The NPOESS Community Collaborative Calibration/Validation Program for the NPOESS Preparatory Project

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Cal/Val● Calibration/Validation | EDR● Environmental Data Record | IPO● Integrated Program Office | NGAS● Northrop Grumman Aerospace Systems | NPOESS● National Polar-orbiting Operational Environmental Satellite System | NPP ● NPOESS Preparatory Project | RDR● Raw Data Record | SDR● Sensor Data Record | SME ● Subject Matter Expert

Background

OBJECTIVES

- Accomplish the NPOESS Mission of providing environmental observations to meet civilian requirements and military missions.
  - Provide the NPOESS Customers with operationally viable, validated, useful data products for their applications.
  - Provide investigations into product defects and inconsistencies of specific impact to Customers.
- Facilitate the fullest possible exploitation of the unique data provided from NPP and NPOESS by the science, commerce, climate, and academic communities.
  - Provide general Program information to all users about data products, sensors, and algorithms.
  - Provide technical support to broad research and development community in their assessment and exploitation of NPOESS data.
  - Support NASA and NOAA Climate initiatives by sharing data, software tools, and information as needed.

PHILOSOPHY

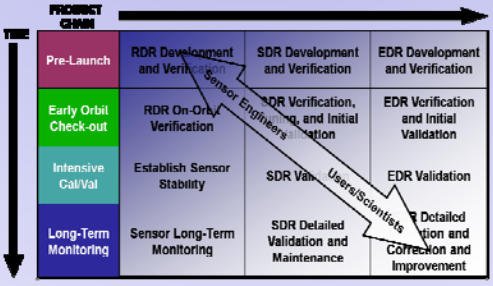
1. Sensor Performance and Characterization are the cornerstone of all data products.
2. Experience and resources from Past Operational and Science Missions should be fully exploited and incorporated into the NPP and NPOESS Programs.
3. Customer and User Satisfaction is achieved through participation in the Cal/Val process.
4. Community Proficiency with Operational Algorithms is essential to efficient Cal/Val and Community buy-in.
5. Space-borne assets, Global models, Surface Networks and Data Assimilation provide a cost effective comprehensive view of sensor and algorithms performances.
6. Targeted Campaigns and Special Studies will be planned and executed as needed.
7. EDR Performance and corrective actions will be handled in accordance with established Program priorities.

PHASES OF CAL/VAL

1. Pre-Launch; all time prior to launch – Algorithm verification, sensor testing, and validation preparation
2. Early Orbit Check-out (EOC); first 30-90 days – System Calibration & Characterization
3. Intensive Cal/Val (ICV); extending to approximately 24 months post-launch – RDR, SDR, and EDR Validation. These are collectively referred to as xDRs.
4. Long-Term Monitoring (LTM); through life of sensors.

EVOLUTION OF EXPERTISE DURING CAL/VAL

As the Cal/Val program progresses through RDRs, SDRs, and EDRs, expertise needed will evolve from Contractor Sensor Engineers to Government Users.



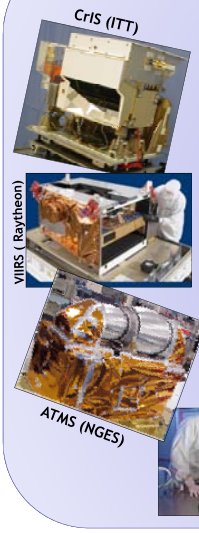
NGAS is leading the RDR and SDR teams and the IPO is leading the EDR teams. The IPO selected Cal/Val Product Area Discipline Leads in March 2008. These Leads have professionally recognized experience with remotely sensed satellite data and are considered highly qualified by their respective communities to lead their Discipline's Cal/Val effort. These Leads have formed their own teams of SMEs and will work with the designated NGAS Leads to plan, coordinate, and execute the activities of the entire Cal/Val team.

