

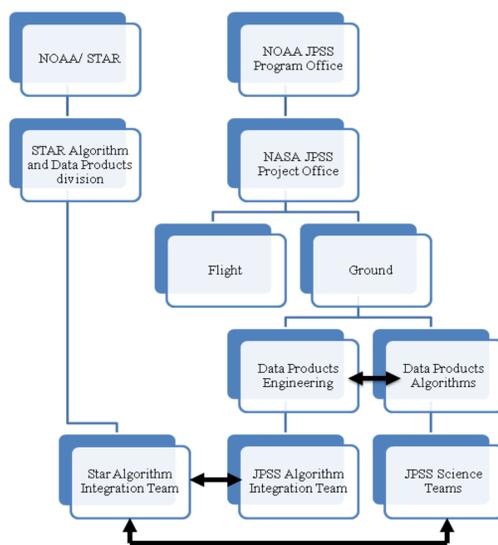
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STAR AIT

The NOAA/NESDIS Center for Satellite Research and Applications (STAR) provides technical support of the Joint Polar Satellite System (JPSS) algorithm development and integration tasks in coordination with the JPSS Ground Project Data Products Engineering (DPE) Team. Utilizing data from the Suomi National Polar-orbiting Partnership (S-NPP) satellite, JPSS generates over thirty Environmental Data Records (EDRs) and Intermediate Products (IPs) spanning atmospheric, ocean, cryosphere, and land disciplines. The Algorithm Integration Team (AIT), part of the STAR Algorithm and Data Products (ADP) division, brings technical expertise and support to product algorithms, specifically in testing and validating science algorithms in the Algorithm Development Library (ADL) environment. The AIT assists JPSS science teams in implementing algorithm changes. The chart below shows how the STAR AIT fits into the JPSS infrastructure.



JPSS and S-NPP Overview

JPSS is responsible for a series of polar-orbiting environmental satellites. The first satellite in the series, Suomi NPP, launched October 28, 2011, and contains the following instruments:

- **Visible Infrared Imager Radiometer Suite (VIIRS):** uses visible and IR images to study dynamical processes on Earth's surface (fires, clouds, ice, oceans)
- **Cross-track Infrared Sounder (CrIS):** measures atmospheric characteristics using infrared spectrum
- **Advanced Technology Microwave Sounder (ATMS):** retrieves temperature and moisture profiles using microwaves
- **Ozone Mapper Profiler Suite (OMPS):** maps the ozone with visible and UV backscatter
- **Clouds and the Earth's Radiant Energy System (CERES):** studies Earth's clouds and radiation budget by measuring short and long-wave radiation

The Algorithm Development Library

The Algorithm Development Library (ADL) is a programming environment maintained by DPE. It emulates the programming interfaces available within the JPSS operational system. *Why use ADL?*

- ADL ensures a common baseline between the science developers and the operational code.
- ADL provides a diagnostic framework that supports diagnostic code blocks within an operational algorithm.

AIT Support Role

AIT provides the following support functions to science teams during the algorithm change process:

- Assists science teams by integrating their pre-operational code into the ADL environment, testing software and validating the implementation prior to delivery
- Develops scripts to facilitate chain runs of code to test the algorithms
- Adapts the algorithm source code provided by scientists to comply with the established software standards
- Verifies that new and updated algorithms function within the development environment
- Ensures that packages delivered to DPE are functional and complete

Support to JPSS Science Teams

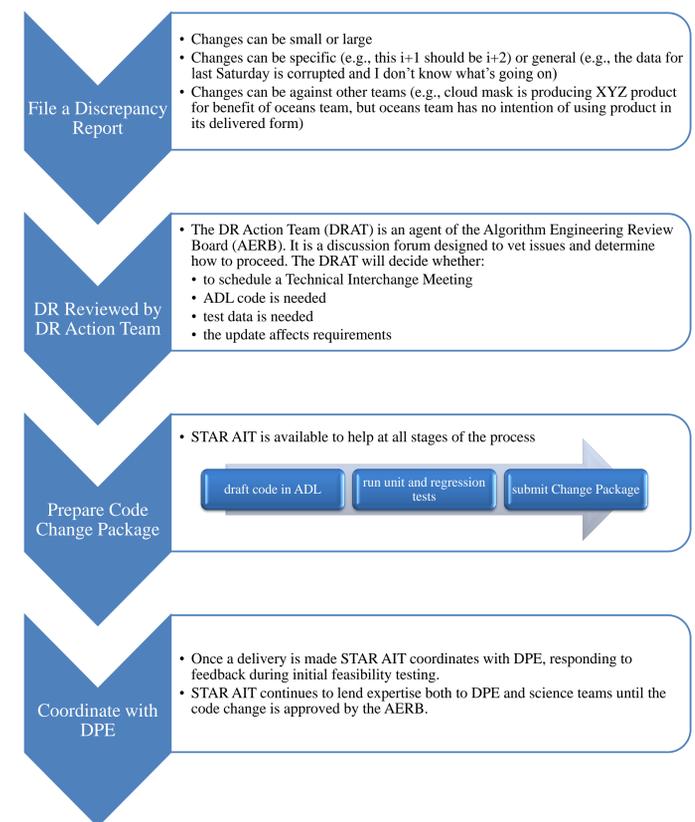
Utilizing data from the Suomi National Polar-orbiting Partnership (S-NPP) satellite, JPSS generates Sensor Data Records (SDRs), Environmental Data Records (EDRs), and Intermediate Products (IPs) spanning atmospheric, ocean, cryosphere, and land disciplines. AIT brings technical expertise and support to product algorithms. AIT is already actively embedded in a number of science teams, assisting with ADL testing and code change deliveries. Once a code discrepancy is identified, the code change process formally begins with the filing of a Discrepancy Report (DR). The Table below summarizes some of the most recent AIT activities.

