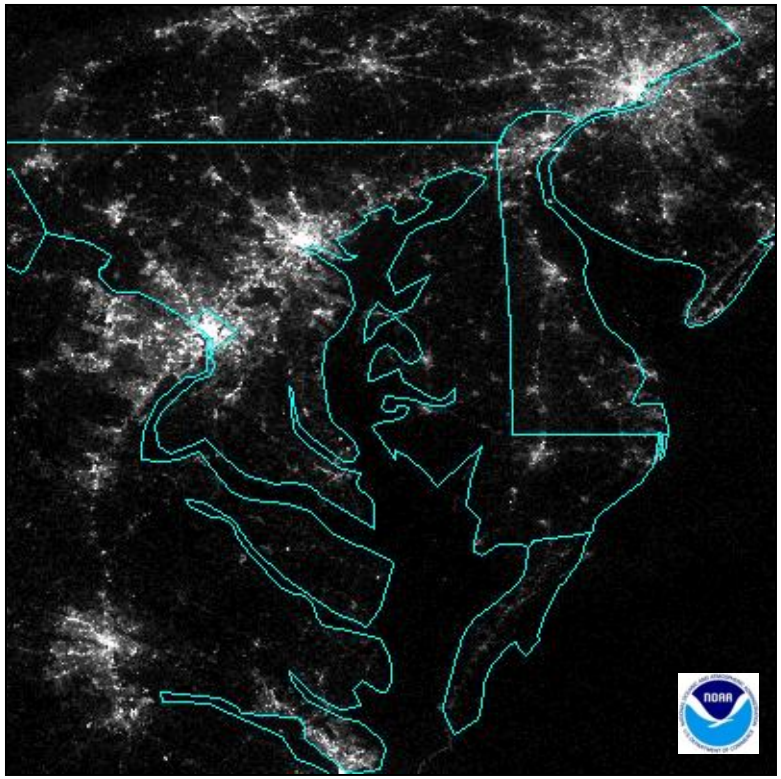




- 740 m instantaneous geometric field of view (DNB) vs. ~5 km for the OLS results in dramatic spatial resolution improvements
- DNB Imagery courtesy of Steven Miller CIRA/CSU

Resolution Improvements: OLS vs. DNB





- 740 m instantaneous geometric field of view (DNB) vs. ~5 km for the OLS results in dramatic spatial resolution improvements
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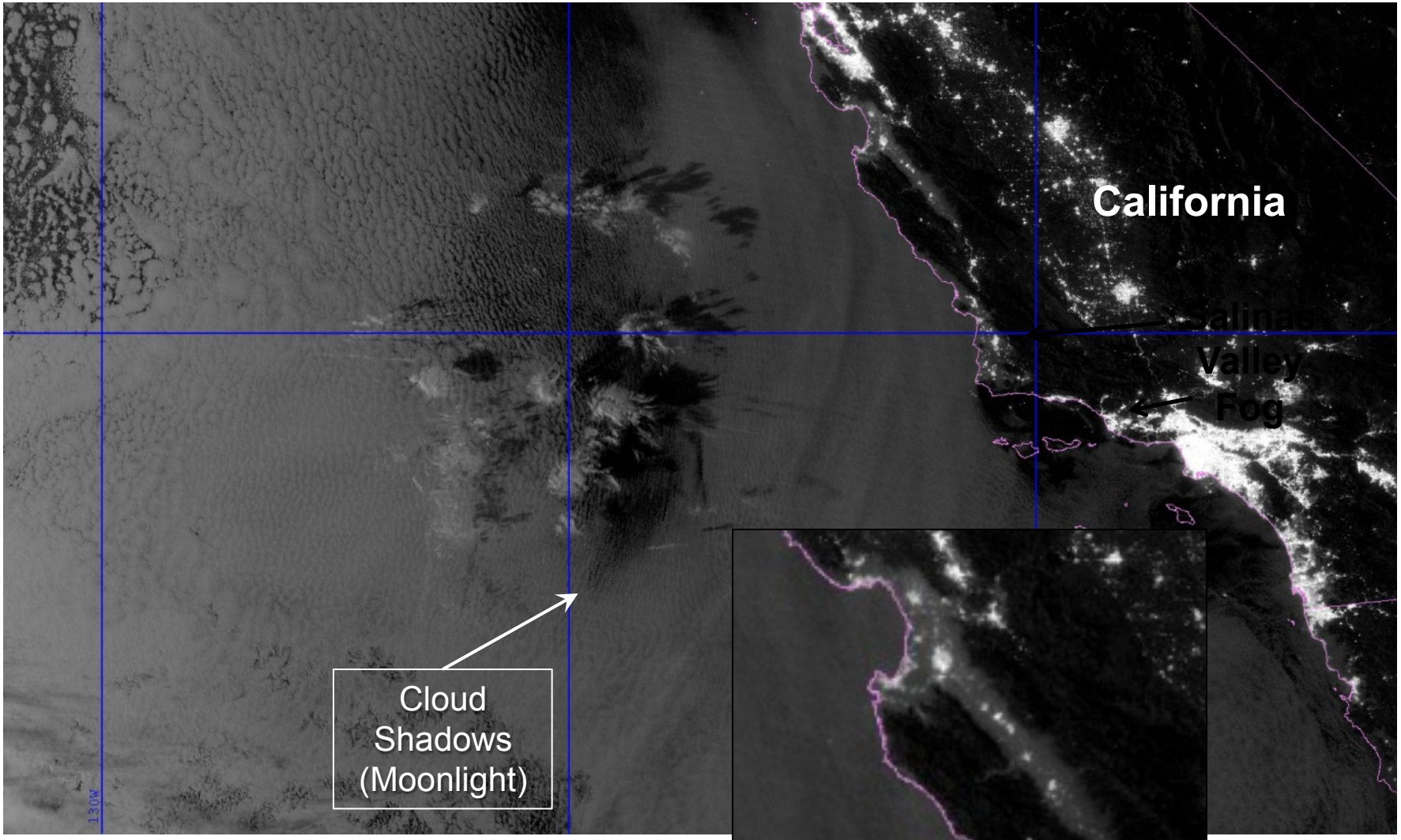
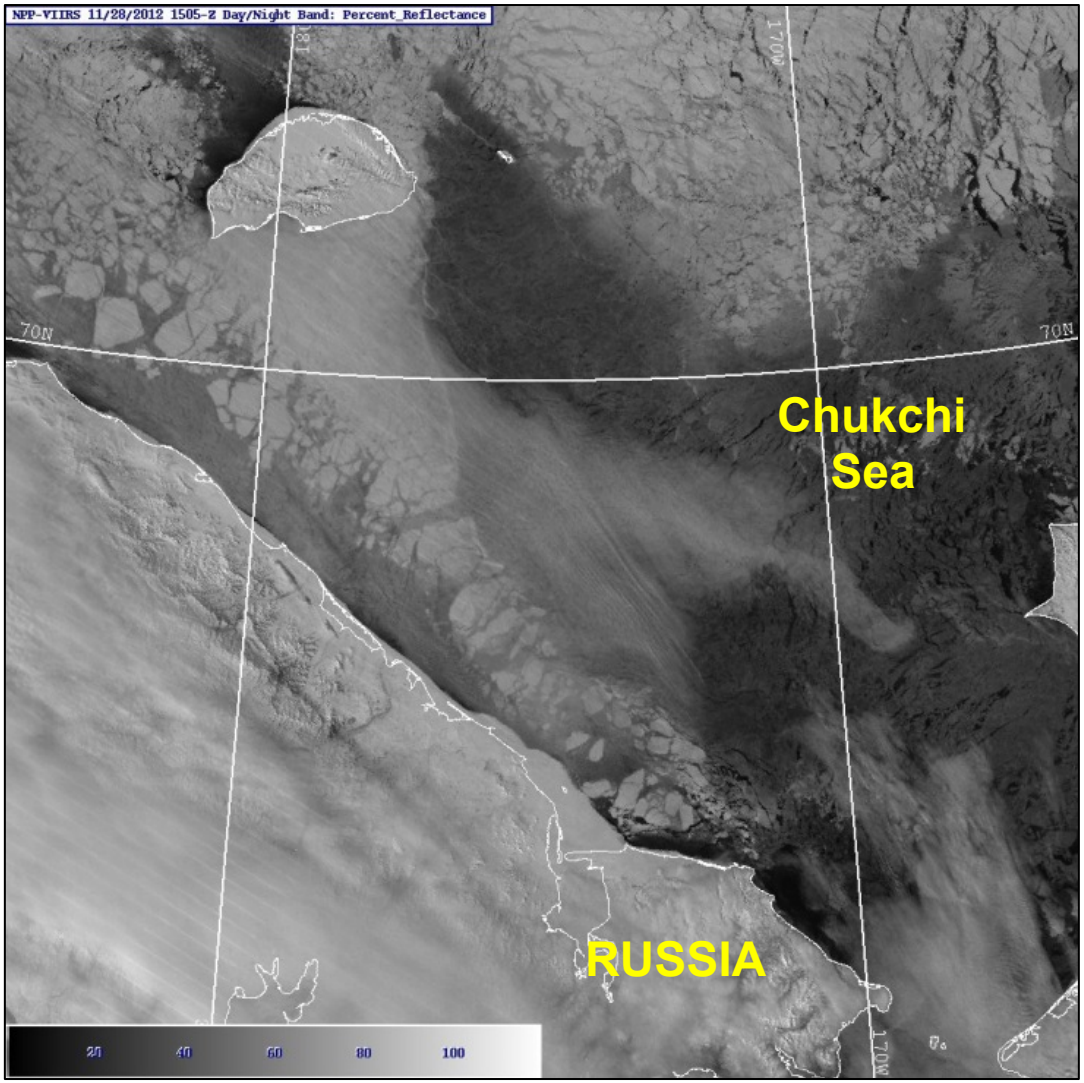
Clouds by Moonlight
September 26, 2012



