NPP & NPOESS Update

Presentation to the Ocean Color Meeting
Washington, D.C.
April 15, 2004

Dr. Robert E Murphy
NPP Project Scientist

NPP & NPOESS

- Goals of NPP and NPOESS
- Continuity of Ocean Color Measurements
- Mission Characteristics
- Science Guidance for NPP
  - NASA Science Team(s)
- Science Guidance for NPOESS
  - Operational Algorithm Teams (OAT's)
  - Roll of NASA
- Source of Data in the NPOESS Era

What is NPP?

- **NPP is a "bridging mission" that provides for the continuation of measurement series initiated with EOS Terra, Aqua & Aura for NASA's global change research**
  - **Climate change**
  - **Global carbon cycle**
  - **Global water cycle**
  - **Atmospheric Chemistry**
- **NPP provides risk reduction for the National Polar-Orbiting Operational Environmental Satellite System (NPOESS) which will continue these measurements into the indefinite future**
- **NPP is a joint program of NASA and the Integrated Program Office (IPO), the tri-agency activity that is responsible for NPOESS**
- **NPP will launch in the fall of 2006**

What is the NPOES Mission?

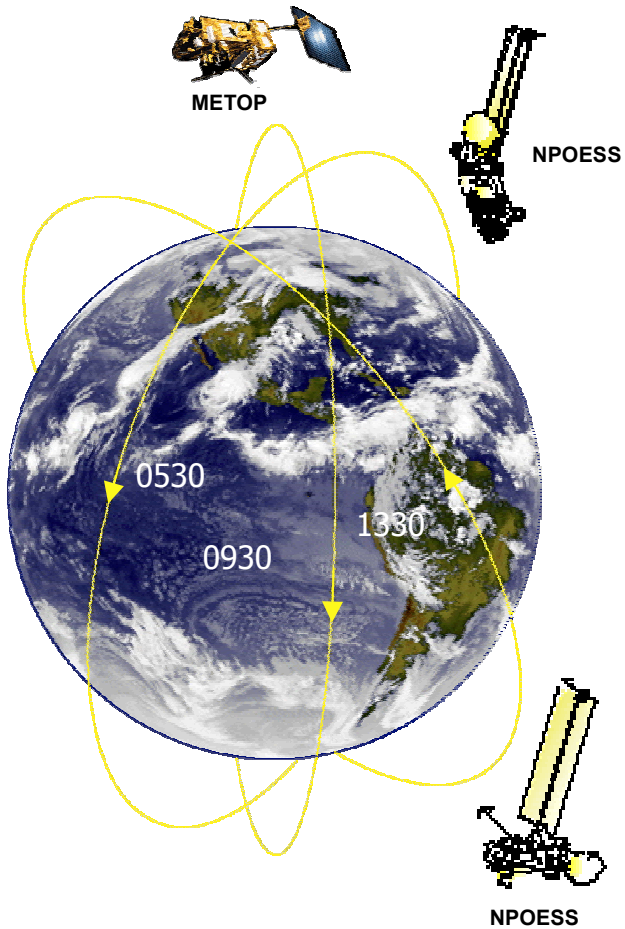
Mission

Provide a national, operational, polar-orbiting environmental capability

Achieve National Performance Review savings by converging DoD and NOAA polar satellite programs

Incorporate new technologies from NASA and others

Incorporate, where appropriate, International Cooperation (EUMETSAT)



CONTINUITY!

- **The combination of NPP and NPOESS means that the ocean color measurement series initiated with the launch of SeaWiFS will be continued into the indefinite future.**
- **The measurement capability is similar to that of MODIS**
  - **High radiometric accuracy**
  - **Low scattered light**
  - **12-bit quantization**
  - **Global coverage in 1 day**
  - **740 m resolution at nadir**
- **VIIRS details presented by Wayne Esaias tomorrow**
- **NPOESS is an operational mission with standard data products under the control of the operational users**
- **All data will be available to the research community**

Mission Characteristics

- **NPP has 824 km Sun synchronous orbit**
  - **10:30 AM descending node**
  - **98.74° inclination**
  - **Mimics Terra ground track repeat**
    - **16 day ground-track repeat**
  - **Swath width 0f 3,000 Km (±56.06°) for VIIRS**
- **NPOESS has 833 km Sun synchronous orbits**
  - **All 3 satellites will carry a VIIRS**
    - **09:30 descending node**
    - **13:30 ascending node**
    - **17:30 ascending node**
  - **Ground track repeat not yet determined**
  - **Swath width of 3,000 km (±56.06°) for VIIRS**
- **Data latency is a priority**
  - **NPP - 120 minutes from acquisition of photons**
  - **NPOESS - <30 minutes from acquisition of photons**
- **Replacement satellite to be launched on failure of key sensors including VIIRS in NPOESS era (c.a. 2010)**

