From POES to JPSS: New capabilities in satellite observations
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.*
JPSS Supports All Four Key NOAA Mission Areas

**Climate Adaptation and Mitigation**
- Improved understanding of a changing climate system that informs science, service and stewardship.

**Weather Ready Nation**
- Reduced loss of life from high-impact weather events while improving efficient economies through environmental information.

**Resilient Coastal Communities and Economies**
- Improved coastal water quality support that enables coastal communities to effectively manage resources and improve resiliency.

**Healthy Oceans**
- Improved understanding of ecosystems to inform resource management decisions.
## JPSS Instruments

<table>
<thead>
<tr>
<th>JPSS Instruments</th>
<th>Measurements &amp; Products</th>
<th>Contractor</th>
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</thead>
<tbody>
<tr>
<td><strong>ATMS</strong> - Advanced Technology Microwave Sounder</td>
<td>High vertical resolution temperature and water vapor information critical for forecasting extreme weather events, 5 to 7 days in advance</td>
<td>Northrup Grumman Electronic Systems</td>
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<tr>
<td><strong>CrIS</strong> - Cross-track Infrared Sounder</td>
<td></td>
<td>Exelis</td>
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<tr>
<td><strong>VIIRS</strong> – Visible Infrared Imaging Radiometer Suite</td>
<td>Critical imagery products, including snow/ice cover, clouds, fog, aerosols, fire, smoke plumes, vegetation health, phytoplankton abundance/chlorophyll</td>
<td>Raytheon Space and Airborne Systems</td>
</tr>
<tr>
<td><strong>OMPS</strong> - Ozone Mapping and Profiler Suite</td>
<td>Ozone spectrometers for monitoring ozone hole and recovery of stratospheric ozone and for UV index forecasts</td>
<td>Ball Aerospace and Technologies Corp.</td>
</tr>
<tr>
<td><strong>CERES</strong> – Clouds and the Earth’s Radiant Energy System (S-NPP and JPSS-1)**</td>
<td>Scanning radiometer which supports studies of Earth Radiation Budget (ERB)</td>
<td>CERES - Northrup Grumman Aerospace Systems</td>
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<tr>
<td><strong>RBI</strong> – Radiation Budget Instrument (JPSS-2, 3, 4; provided by NASA)</td>
<td></td>
<td>RBI - Exelis</td>
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</table>
JPSS Enhanced Data Products

- Atmospheric temperature/moisture profiles
- Hurricane intensity and position
- Thunderstorms, tornado potential
- Alaska “nowcasting” (e.g. imaging for operational weather forecasting)
- Significant precipitation and floods
- Dense fog
- Volcanic ash
- Fire and smoke
- Sea surface temperature, ocean color
- Sea ice extent and snow cover/depth
- Polar satellite derived winds (speed/direction/height)
- Vegetation greenness indices and health
- Ozone
- Oil spills
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
History of NOAA POES Weather Satellites

TIROS-1-10/ESSA 1-9/ITOS 1-8
Two cameras and (some) radiometers

TIROS-N /NOAA 6-14 (TIROS-N LD - Oct 1978)
First to fly AVHRR and the three sounders and a data collection system

First to fly advanced microwave sounding units, AVHRR flew additional 1.6micron channel

JPSS (S-NPP LD – Oct 2011)
- 5 new instruments
- 100x more channels
- Higher resolution
- Lower latency
- Wider swath
- 200X data

NOAA-18 (LD – May 2005)
Improved resolution for the HIRS sounder
# NOAA & Partner Polar Weather Satellite Programs

## Continuity of Weather Observations

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### Notes
- DMSP: Defense Meteorological Satellite Program
- JPSS: Joint Polar Satellite System Program
- Suomi NPP: Suomi National Polar-orbiting Partnership

### Abbreviations
- **Post Launch Test**
- **Operational based on design life**
- **Secondary**
- **Operational beyond FY 2036**
- **Extended mission life**
- **Launched before Oct 2008**
NOAA Polar Satellites Status

Constellation Orbital Configuration

- NOAA-19
- NOAA-18
- NOAA-15
- NOAA-17
- NOAA-16

Constellation as of 20 February 2014
Dashed Lines are from July 2012
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Suomi-NPP Mission Status

• Launched on October 28, 2011, bridge from legacy POES/EOS to JPSS
• 3rd Anniversary on October 28, 2014
• In three years - 15,550 orbits, more than 31.719 petabytes of data = to 266,076,160 (16GB) smartphones.
• Observations are exceeding expectation with high data availability.
• Named NOAA’s primary polar-orbiting weather satellite on May 1, 2014

This animation depicts vertical resolution enhancement by using CrIS with ATMS
**JPSS Program Baseline**

**NOAA responsibilities:**
- End-to-end responsibility, requirements, funding, delivering to National Weather Service
- Operations, data product science, enterprise ground elements

**NASA Goddard Space Flight Center responsibilities:**
- Systems engineering lead
- Flight Segment, majority of Ground Segment
- Safety and mission assurance