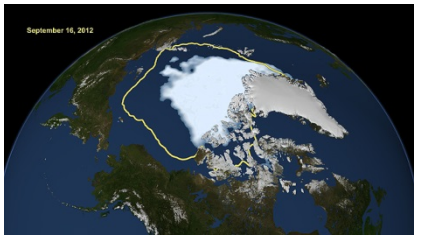
Sea Ice Mapping



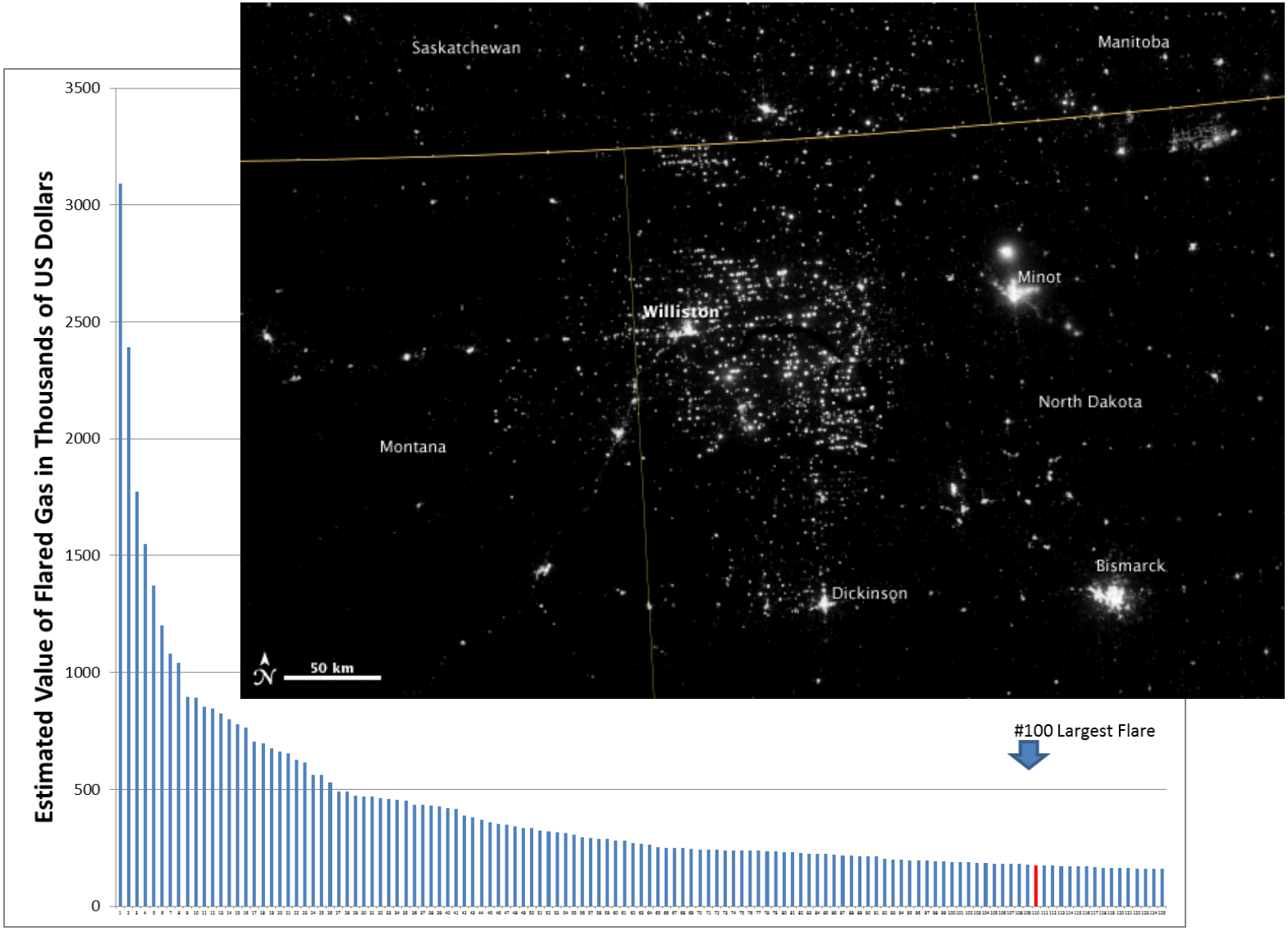
The Northern Passage

The "Deadliest Catch"

Climatology

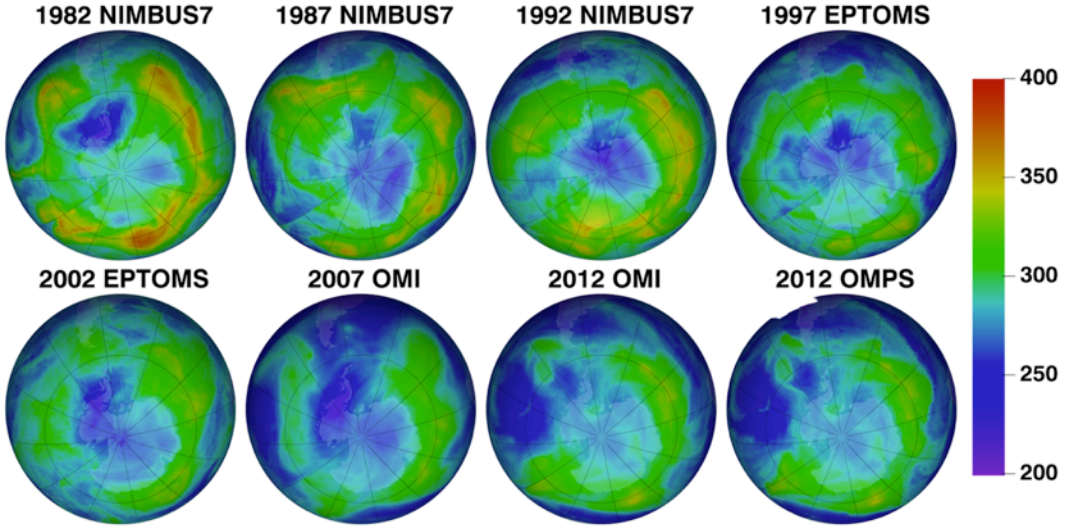


Gas Flares

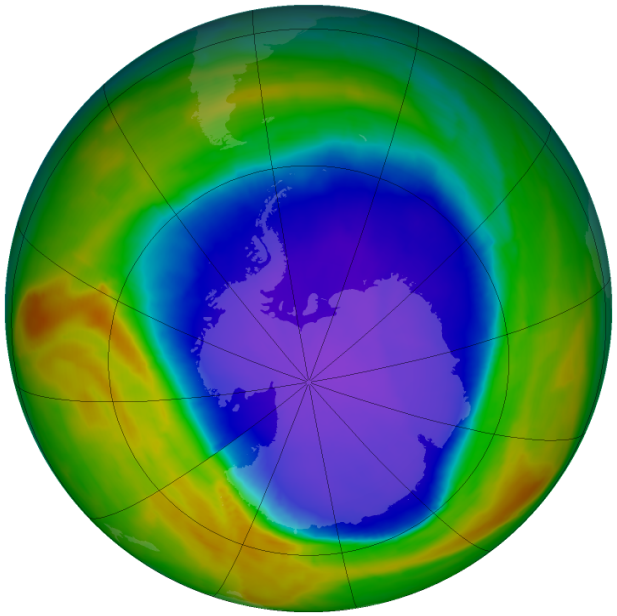

Saskatchewan
Manitoba
Minot
Williston
North Dakota
Montana
Bismarck
Dickinson
50 km
Estimated Value of Flared Gas in Thousands of US Dollars
3500
3000
2500
2000
1500
1000
500
0
#100 Largest Flare

