2015 STAR ICVS Instrument Performance Review

Session 4 - User Feedback and Experiences:
ICVS-Lite on GRAVITE
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GRAVITE Background

- GRAVITE stands for Government Resource for Algorithm Verification, Independent Test, and Evaluation
  - GRAVITE is the Cal/Val node in the JPSS Ground System

- GRAVITE services facilitate:
  - Algorithm Integration and Checkout
  - Algorithm and Product Operational Tuning
  - Instrument Calibration/Product Validation
  - Algorithm Investigation
  - Offline Data Quality Monitoring

Data Quality Assurance Offline Background

- JPSS Ground Project management decided in August 2013:
  - DQM functionality within IDPS will be replaced with Data Quality Assurance (DQA) Online and DQA Offline functions in Block 2.0
  - DQA Online functions reside on IDPS
  - DQA Offline functions reside on GRAVITE
  - DPES is responsible for developing and deploying DQA Offline functions with GRAVITE version 4 (GV4.0)

DQA Offline Functions
Stakeholders, Scope, and Requirements

- Stakeholders
  - OSPO Data Quality Engineers (DQEs) and Product Area Leads (PALs)

- Scope
  - Assess instrument and calibration performance
    - Track, trend, and archive instrument and calibration data
  - Ingest Data Quality Notifications (DQNs) and generate and distribute DQN reports
  - Identify data anomalies that may arise from sensors or algorithms
  - Send out alerts and reports

- Requirements
  - Real-time monitoring
  - Comprehensive checking and trending
  - Automated data collection and archival of calibration and instrument analyses
  - Automated reporting

DQA Offline Tools in GV4.0

- DQA Offline tools
  - Satellite Applications and Research's (STAR's) Integrated Calibration and Validation System (ICVS)-Lite
  - Gap Identifier
  - Trend Data Collector
  - Product File Quality Analyzer
  - Sensor Quality Analysis Product Generation Executables (PGEs)
  - Data Quality Notifications (DQN) Reporter

ICVS-Lite Introduction

- ICVS has been identified as one of the important tools for data quality monitoring by the OSPO Data Quality Engineers (DQEs) to support OSPO real-time operations

- ICVS-Lite on GRAVITE only monitors S-NPP satellite, whereas ICVS hosted at STAR not only monitors S-NPP satellite but also monitors METOP, NOAA, and GOES satellites

- The S-NPP monitoring capabilities between ICVS-Lite hosted on GRAVITE and ICVS hosted at STAR are identical
  - As ICVS software at STAR is updated, updates will be integrated into GRAVITE

ICVS-Lite on GRAVITE

- The GRAVITE system is an ideal host for hosting ICVS-Lite as it provides the real-time data access, computing powers, redundancy, and secured environment to support operations
  - GRAVITE will receive all data (RDRs, SDRs, EDRs, etc.) in real-time from IDPS through a 10G line in Block 2.0
  - 24/7 GRAVITE IT support is in place to resolve emergencies in Block 2.0

ICVS-Lite Packages

- As part of the agreements, STAR delivered 15 packages to be integrated into GRAVITE

- The following ICVS packages will be part of GV4.0:
  - ICVS-Lite Website
  - OMPS Telemetry Monitoring
  - CrIS Instrument Performance and Telemetry Monitoring
  - VIIRS Instrument Performance and Telemetry Monitoring
  - ATMS Instrument Performance and Telemetry Monitoring
  - ATMS TDR Data Quality Monitoring
  - VIIRS EDR Imagery Over Alaska
  - Spacecraft Health Status and Telemetry Monitoring
  - CrIS SDR Monitoring
  - CrIS RDR Monitoring
  - VIIRS SDR Imagery
  - VIIRS SRD Quality Flags
  - ATMS TDR Bias Characterization
  - OMPS SDR Monitoring

- The following package is still being Integrated:
  - CrIS Bias Characterization

GRAVITE Login Page

ICVS-Lite Homepage

STAR ICVS Light for GRAVITE – Integrated Calibration / Validation System Long-Term Monitoring

Monitoring and characterizing satellite instrument performance in orbit for weather, climate and environmental applications

