Updates on NPP/NPOESS; NOAA Ocean Color Activities

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Mission

- National, operational, polar-orbiting environmental monitoring capability
- Converges DoD & NOAA weather satellite programs
- Incorporates new technology from NASA programs
- International cooperation with European MetOp satellite

Benefits

- Critical input to weather forecast models
  - NPOESS will improve accuracy and expedite data products
- Greatly improved direct broadcast data to users worldwide
- Science-quality data to all users – including research scientists and continuity of climate data records
• NPOESS has completed restructure and is executing to re-baseline contract
• Performance on NPOESS Engineering, Manufacturing & Development program
  ▪ On schedule and budget for last two years
  ▪ Contract modification signed in July 2007
  ▪ System design meets requirements for improvements in data delivery for current and accurate weather forecasting
  ▪ On track to deliver essential weather measurements and 14 of 26 essential climate variables
  ▪ System capacity to accommodate de-manifested sensors and other sensors to provide additional monitoring
    ▪ Currently re-manifesting OMPS-Limb and CERES on NPP
• NPOESS sensors are in final testing for delivery for NPOESS Preparatory Project launch
• NPOESS remains on track for Jan 2013 launch of C1 spacecraft
Systems Engineering & Science Progress

Integration and Test
- Critical Design Review scheduled for April 2009
- NPOESS Preparatory Project compatibility tests completed
- Command, Control, Communications (C3) Segment for NPP is complete

Algorithms & Verification
- Algorithms functioning as an integrated system
- Initial phase of algorithm development is ~85% complete
- Near-term focus is on completing test & verification of operational algorithm software

Operations & Support
- Effective transition from C3 to Operations & Support (O&S) in Jan 07
- On track for Integrated Data Processing System and C3S development teams to perform O&S through EMD
Sensor Payload Development Progress

VIIRS EDU
- Completed system data handling testing while integrated on NPP

VIIRS Flight Unit
- System integration completed
- Environmental testing in Spring 08

OMPS Flight Unit
- Nadir environmental testing completed
- Electrical and mechanical interface to NPP verified
- OMPS Limb re-manifested on NPP
- Integrated Sensor Suite Testing in Spring

OMPS Instrument (BATC)

CrIS EDU
- Completed system data handling testing while integrating on NPP

CrIS Flight Unit
- Frame testing successfully completed
- System integration and test started in October 2007
- Delivery in May 2008

CrIS Instrument (ITT)

VIIRS EDU (Raytheon) integrated on NPP (BATC)
Ground Segment Progress

- **Ground Segment**
  - NOAA Satellite Operations Facility (NSOF) complete
  - Command and Control completed and installed at 4 locations
  - NPP Flight Vehicle Simulator installed

- **NOAA Satellite Operations Facility**

- **NPP Svalbard Modifications Completed**
  - Communications services to NSOF established
  - End to End compatibility checkouts conducted
  - WindSat data relay operational

- **IDP Segment**
  - Build 1.4 completed qualification testing
  - Final NPP Software Increment Build 1.5 in development
  - Acceptance Test at sites in Summer 2008

- **Downlink at Svalbard**
NPP-VIIRS Ocean Color Status, Impacts & Plans

• The Visible/Infrared Imager/Radiometer Suite (VIIRS) on the NPOESS Preparatory Project (NPP) does not appear capable of providing climate-quality ocean color data for the U.S. research and applications communities.

• Regardless if NPP delayed, unable to seek changes to VIIRS to ensure adequate performance for ocean color imaging that meets radiometric standards for climate-quality data; there would be unreasonable risk in opening up the optics module in which the filter resides.

• Every effort is being made to implement changes to VIIRS on NPOESS C1 to ensure performance for ocean color imaging that meets radiometric standards for climate-quality data, and will do with other climate products, make pre-flight test data sets available in a timely and transparent manner.

• Discussion and coordination efforts underway with ESA (MERIS) and ISRO (OCM-II) regarding international sources of ocean color data
NPOESS Data Exploitation (NDE)

NDE Mission Statement: Deliver data products and assist NOAA and other civilian operational users to realize the potential of NPOESS observations.

