



NPOESS Preparatory Project - Joint Polar-orbiting Satellite System Program Overview

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● **NPOESS Program Terminated 30 Sep 2010**

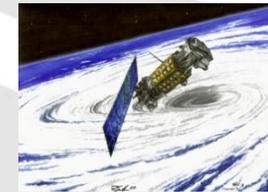
- NOAA assigned 1330 orbit – Joint Polar Satellite System (JPSS)
- DoD assigned 0530 orbit – Defense Weather Satellite System (DWSS)
- EUMETSAT MetOp will provide 0930 orbit
- Common Ground System (GCS) using systems developed for NPOESS
 - Command, Communications & Control (C3S)
 - Data production system (IDPS)
 - Globally Distributed Receptor Network (DRN)
- Advanced sensors developed for NPOESS will be continued
 - VIIRS (MODIS heritage)
 - CrIS (AIRS/IASI heritage)
 - OMPS (OMI/TOMS heritage)
 - ATMS (AMSU heritage)
 - CERES/ERBS

Evolution of The Polar Satellite Programs



NPOESS C-2

Early Morning Orbit



DWSS



MetOp

Mid-morning Orbit



MetOp



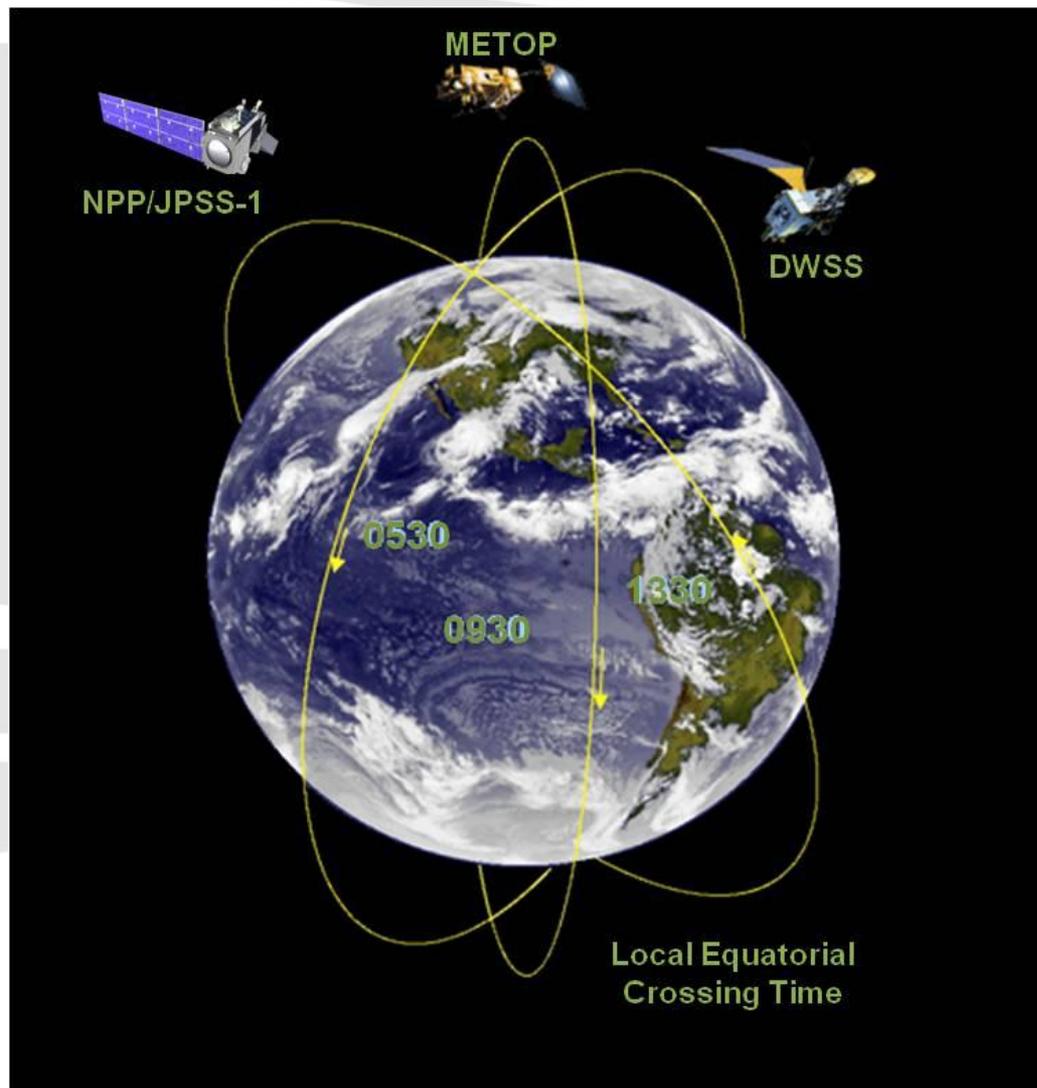
NPOESS C-1

Afternoon Orbit



JPSS

SATELLITE CONSTELLATION IN JPSS ERA

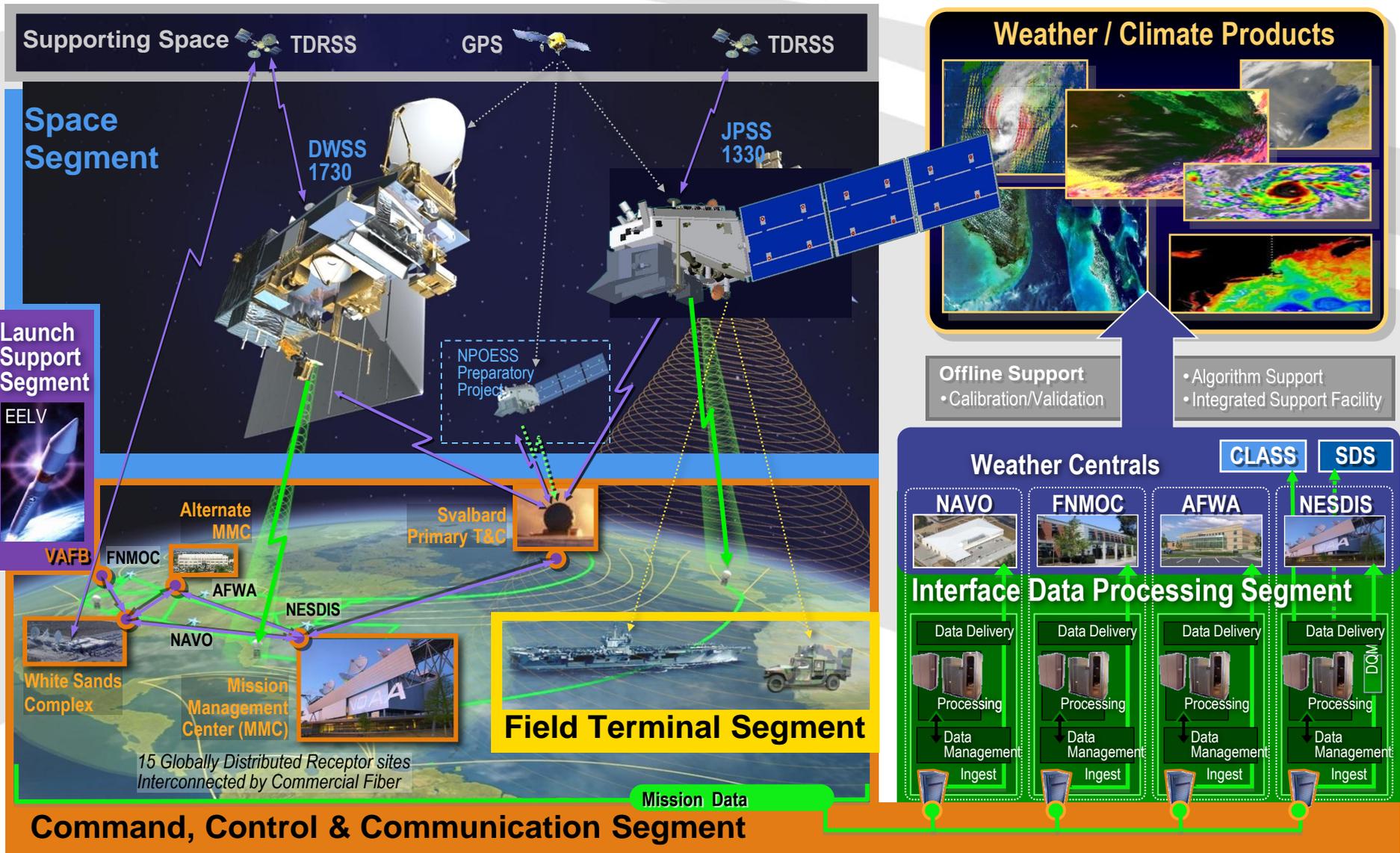


JPSS PROGRAM PLANS



- **NASA will procure and integrate JPSS for NOAA**
 - POES / GOES model
- **NPOESS Preparatory Project (NPP) will be completed as planned**
 - Five Sensors (VIIRS, CrIS, ATMS, OMPS, CERES)
 - NPP will use C3S and IDPS developed for NPOESS
- **NOAA/NASA will develop JPSS series for 1330 Orbit**
- **JPSS-1 will be NPP Clone**
 - SARSAT and A/DCS will likely fly on separate satellite
 - JPSS-1 will use Distributed Receptor Network
- **JPSS-2 and beyond will be competed**
- **DoD plans for DWSS being developed**
 - DoD will launch remaining inventory of DMSP in the interim

JPSS System Architecture



JPSS Program Overview



Benefits

- Maintains continuity of climate observations and critical environmental data from the polar orbit
- Increases timeliness and accuracy of severe weather event forecasts
- VIIRS advanced imaging will improve weather and oceanographic support , fire and volcano analysis, Gulf oil tracking, and similar incidents.
- CrIS and ATMS will provide advanced atmospheric temperature, moisture and pressure profiles for support of improved NWP forecasts.



