NPOESS Preparatory Project (NPP)  
Access to Data  

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Overview

- Requirements
- Mission Products
- Data Access
- Summary
Real-Time Operational Demonstrations

Use of Advanced Sounder Data for Improved Weather Forecasting/Numerical Weather Prediction

NOAA Real-Time Data Delivery Timeline
Ground Station Scenario

Joint Center for Satellite Data Assimilation

C3S → IDPS → NOAA Real-time User

NWP Forecasts

NWS/NCEP
GSFC/DAO
ECMWF
UKMO
FNMOC
Meteo-France
BMRC-Australia
Met Serv Canada

Aqua (2002)
AIRS/AMSU/HSB & MODIS

WindSat (2003)

Coriolis

METOP (2006)
IASI/AMSU/MHS & AVHRR

NPP (2008)
CrIS/ATMS
VIIRS
OMPS

NPOESS (2009-2010)
CrIS/ATMS, VIIRS, CMIS,
OMPS & ERBS
NPP Requirements Summary

- NPP programmatic requirements established by NASA Mission Level 1 Requirements document and science performance by NPOESS Integrated Operational Requirements Document (IORD).
- Key Level 1 requirements include:
  - 5 year mission lifetime.
  - Accommodation of the ATMS, CrIS, OMPS, and VIIRS instruments.
  - Concurrent operations of all instruments.
  - Real-time direct broadcast of VIIRS, CrIS, OMPS and ATMS instrument data.
  - Polar sun-synchronous orbit (824km, 20km ground track repeat, 20 day cycle, and descending equatorial crossing time of 10:30 AM).
  - Science Data Segment shall be a research tool (with no operational requirements) used to test the usefulness of NPP EDRs for accomplishing climate research.
    > SDS shall use a fully distributed interoperable architecture with 5 (nominally) independent elements (Climate Analysis Research System or CARS) organized around key EDRs.
  - Delta II Launch Vehicle with a 2008 Launch Readiness Date.
Spacecraft Progress
Ground Systems Progress

IPO Antenna Ribbon Cutting
March 1, 2005
Growing Data Volume and Rate Could Stress Processing and Archive

1960 - 2010

DMSP
(Defense Meteorological Satellite Program)

POES
(Polar Orbiting Operational Environmental Satellites)

Sensor data rate: 1.5 Mbps
Data latency: 100-150 min.
1.7 GigaBytes per day (DMSP)
6.3 GigaBytes per day (POES)

2000 - 2010

NPP
(NPOESS Preparatory Project)

EOS
(Earth Observing System)

15 Mbps sensor data rate
Data latency: 100-180 min.
Data availability: 98%
Ground revisit time: 12 hrs.
2.6 TeraBytes per day (EOS)

2010 – 2020+

NPOESS
(National Polar-orbiting Operational Environmental Satellite System)

20 Mbps sensor data rate
Data latency: 28 min.
Data availability: 99.98%
Autonomy capability: 60 days
Selective encryption/deniability
Ground revisit time: 4-6 hrs.
8.1 TeraBytes per day
Ensuring Direct Broadcast Continuity

POES/DMSP/SeaStar

- AVHRR
- SeaWiFS
- OLS
- HIRS

Terra

- MODIS

Aqua

- AMSR-E
- MODIS
- AIRS
- AMSU
- HSB

NPP

- VIIRS
- CrIS
- ATMS
- OMPS

NPOESS

- CMIS
- VIIRS
- CrIS
- ATMS
- OMPS

Spacecraft and Instrument Evolution

L-Band, S-Band
665 - 2 Mbps
BPSK

X-Band
13.1 Mbps
Convolutional
UOQPSK
NRZ-M

X-Band
15 Mbps
QPSK
NRZ-M

X-Band
15 Mbps
Convolutional
QPSK
NRZ-M

X-Band
20 Mbps/3.8 Mbps
Convolutional
QPSK
NRZ-M

Standardization and Increasing RF, Modulation, and Bandwidth Requirements

Custom Formatters and Ingest Software
Analog Custom Receivers
NOAA Level B (AVHRR)
Limited Data Distribution Mechanisms

Spacecraft Specific STPS
Level-0
Return Link Processor
Analog Configurable Receivers
MODIS Level-1
MODIS Simulcast

Reconfigurable RT-STPS
Return Link Processor
Digital Configurable Receivers
MODIS and AIRS Level-1
NEPster with Level-0 and Level-1 Data
MODIS Simulcast

Reconfigurable RT-STPS
Digital Reconfigurable Receiver (PC-based)
Select Instrument Level-1 Software
NEPster with Level-0, Level-1, and Select Level-2 Data Products
Simulcast of Select Instruments
Multi-Mission Scheduler

Evolution of Concurrent Ground Systems Supporting Technologies and Algorithm Development
NPP’s Communications

TDRS

CMD: 2067.270833 MHz
.125 & 1 kbps
TLM: 2247.5 MHz
1, 4 or 16 Kib/s

CMD 2067.270833 MHz
2 & 125 kbps
TLM 2247.5 MHz
1, 4, 16, 32 Kib/s
(Realtime)
512 Kib/s
(Stored)

NPP SPACECRAFT

TDRSS Ground Link

S-Band Omni Antenna

HARDLINE
Launch Operations Only

HARDLINE Downlink

User Terminal

Norway SVALBARD STATION

HRD Direct Downlink

S-Band Omni Antenna

SMD Antenna

7.812 GHz
15 Mbps

8.2125 GHz
300 Mbps

TDRSS WHITE SANDS STATION

CMD 2067.270833 MHz
.125 & 1 kbps
TLM: 2247.5 MHz
1, 4 or 16 Kib/s

HRD Antenna

S-Band Omni Antenna

S-Band Omni Antenna

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S-Band Omni Antenna

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Risk Reduction & Mitigation

• For NPP, the NASA Direct Readout Laboratory (DRL) provides risk reduction and a roadmap for the NPOESS IDPS system in the Field Terminal Segment (FTS).

• The DRL has been, and will continue to do this by providing NPP packet processing and Level-0 algorithms, real-time NPP-specific visualization tools, lessons learned and an environment for testing and validating the FTS processing system.
NPP & NPOESS Realtime Data

• Data will be available to all
  – Real time data from direct downlink sent in the clear
  – Processing software will be available to all
  – No cost other than media and shipping
  – No cost if downloaded from the net

• Domestic and International Users will be part of the development process

• IPO Realtime Data Contact
  – Mr. John Overton, IPO Field Terminal Manager
  – Email : john.overton@noaa.gov
Summary

• NPP and NPOESS will have HRD direct readout
• NPP most likely to launch in 2008
  – Technical problems with the Raytheon VIIRS instrument have caused a delay of 14-16 months to NPP
• For more information:
  – http://www.ipo.noaa.gov
  – http://jointmission.gsfc.nasa.gov