



Algorithm Evaluation and Integration for JPSS Satellite Mission



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Introduction

This work discusses the algorithm evaluation and integration activities performed at NOAA/NESDIS/STAR by the STAR Algorithm Integration Team (AIT) for Joint Polar Satellite System (JPSS) satellite mission. JPSS is the next generation satellite system that is planned to be launched in 2017. The satellite will carry a suite of sensors that are already on board of Suomi National Polar-orbiting Partnership (S-NPP) satellite. S-NPP satellite was launched successfully in October 2011. STAR AIT uses Algorithm Development Library (ADL) framework and a change management strategy using ClearCase and ClearQuest to carry out testing, evaluation and integration activities for various Sensor Data Record (SDR) and Environmental Data Record (EDR) algorithms. We have used ADL for troubleshooting, testing, evaluating and integrating algorithm code changes as well as changes in Look-Up-Tables (LUTs). After the proposed changes are evaluated in ADL framework, the changes are implemented in the operational system IDPS (Interface Data Processing Segment).

JPSS Instruments

- Advanced Technology Microwave Sounder (ATMS)
- Cross-track Infrared Sounder (CrIS)
- Visible/Infrared Imager Radiometer Suite (VIIRS)
- Ozone Mapping and Profiler Suite (OMPS)
- Clouds and the Earth's Radiant Energy System (CERES)