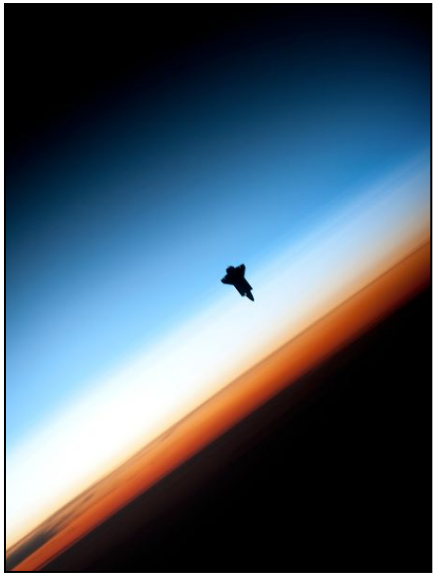
Ozone Monitoring

Thirty Years of January 19, 2014 Ozone

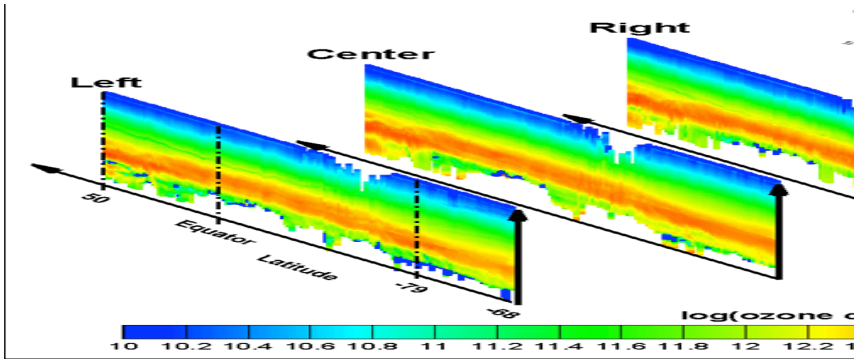


September 30, 2014
Lowest Value 114 DU





OMPS/LP Retrieved Ozone Profile January 10, 2012



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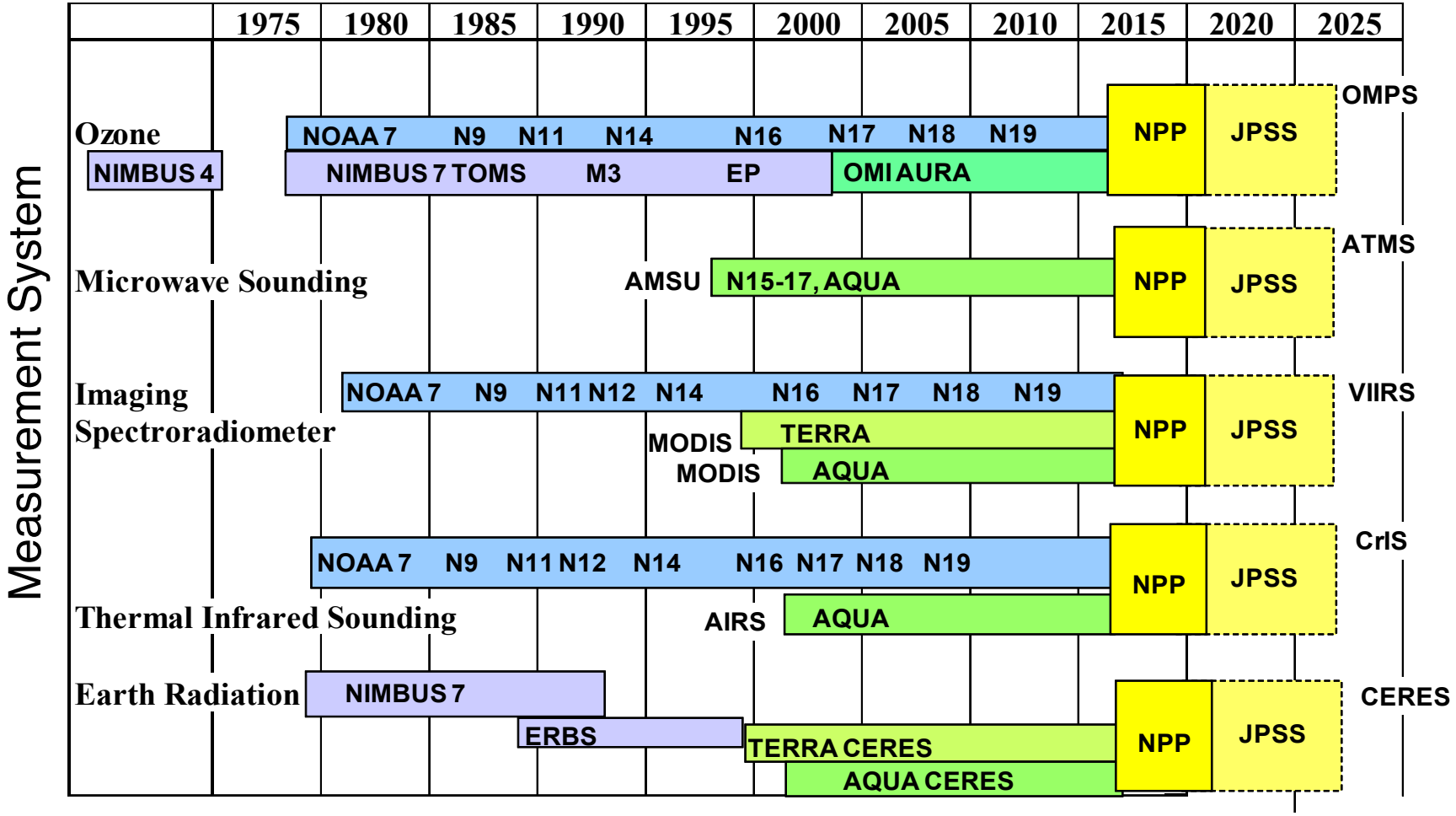
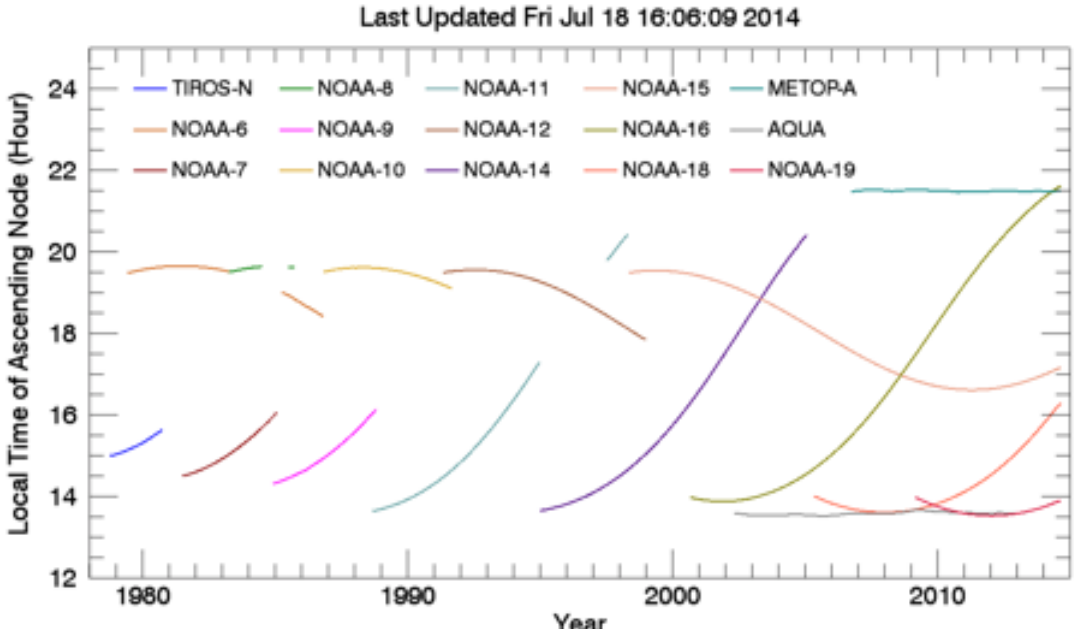
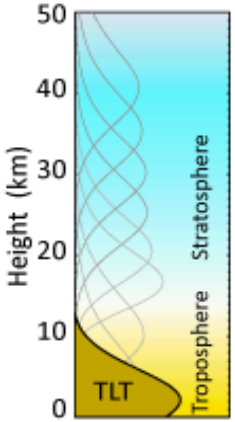
S-NPP Continues Data Time Series

