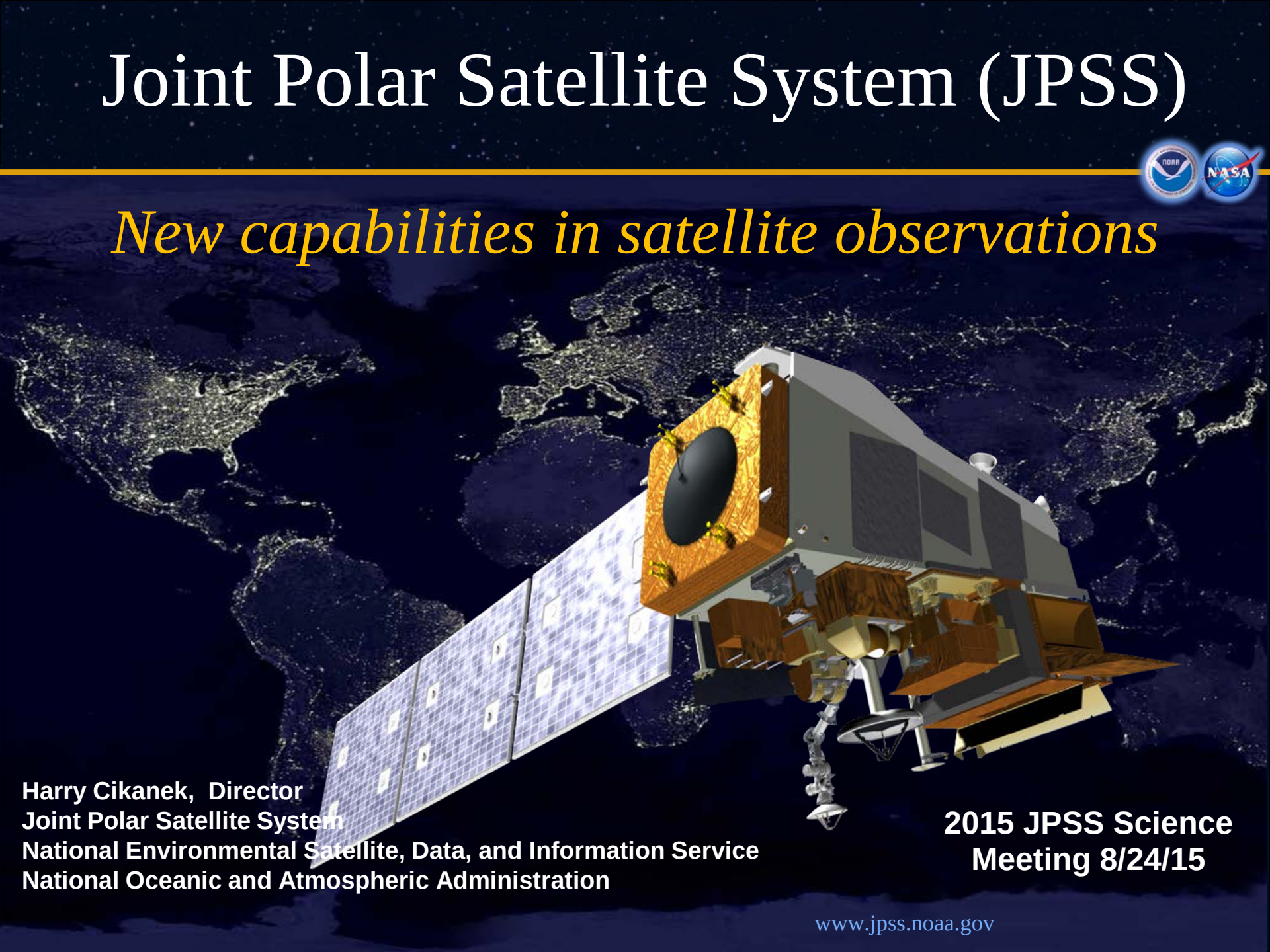
Joint Polar Satellite System (JPSS)

New capabilities in satellite observations



Harry Cikanek, Director
Joint Polar Satellite System
National Environmental Satellite, Data, and Information Service
National Oceanic and Atmospheric Administration

2015 JPSS Science Meeting 8/24/15

www.jpss.noaa.gov

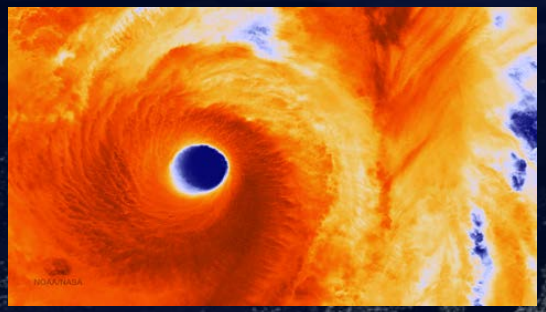
Why JPSS?
JPSS provides…

…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

…global coverage and unique day and night imaging capabilities in support of civilian and military needs