<table>
<thead>
<tr>
<th>JPSS Summary</th>
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<tbody>
<tr>
<td><strong>Launch Dates</strong></td>
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<td><strong>Program Architecture</strong></td>
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<td><strong>Program Operational Life</strong></td>
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</table>

*Launch Date based on President’s FY 2014 Budget Request
*Suomi NPP is a joint NASA / NOAA mission
Polar Follow On (PFO)

FY2016 President’s Budget Request includes new missions

- Adds JPSS-3 and JPSS-4 Missions to ensure a stable NOAA Polar Operational Weather Satellite System expected to operate into the late 2030’s
- Proposes a small microwave sounding mitigation mission (EON) for the late 2010’s when continuity risk is highest
- Complemented by activities underway as documented in the NOAA gap mitigation plan, and COSMIC 2 Radio Occultation

Approach:

- JPSS 3 and JPSS 4 to be copies of JPSS-2, procurement activities underway
- Managed as an integrated program with S-NPP, JPSS-1 and JPSS-2
- EON managed outside JPSS
- JPSS-3 and JPSS-4 to be ready ahead of planned need to enable recovery from loss of sounders in orbit

<table>
<thead>
<tr>
<th>Mission</th>
<th>Launch Readiness Date</th>
<th>Launch Date</th>
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<tbody>
<tr>
<td>PFO/JPSS-3 Contingency</td>
<td>Q3 FY 2023</td>
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<td>PFO/JPSS-3 Full</td>
<td>Q2 FY 2024</td>
<td>Q4 FY 2026</td>
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<tr>
<td>PFO/JPSS-4</td>
<td>Q3 FY 2026</td>
<td>Q4 FY 2031</td>
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</table>

Bottom Line: Establish a stable, fault tolerant polar observing system as quickly as possible to ensure delivery of critical weather observations
JPSS-1 Satellite & Instruments

- Clouds and Earth’s Radiant Energy System
- Visible Infrared Imaging Radiometer Suite
- Ozone Mapping Profiler Suite
- Advanced Technology Microwave Sounder
- Cross-track Infrared Sounder
JPSS System Architecture

- Svalbard, Norway
- Fairbanks, Alaska
- TDRS - Tracking and Data Relay Service, New Mexico
- McMurdo - U.S. Antarctic Research Station
- NSOF - NOAA Satellite Operations Facility
- NWS - National Weather Service
- NOS - National Ocean Service

- NWS, NOS and other users
- White Sands Complex NM, TDRS
- Direct Broadcast

Suomi NPP
Program Status

JPSS-1

CERES being attached to JPSS-1 spacecraft
(Courtesy of Ball Aerospace)

Spacecraft with CrIS, VIIRs, OMPS, CERES integrated
(Ball Aerospace)

ATMS EDU integration
(Ball Aerospace)

Delta II Fairing and Booster Assembly
(United Launch Alliance)

Delta II Second Stage
(United Launch Alliance)
Program Status
JPSS-2, Ground, Science

- JPSS-2 instruments under contract, spacecraft in procurement
- Block 2.0 Ground deployed, in Integration, Test, Verification – TTO early 2016
  - Multi-Mission
  - Technology Refresh
  - Security
  - Efficient flexible operations
- Significant Block 1 updates operating well
- User readiness / risk reduction progress
- Plan beyond JPSS-2 submitted
- Joint Polar System Agreement with EUMETSAT approved
We Want Your Input!

- JPSS tracks usage of JPSS data products.
- Conference presenters have been asked to respond to the following:
  - Do S-NPP/JPSS products provide continuity from legacy POES, METOP, DMSP, EOS satellites? Are the legacy products well-utilized in user operations? When will users switch to S-NPP/JPSS products?
  - What S-NPP/JPSS products are in use now in operations and for what purpose (e.g., data assimilation, validation, decision support, etc.)?
  - If a JPSS product is not in use, is there an actionable/funded plan to use the S-NPP/JPSS product?
  - Are there issues with the current product performance or data access that inhibit the use?
  - For products where JPSS provides advanced capabilities, what are the benefits?
  - What additional work needs to be done to ensure that the S-NPP/JPSS product is/will be well-utilized? Are additional enhancements needed?
- We invite those not presenting to provide input via the JPSS Program Science Office

JPSS - Program Science Office
Dr. Mitch Goldberg, Bill Sjoberg, Arron Layns, Julie Price, & Kathryn Shontz,
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
- The spacecraft bus is built and undergoing testing
- Development and implementation of the new ground data processing system are underway

JPSS-2 procurement activities are progressing well
- The VIIRS, OMPS, CrIS, and ATMS and Radiation Budget Instrument are underway

PFO: JPSS-3 and JPSS-4 in the President’s FY2016 Budget Request
Thank you!

For more information visit www.jpss.noaa.gov/NOAANESDIS

www.jpss.noaa.gov/NOAAASatellites

@NOAAASatellites