**JPSS-1 Satellite
(NPP-clone)**

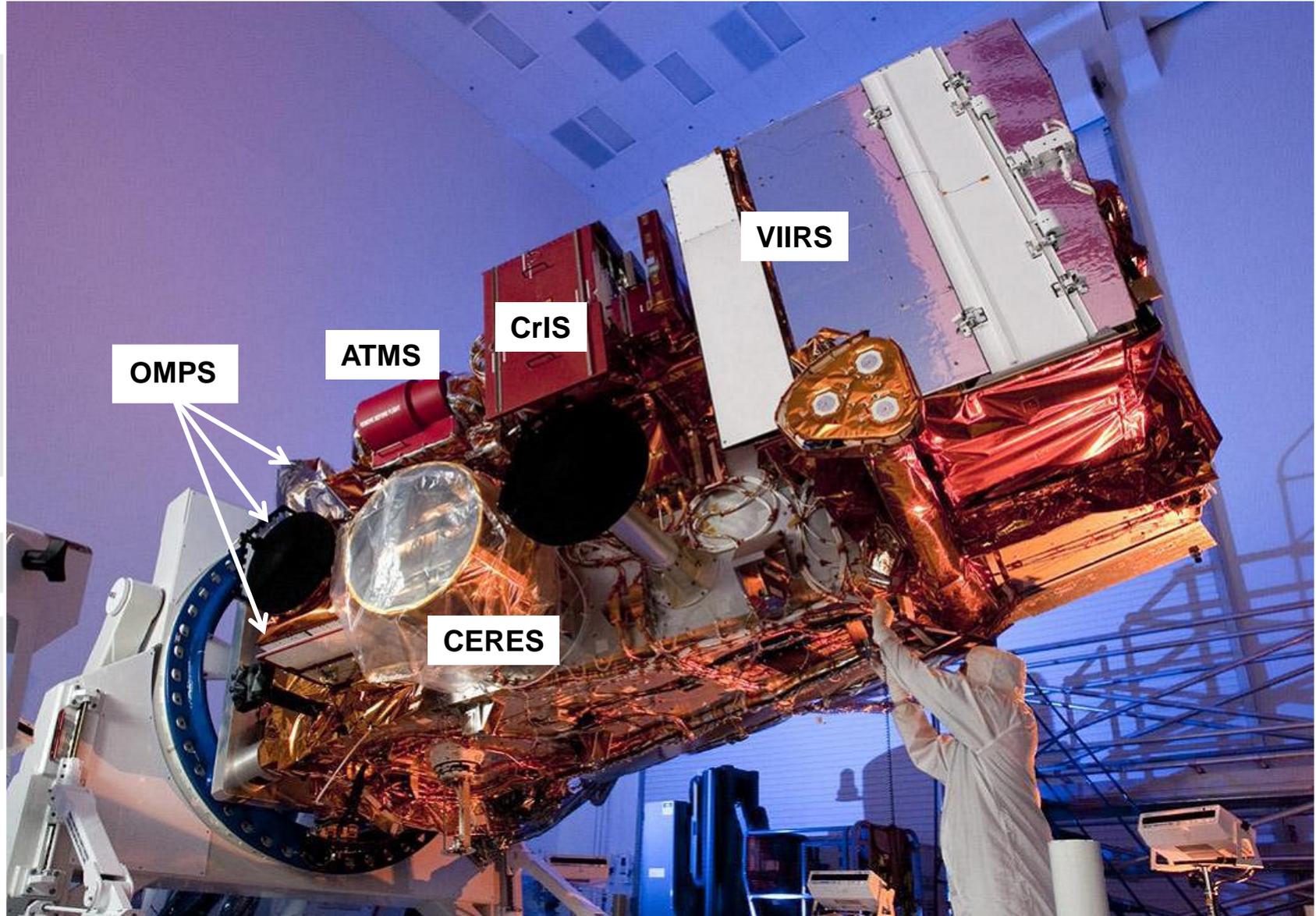
JPSS Launch Readiness Date	JPSS-1 – FY-2016, JPSS-2 – FY-2018
Program Architecture	Satellite system to support accommodations of NPOESS pm orbit instruments, climate sensors, and user services; 5-7 year operational design life
Program Operational Life	FY 2016 – FY 2026
Program FY 2011 President's Budget through 2024	\$11.9 billion

NPP Mission Status



- **Updated NPP Level 1 requirements signed by NASA HQ Science Mission Directorate last month; Launch Readiness Date is October 25, 2011**
 - Re-baseline Review Presentation to NASA HQ on January 21
- **The NPP Satellite successfully complete EMI/EMC testing; the consent to break configuration was granted on January 13, 2011**
- **The NPP team successfully completed the NPP Connectivity Test 3(NCT#) in February and will hold the 72 hour NCT3 Part 2 “Run for Record” (RFR) beginning April 11.**
- **The NPP Observatory is currently in TVAC with the sensors providing data**

NPP Spacecraft (JPSS-1 Concept)