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

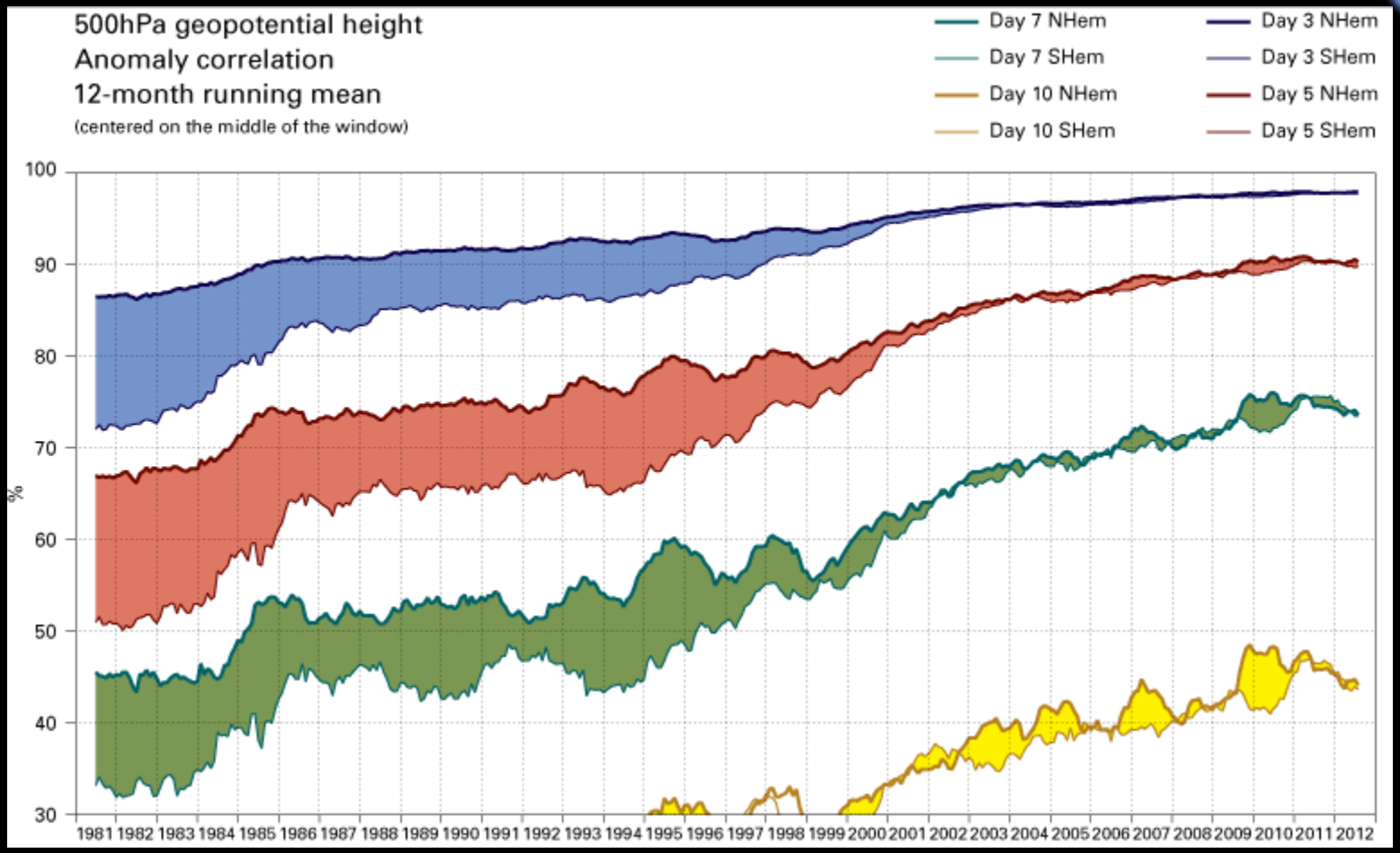


October 2014 - Vongfong IR

March 2015 - ice congests Chesapeake Bay

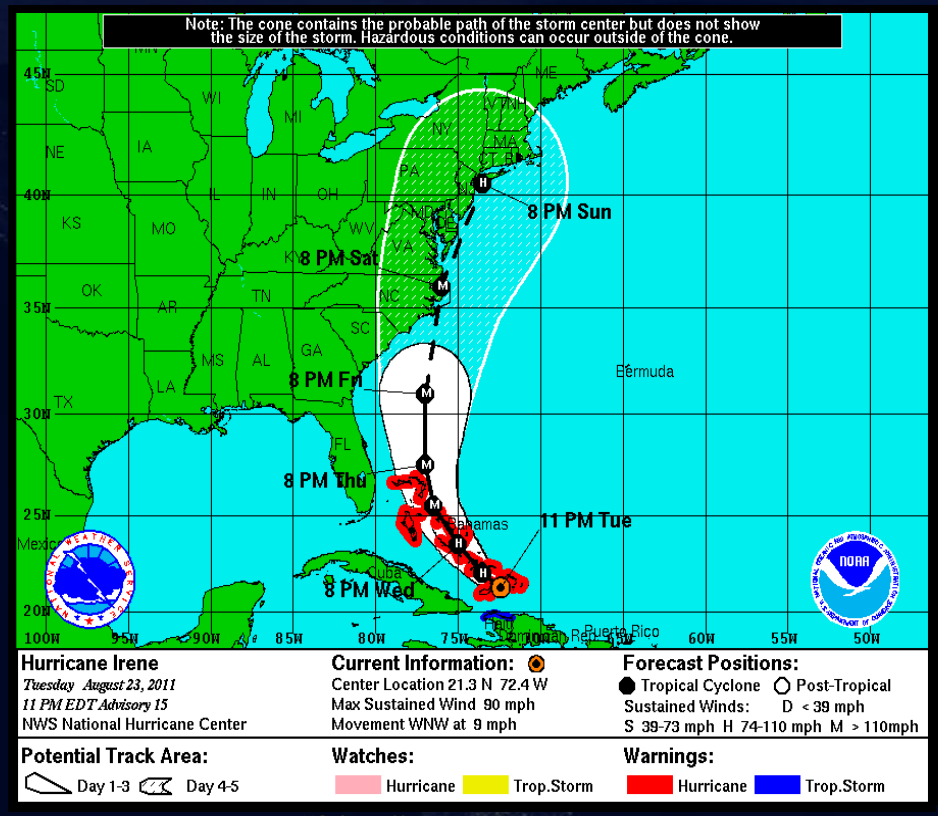
May 2013 - Tropical Cyclone Mahasen

Improvements in forecasting

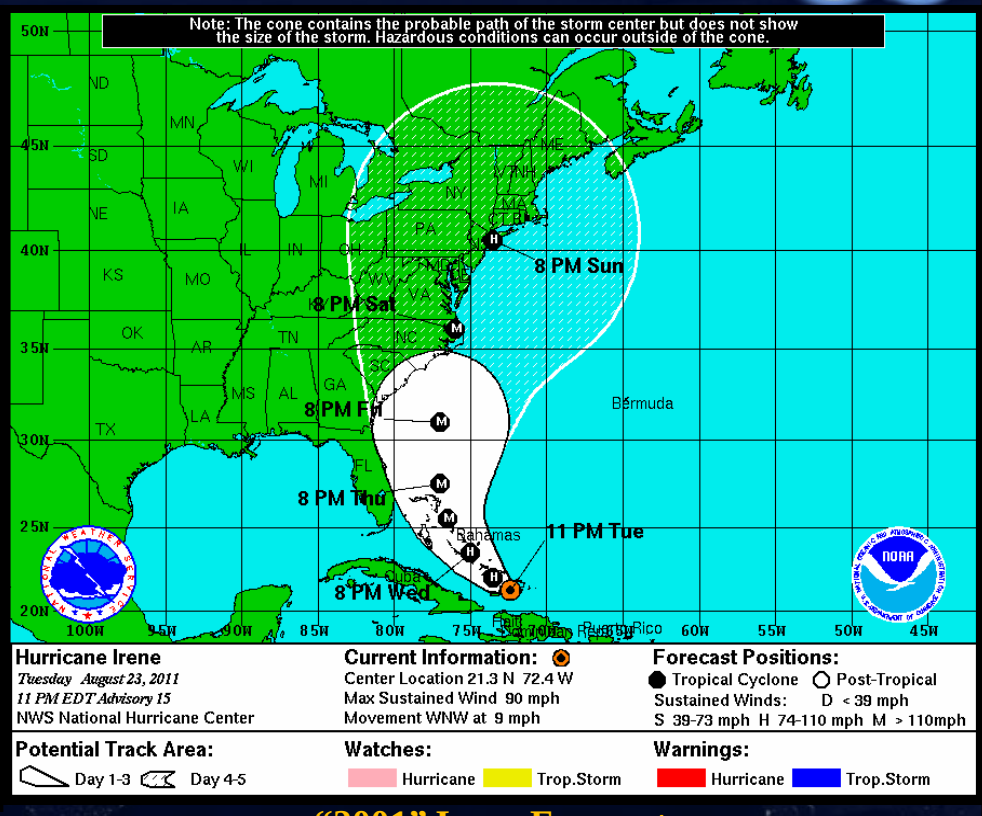


From ECWMF

JPSS: Supporting the Advanced Forecast Enterprise



"2011" Irene Forecast



"2001" Irene Forecast

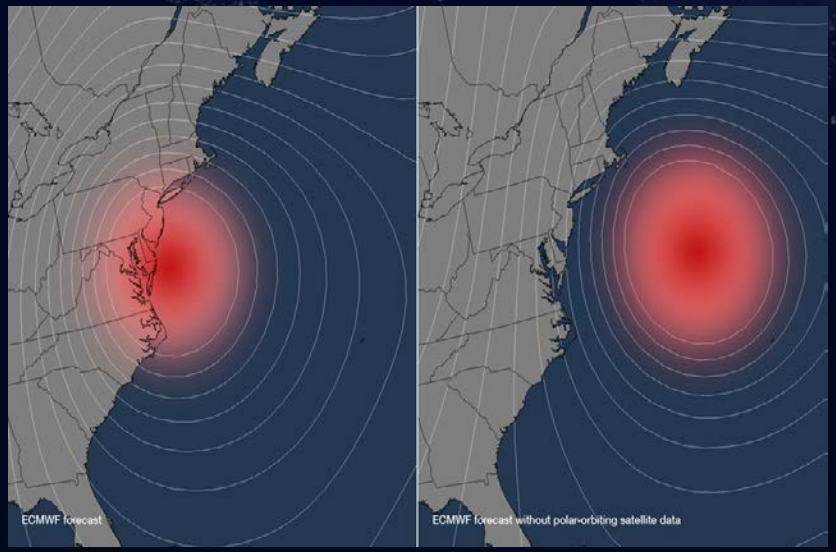
Advanced Forecast Enterprise

Observations + Models + Supercomputers + Expert Forecasters