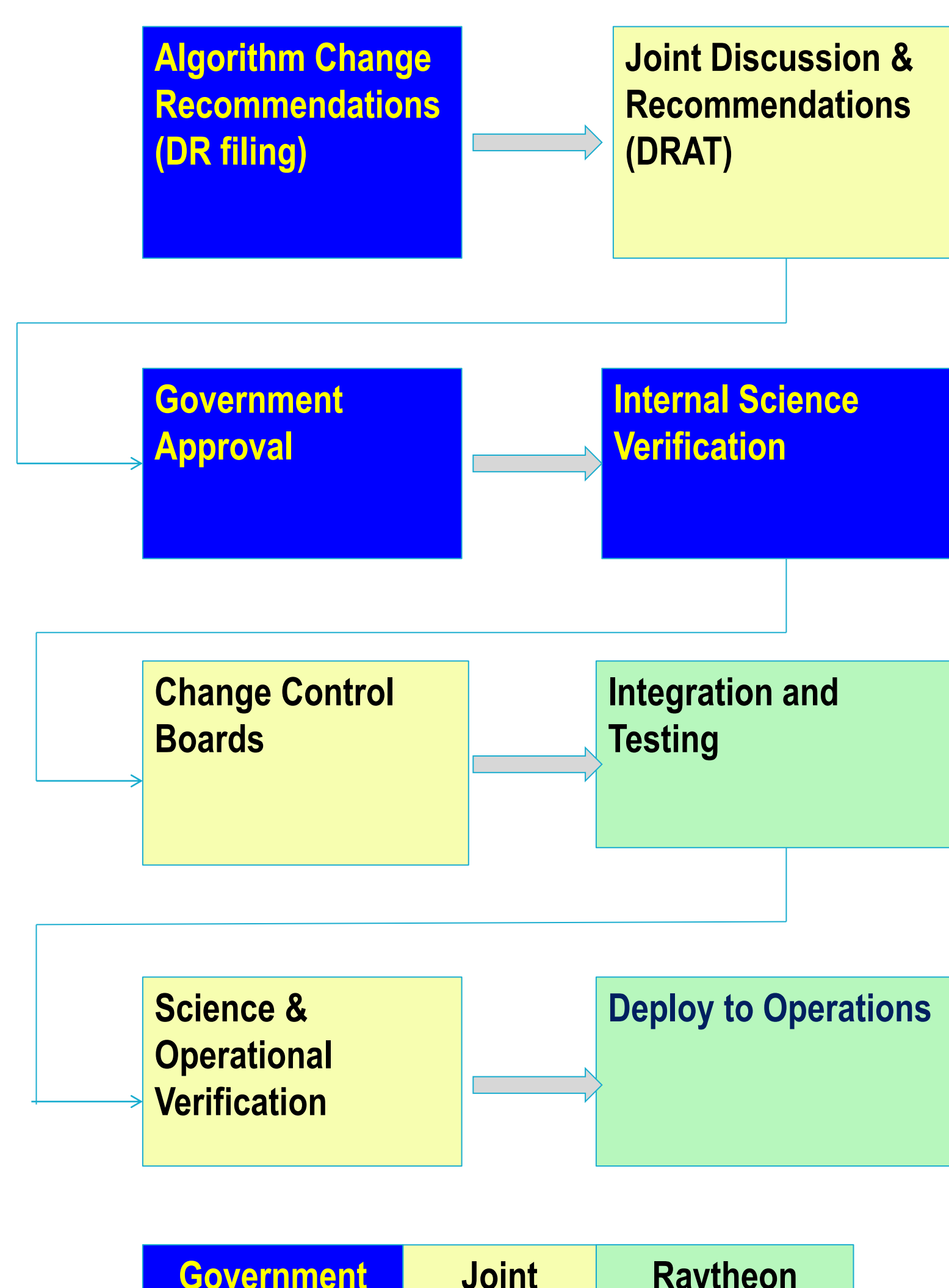
ADL Framework

- ADL is the Test System - Developed by Raytheon
- ADL mimics IDPS system
- ADL provides a Diagnostic Framework
- ADL provides one system to implement and test all the algorithms
- I-P-O Model (Input-Processing-Output)

Role of STAR AIT

- Code Testing in ADL
- Communication with Science Teams and DPE
- Troubleshooting
- Change Request Submission
- Attending Team Meetings
- Reviewing Algorithm Theoretical Basis Documents (ATBD) and Operational Algorithm Description (OAD) documents
- Consultancy to Science Teams
- Emulation of Various Operational Scenarios
- Code Analysis and Result Analysis

