The National Polar-orbiting Operational Environmental Satellite System (NPOESS) Sensor Suite

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*National Polar-orbiting Operational Environmental Satellite System*
NPOESS Still Brings Phenomenal New Capabilities to Users

**NPOESS**
- VIIRS
- [MODIS Sim.]
- 9+ VIS/NIR bands
- 12 IR bands

**Wind Speed-MIS**

**Ozone-OMPS**

**True color**

**Soundings-CrIMSS**

**Yemen Oil Tanker Attack: 10/06/02**

- Tanker
- Smoke Plume
- Contrail
- Clouds
- Urban details
- Littoral details
- Snow
NPOESS/NPP Data Products and date rate capability still sized for growth

**Raw Data Records (RDRs)**
- Similar to Level 1A for CEOS/NASA.
- ~150 giga bytes per day (similar to Terra or Aqua).

**Sensor Data Records (SDRs)**
- Similar to CEOS/NASA Level 1B

**Environmental Data Records (EDRs)**
- Similar to CEOS/NASA Level 2.
- *NPP Provides 25 of 55 NPOESS EDRs.*
International TOVS Study Conference - 15

NPOESS Certified Program - 39 EDRs

MIS (16)
- CLOUD LIQUID WATER
- PRECIPITATION TYPE/ RATE
- PRECIPITABLE WATER
- SEA SURFACE WINDS
- CLOUD ICE WATER PATH
- Surface Wind Stress
- TOTAL WATER CONTENT

SESS (5)
- Auroral Boundary
- Auroral Energy Deposition
- Energetic Ions
- Med Energy Chgd Parts
- Supra-Therm-Aurora Prop

VIIRS (22)
- ALBEDO (SURFACE)
- CLOUD BASE HEIGHT
- CLOUD COVER/LAYERS
- CLOUD EFFECTIVE PART SIZE
- CLOUD OPTICAL THICKNESS
- CLOUD TOP HEIGHT
- CLOUD TOP PRESSURE
- CLOUD TOP TEMPERATURE
- LAND SURFACE TEMP
- SURFACE TYPE
- Net Heat Flux
- Ocean Color/Chlorophyll
- SUSPENDED MATTER
- VEGETATION INDEX
- AEROSOL OPTICAL THICKNESS
- AEROSOL PARTICLE SIZE

CrIS/ATMS (3)
- ATM VERT MOIST PROFILE
- ATM VERT TEMP PROFILE
- PRESSURE (SURFACE/PROFILE)

OMOPS (1)
- O₃ Total Column (also CrIS)
- O₃ Profile (OMPS, Nadir Only, Deg)

28 July 2006
DOC, NOAA, NESDIS
Integrated Program Office
M. Buradon, M. Haas, J. W-toomb

*National Polar-orbiting Operational Environmental Satellite System*
1330 CONFIGURATION for NPOESS C1 Still provides Soundings, Imagery, Surface, Space Environment, and Climate monitoring Capability

STOWED CONFIGURATION

Unused Real Estate

- 0.25m X 0.25m

Configurations:
- HRD ANTENNA
- OMPS
- No Limb
- S-BAND (NADIR)
- SARSAT-Tx
- CERES
- ATMS
- ADCS-Tx
- SEM
- VIIRS
- SMD ANTENNA

Not available For C1

Dimensions:
- 0.47m² (5.1ft²)
- 1.0m² (10.7ft²)
1730 CONFIGURATION

Unused Real Estate

0.25m X 0.25m
Reliance on METOP allows us to Remove the 2130 Plane
**Payload Overview**

**VIIRS**
- **Purpose:** Land, ocean, atmospheric parameters at high temporal resolution
- **Precursors:** AVHRR, OLS, MODIS, SeaWiFS
- **Developer:** Raytheon
- **Approach:** Multi-spectral scanning radiometer, 3000 km swath width
- **TRL:** 6.5