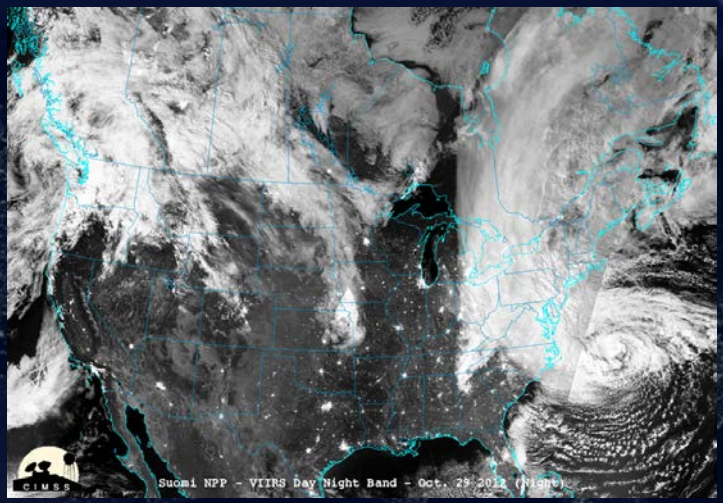
Without JPSS data in the models, Irene's path would have been less accurately predicted, resulting in more evacuations and greater economic impact to coastal communities

Hurricane Sandy

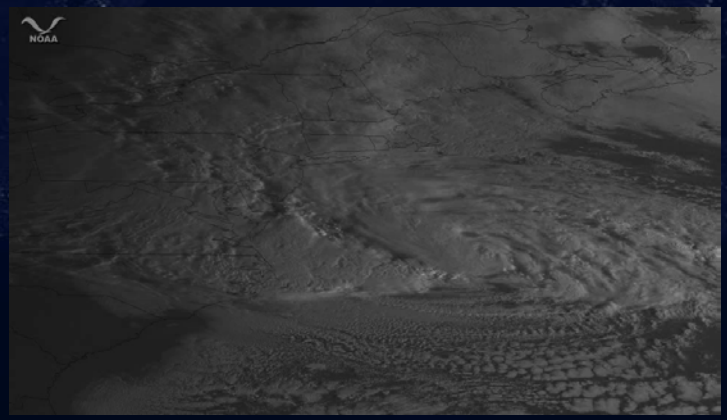
Measurements from polar satellites enabled forecasters to predict Sandy's infamous "left hook." Without this data, weather models would not have identified this left-hand turn and forecasts would have placed the storm out to sea.