Algorithm Change Process



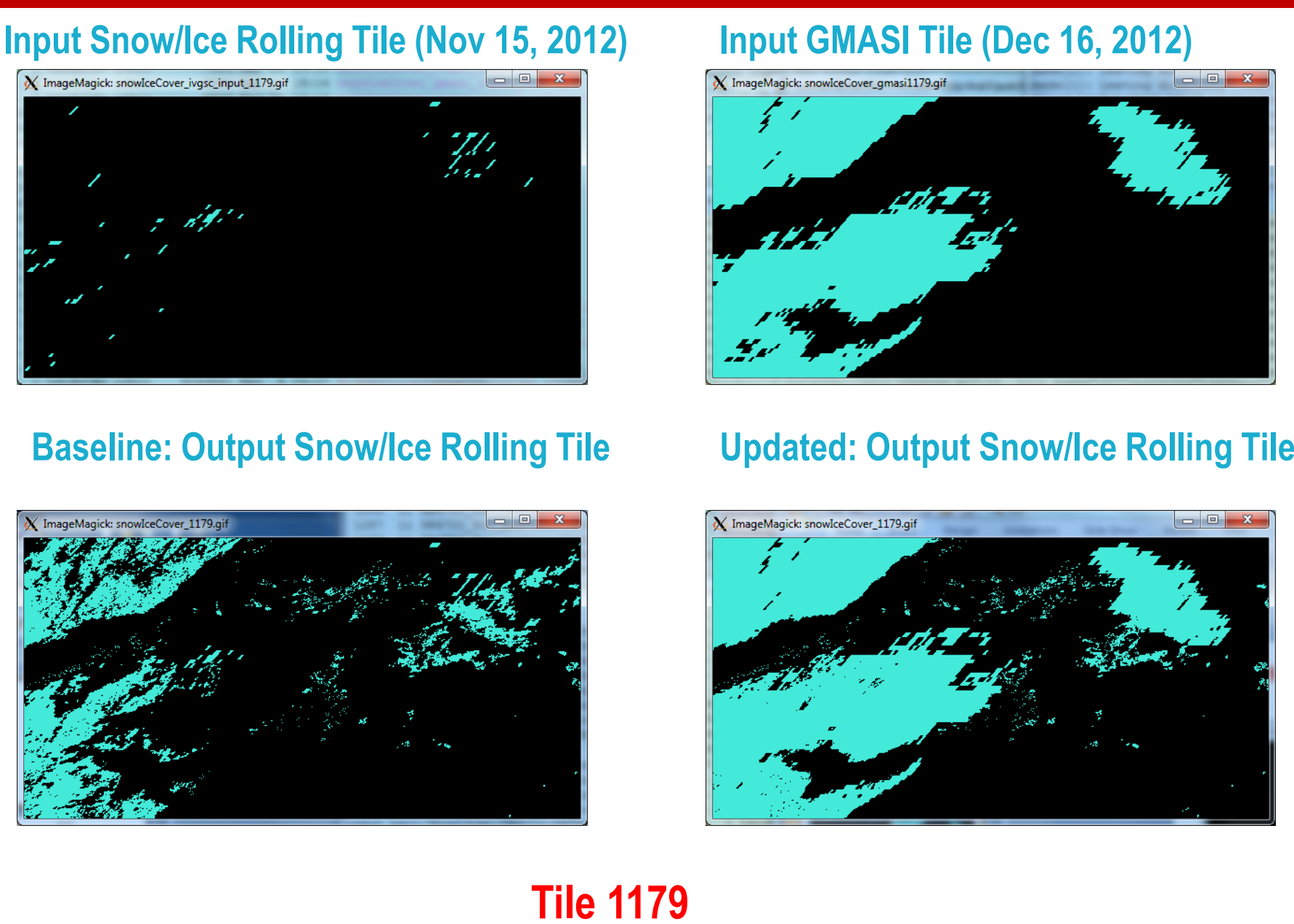
Testing and Troubleshooting Steps

- **Step 1:** Get ADL Version from Raytheon Configuration Management (CM) system
- **Step 2:** Put these versions in STAR AIT Common CM system giving this a distinct name to differentiate from other baselines
- **Step 3:** Create a Test Stream out of the above Main Integration Streams
- **Step 4:** Work with the Test Stream creating Future Emulation Scenarios
- **Step 5:** Commit these changes so that others can use their changes over your changes and create a new emulation scenario
- **Step 6:** Find out the Golden Day (special days for specific events) of interest from the science team member
- **Step 7:** Organize all the needed input files for this test date
- **Step 8:** Build ADL and Run the Executables to generate Product Data