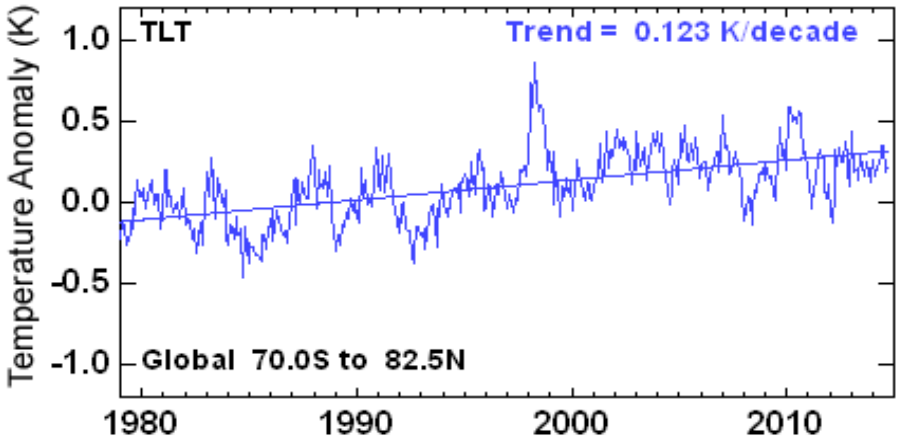


Conventional Operations EOS Technology Jump Research Quality Operations

Microwave Tropospheric Temperature Trends





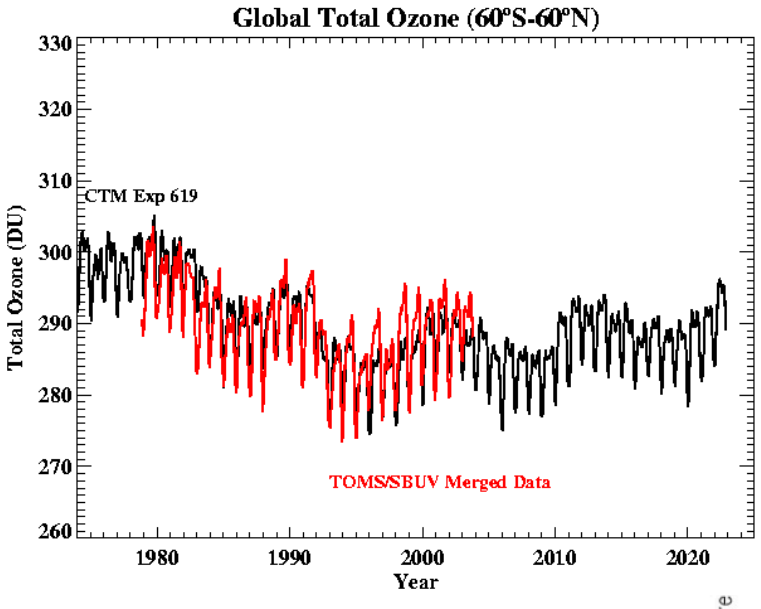


S-NPP & JPSS
keep same observing time

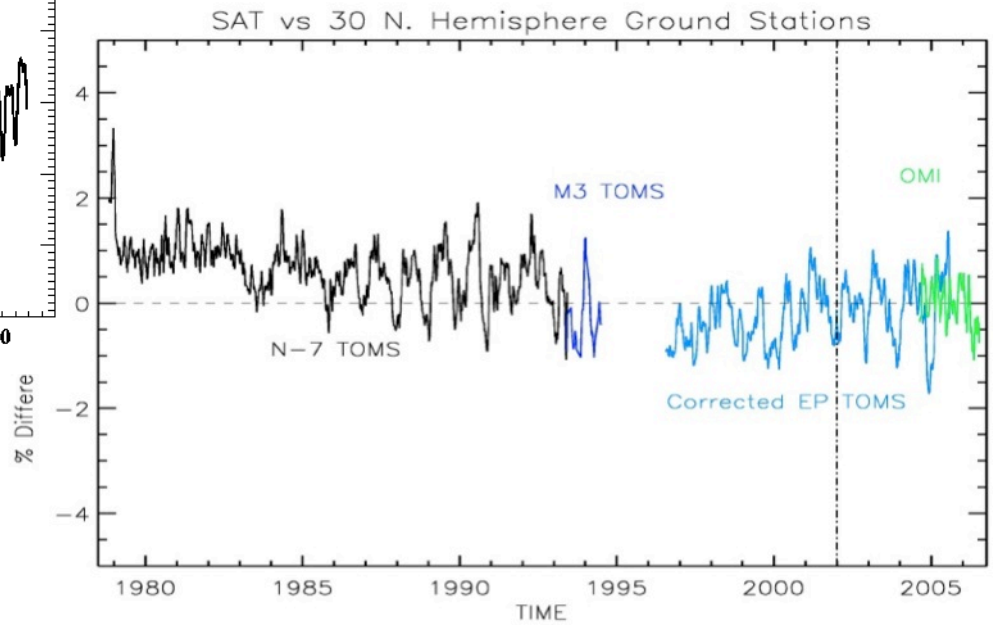
MSU/AMSU data are produced by Remote Sensing Systems
http://images.remss.com/msu/msu_time_series.html

Climate Science Questions
Can we use past performance to predict the future?

Does the model data reproduce the satellite observations?



How much confidence do we have in the observations?



JPSS Flight Project

Jean Grady
Deputy Project Manager
JPSS Flight Project
October 2014

Agenda

- JPSS Flight Project Overview
- Instruments
- JPSS-1 Mission Overview - Space Segment Perspective
- JPSS-2 Mission Overview - Space Segment Perspective
- JPSS Space Segment Challenges / Risk Management

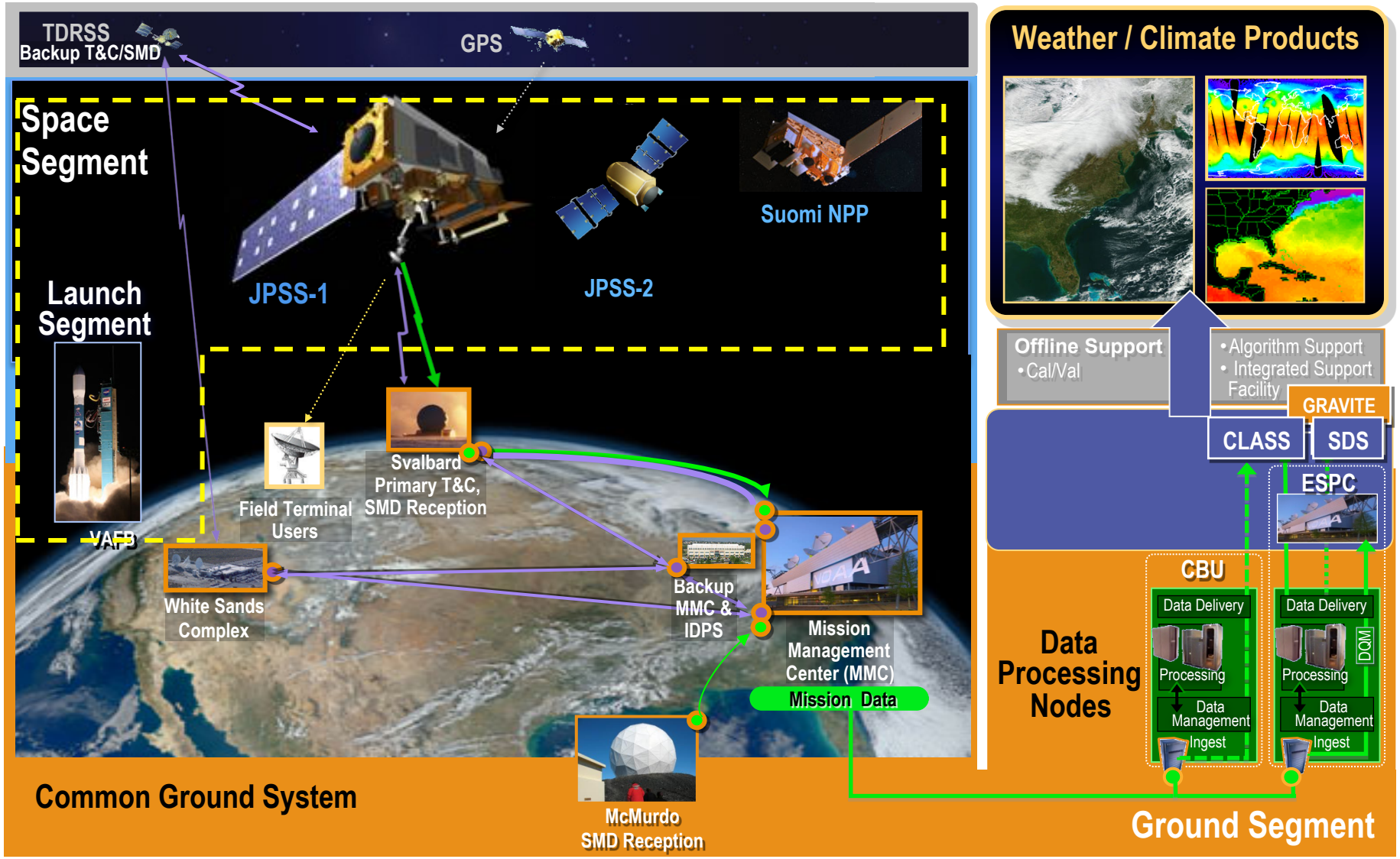
JPSS Flight Project

Overview

Flight Project Scope

- Under the JPSS Program, the JPSS Flight Project is tasked with the Flight and Launch Segments for JPSS
- The Flight Project responsibilities include three primary satellites
  - Engineering sustainment of the Suomi NPP satellite
  - Development and launch of the JPSS-1 satellite
    - Initiated at the start of the Program as a sole-source **"near-clone"** of SNPP
      - Payload identical to SNPP (ATMS, CrIS, VIIRS, OMPS, and CERES), except NO OMPS-Limb Sensor
      - Instruments were inherited as in-process hardware from the legacy NPOESS Program
  - Development and launch of the JPSS-2 satellite
    - Includes "same" payload as SNPP, including the return of the OMPS-Limb sensor
      - Radiation Budget Instrument (RBI) next generation instrument replaces the heritage SNPP and JPSS-1 CERES
    - RBI and OMPS-Limb are being provided to JPSS by NASA's Earth Systemic Missions (ESM) Program

Joint Polar Satellite System
Flight Project Scope



Flight Project Management Structure

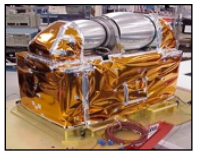
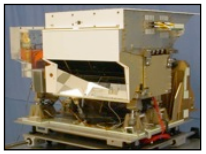
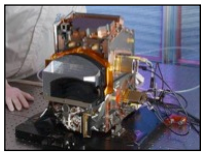
- Flight Project management structure configured to support multiple missions effectively, while maintaining the appropriate synergy across the various instrument builds and satellites
- Flight Project works closely with Program Office Mission integration team for coordination across Flight and Ground Projects
- Flight Project leverages heavily on Lessons Learned as we look back (SNPP), look down (JPSS-1), and look forward (JPSS-2)
  - SNPP on orbit lessons learned significantly influence JPSS-1 and as issues and risks are identified on JPSS-1, assessments back to SNPP and forward to JPSS-2
  - JPSS-1 Instrument and Spacecraft teams are effectively using the lessons learned process