Search Go

- STAR ICVS Home >>
  - About ICVS
  - NPP Instrument Descriptions
- Instrument Performance Monitoring
  - Suomi NPP
    - Spacecraft Telemetry
    - ATMS
    - CrIS
    - VIIRS
    - OMPS Nadir Mapper
    - OMPS Nadir Profiler
    - OMPS Limb Profiler

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STAR ICVS Long-Term Monitoring

Benefits of Integrated Calibration/Validation

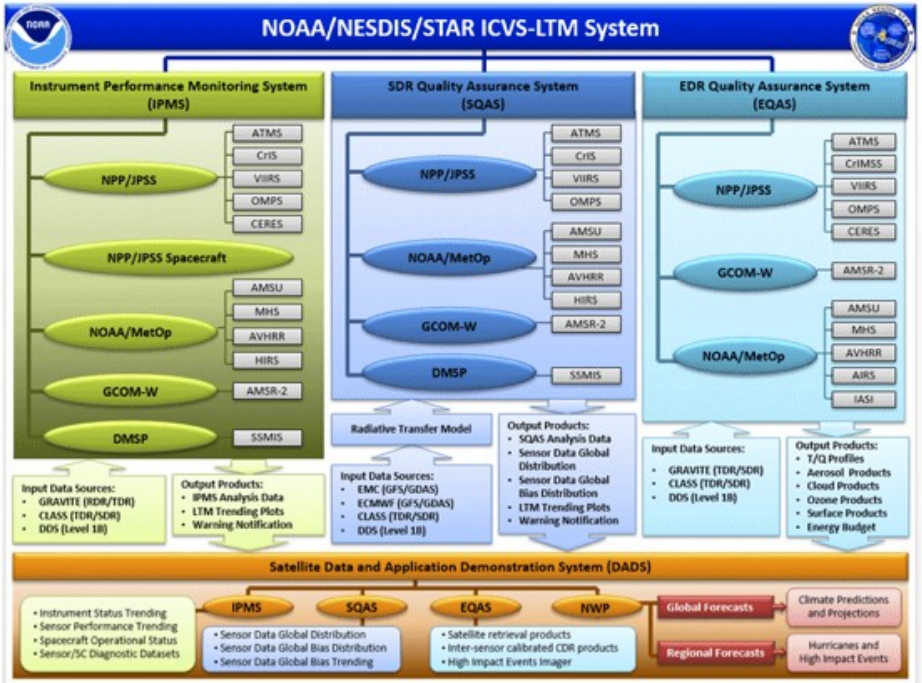
- Turn instrument measurements into accurate environmental parameters.
- Ensure high-quality satellite imagery for forecasts (e.g., hurricane tracking and monitoring).
- Deliver accurate products for weather forecasts and environmental monitoring
- Ensure the integrity of the climate data records from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

ICVS Vision

Satellite observations are intercomparable and tied to international standards for weather, climate, ocean and other environmental applications.

ICVS Goals

1. Provide real-time environmental satellites performance monitoring.
2. Reduce the uncertainty in climate trend detection and prediction through vigorous calibration and reprocessing.
3. Increase accuracy of satellite data for weather and environmental prediction models.
4. Smoothly transition new calibration algorithms to operations.
5. Develop common practices for calibration of Earth observation sensors.
6. Achieve traceability to the International System of Units (SI)
7. Optimize sensor choice and design for achieving these goals.