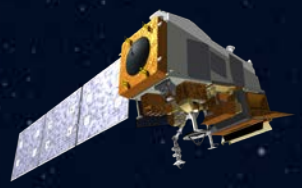
Hurricane Sandy's path with and without polar satellite data



Suomi NPP VIIRS Day/Night Band image of Sandy
Credit: CIMSS



NOAA satellite imagery reveals the intensity of the storm.
Credit: GOES-13



JPSS: Integral to 3-Orbit Global Polar Coverage

- JPSS implements U.S. Space Policy and international agreements to ensure:

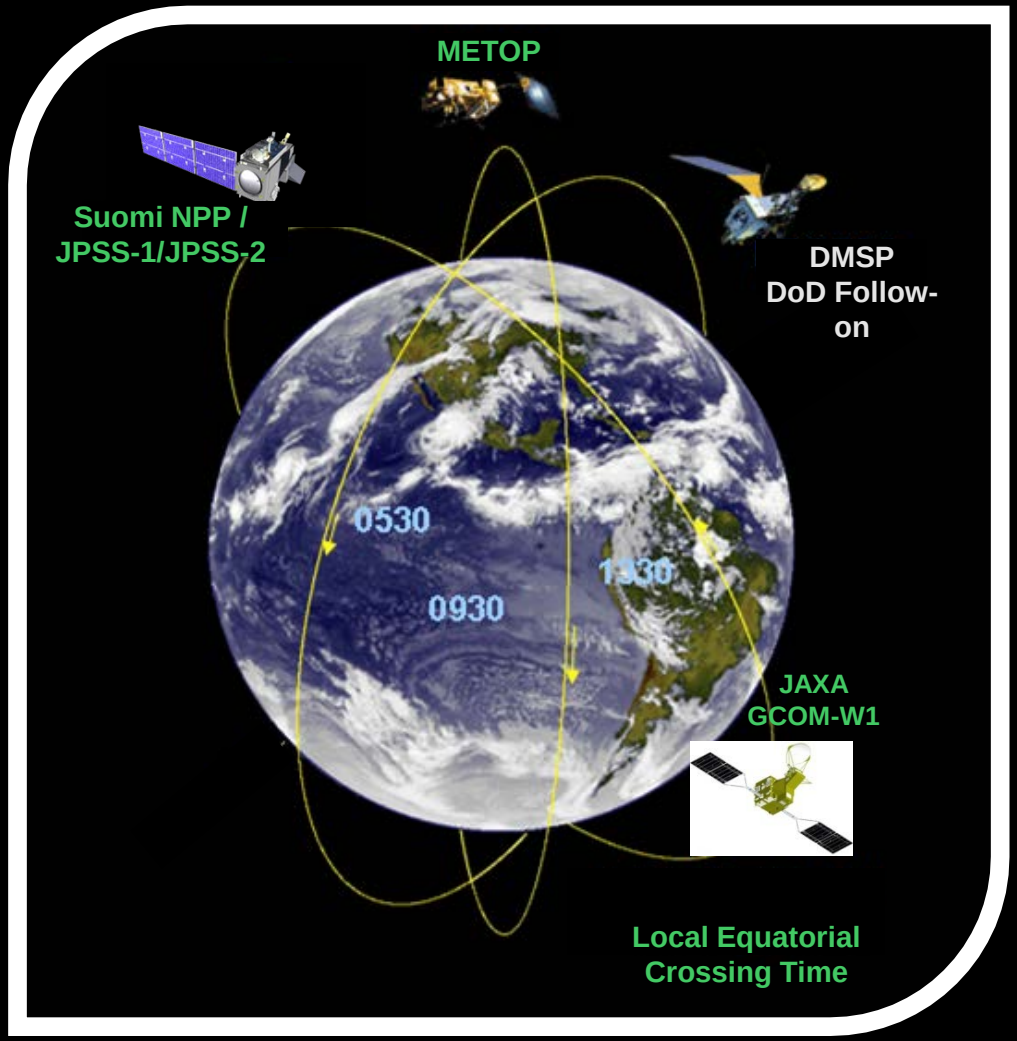
Global coverage Observational continuity for the afternoon orbit

- Orbits:

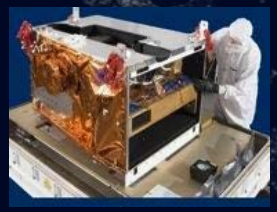
Early Morning: DoD
Mid Morning: EUMETSAT
Afternoon: NOAA

- 3-orbit coverage provides vast majority of data critical to 3-7 day ahead forecast and environmental monitoring

- JAXA provides microwave imagery



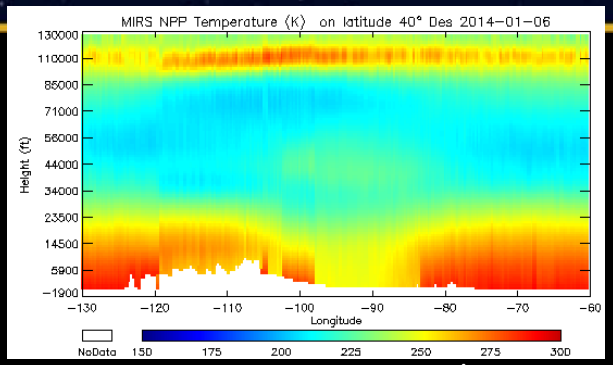
JPSS Instruments

JPSS Instruments		Measurements
	**ATMS** - Advanced Technology Microwave Sounder	ATMS and CrIS together provide high vertical resolution temperature and water vapor information needed to maintain and improve forecast skill out to 5 to 7 days in advance for extreme weather events, including hurricanes and severe weather outbreaks
	**CrIS** - Cross-track Infrared Sounder	
	**VIIRS** – Visible Infrared Imaging Radiometer Suite	VIIRS provides many critical imagery products including snow/ice cover, clouds, fog, aerosols, fire, smoke plumes, vegetation health, phytoplankton abundance/chlorophyll
	**OMPS** - Ozone Mapping and Profiler Suite	Ozone spectrometers for monitoring ozone hole and recovery of stratospheric ozone and for UV index forecasts
	**CERES** - Clouds and the Earth's Radiant Energy System	Scanning radiometer which supports studies of Earth Radiation Budget (ERB)