Key Requirements

- NASA Categorization
  - Category 1 - NPR 7120.5
    - High National Priority with Life Cycle Cost >$1B
  - Class B Payload Risk Classification - NPR 8705.4
    - High National Significance, High Complexity, High Cost Mission Lifetime 2-5 Years
  - Launch Vehicle Risk Category 2 - NPR 8610
    - Medium Risk
- Mission Design
  - Instrument Payload: ATMS, CrIS, VIIRS, OMPS-Nadir, OMPS-Limb (JPSS-2) , & CERES / RBI (JPSS-2)
  - Ka-band: 300 Mbps Stored Mission Data (SMD) (TDRS back-up)
  - X-band: 15 Mbps High Rate Data (HRD) direct broadcast
  - Lifetime: 7 years
  - Orbit: Sun-Synchronous (824 km, LTAN: 1330)
  - End of Mission Disposal: Controlled Re-entry

Instruments

JPSS Instrument Suite

JPSS Instrument		Measurement
	**ATMS** - Advanced Technology Microwave Sounder	ATMS and CrIS together provide profiles of atmospheric temperature, moisture, and pressure
	**CrIS** - Cross-track Infrared Sounder	
	**VIIRS** – Visible Infrared Imaging Radiometer Suite	Provides daily high-resolution imagery and radiometry across the visible to long wave infrared spectrum
	**OMPS** - Ozone Mapping and Profiler Suite	Spectrometer with UV bands for ozone total column measurements
	**CERES*** - Clouds and the Earth's Radiant Energy System	Scanning radiometer which supports studies of Earth Radiation Budget

* Replaced with Radiation Budget Instrument (RBI) for JPSS-2

JPSS Development Partners / Contracts

Hardware Element	Responsible Organization	Contractor	S-NPP	JPSS-1	JPSS-2
ATMS	NASA GSFC	Northrop Grumman Electronic Systems	X	X	X
CrIS	NASA GSFC	Exelis Geospatial Systems	X	X	X
VIIRS	NASA GSFC	Raytheon Space and Airborne Systems	X	X	X
OMPS	NASA GSFC	Ball Aerospace and Technologies Corporation	X	X	X
CERES	NASA LaRC	Northrop Grumman Aerospace Systems	X	X	
RBI	NASA LaRC	Exelis Geospatial Systems			X
Spacecraft	NASA GSFC	Ball Aerospace and Technologies Corporation	X	X	
Launch Vehicle	NASA KSC	United Launch Alliance	X	X	

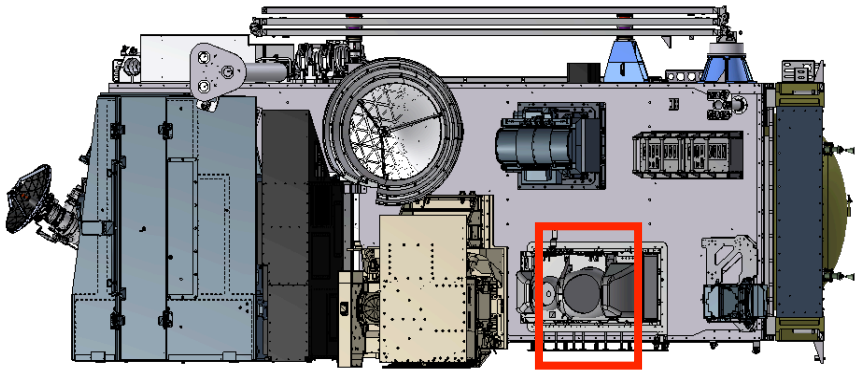
Advanced Technology Microwave Sounder (ATMS) Instrument Overview

- **Multispectral, cross-track-scanning instrument**
  - 22 spectral bands (23.8 -183.3 GHz)
  - Total power, two point external calibration
  - Continuous cross-track scanning with torque and momentum compensation
  - Four modes: Off/Survival, Safe Hold, Diagnostic, and Operational
  - Software upload, built-in diagnostics
  - Thermal control by spacecraft cold plate
- **Heritage: AMSU-A and MHS /AMSU-B**
- **Current Status:**
  - SNPP fully operational
  - JPSS-1 post environmental testing
  - JPSS-2 development

Technical Performance Measures (TPM)

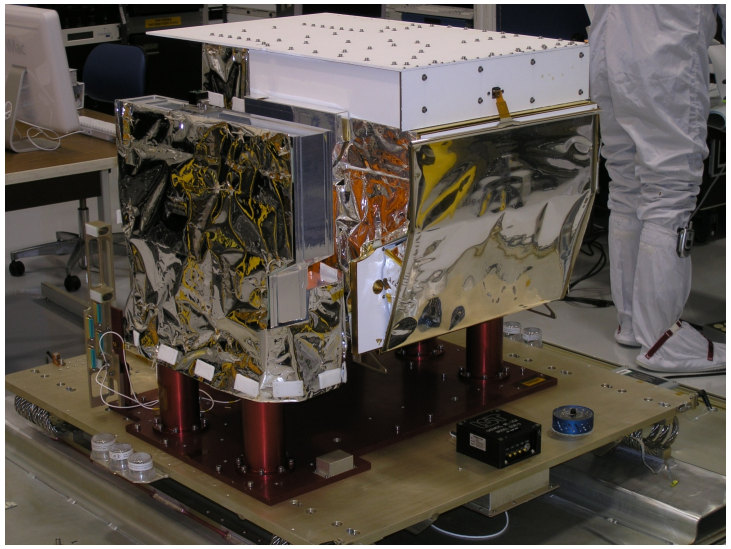
	Requirement	CBE*	Margin
Mass (Kg)	85	74	13%
Operational Peak Power (w)	373	365.7	2%
Operational Average Power (w)	130	112.7	14%
Survival Peak Power (w)	14	9	36%
Average Data Rate (kbps)	32	20.4	36%
Peak Data Rate (kbps)	34	31.2	8%
Memory Utilization	70%	17%	76%
CPU Utilization	70%	23%	67%

* Includes reserves



JPSS-1 Spacecraft

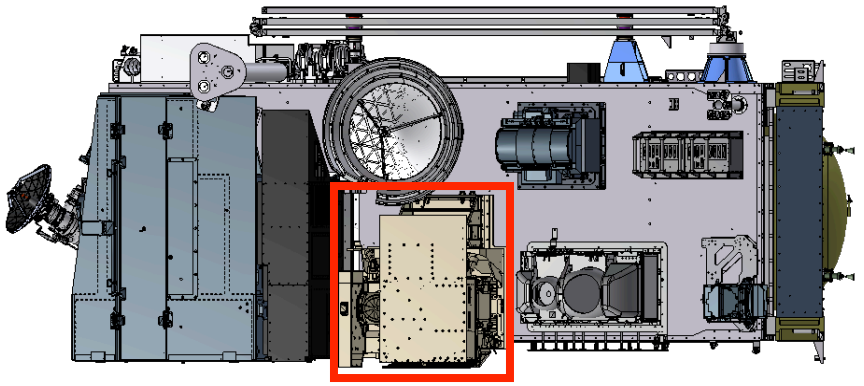
Cross-track Infrared Sounder (CrIS) Instrument Overview



- **Fourier Transform Spectrometer**
  - Measures upwelling infrared radiance at high spectral res.
  - 1,305 spectral channels compared to 18 IR channels on HIRS sounders (NOAA-KLM); similar number as on AIRS
  - Low noise levels (NEdN)
  - Increased radiometric and spectral accuracy
  - Typical temperature retrieval accuracy well below 1K
  - Fields of Regard each 3 x 3 FOVs
  - Photovoltaic Detectors in all 3 bands
  - 4-Stage Passive Detector Cooler
  - On-board internal calibration target
- **Current Status:**
  - SNPP fully operational
  - JPSS-1 in environmental test
  - JPSS-2 development

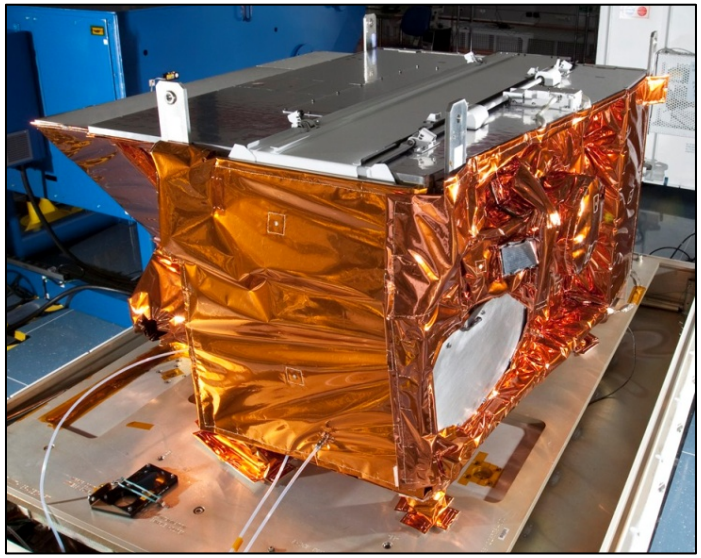
Technical Performance Measures (TPM)