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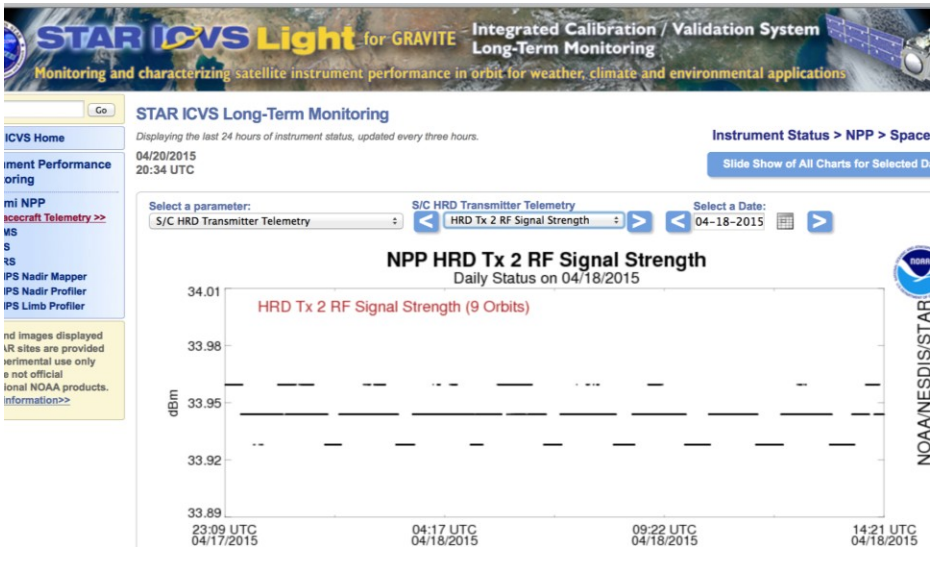
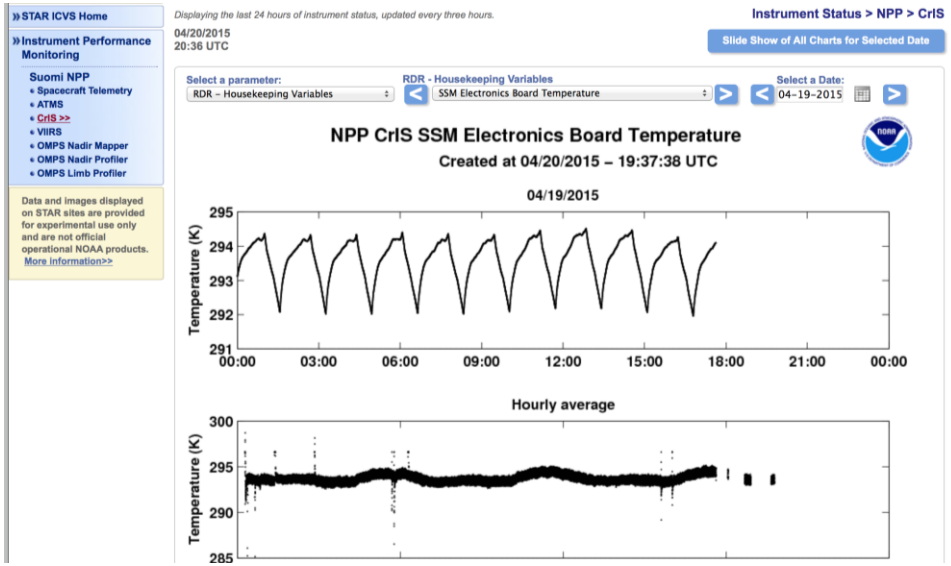
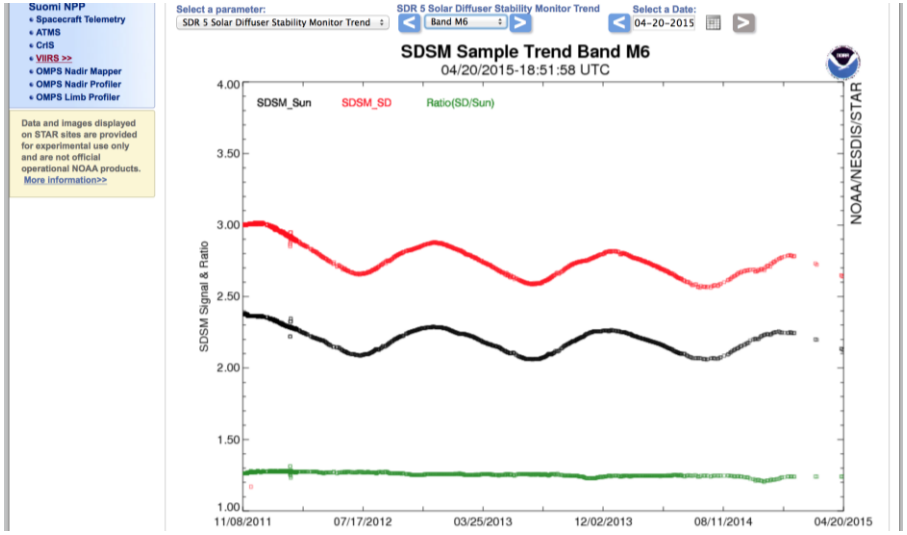
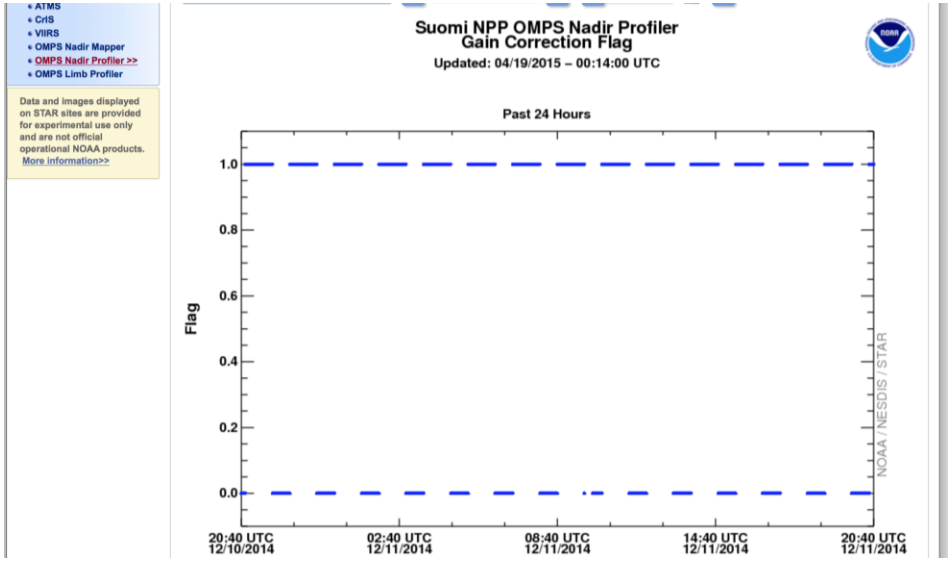
ICVS-Lite Screenshots