NPP Sensors

- **The Visible Infrared Imaging Spectroradiometer Suite (VIIRS) extends measurement series initiated by MODIS on EOS Terra & Aqua**
  - **Design is evolutionary from MODIS**
- **The Cross-track Infrared Sounder (CrIS) continues measurement series initiated by AIRS on EOS Aqua**
  - **Utilizes a Michelson interferometer in contrast to AIRS, which is a spectrometer**
- **The Advanced Technology Microwave Sounder (ATMS) continues the measurement series initiated by the AMSU on NOAA-15**
  - **MMIC Technology used to reduce mass, power & volume**
- **The Ozone Mapping and Profiling Suite (OMPS) continues the measurement series of SBUV & TOMS and adds a new limb profiler**
  - **New design features CCD array detectors**

Science Guidance for NPP

- A pre-launch science team was selected in October, 2003
- Science Team is focused on meeting NASA's needs
- This team will test the hypothesis that the operational Environmental Data Records (EDRs) are suitable to serve as Climate Data Records (CDRs)
  - Examine ATBD's and science code
  - Conduct simulation studies using synthetic and proxy data sets
  - Support development of cal/val planning and sensor testing
  - Prepare Operations Concept Document
- Ocean issues addressed by teams led by
  - Chuck McClain (NASA GSFC)
  - Peter Minnett (U Miami)
  - Knute Stamnes (Stevens Tech)
  - Menghua Wang (UMBC)
- A 2nd science team will be selected closer to the launch of NPP
  - NASA HQ planning discipline-based centers to produce CDRs

Science Guidance for NPP

- **Science Team has met twice.**
  - **November 2003 in Annapolis, MD**
    - > **Mission briefings**
    - > **Interactions with IPO and contractors**
    - > **Working groups, plans**
  - **February 2004 in El Segundo, CA**
    - > **Joint with IPO OATS**
    - > **Details of NGST algorithms & cal/val plans**
    - > **Initial cut at OpsCon**
- **Participation in cal/val workshops**
- **Bi-Weekly sensor specific telecons for L1 and L2 issues**
- **Prioritized issues for NASA to work with IPO & its system contractor**
- **Detailed analysis of algorithms underway**

NPP Science Team Members

Name	Organization	Short Proposal Title
Baum, Bryan	NASA Langley Research Center	Science Support for NPP Cloud Retrieval Effort
Fishbein, Evan	Jet Propulsion Laboratory	Error Assessment of Climate Data Derived from CrIMSS
Han, Qingyuan	University of Alabama Huntsville	Impact on Cloud EDR by Implicit Assumptions Used in the ATBD
Justice, Christopher	University of Maryland College Park	Assessing the NPP VIIRS Fire Product as a Climate Data Record
Lambrigtsen, Bjorn	Jet Propulsion Laboratory	Optimizing ATMS Calibration for Climate Data Records
Loveland, Thomas	US Geological Survey EROS Data Center	A Strategy to Evaluate and Enhance the NPOESS Surface Type EDR
Lyapustin, Alexei	University of Maryland Baltimore County	Analysis of Aerosol and Surface Reflectance EDRs over Land from VIIR
Maslanik, James	University of Colorado, Boulder	Assessment of NPP Sea Ice Products and Product Continuity
McClain, Charles	NASA Goddard Space Flight Center	An Assessement of VIIRS Ocean Color Data
McPeters, Richard	NASA Goddard Space Flight Center	An Evaluation of OMPS Ozone Measurements for Producing NPP CDR's
Menzel, Paul	University of Wisconsin-Madison	VIIRS L-1 Product Assessment During the Pre-Launch and Early Post-La
Minnett, Peter	University of Miami	CDRs of Sea Surface Temperature from VIIRS
Pagano, Thomas	Jet Propulsion Laboratory	Calibration Support for CrIS and VIIRS
Privette, Jeffrey	NASA Goddard Space Flight Center	Assessment of VIIRS Land Biophysical EDRs
Ranson, Jon	NASA Goddard Space Flight Center	Assessing the VIIRS Surface Type EDR using Global MODIS Data
Revercomb, Henry	University of Wisconsin-Madison	CDR's from CrIS: Assessment and Optimization of the Overall Calibratic
Schaaf, Crystal	Boston University	Assessment of Aersol, Albedo and Surface Type EDRS
Staelin, David	Massachusetts Institute of Technology	NPP Science Team for CDR's: ATMS Contributions to Sounding Produc
Stamnes, Knut	Stevens Institute of Technology	Evaluation of VIIRS Aerosol, Ocean Color and Snow/Ice Products
Strow, Larrabee	University of Maryland Baltimore County	NPP CrIS Sensor: Calibration and Radiative Transfer for the Climate Rec
Torres, Omar	University of Maryland Baltimore County	Combined Use of VIIRS and OMPS Observations for Aerosol Characteri
Vermote, Eric	University of Maryland College Park	Evaluation of VIIRS Land Surface EDRs for Climate Objectives
Wang, Menghua	University of Maryland Baltimore County	Atmospheric Correction for the Ocean Color EDRs
Wolfe, Robert	Raytheon Technical Service Company	Evaluation of the VIIRS Geolocation Appraoch in Support of the Land C

