NOAA Integrated Calibration/Validation System (ICVS)

Real-Time Instrument Status, Performance and Data Quality Monitoring

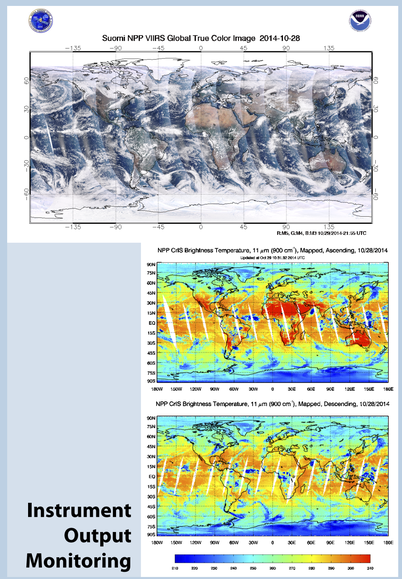
Introduction

The quality of satellite radiances is essential for direct radiance assimilation in numerical weather prediction, for retrievals of various geophysical parameters, and for climate trending studies. It is also a measure of the success of the engineering and science efforts of our operational satellite program. However, past efforts in post launch calibration/validation took piecemeal approach, focusing on onboard calibration, with much less attention paid to the quality of radiance data of earth observations, without evaluation of impacts. The lack of on-orbit calibration standard and methodology for radiance verification aggravated the problem. In order to meet challenges of increasing demand for better satellite data quality, NOAA developed an integrated system that incorporates prelaunch, post-launch onboard and vicarious, and long-term monitoring, as well as forward radiance calculation.

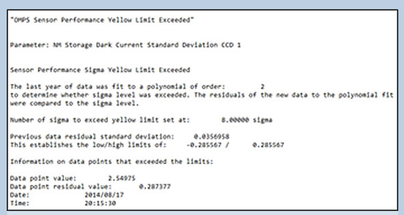
Benefits

- Turn instrument measurements into accurate environmental parameters.
- Ensure high-quality satellite imagery for forecasts (e.g., hurricane tracking and monitoring).
- Deliver accurate products for weather forecasts and environmental monitoring
- Ensure the integrity of the climate data records from broader satellite instruments.