Cal/Val Discipline Leads have built teams from the NPOESS Community

Discipline Team Leads		
Sensor	**SDR Leads**	**EDR Leads**
ATMS	Ed Kim, NASA/GSFC Giovanni DiAmici, NGAS Bill Blackwell, MIT/LL	See CrIS EDR Leads
CERES	N/A (xDRs produced by NASA for NASA Community)	N/A
CrIS	Denise Hagan, NGAS Gail Bingham, SDL/USURF	Chris Barnet, NOAA/NESDIS/STAR Denise Hagan, NGAS
OMPS	Bhaswar Sen, NGAS Scott Janz, NASA/GSFC	Larry Flynn, NOAA/NESDIS/STAR Bhaswar Sen, NGAS
VIIRS	Lushalan Liou, NGAS Frank DeLuccia, Aerospace Corp. & Bruce Guenther, IPO	VCM/Imagery: Tom Kopp, Aerospace Corp.;Keith Hutchison, NGAS Atmosphere: David Starr, NASA/GSFC; Land: Jeff Privette, NOAA/NESDIS/NCDC; Alain Sei, NGAS Ocean: Bob Arnone, NRL; Sid Jackson, NGAS

The SME's that comprise the Cal/Val teams come from each of the three NPOESS parent agencies and the scientific user communities in order to have representative from all perspectives within each team. Team members were also chosen to forward the Program's objectives of mission integration and supporting the climate science. The NPOESS Data Products Division (NDPD) is working with the Joint Center for Satellite Data Assimilation, ECMWF, and UKMet to develop roles for the Numerical Weather Prediction community in NPP Cal/Val, and with NOAA's National Climatic Data Center to support their use of NPOESS data. See respective team posters at this conference.

Team Strategy Summaries



SDR Teams

- Prelaunch activities
  - Analyze TVAC data
  - Evolve TVAC findings into improved operational algorithm
  - Verify sensor vendor engineering parameters
  - Update TVAC analysis tools for on-orbit operational data
  - Exercise operational algorithm with TVAC data
- Postlaunch activities
  - Compare SDRs against other sensor measurements (e.g. A-Train; MetOp)
  - Evaluate radiometric, spectral and geolocation evaluation and trending
  - Scan uniformity/bias analysis
  - Perform underflights and maneuvers
  - Characterize long-term stability of SDR
  - Perform calibration - vicarious, lunar
  - Identify problems using EDRs
  - Compare with ground truth data sources
  - Trend calibration parameters and results

EDR Teams

- Build teams of Subject Matter Experts from both customer and science communities to leverage heritage knowledge and tools .
- Incorporate lessons learned from Heritage Data Product Validation
  - Concentrate early on datasets proven valuable for global validation (e.g. ECMWF, NCEP/GFS, RAOB's)
  - Inter-compare operational products with research products generated by heritage algorithms
  - Work with experiments of opportunity for detailed characterization of products
  - Characterize all EDR products against operational and dedicated in situ observations
  - Use existing community tools where possible for most efficient activity execution, and develop new tools to expedite activities as needed
- Develop efficient processes to communicate within and across all team
  - IPO/NDPD and NGAS Cal/Val have been working together to develop a unified process for algorithm updates to satisfy IPO and NGAS goals and priorities.

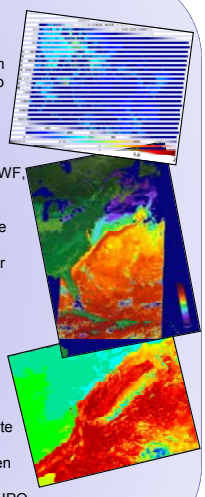


Image Source: LEF: http://www.ncdc.noaa.gov/oa/climate/severeweather/extremetemps/2006/720 - 09/09 at 21 :00UTC Heat wave in Southern California (surface temperature image) ; ACT Image Source: MODIS Granule 2000-288 0830 VIIRS Cloud Test Report: The VIIRS Aerosol Algorithm, ACT Image Source: http://ge.ssai.asu.edu/modis/index_detailed.htm

Community Input Provides Insight to Product Performance

- Pre-Launch
  - Provide insight into use of data to determine operational viability
  - Review Cal/Val plans for viable collaboration opportunities
- Post-Launch
  - Provide information on data product performance
  - Comparison with heritage products
    - Comparison with other satellite products
    - Comparison with *in-situ* data if available
  - Submit bugs/issues with data products through IPO tracking system
  - Provide resolutions for algorithm issues, if known

IPO Cal/Val Program Contacts

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Web Sites

IPO Web Site - General NPOESS Information & Documentation
http://npoess.noaa.gov/index.php

NPOESS UserPort on COMET - Training modules featuring NPOESS data applications
http://www.meted.ucar.edu/npoess.php

NEXSAT - Developed by NRL and uses near real time MODIS data to provide examples of imagery and advanced imagery interpretation techniques that will be available from VIIRS
http://www.nrlmry.navy.mil/NEXSAT.html

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