NPP/JPSS-1 SENSORS



*Visible/Infrared
Imager Radiometer
Suite (VIIRS)
Raytheon*



*Cloud and Earth
Radiant Energy
System (CERES)
(FM5 for NPP)
Northrop Grumman*



*Cross-track Infrared
Sounder
(CrIS)
ITT Corporation*



*Ozone Mapping and
Profiler Suite
(OMPS)
Ball Aerospace*



*Advanced Technology
Microwave Sounder
(ATMS)
Northrop Grumman*

NPP/JPSS-1 Sensor Characteristics



- VIIRS is a 22-band imager covering the 412 nm to 12 μm region. Similar capabilities to MODIS plus reduced pixel growth for overall higher spatial resolution, full global daily coverage, & a day/night imager
 - Intensive pre-launch calibration & characterization
 - Key Environmental Data Records (EDR's) are Sea Surface Temperature & Imagery (for manual interpretation)
 - Other EDR's provide properties of clouds & aerosol, land surface, ocean chlorophyll, sea ice
 - Major upgrade in capabilities compared to *operational* heritage (AVHRR 6-bands)
- CrIS is a Michelson interferometer operating in 3 spectral windows between 650 cm^{-1} & 2,700 cm^{-1} with spectral resolution typically of 1,000. Capabilities are similar to AIRS
 - Intensive pre-launch calibration & characterization
 - Works in conjunction with ATMS
 - EDR's are atmospheric temperature, moisture & pressure profiles
 - Uncertainties typically $\sim 1^\circ$ for 1 km layers in clear troposphere
 - Major upgrade compared to the operational heritage (HIRS 40 channels vs $\sim 1,300$)
- ATMS is a cross-track microwave radiometer operating in 22-channels covering the range from 23.8 to 183 GHz. Similar capabilities to the *operational* AMSU-A & AMSU-B
 - Intensive pre-launch calibration & characterization
 - Works in conjunction with CrIS to provide initial profile estimates & coverage with cloudy conditions

JPSS SENSORS

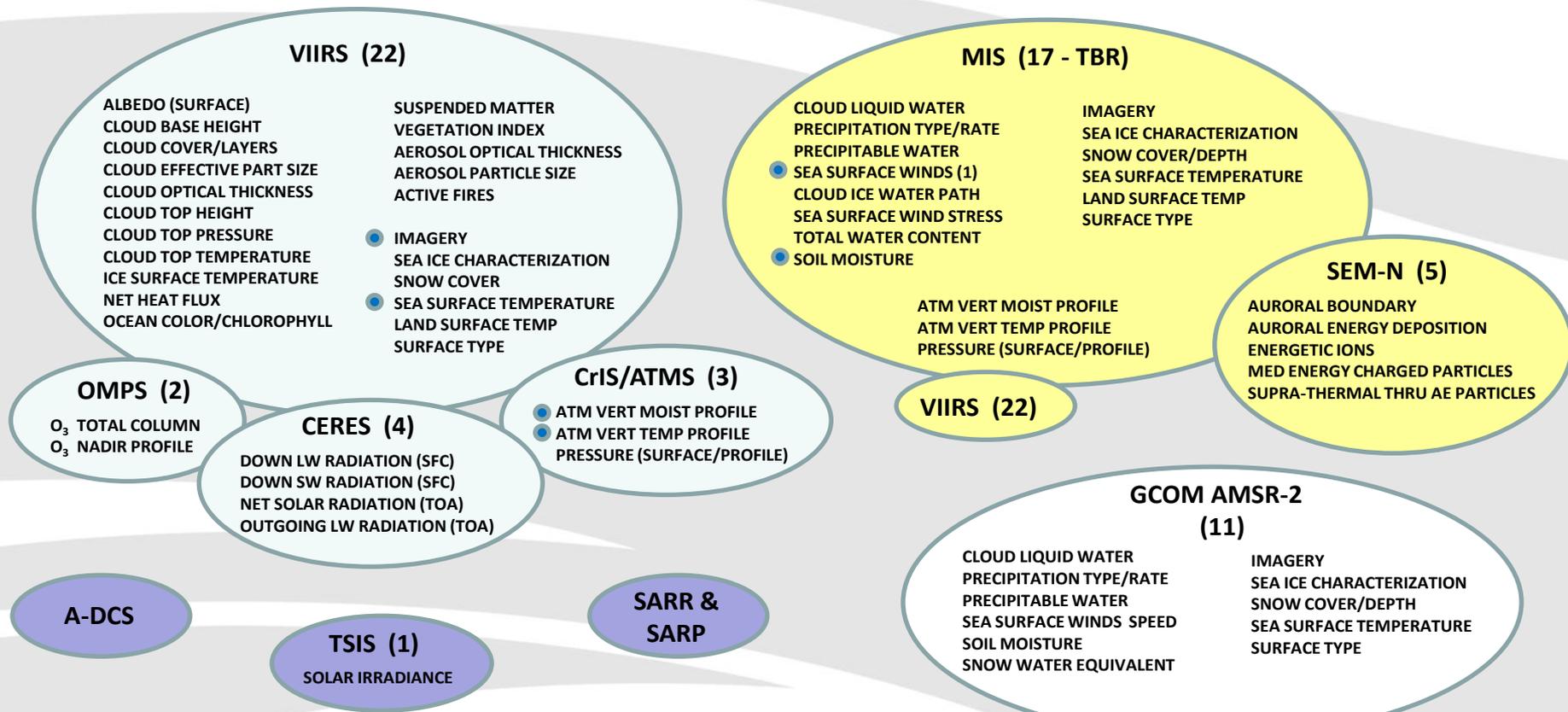
NPP/JPSS-1 Sensor Characteristics (Con't)