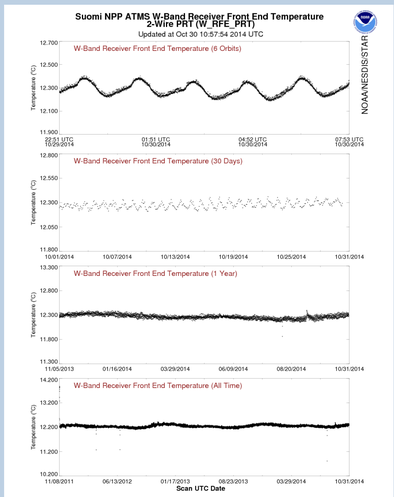
Graphical User Interface



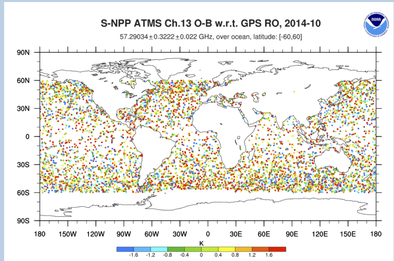
Instrument Output Monitoring



Automated Anomaly Detection and Notification

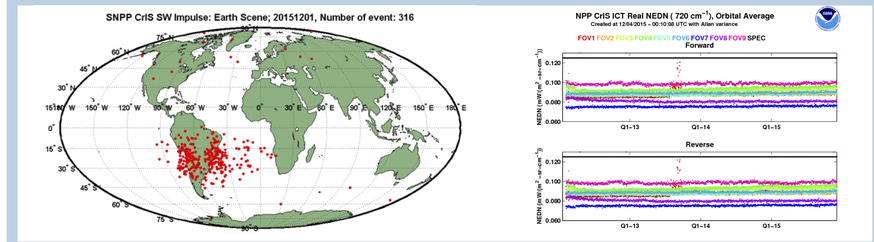


Instrument Health and Safety



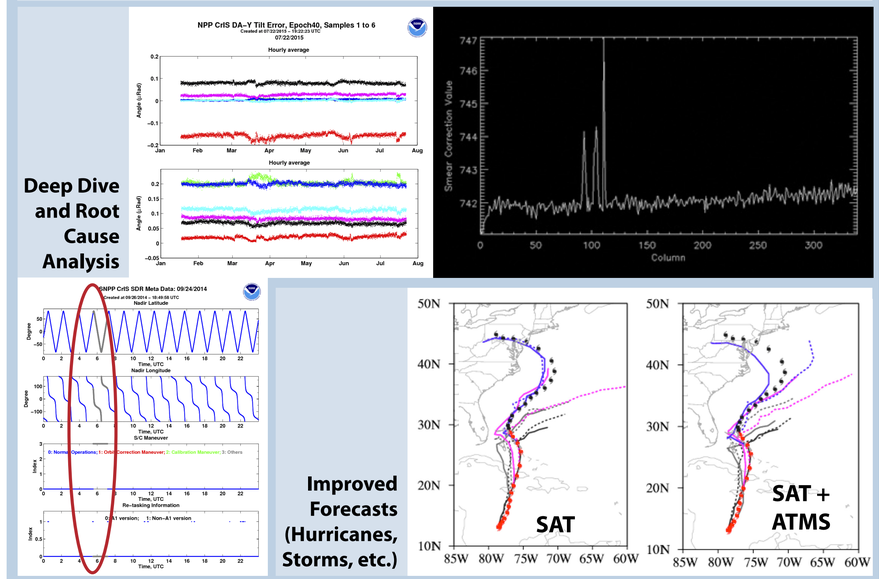
Data Quality Assessments

Highlighted Results



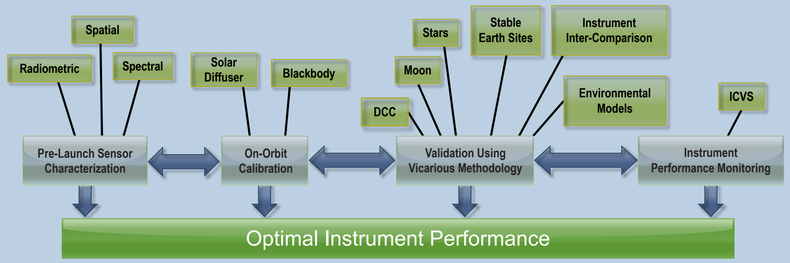
FSR, Noise and NeDT Trending

Deep Dive and Root Cause Analysis



Improved Forecasts (Hurricanes, Storms, etc.)

Data and Methods



1. Implementing most reliable algorithms for instrument noise trending to establish an internationally recognized reference for the science community, e.g. using Allan deviation to derive the sensor noise
2. Temporally and spatially visualizing comprehensive information to cover every aspect of calibration process down to pixel level, leading to the discoveries of numerous instrument/algorithm/operation issues and unknown/underestimated phenomena, such as the impulse noise issue and lunar intrusion
3. Intact spacecraft/instrument event record throughout the history of satellite mission, providing authoritarian knowledge pool for wide range of users in many areas, e.g., instrumentation, calibration, data assimilation, climatology, science education, and etc.
4. Advanced data management architecture, facilitating deep diving in case studies, system debugging, operational procedure optimization and data reprocessing
5. Real-time anomaly email alert functionality and permanent processing logs
6. User-friendly interface together with convenient tools rooted in popular operational system for easy access, indexing and viewing
7. Modular programming style, easy maintenance and integration of future satellites
8. Robust performance after three years of operation at industrial scale.

JPSS STAR SDR Team FY15 Accomplishments

Milestones/Schedule: Critical JPSS Algorithms Improvements/ Deliveries:

- ATMS full radiance calibration algorithm
- CrIS Full Spectral Resolution
- OMPS SDR extended spectral range/higher resolution
- VIIRS GEO codes/LUT updates
- ICVS-Lite to GRAVITE

Completed Development/Delivery J1 CrIS SDR software

- Successful transition normal spectral resolution (NSR) mode to full spectral resolution (FSR) mode on 12/4/2014
- Completed and delivered J1 CrIS SDR software with backward compatibility for S-NPP data processing
- Both NSR and FSR SDRs are routinely generated in offline system; made available to the users; and monitored with web-based ICVS

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