AIT Work Examples

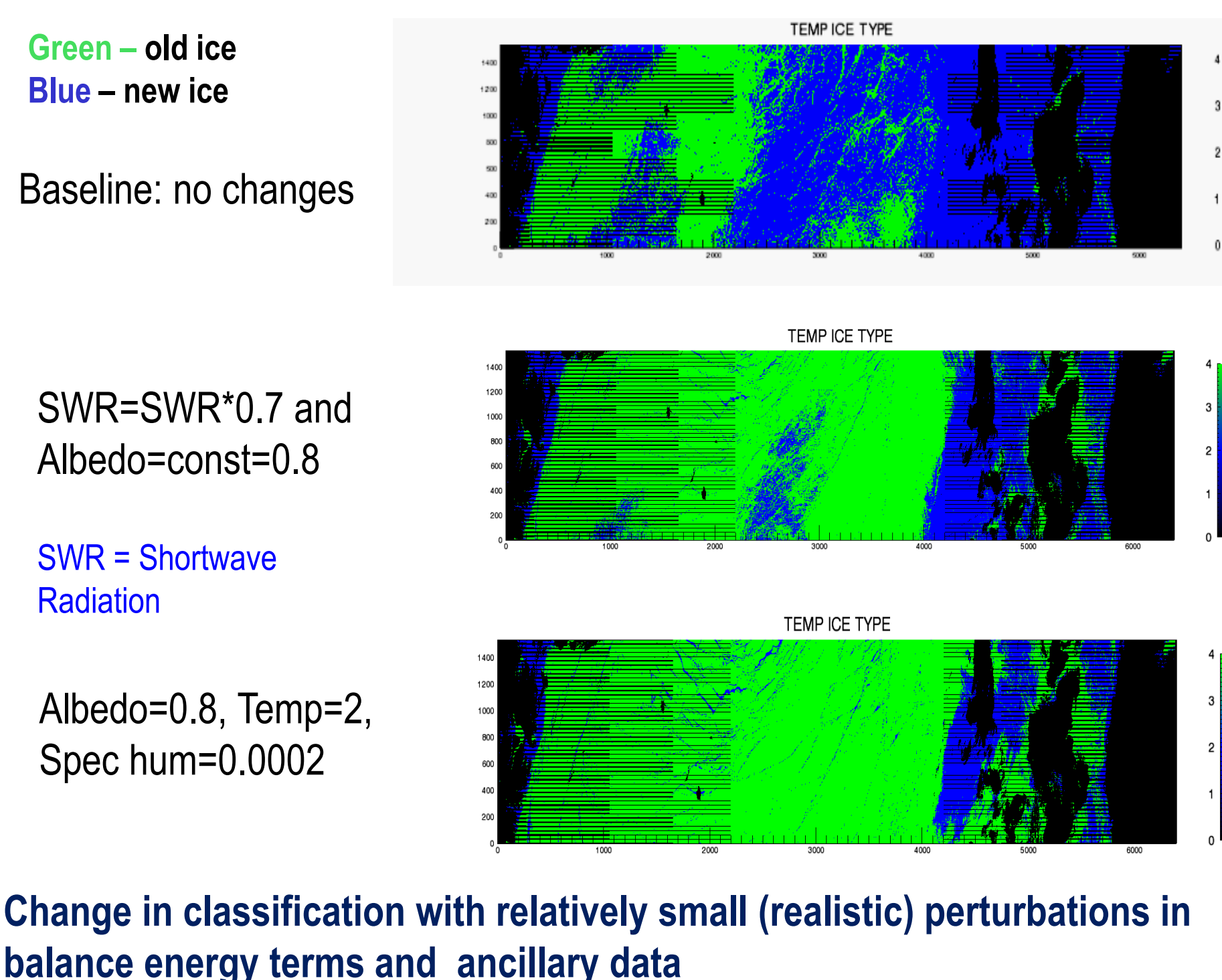
- Land surface albedo LUT updating
- Adjust Quality Flag for Thin Cirrus in Land Surface Temperature (LST) and Update LUT
- Add Quality Check for Active Fire
- Equation Modification for Sea Surface Temperature and Evaluating Downstream Impact
- Roll Back LST LUT from Provisional to Beta Version
- New Rain Algorithm for CrMSS (Cross Track Infrared and Microwave Sounder Suite)
- Wavelength Shift and New Ozone Mixing Fraction for OMPS
- Implementing NOAA Global Multi-sensor Automated Snow/Ice Map (GMAI) Tile

AIT Work Examples: VIIRS Snow Cover Gridding



Tile 1179

AIT Work Examples: Sensitivity Tests



Change in classification with relatively small (realistic) perturbations in balance energy terms and ancillary data

Communication

Communication with Science Team	Attend Weekly Meetings, Review Algorithms, Discuss Test Results
Communication with Data Products and Engineering Services (DPES)	Verify Functional Test Results, Regression Test Results, Discrepancy in LUTs and Code etc.
Communication with Data Products Algorithm (DPA) Team, Algorithm Engineering Review Board (AERB), Management etc	Attend AERB Review Meeting and answer to questions, work with JPSS Algorithm Managers (JAM)

Quality Check: ADL Version & Science Check

ADL Version Check

When we get a new ADL version, we build and use the executables to run a few sample SDR and EDR cases and compare the results with IDPS results.