- OMPS measures the total column ozone and ozone profile in the nadir using two UV spectrometers covering the range from 250 nm to 380 nm. Total column ozone is measured with a 50 km nadir resolution & the ozone profile with a 250 km nadir resolution. There is no operational heritage, but the capabilities are improvements upon the routine research measurements of SBUV & TOMS. A research capability for higher resolution vertical profiles from a limb scanner will fly on NPP.
 - Intensive pre-launch calibration & characterization
 - Total column ozone from 50 to 650 DU with accuracy better than 15 DU
 - Vertical profile in 5 km layers to 60 km with accuracy 7% at 1 mb & precision 10% at 30 mb
 - First *operational* ozone sensor
- CERES measures the Earth radiation budget in 3 broad bands from 0.3 to >50 μm . There is no operational heritage, but identical capabilities are available from the routine research measurements of CERES on EOS Terra & Aqua
 - Intensive pre-launch calibration & characterization
 - First *operational* radiation budget sensor
- TSIS measures the variability in the Sun's total output using two sensors. TIM is a broadband measurement while SIM measures the spectral distribution of the solar irradiance between 0.2 & 2.7 μm . There is no operational heritage, but identical capabilities are available from the routine research measurements of TSIS on NASA's SOLAR mission

JPSS SENSORS

JPSS L1RD Defined Environmental Data Records (EDRS)



KEY

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

Notes:

(1) Delivered as two MIS products – Speed (Key EDR) and Direction

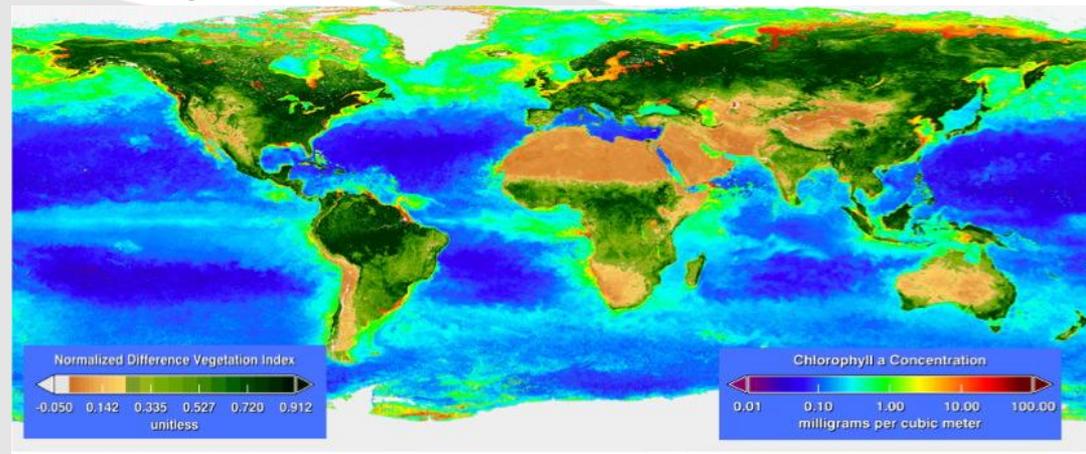
In addition to clouds and SST, VIIRS provides continuity of essential environmental monitoring from AVHRR and MODIS



Fire monitoring and mapping



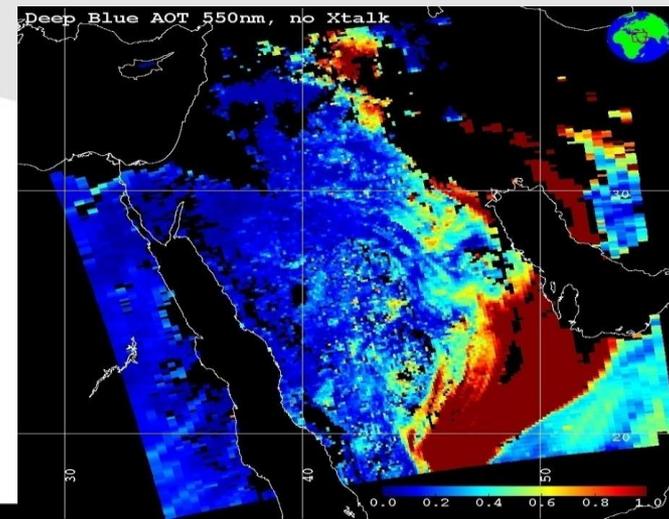
Biosphere monitoring: Vegetation and Ocean Color