	Requirement	CBE	Margin
Mass (Kg)	175	146	17%
Operational Peak Power (w)	245	173	29%
Operational Average Power (w)	127	114	10%
Survival Peak Power (w)	249	240	4%
Average Data Rate (Mbps)	1.9	1.73	8.9%
Peak Data Rate (Mbps)	2.2	2.01	8.6%
Memory Utilization (%)	50%	19%	62%
CPU Utilization (%)	50%	14%	72%



JPSS-1 Spacecraft

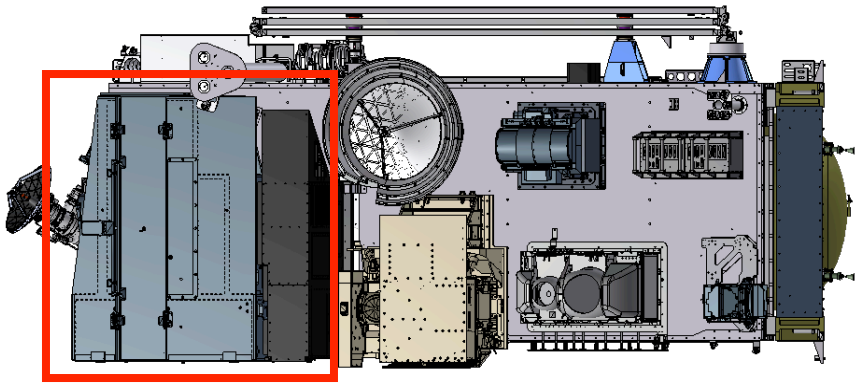
Visible Infrared Imaging Radiometer Suite (VIIRS) Instrument Overview



- **Multispectral, cross-track-scanning, imaging instrument**
  - 22 spectral bands 0.4 – 12.5 mm
  - Single 20 cm diameter, rotating, all-reflective telescope
  - Day-Night Band, VisNIR, S/MWIR & LWIR Focal Plane Assemblies
  - Solar reflective and IR emissive on-board calibration sources
- **Heritage: SeaWiFS, MODIS, and S-NPP VIIRS**
- **Current Status:**
  - SNPP fully operational
  - JPSS-1 in environmental test
  - JPSS-2 development

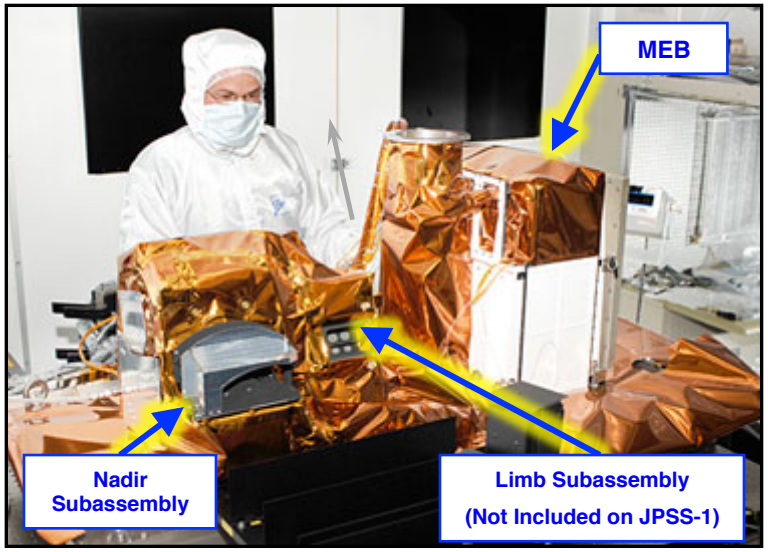
Technical Performance Measures (TPM)

	Spec	CBE	Margin
Mass (Kg)	285	269.9	5%
Operational Peak Power (W)	339	203.5	40%
Operational Average Power (W)	230	183.4	20%
Survival Peak Power (W)	390	352.9	10%
Average Data Rate (Mbps)	9.8	9.1	7%
Peak Data Rate (Mbps)	11.8	11.4	3%
Memory Utilization	<70%	33%	53%
CPU Utilization	<70%	65%	7%



JPSS-1 Spacecraft

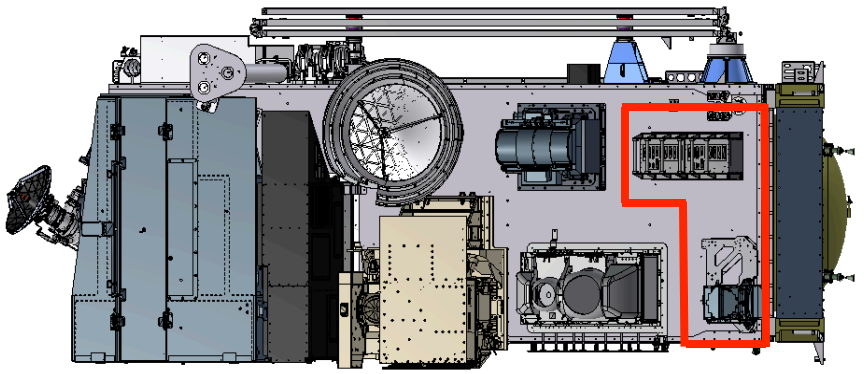
Ozone Mapping and Profiling Suite (OMPS) Instrument Overview



- **Two push broom spectrometers**
  - Nadir Total Column Spectrometer covers a 50km x 2800km cross-track swath
  - Nadir Profile Spectrometer provides performance over $(250km)^2$ cell
- **Heritage: TOMS (Nadir Total Column) and SBUV/2 (Nadir Profiler)**
- **Current Status:**
  - SNPP fully operational
  - JPSS-1 in environmental test
  - JPSS-2 development

Technical Performance Measures (TPM)

	Requirement	CBE	Margin
Mass (Kg)	56	51.5	8.7%
Operational Peak Power (w)	102	84.5	17%
Operational Average Power (w)	85	69.2	19%
Survival Peak Power (w)	44	11.5	74%
Average Data Rate (kbps)	409.6	384	6.3%
Peak Data Rate (kbps)	409.6	384	6.3%
Memory Utilization	70%	49.5%	29%
CPU Utilization	70%	34.5%	51%



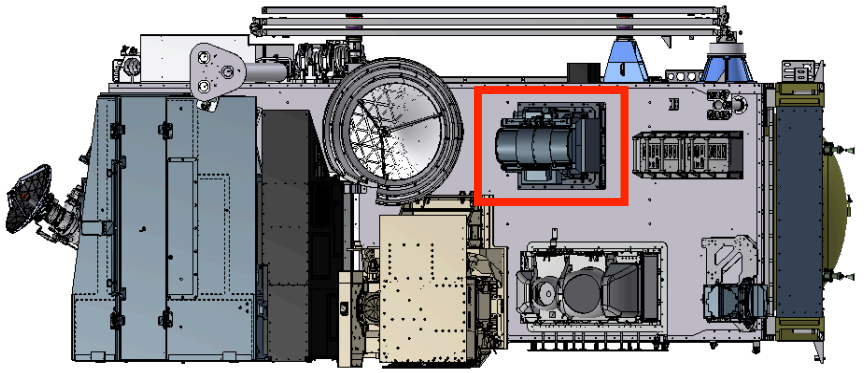
JPSS-1 Spacecraft

Clouds and the Earth's Radiant Energy System (CERES) Instrument Overview

- **Scanning radiometer measuring three spectral bands at top of atmosphere**
  - Total (0.3 to >50μm)
  - Shortwave (0.3 to 5.0μm)
  - Longwave (5 to 50μm)
- **Heritage:** TRMM, Terra (2), Aqua (2), and S-NPP
- **Current Status**:
  - SNPP fully operational
  - JPSS-1 in environmental test

Technical Performance Measures (TPM)

	Requirement	CBE	Margin
Mass (Kg)	54	46.78	13.4%
Operational Peak Power (w)	75	62.77	16.3%
Operational Average Power (w)	50	43.87	12.3%
Survival Peak Power (w)	40	39.66	0.9%
Average Data Rate (kbps)	10	8.5	15%
Memory Utilization	60%	32%	68%
CPU Utilization (ICP/DAP), ms	75%	82% / 75%	18%/25%



JPSS-1 Spacecraft

JPSS-1

Mission Overview

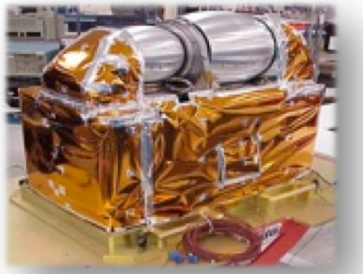
JPSS-1 Acquisition

- JPSS-1 Acquisition Strategy clearly defined by the restructuring of the NPOESS program
- Instruments
  - Overall Requirement: Transition ongoing contracts from NPOESS to NASA
    - Streamline management, consolidate and improve oversight
    - Address known reliability and performance issues
- Spacecraft
  - Overall Requirement: Acquire a functional copy of the S-NPP spacecraft for the JPSS-1 mission with the following changes:
    - Class B Mission Assurance Requirements
    - 7 year lifetime
    - Addition of Ka-band SMD, TDRS back-up
  - Procurement completed through a S-NPP derived, sole-source RSDO RAPID III FFP contract with BATC
- Launch Vehicle
  - Acquisition via NASA KSC NLS II contract