Science Staffing for NPP

- **The Project Science Group (PSG) is an in-house GSFC group that provides science and technical staffing to the Project Scientist and the Science Team**
- **The PSG is involved in technical interactions with the IPO's system contractor through the Integrated Product Teams**
- **The PSG facilitates the interaction of the Science Team with the IPO, its system contractor and the sensor developers**
- **PSG is patterned after the MODIS Characterization Support Team (MCST)**
- **PSG is the primary source of sensor expertise for NASA**

Science Guidance for NPOESS

- The IPO has formed an Operational Algorithm Team (OAT) for each group of data products/sensors
- OATs are focused on meeting the operational agency needs
  - OATs advise the IPO on the algorithms and sensors capability to meet the Integrated Operational Requirements Document (IORD)
  - Primarily government scientists representing the user agencies
  - Participate in contractor selection, review algorithms, sensor development, characterization & calibration plans etc.
- The VIIRS OAT (VOAT) is chaired by Dr Paul Menzel of NOAA
- OATs have extensive interaction with system contractor and sensor developers
- NASA PSG has historically interacted with and through the OATS
- NGST (the IPO's system contractor) has formed a Science advisory team to guide them.
  - Chair is Dr. Joe Friday

IPO Manages the Development of VIIRS

- **VIIRS, the key sensor for ocean color research is being developed by Raytheon under the ultimate direction by the IPO**
- **The IPO science advice is from the VIIRS OAT**
- **NASA works through the VOAT**
  - **Science Team members on the OATs**
  - **PSG staff on the OATS**
  - **Open meetings and a cooperative atmosphere**
- **NASA PSG also participates directly on IPT's and "Tiger Teams"**
  - **Draws upon expertise of the Science Team**
- **Project Scientist provides coordinated NASA position to IPO**
  - **Resolves conflicting requirements among science user communities**
  - **VIIRS ocean, land, cloud & aerosols, polar communities**
  - **Calibration plans, sensor configuration, level 1 algorithm**

Data from NPP & NPOESS

- **Operational data products produced in the Interface Data Processing Segment (IDPS) using common algorithms, optimized for accuracy and low data latency**
  - **NPP Era: IDPS at NOAA NESDIS & AFWA**
  - **NPOESS Era: IDPS at NOAA NESDIS, AFWA, NAVO and FNMOC**
  - **Limited intermediate products & quality flags, no reprocessing**
- **Data will be distributed to the general community by the NOAA Long Term Archive**
- **NASA will have a limited Science Data Segment (SDS) to support**
  - **Calibration & validation**
  - **Testing EDR=CDR hypothesis**
  - **Test and delivery of improved algorithms for possible use in IDPS**
  - **No permanent archiveable products**
- **Outside of NPP, NASA is planning theme-based "Climate Analysis Research Centers" (CARS)**
  - **SeaWiFS is serving as a prototype CARS**
  - **Scope of CARS is under development**
  - **CARS to be competed**

Some Web Sites

- A description of the NPP mission may be found at:
  - http://jointmission.gsfc.nasa.gov/
- The VIIRS instrument is described at:
  - http://www.ipo.noaa.gov/viirs.html
- The VIIRS ATBDs are at:
  - http://npoesslib.ipo.noaa.gov/atbd_viirs.htm
- The complete list of NPOESS requirements may be obtained at:
  - http://npoesslib.ipo.noaa.gov/Req_Docs.htm