NDE will be a critical link to achieve return on the NPOESS investment.

NPOESS Ground Systems

- SafetyNet
- Command and Control

NPOESS Data Exploitation

- Ingest
- Process
- Quality Control

(operated in ESPC)

Near Real-time Delivery

Archive and Access

Operational User Community

NOAA Science Center
NDE Operational System Objectives

- Disseminate NPOESS Data Records to customers
- Generate and disseminate tailored NPOESS Data Records (versions of NPOESS Data Records in previously agreed alternative formats and views)
- Generate and disseminate NOAA-unique products (augmented environmental products constructed from NPOESS Data Records)
- Deliver NOAA-unique products, product processing elements, and associated metadata to CLASS for long-term archiving
- Provide services to customers, including NDE product training, product enhancement, and implementation support across NOAA
- Provide software for NPOESS Data Record format translation and other data manipulations
NDE User Community

US GOVERNMENT

- DOC / NOAA
  - National Weather Service
  - Ocean Service
  - Fisheries
  - Research
  - Satellites & Information
- Department of Agriculture
- Federal Aviation Administration
- Coast Watch
- NOAA/Navy National Ice Center

DOMESTIC AND INTERNATIONAL

- Commercial Sector (e.g. Energy Industry)
- Universities, Researchers et al.
- European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)
- International Meteorological Services (India, Japan, Brazil, UK, ECMWF, etc.)
- World Meteorological Organization
- Data Collection Service
- Search and Rescue
NPP Phase 1

Legacy mission continuity replacement products comprised of currently funded NOAA Unique Products (NUPs) and xDRs

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<td>Blended SST</td>
<td>Sea Surface Temperature (SST)</td>
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**NPP Phase 2**

Enhanced products comprised of additional NUPs and xDRs not linked to mission continuity

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<td>Cloud Top Temperature (VIIRS)</td>
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Coastal Waters Imaging (CWI)

- **Analysis of Alternatives (AoA)**
  - Due to cancellation of GOES-R HES, the NOAA-NESDIS Office of Systems Development led an AoA study including NOAA Goal Teams, Academia, Contractors and other participants to address NOAA requirements for advanced sounding and coastal waters imaging capability.

- **Summary**
  - Both LEO and GEO solutions studied in AoA can meet NOAA requirements for High-temporal, operational Coastal Waters Imaging (CWI) in 2014.
  - Four small satellites with CW Imagers could provide the required frequency of sampling.
  - Designs for a low-risk operational multispectral or hyperspectral coastal waters imager exists for Low Earth Orbit (LEO).
  - Coverage includes WA, ME, AK and HI, which are not covered at 300 meters resolution by a single GEO sensor.
  - Preliminary designs for multispectral CWI for Geostationary Orbit (GEO) look promising, but require long integration times.
  - Spacecraft stability may not be adequate for ocean color imaging at 300 m GSD; requires further study.
  - Conflicting estimates on the cost of the ground segment need to be resolved.
  - Cost of ground segment for LEO or GEO solution similar – not a deciding factor when comparing the two approaches.
Path Forward for Coastal Waters Imaging

- Recommended path forward for a 2014 operational CWI system involves an earlier demonstration to:
  - Allow time for algorithm development and testing and user familiarization
  - Provide risk reduction in the product generation, product distribution, and user readiness
  - Take advantage of Hyperspectral Imager for the Coastal Ocean (HICO) to be launched in July 2009 on the Japanese External Module on the International Space Station (JEM-ISS) to collect a demonstration data set
    - Office of Naval Research funded instrument, Space Test Program funding integration and launch, NASA and Japanese Space Agency (JAXA) providing space and support on the ISS
    - ISS orbit allows for the collection of data at all times of day to assess optimal timing of coastal waters imaging
  - Support the COAST science team for related activities
  - Requires support for operational in situ calibration source (i.e., MOBY/next generation replacement)
  - At the same time initiate a Pre-Phase A study to evaluate issues with geostationary ocean color imaging and choose between the LEO or GEO solution (should be pursued in coordination with NASA).