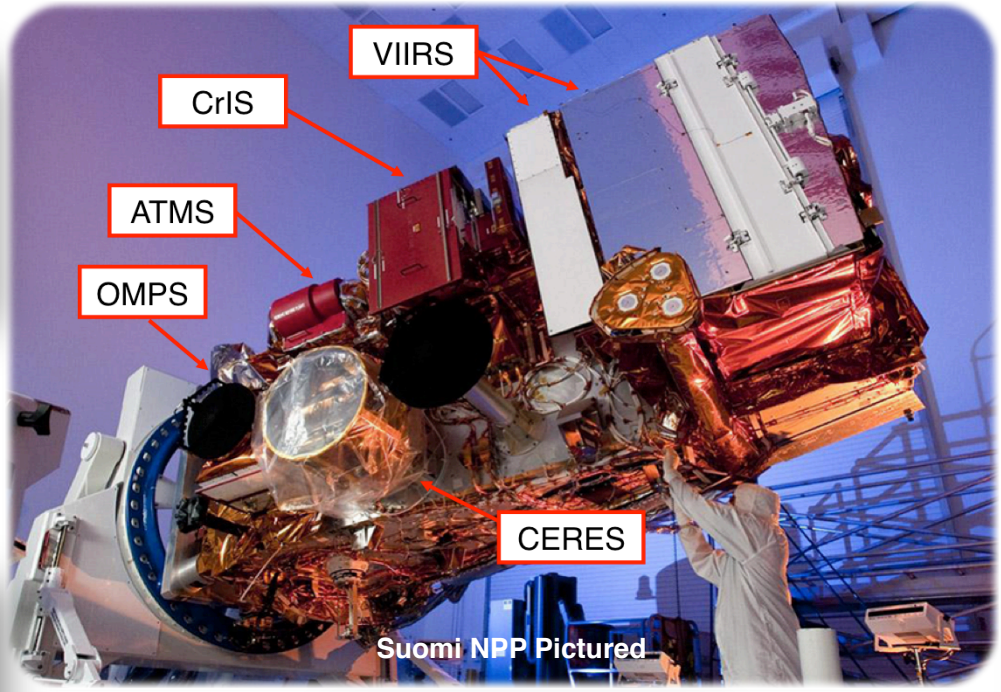
JPSS-1 Observatory Overview

- Mission Design
  - Instruments: ATMS, CrIS, VIIRS, OMPS-Nadir, & CERES
  - Spacecraft:
    - Mass: 1973.4 kg (dry)
    - Power: 1924 W (BOL)
  - Ka-band: 300 Mbps Stored Mission Data (SMD) (TDRS back-up)
  - X-band: 15 Mbps High Rate Data (HRD) direct broadcast
  - Lifetime: 7 years
  - Orbit: Sun-Synchronous (824 km, LTAN: 1330)
  - LRD: December 2016 (Western Range)
  - End of Mission Disposal: Controlled Re-entry
- NASA Categorization
  - Category 1 - NPR 7120.5
  - Class B Payload Risk Classification - NPR 8705.4
  - Launch Vehicle Risk Category 2 - NPR 8610

JPSS-1 Observatory Layout is Similar to NPP



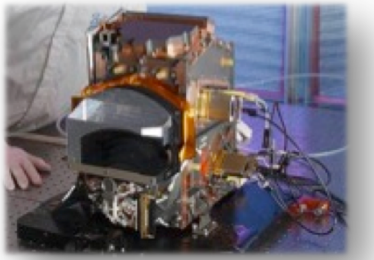
ATMS
Advanced Technology Microwave Sounder



CERES
Clouds and the Earth's Radiant Energy System

CrIS
Cross-track Infrared Sounder

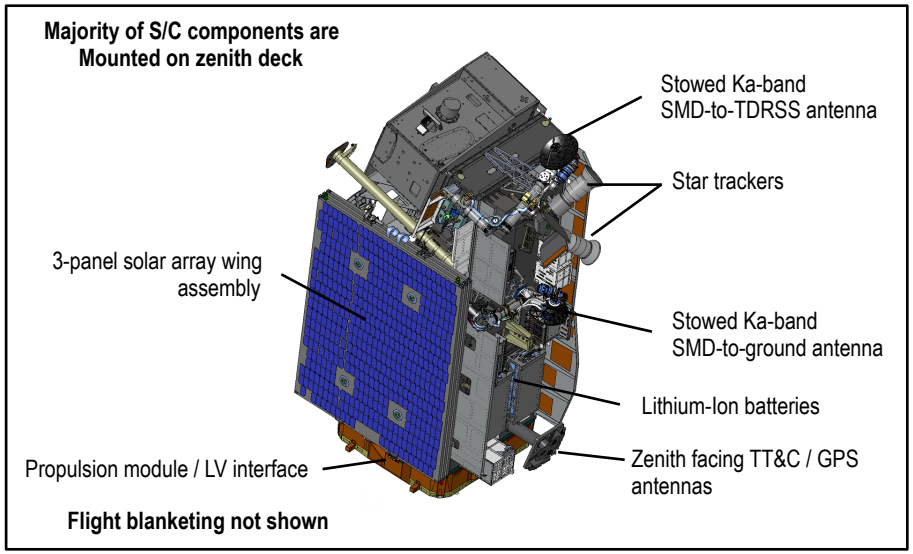
VIIRS
Visible Infrared Imager Radiometer Suite



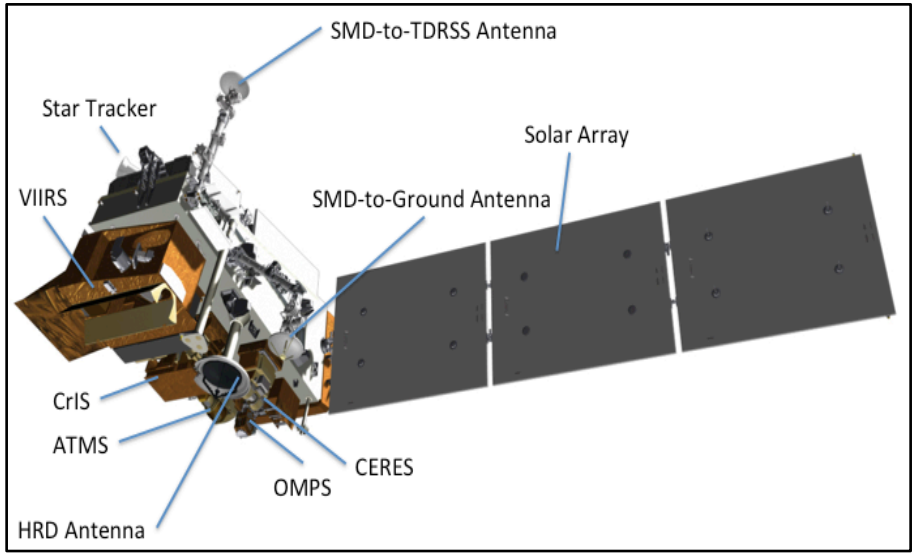
OMPS
Ozone Mapping and Profiler Suite

JPSS-1 Observatory

Launch Configuration



Orbital Configuration



JPSS-1 Mission / Satellite Overview

Changes from SNPP

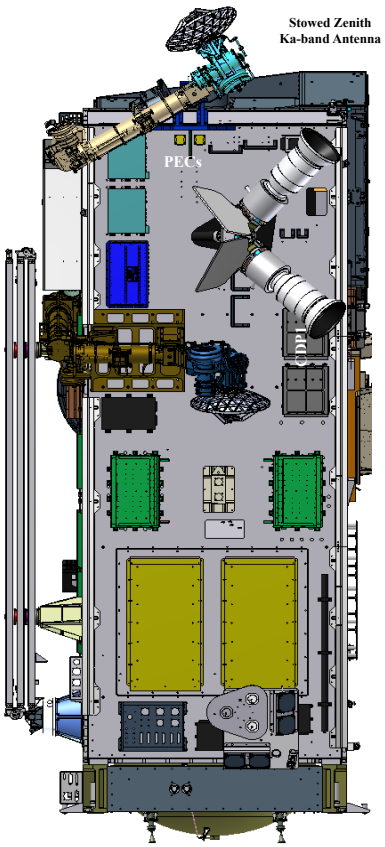
Mission

- 7-year operational mission life, LRD December 2016
- Orbit: 824 km, sun-synch (i=98.7 deg), 1330L ascending node
- Launch Vehicle: Delta-II 7920-10 configuration