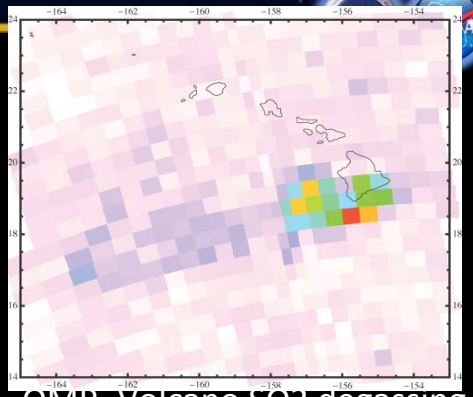
JPSS-1 Spacecraft

JPSS provides a wide range of capabilities

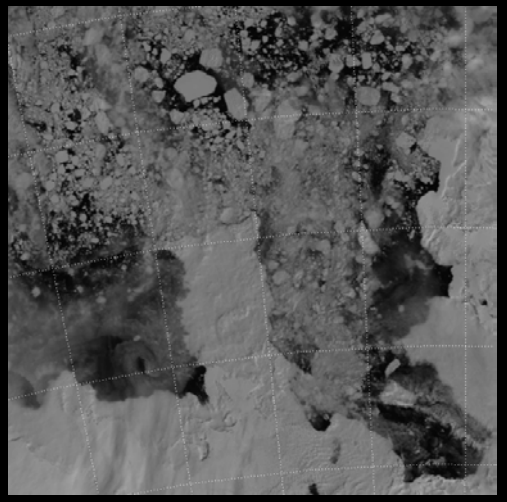
- Microwave – provides temperature and moisture soundings in cloudy conditions and rainfall rates, sea ice, snow, surface temperature
- Infrared – provides high vertical resolution temperature and moisture soundings in clear and cloud corrected regions; atmospheric chemistry - CO, CH4, SO2, … and cloud products
- Visible (day & night) and Infrared Imagery (including deep blue channels) – chlorophyll, cloud imagery, cloud products, SST, Active Fires, Smoke, Aerosols, land products, Snow, Ice, oil spills… at exceptional resolution/global coverage
- UV - ozone - Aerosols over bright surfaces, SO2 plumes, NOx (air quality)…

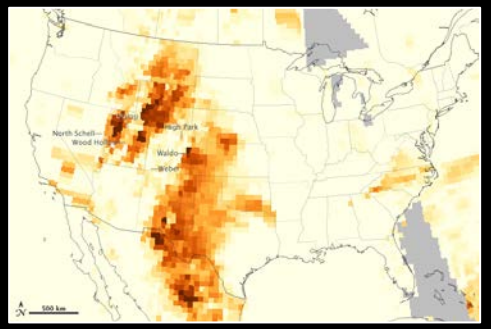


Temperature X-Section Polar Vortex


OMP- Volcano SO2 degassing


Algae in Lake Erie

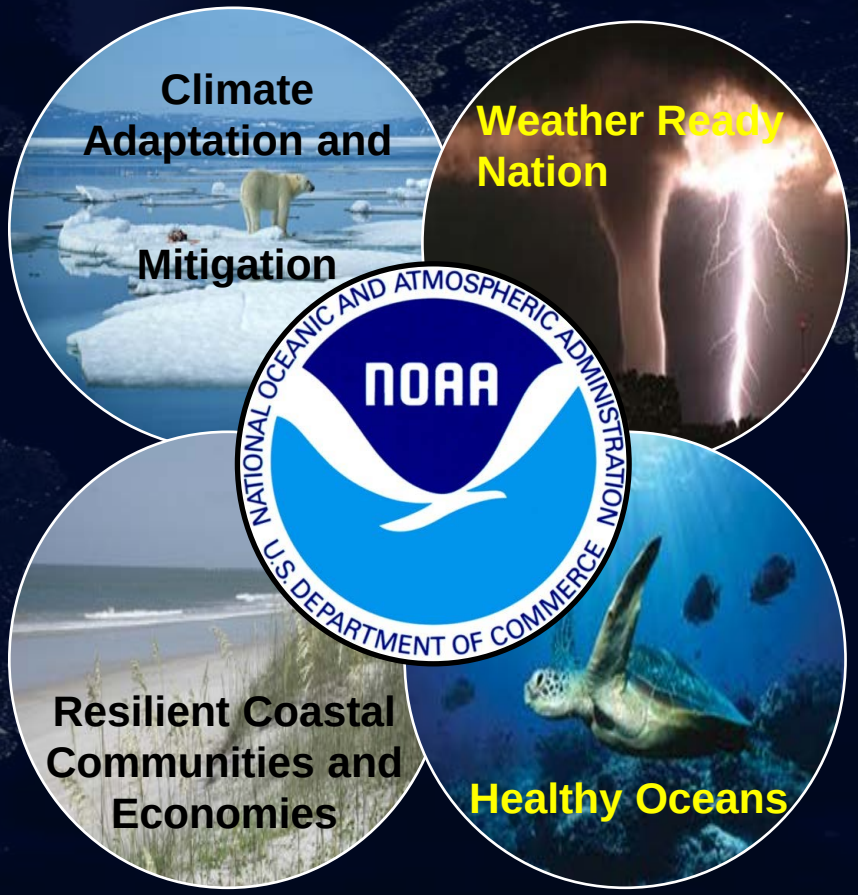

DNB Ice detection


OMPS Aerosols from Fires

JPSS Supports NOAA's Mission

- JPSS supports all four key NOAA mission areas

Improved understanding of a changing climate system that informs science, service, and stewardship