Science Check

We keep **Constant Communication** with the Science Team for Verification of the Results and DPES for Integration

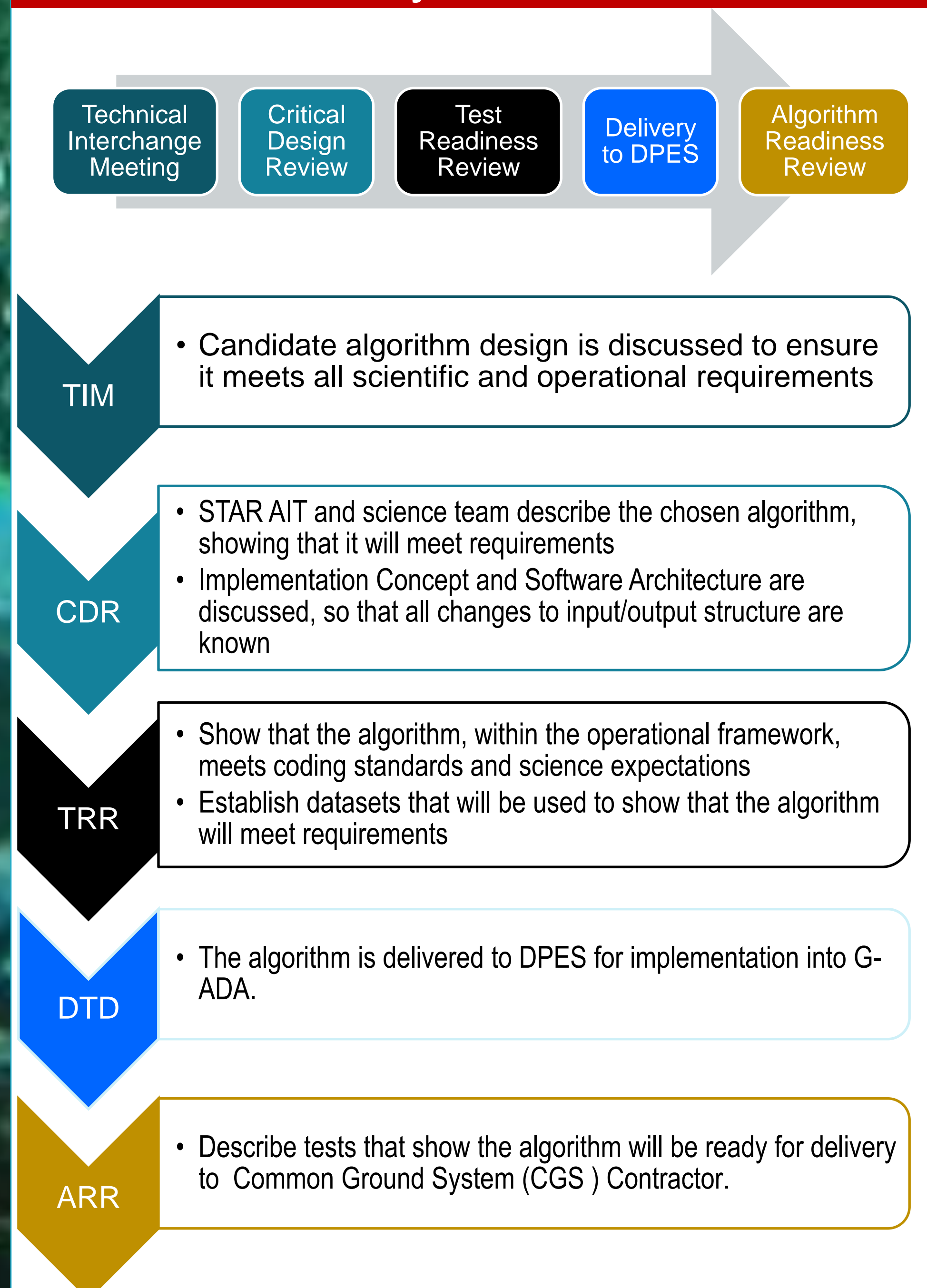
Quality Check: Document Check

- Review ATBD
- Review OAD
- Other presentations made by science team members
- Publications by the corresponding science team members.
- Requirement documents
- CDR (Code Design Review) and Other related documents.

Quality Check: Algorithm Package Check

- ATBD Documents
- OAD Documents
- Test Data Sets
- Updated Software
- Baseline and Updated Results
- DPES Processing Request Form
- Algorithm LUT PCT or Algorithm Delivery Checklist
- Update Delivery Report
- Any Other Supporting Documents

Life Cycle Reviews



Risk Reduction

The STAR AIT is by nature designed to mitigate risk in transitioning algorithms from research to operations.

Contact Information

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