**CrIS**
- **Purpose:** Temperature and moisture profiles at high temporal resolution
- **Precursors:** HIRS, AIRS, IASI
- **Developer:** ITT
- **Approach:** Michelson interferometer, 2300 km swath width. Co-registered with ATMS
- **TRL:** 6.5
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<tr>
<th>Instrument</th>
<th>Purpose</th>
<th>Precursors</th>
<th>Developer</th>
<th>Approach</th>
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<tr>
<td>ATMS</td>
<td>Temperature and moisture profiles at high temporal resolution</td>
<td>AMSU, MHS</td>
<td>Northrop Grumman</td>
<td>Scanning passive microwave radiometer, 2300 km swath width. Co-registered with CrIS.</td>
<td>6.5</td>
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<tr>
<td>OMPS</td>
<td>Monitors total column, vertical ozone profile</td>
<td>TOMS, SBUV, GOME, OSIRIS, SCHIAMACHY, OMI</td>
<td>Ball</td>
<td>Nadir and limb push broom CCD spectrometers, 2600 km swath width</td>
<td>6.5</td>
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Payload Overview - 3 NPP instrument in various stages of Test

- CrIS Entering TVAC Testing
- VIIRS EDU Finished TVAC
- ATMS Delivered to S/C
- OMPS FU1 Finished TVAC
- Nadir Sensor in TVAC Chamber (seen from cold plate side)
VIIRS EDU finished TVAC and in Data Analysis phase
VIIRS Flight Hardware making good progress
CrIS Is integrated and has gone through Bench, EMI and in TVAC Testing

CrIS FM1 Test Flow Campaign
CrlS is meeting performance with low NEdN.
OMPS in Acceptance Testing and ahead of schedule

OMPS Cleanroom with EGSE and Nadir Sensor (far left)

Nadir Sensor in TVAC Chamber (seen from coldplate side)

Nadir Sensor on Optical Bench in Cleanroom
OMPS In test data analysis phase

NP, 20 deg C, iAz(L&R)

Amb #1  Amb #2  Amb #3a  Amb #3b  Amb #4a  Amb #4b (-35C NP)  (-35C NP)

NP, 20 deg C, iAz(L&R)
ATMS is delivered and integrated on the NPP Spacecraft
NPOESS Retains the growth and accommodation potential to bring Leveraged Sensor back

- **Radar Altimeter (ALT)**
  - Measures range to ocean surface with a radar at 13.5 GHz
  - Corrects for ionosphere with 5.3 GHz radar
  - Corrects for atmosphere with CMIS water vapor measurements
  - Precise orbit determination with GPS

- **Total Solar Irradiance Sensor (TSIS)**
  - Two sensors for total irradiance (TIM) & spectral irradiance (SIM)
    - TIM measures total solar irradiance
    - SIM measures spectral irradiance 200 to 2000 nm
  - Pointing platform and sensor suite to be provided by CU LASP

- **Aerosol Polarimetry Sensor (APS)**
  - Aerosol characterizations of size, single scattering albedo, aerosol refractive index, aerosol phase function
    - Multispectral (broad, 0.4 to 2.25 μm)
    - Multiangular (175 angles)
    - Polarization (all states)

Additional Space Environment Sensor Suite (SESS)

- UV disk imager (BATC), and thermal plasma sensors
NPOESS Studying a Capable Microwave Imager for Implementation on NPOESS C2 (1730)

- Exploring the concept based on Heritage Designs and planned systems
  - The expectation is to meet heritage performance while meeting key performance parameters
  - Produce a system that is available for 2nd NPOESS launch
  - How to handle Soundings?

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<th>X-Track</th>
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<td>Radiometric Calibration</td>
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<td>Weighting Function</td>
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<td>Heritage Application</td>
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• Post NPOESS Restructure Still brings enhanced capability for NPOESS and NPP
• NPP still provides an opportunity for early NPOESS data utilization and sensor risk reduction
• All four NPP sensors are either in test or post test analysis phase
• Preparations are being made for PFM and or EDU accommodation on the NPP spacecraft for early risk reduction testing
• There is no redesign of the NPP or NPOESS spacecrafts: thus allowing accommodation of de-manifested sensors
• NPOESS is actively studying conical microwave concepts to fly post NPOESS C1