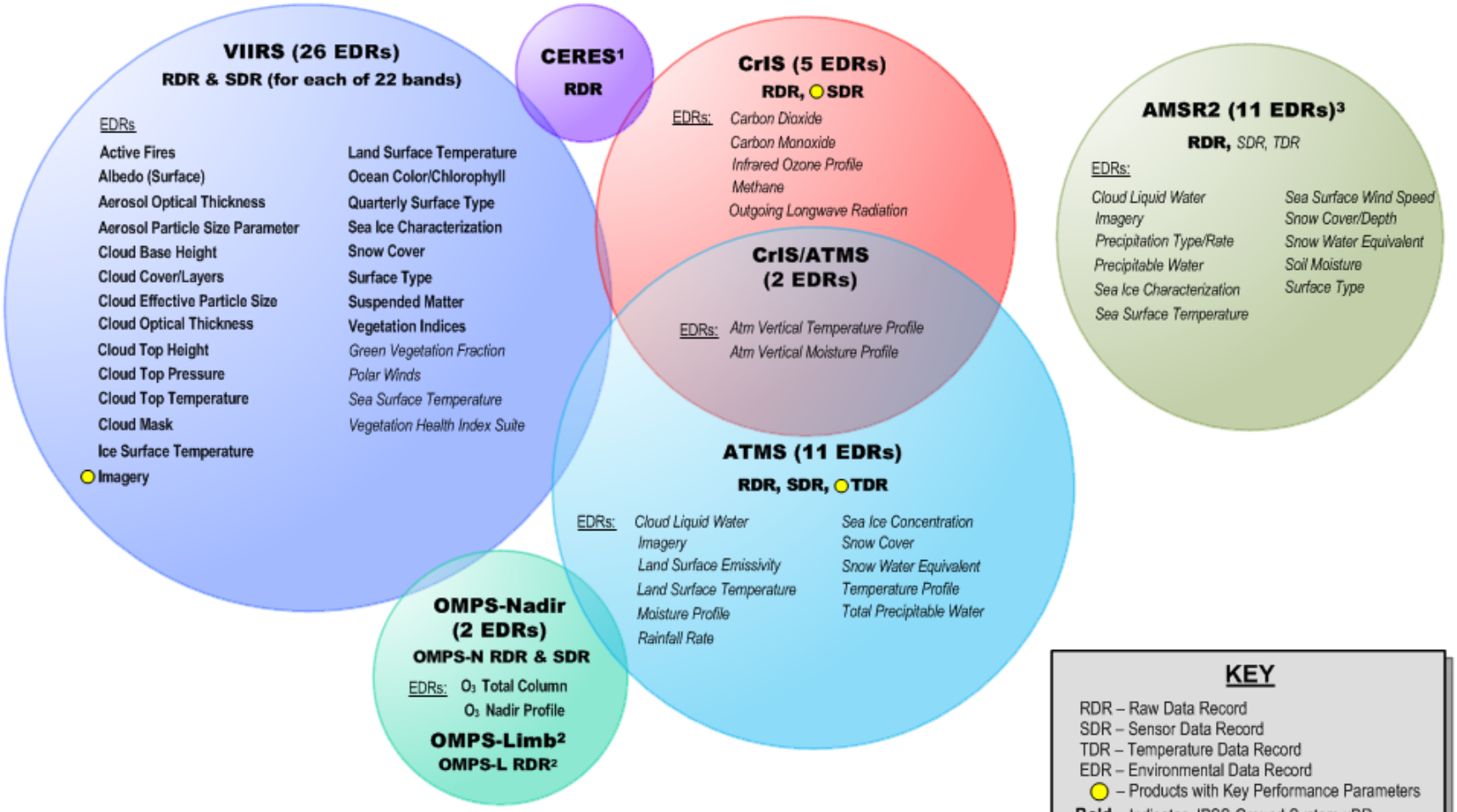


Reduced loss of life from high-impact weather events while improving efficient economies through environmental information

Improved coastal water quality support that enables coastal communities to effectively manage resources and improve resiliency

Improved understanding of ecosystems to inform resource management decisions

JPSS Program Data Products



KEY

RDR – Raw Data Record
SDR – Sensor Data Record
TDR – Temperature Data Record
EDR – Environmental Data Record
● – Products with Key Performance Parameters
Bold – Indicates JPSS Ground System xDR
Italics – Indicates NOAA Polar Legacy (ESPC) xDR

Notes:
[1]RDRs for the JPSS-2 Mission are contingent on NASA manifest of the Radiation Budget Instrument (RBI)
[2]Not applicable to JPSS-1; contingent on NASA manifest of OMPS-Limb on the JPSS-2 Mission
[3]Dependent on the Global Change Observation Mission (GCOM) provided by the Japan Aerospace Exploration Agency

The JPSS Program includes Ground System Support for the Metop, DMSP, and GCOM missions