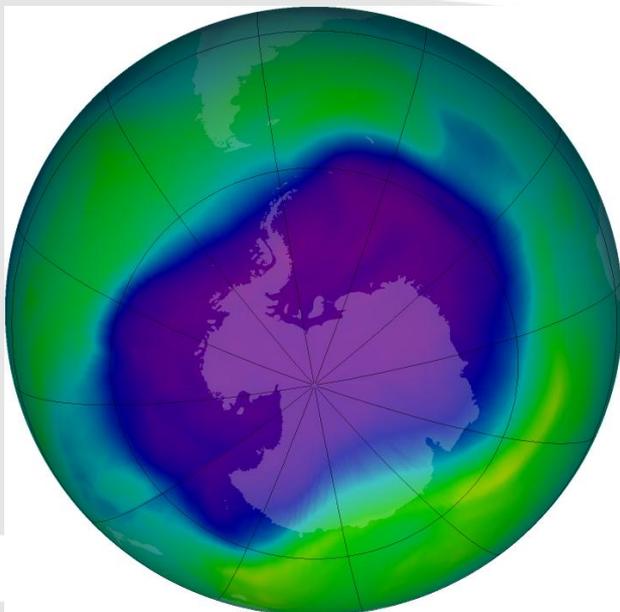
Oil slick monitoring and mapping



Aerosols for air quality and aviation safety

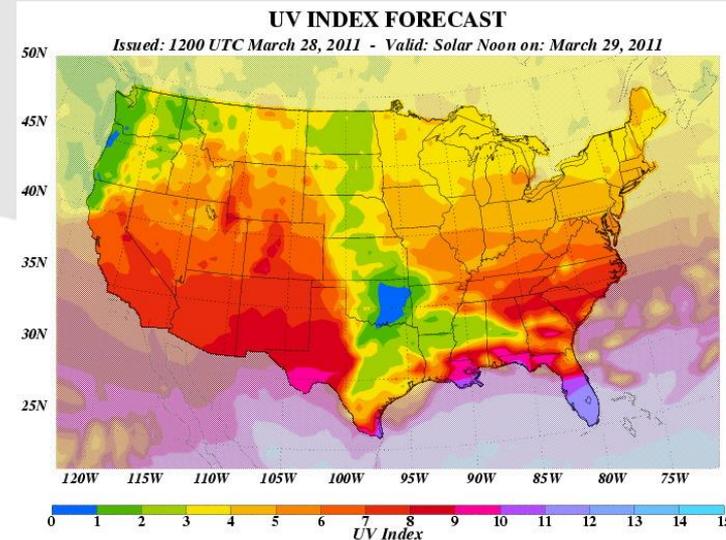
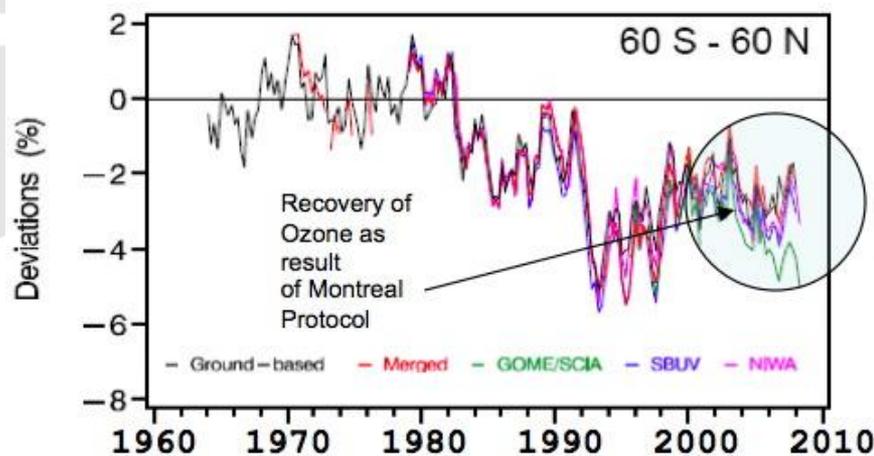