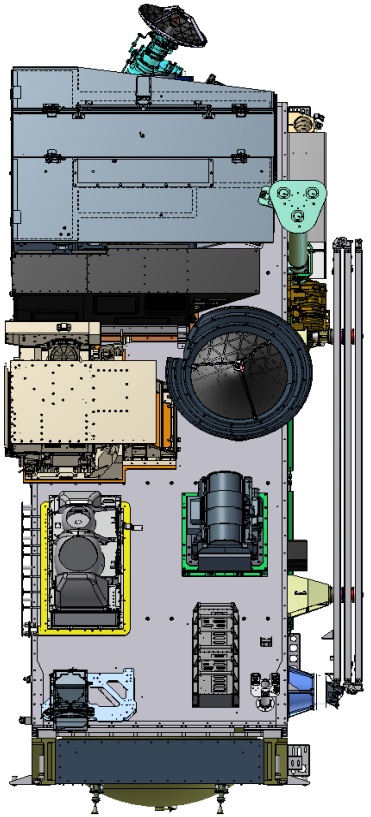
Satellite

- Evolution from SNPP and BATC BCP2000/BCP5000 Product Lines
- Structure: 1.3m^2 base, 4.2 m tall; Aluminum Honeycomb
- Mass: 1998 kg (dry); 280 kg (prop/pressurant)
- Direct Energy Transfer power system: 12 m^2 single-wing array
- Solar Array Capability: 1965W (BOL); 1914W (EOL)
- Power Loads: 1575W (EOL, orbit avg.)
- Data Networks: 1553 & SpaceWire
- S-band: Command & Telemetry via Svalbard and TDRS
- Ka-band: 300 Mbps Science Mission Data (SMD) link to ground (Primary) and TDRSS (contingency)
- X-band: 15 Mbps High-Rate Data (HRD) link to users
- Propulsion: 8 – 22N thrusters, Hydrazine

Zenith Deck



Nadir Deck



JPSS-1 Spacecraft
October 3, 2014

Launch Service Overview

- Level 1 Requirement for a Cat 2 / Medium Risk launch service per NPD 8610.7D
- NLS-II Launch Service Task Order (LSTO) was awarded in July 2012 to ULA for launch on a Delta II 7920-10 Launch Vehicle
- Launch from SLC-2 at Vandenberg AFB
- Remaining NASA Delta II missions
  - OCO-2 (7320-10) in Launched July 2014
  - SMAP (7320-10)
  - JPSS-1 (7920-10) in December 2016
  - ICESat-2 (7420-10)
- PPOD secondary payloads have been manifested by the HQ/Flight Planning Board on the JPSS-1 mission

JPSS-2

Mission Overview

JPSS-2 Overview

- Programmatic
  - Program Requirements consistent with JPSS-1
    - Level 1, Mission System Specification (MSS), Concept of Operations, etc.
  - Instruments
    - ATMS, CrIS, VIIRS, OMPS-Nadir, OMPS-Limb and RBI
- Acquisition
  - Instruments
    - JPSS provides (ATMS, CrIS, VIIRS, and OMPS-Nadir) via Sole Source Contracts with Current Development Contractors
    - Earth Systematic Missions (ESM) provides (OMPS-Limb and RBI)
  - Spacecraft via a Rapid Spacecraft Development Office (RSDO) RAPID III Firm Fixed Price (FFP) Competitive Procurement
  - Launch Vehicle via a KSC NLS Competitive Procurement

JPSS-2 Observatory Overview

- Mission Design
  - Payload: ATMS, CrIS, VIIRS, OMPS-Nadir, OMPS-Limb, & RBI
  - Spacecraft: TBD
  - Ka-band: 300 Mbps Stored Mission Data (SMD) (TDRS back-up)
  - X-band: 15 Mbps High Rate Data (HRD) direct broadcast
  - Lifetime: 7 years
  - Orbit: Sun-Synchronous (824 km, LTAN: 1330)
  - LRD: July 2021 (Western Range)
  - End of Mission Disposal: Controlled Re-entry
- NASA Categorization
  - Category 1 - NPR 7120.5
  - Class B Payload Risk Classification - NPR 8705.4
  - Launch Vehicle Risk Category 2 - NPR 8610

JPSS Space Segment Challenges

Supply Chain Challenges / Risk Management

- The restructuring of the NPOESS Program in February 2010 presented the challenge of transitioning the instrument DoD contracts to NASA contracts, most notably
  - In-process Flight hardware, residual/spare hardware, Ground Support Equipment (GSE), tooling, etc.
- JPSS Program Office / Flight Project repeatedly challenged on why more significant cost and schedule build efficiencies are not being realized and believe it or not, supply chain is a large part of that
  - Drives non-recurring engineering, design changes, schedules, etc.
- It starts with the realization that building a series of instruments over 20+ years, procuring them one at a time brings some unique challenges

Program	Review	ATMS	CrIS	VIIRS	OMPS
NPOESS	PDR	2000 (NASA)	1999	2000	1999
NPOESS	CDR	2002 (NASA)	2003	2003	2003
NPOESS	dCDR	2008	-	-	-
JPSS	dCDR / Technical Review	-	2011	2011	2011

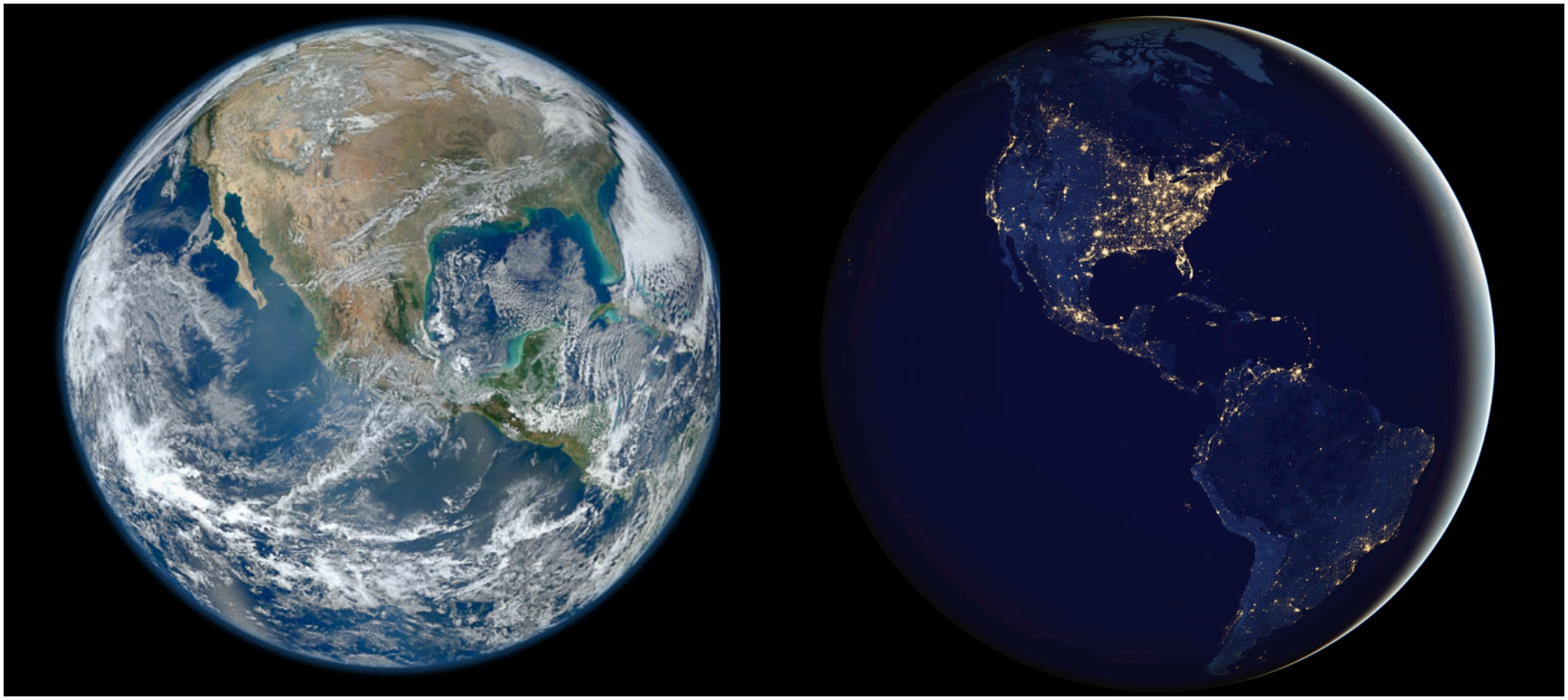
Supply Chain Challenges / Risk Management

- Some of the challenges to date include both the obvious and the not so obvious:
  - Parts Obsolescence / Technology Evolution
    - EEE parts – parts just no longer available (technologies, packages styles, etc.)
    - Single Board Computers – technology evolution shortens availability of computers
  - Process Evolution
    - Manufacturing processes changed due to environmental policy changes and technology improvements – acceptable manufacturing chemicals
  - Requirements / Standards Changes
    - Printed Wiring Board requirements have changed dramatically
    - Micrometeoroids and Orbital Debris (MMOD) environment / requirements have changed dramatically
  - Supply Base
    - Changing subcontractor business base - switch between commercial and aerospace
    - Corporate consolidations / sales – large disruption to personnel and manufacturing
  - Lost recipes
    - Just can't build it anymore – big deal for detectors and optics
    - Loss of key personnel – retirements, etc.

Supply Chain Challenges / Risk Management

- To date JPSS has been very successful in addressing these challenges when they arise, and it starts with the team
  - Timely decisions and sufficient resources
- JPSS relies heavily on lessons learned and actively manages Supply Chain risks similar to the more traditional technical and programmatic risk
- **JPSS makes a concerted effort to**
  - **Bring our prime contractors together as "competi-mates"**
  - **Use our collective resources to be successful**
  - **and insure we aren't "hurting" each other since we have much overlap in our Supply Chain**

The End…



Questions?

http://www.jpss.noaa.gov/