Team	Desired algorithm change	AIT became involved	Assistance provided
CrIMSS ¹ EDR	Code error fixes, LUT ² updates	After submission of DR	Ran tests in ADL, prepared and delivered code change package
VIIRS Imagery Team	NCC Imagery EDR not triggered properly	After submission of DR	Assisted with code and parameter modifications. Tested code and LUT ² updates in ADL
VIIRS Land	Land Surface Albedo LUT ² update needed	After submission of DR	Ran tests in ADL, prepared test data for package delivery, assisted with delivery package, maintained communication with DPE with regards to documentation updates
VIIRS Active Fire	Trouble-shooting runs of problem granules in ADL	During ADL testing	Ran end-to-end chain tests of algorithm in ADL. Assisted team in understanding required inputs and staging process.
VIIRS Sea Surface Temperature	Major change of algorithm science	Prior to DR submission	Assisted with ADL installation and operation

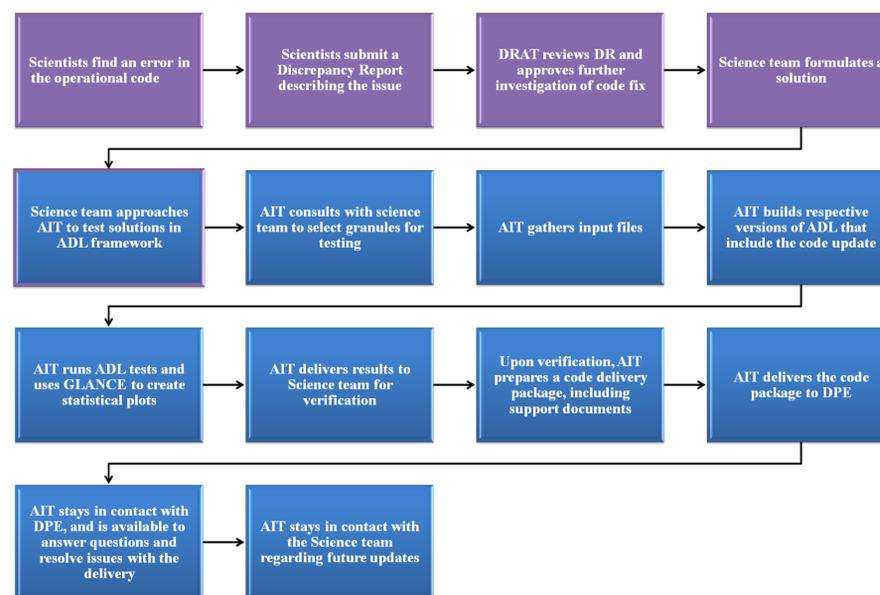
Notes: ¹CrIS and ATMS are used in conjunction to produce accurate temperature and moisture profiles as part of the Cross-track Infrared Microwave Sounder Suite (CrIMSS). ²JPSS algorithms utilize the Look-Up Table (LUT) in lieu of real-time algorithm computations. LUTs can contain algorithm processing coefficients, model inputs, thresholds, etc.

Algorithm Change Process

The flow chart below describes the initial steps in implementing an algorithm change into operations, leading up to submission to DPE. DPE is then responsible for vetting the code changes in a simulated operational environment, and later delivering the code changes to Raytheon to implement into operations.



Taking the Headache Out of Algorithm Deliveries



- AIT recently assisted the CrIMSS EDR team with the delivery of six DRs involving both code fixes and LUT updates.
- The CrIMSS EDR team approached the AIT after submitting their DRs.
- The AIT assisted the CrIMSS EDR team with testing the code updates in the ADL framework, and worked with them throughout the delivery process.
- The AIT remained in contact with both the science team and DPE with regards to getting the updates into the next IDPS build.
- The flow chart (left) summarizes the AIT assistance to the science teams

Configuration Management

AIT utilizes a Configuration Management (CM) environment using IBM ClearCase and ClearQuest. The use of CM is vital to controlled testing, calibration, and validation of the JPSS Algorithms. The CM advantages are it:

- Protects software assets from corruption, unintentional changes, and unauthorized access.
- Controls the flow of changes among development branches.
- Provides the ability to reproduce the configuration of the entire development environment.
- Enables algorithm developers to use the most recent algorithm updates provided by other algorithm teams.

Risk Reduction

The STAR AIT is by nature designed to mitigate risk in transitioning algorithms from research to operations. In order to be effective, the AIT must be familiar with the algorithm life-cycle and adherent to code change, version control, configuration management, and change management processes. Communication between the AIT, science teams, and DPE is key to risk management. The earlier the AIT becomes involved in the transition to operations process, the more effective the mitigation of both short term and long term risk.