OMPS provides continuity of essential ozone products and applications



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

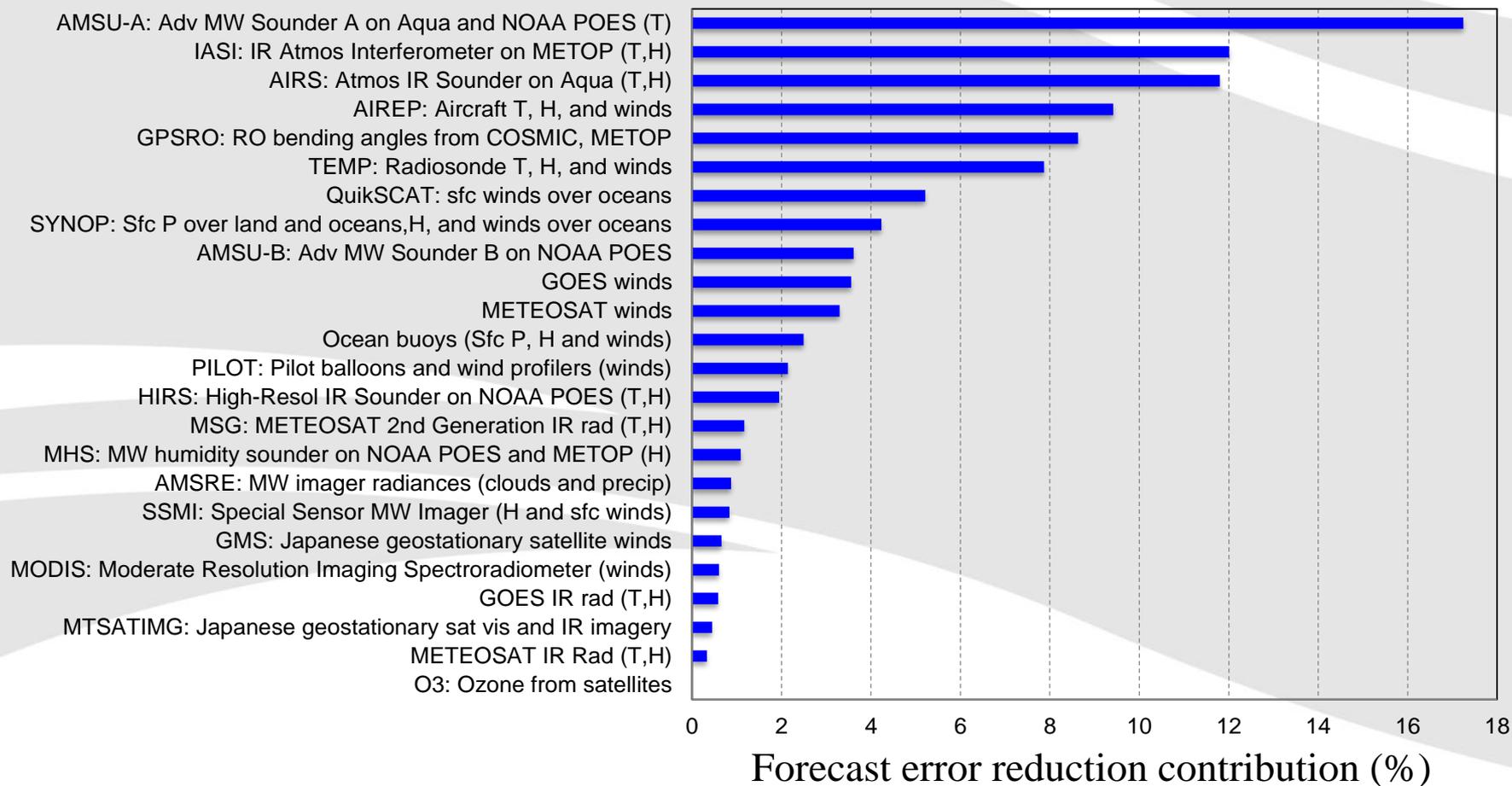
Used in NWS UV Index forecast to allow public to avoid overexposure to UV radiation



CrIS and ATMS provide continuity of essential atmospheric sounding information for weather forecasting



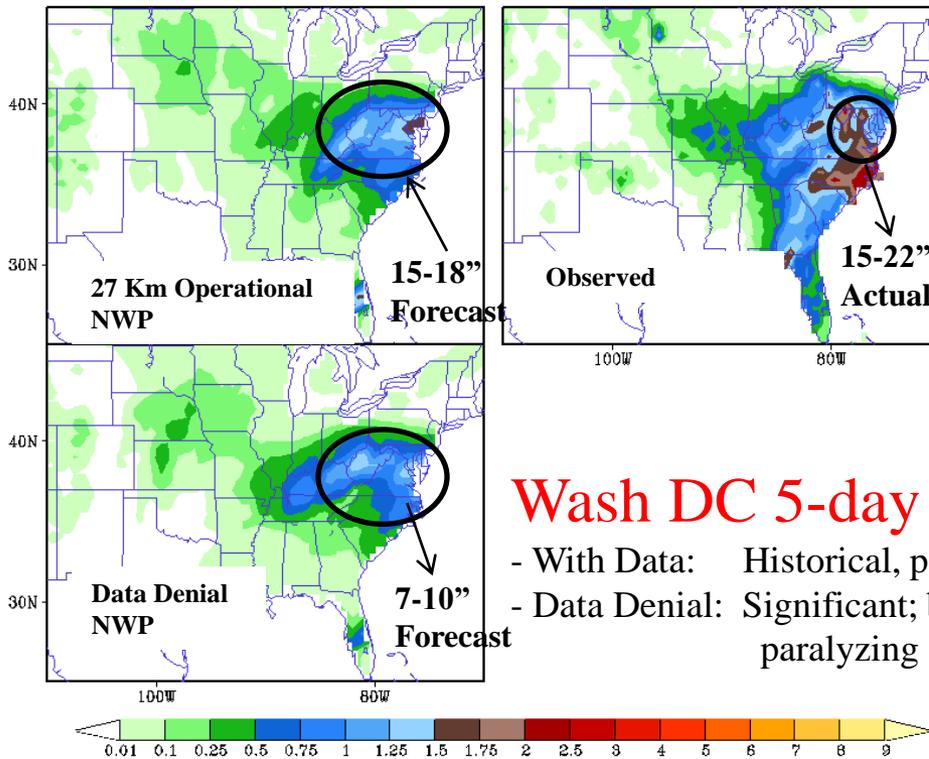
Hyperspectral Infrared Sounders (CrIS) and Advanced Microwave Sounders (ATMS) are the top two contributors for reducing forecast errors