Feedback on ICVS-Lite (1 of 4)

- GRAVITE Development and DQST groups within DPES have worked closely with the STAR ICVS team to integrate the ICVS packages into GRAVITE

- STAR ICVS team has made significant efforts to help the DPES teams meet the GRAVITE 4.0 schedule

Feedback on ICVS-Lite (2 of 4)

- ICVS packages were delivered with large amounts of input and intermediate data, which made it complicated to receive and use the data
  - Most packages require >10 GB of intermediate data
    - OMPS SDR package requires 2 months of input data (650 GB)
    - CrIS RDR package requires >50 GB of intermediate data, one 20-25MB file per day from beginning of mission to present
  - ICVS package data and code are combined in the same directory structure

- Some packages cannot run without requiring intermediate data, which complicates processing and recovery from data flow interruptions

- Data accumulates over time
  - Intermediate files that are necessary for subsequent ICVS package runs are not cleaned up
    - Rate of data accumulation for each package should be known to determine future resource needs
    - Any files produced during runtime that are not required to be saved should be deleted to conserve storage space

Feedback on ICVS-Lite (3 of 4)

- Hardcoded paths
  - Code often contains hardcoded data paths, such as "../data…"
  - On GRAVITE, instances of ICVS-Lite are run on the operational system and on multiple test systems, so the data paths need to be configurable
  - "NPP" is hardcoded in many places
    - ICVS packages need modification to support Block 2.0/ J1 data

- Inconsistencies
  - Input directory structure is inconsistent between packages
  - Two different versions of Community Radiative Transfer Model (CRTM) are used in two different packages

Feedback on ICVS-Lite (4 of 4)

- Some packages require long processing time and high memory
  - OMPS SDR takes 15 hours to run
  - ATMS TDR bias characterization package requires 20GB of memory
  - CrIS RDR package has similar high memory requirement

- Error handling
  - Need more descriptive error messages for debugging

Summary

- The ICVS-Lite will be a very important tool for daily comprehensive data quality monitoring, trending, and anomaly analyses
- The STAR ICVS and DPES teams consist of staff members with very strong science and technical background
- STAR and DPES teams have been working well side-by-side to make this transition a success
- Teams will maintain a good working relationship as we continue to improve ICVS-Lite to better serve OSPO Operations and other stakeholders