December 18, 2014
This chart is controlled by JPSS Program Systems Engineering

JPSS-P Rev C

JPSS System Architecture

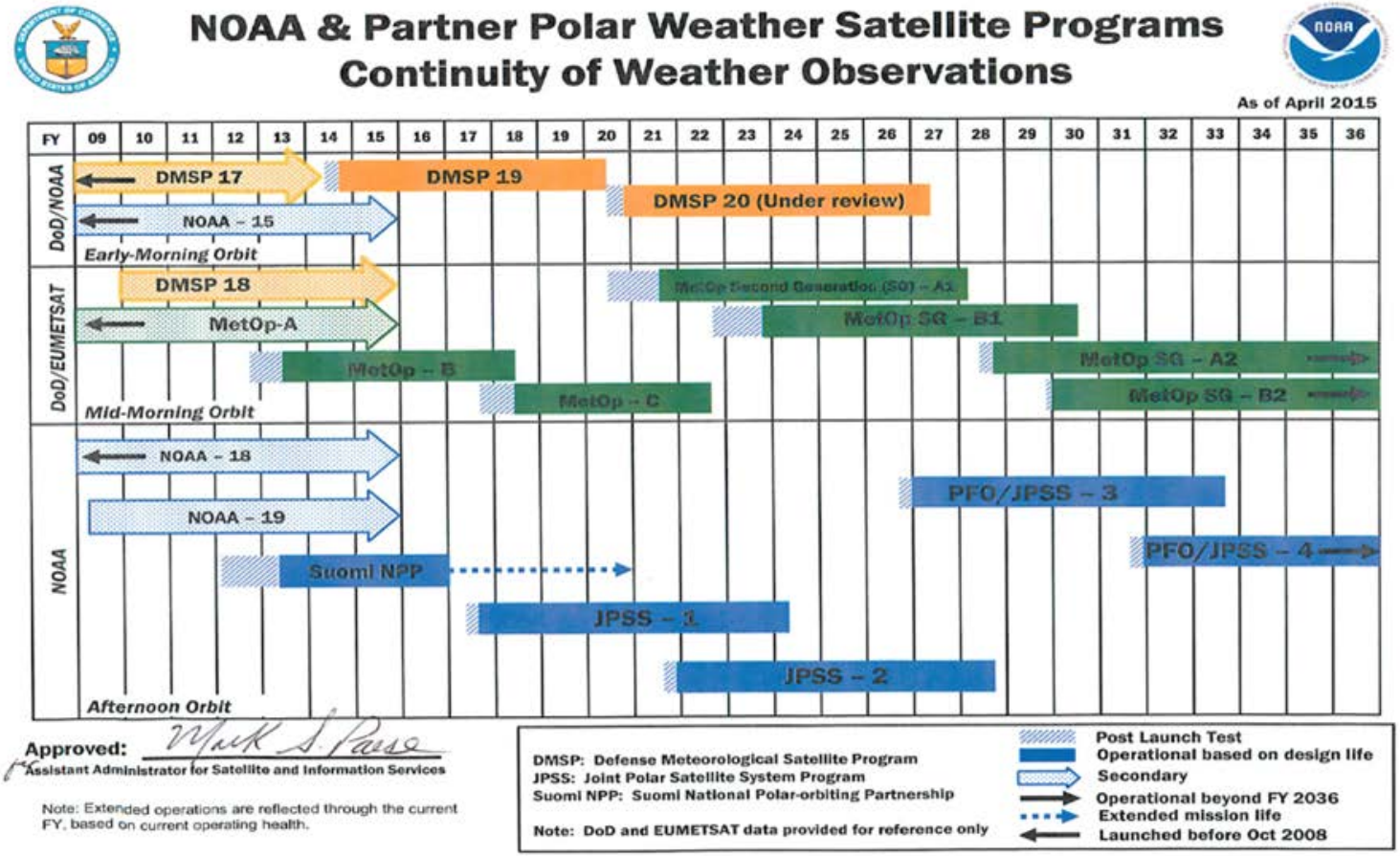
- Svalbard, Norway
- Fairbanks, Alaska

- NWS-National Weather Service
- NOS-National Ocean Service

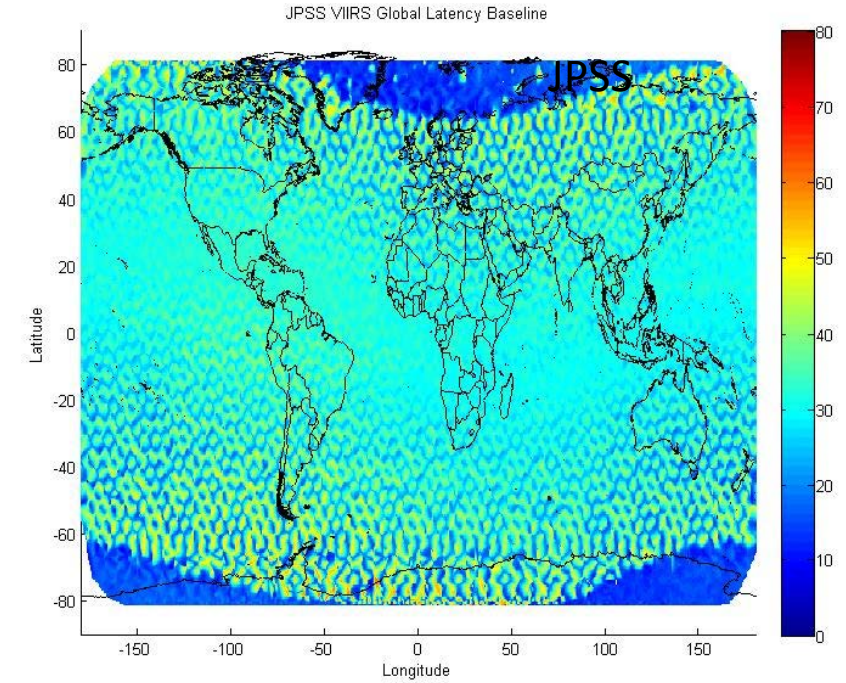
- NSOF-National Satellite Operations Facility

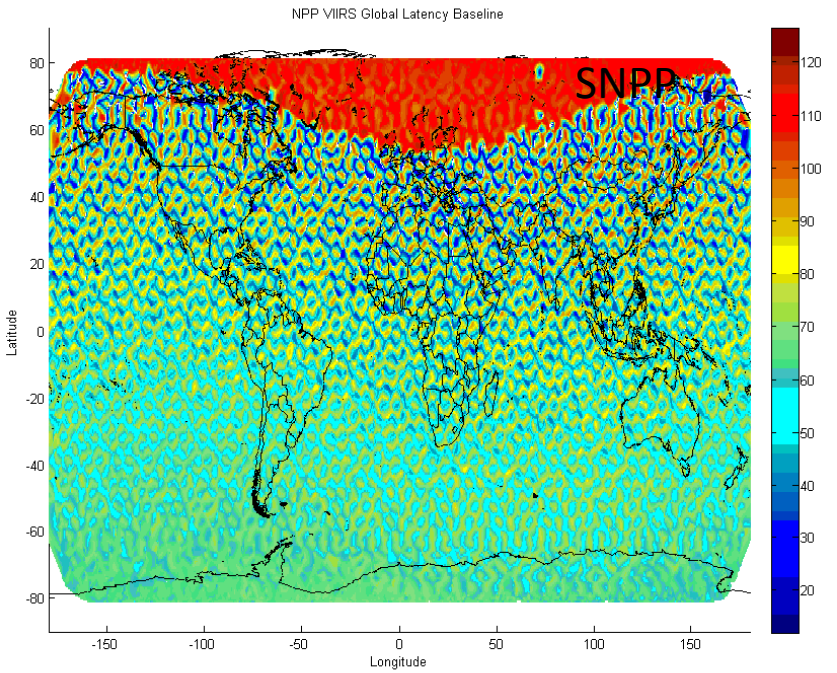
- McMurdo, U.S. Antarctic Research Station