Afternoon orbit has large impact on forecasting major weather events



Forecast Period: 5 Feb (am) – 6 Feb (am)



6 Feb: Models without PM data under-forecasted snow totals:

- Operational forecast shows paralyzing event
- Data Denial
 - Did not forecast paralyzing event in DC— at least 10" too low at Day 5
 - Low confidence in extreme snowfall at this point
- Future errors of this scale could result in:
 - Aircraft and airline passengers stranded
 - Ground commerce halted with no mitigation plans
 - Population unprepared for paralyzing snow-depth

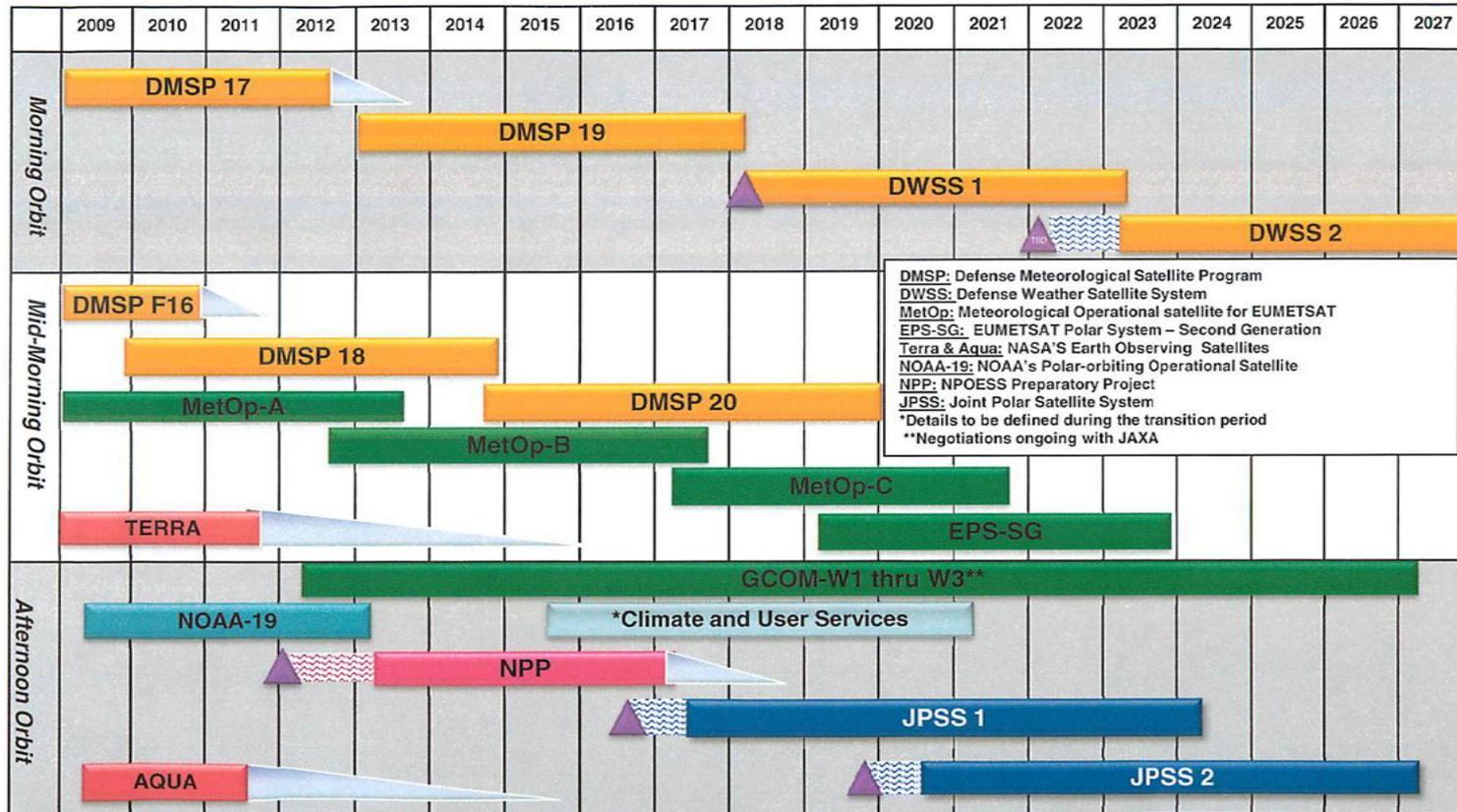
Continuity of Polar Operational Satellites



Continuity of Polar Operational Satellite Programs

Fiscal Year

As of January 14, 2011



Approved: *M. E. Meyer*
 Assistant Administrator for
 Satellite and Information Services

Operational Satellites
 Post Launch Test
 Launch Readiness Date
 Operational beyond design life

QUESTIONS?



- **JPSS Program Director, Gary Davis**
- **JPSS Program Scientist, Dr. Mitch Goldberg, NOAA**
- **JPSS Senior Project Scientist, Dr. James Gleason, NASA**