NSIPS: A Hub for NPOESS Cal/Val Support

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Purpose of NSIPS

The NPP/NPOESS Science Investigator-led Processing System (NSIPS) is an important infrastructure element that supports the Calibration and Validation (Cal/Val) of mission data products. The success of NPP/NPOESS Cal/Val efforts critically depends on close collaboration among industry, government, and the scientific community. As a system for data management, processing, and distribution, NSIPS serves as a data collection, preparation, and dissemination hub for the entire NPP/NPOESS Cal/Val community. The three main functions of NSIPS include:

- Serving as key conduit between the operation of the Interface Data Processing Segment (IDPS) and the Cal/Val scientific community for distribution of Cal/Val relevant mission data products;
- Providing common data packaging and reduction support for Cal/Val analyses; and
- Establishing a data processing environment for evaluating revisions to the IDPS operational algorithms.

The development of NSIPS is coordinated by the NPOESS Integrated Program Office (IPO) and the NPOESS Cal/Val contractor team of Northrop Grumman and Raytheon. In addition to helping establish NSIPS as a data center inside the National Oceanic and Atmospheric Administration (NOAA) Satellite Operations Facility (NSOF), the IPO has also developed a parallel resource, GRAVITE (Government Resource for Algorithm Verification, Independent Test, and Evaluation), to support government and community Cal/Val efforts. The combination of NSIPS and GRAVITE offers maximum agility to leverage industry, government, and scientific community expertise for the NPP/NPOESS Cal/Val effort.

NSIPS Capabilities

NSIPS is designed to manage Cal/Val data, perform routine and automated data processing, and support Cal/Val data distribution. The key capabilities of NSIPS include:

- Ingesting the entire NPP/NPOESS data product stream of RDRs, SDRs, and EDRs at a 3.3TB daily data rate.
- Storing RDR, SDR, and selected EDR and IP products for up to 6 months.
- Ingesting ground data, NWP analyses, and satellite data products from other missions.
- Regenerating official IDPS products using algorithms that are traceable to the operational algorithms utilizing the IDPS Algorithm Support Capability (ASC). The ASC is a scaled down version of the IDPS software with data processing algorithms identical to the operational data processing system.
- Providing a web-based data subscription and data ordering system that allows users to access NPP/NPOESS Cal/Val data via the Internet.

NSIPS serves as a bridge between the NPP/NPOESS operational team and the Cal/Val science teams. A connectivity diagram between the NPOESS operational centers, NSIPS, and Cal/Val participants is shown in Figure 1.

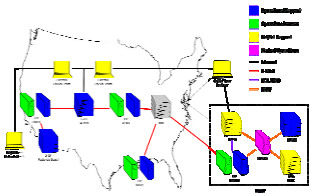


Figure 1. Connectivity of NSIPS

NSIPS and GRAVITE Designs

NSIPS builds on a software infrastructure that has been successfully reused for several missions. The Science Investigator-led Processing System (SIPS) concept and decentralized data processing concept gained popularity during the EOS missions. However, NSIPS differs from the majority of SIPS in that it handles data from all instruments of the NPP/NPOESS program and it is specifically designed to support Cal/Val efforts. In particular, NSIPS needs to receive data from many sources in addition to IDPS, and it must distribute Cal/Val data products to a diverse community of Cal/Val scientists.

Thus, NSIPS expands the design of SIPS in the following areas:

- A dedicated exchange server is added to work with diverse data providers.
- An access server is specifically designed to support web-based data subscription and data ordering. The access server maintains a search database containing relevant metadata information to allow development of flexible data searches.
- One of the computation servers has hardware and an operating system identical to IDPS for implementation of ASC software.
- A cluster of Linux based computer servers is configured to allow quick expansion of NSIPS processing capabilities.

The traditional SIPS design is preserved in the data server of NSIPS. The data server provides the planning, scheduling, and data archive management functions of NSIPS.

As a government Cal/Val resource, GRAVITE is configured similarly to NSIPS. A NSIPS and GRAVITE architecture diagram is shown in Figure 2.

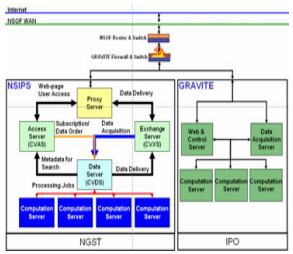


Figure 2. NSIPS/GRAVITE Architecture

In addition to infrastructure software, Cal/Val data processing algorithms for match-up data preparation and Cal/Val data reduction are being developed. A list of examples is shown in the right column.

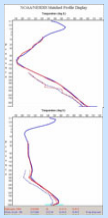
NSIPS Development Milestones

A prototype system, NSIPS-P, is currently being tested. Development of NSIPS-M, the mission system, begins in 2007 and is scheduled for completion in 2008.

Examples of Cal/Val Science Products

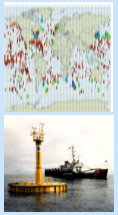
VIIRS Geolocation Validation

Match-up VIIRS imagery with ground control chips based on Landsat images.
Heritage: MODIS MCST
Data Requirement: VIIRS SDR, GCP-Chips



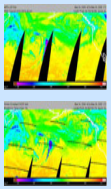
CrIMSS Atmospheric Profiles Validation

Match-up RAOB radiosonde measurements with CrIMSS atmospheric profile.
Heritage: NOAA/NESDIS ATOVS Team
Data Requirement: AVTP, AVMP, RAOB data file



VIIRS SST Validation

Match-up buoy measurement of SST with VIIRS SST using geolocation and time of over flight.
Heritage: AVHRR SST and MODIS SST Validation
Data Requirement: VIIRS SST, CM and buoy data



CrIS Radiance Validation

Match-up clear ocean scene radiances with other satellite radiances or radiative transfer model predictions.
Heritage: NOAA and AIRS Validation Teams
Data Requirement: CrIS SDR, NWP analyses