Polar Satellite Launch Schedule



Much improved latency starting with JPSS-1





Polar region latency improved from 2 hours to 10 minutes

95% of the data is within 50 minutes (taking into account BUFR conversion, etc)

Between +- 50 degrees latitude ~ 30 minutes

Actual performance will be 50% better than specification

JPSS-1 uses real-time playback of data at least while still in view of the ground station, which reduces the minimum latency number, while SNPP plays back first the oldest data of the entire orbit

Priorities

- ✓ Launch JPSS-1 by March 2017
- ✓ Ensure KPP operational readiness (CriS, ATMS and VIIRS Imagery) 90 days after launch
- ✓ More efficient - use enterprise algorithms to reduce overall costs
- ✓ Need user plans/engagement to be more aligned with product development and operational availability

Lifecycle

Development
(new or enhanced algorithm)

Validation
(Is the product meeting requirements?)

Long Term Monitoring
(Sustainment)

Application
(why we are in business)

Summary - JPSS Program Status

Suomi NPP is producing outstanding data

- The satellite is healthy and producing a high availability of data (~99.99%)
- Operations of the satellite transferred from NASA to NOAA in 2013
- Suomi NPP is the primary operational polar-orbiting satellite for NOAA

JPSS-1 is executing as planned

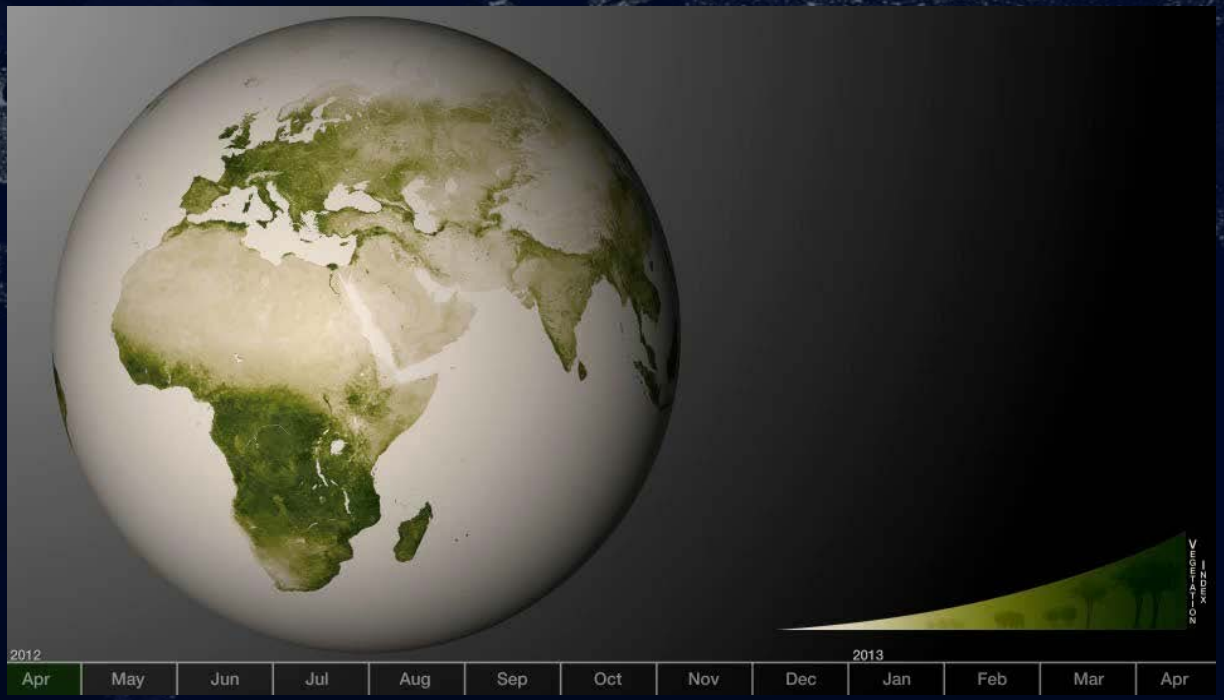
- Instruments and spacecraft are proceeding well
- Instruments are assembled and undergoing testing; one is prepared for integration
- The spacecraft bus is built and undergoing testing
- Development and implementation of the new ground data processing system are underway

JPSS-2 development underway

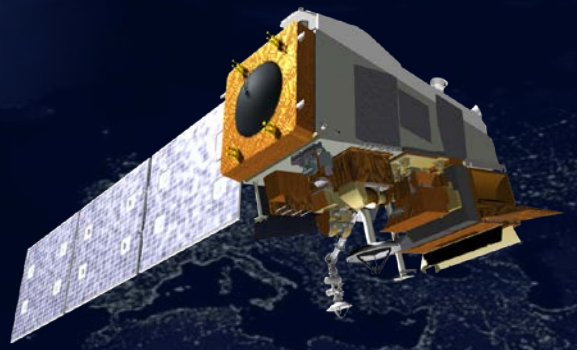
- The instruments are progressing well
- Spacecraft has started

Thank you so much!

Excellent feedback from our users - Worldwide



This animation depicts a year's worth of vegetation data from the VIIRS instrument on Suomi NPP



Thank You

www.jpss.noaa.gov