



# JPSS-1 Science Data Product Verification and Validation: Pre-Launch to Post-Launch Plans

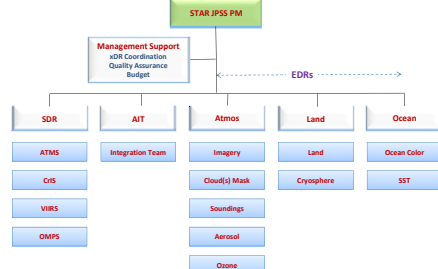


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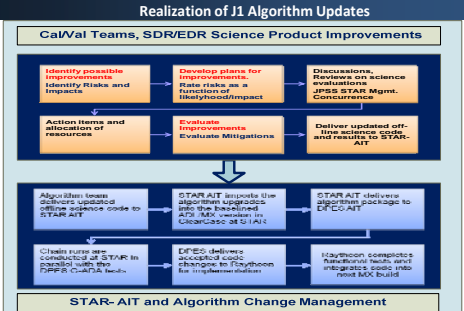
## Abstract

The Joint Polar Satellite System (JPSS)-1 (J1) satellite is scheduled to be launched in early 2017. The J1 and follow-on satellites will host an array of instruments including the Visible Infrared Imaging Radiometer Suite (VIIRS), the Cross-track Infrared Sounder (CrIS), the Advanced Technology Microwave Sounder (ATMS), and the Ozone Mapping and Profiler Suite (OMPS). These instruments are similar to the instruments currently operating on the Suomi National Polar-orbiting Partnership (S-NPP) satellite, a predecessor designed to bridge for the JPSS constellation. Algorithms to process J1 instrument data into xDR products such as Raw Data Records (RDRs), Sensor Data Records (SDRs), and Environmental Data Records (EDRs) have been developed based on the experience gained through the S-NPP algorithms. Optimizations are also being performed for J1-Uppers, which account for future improvements to the instruments on J1 to produce additional or improved data products to meet the JPSS program requirements. These algorithms will be in operations through either the Interface Data Processing Segment (IDPS) or S-NPP Data Exploitation (NDE). This paper presents an overview of the JPSS Cal/Val activities and science verification plans for the xDR requirements. Lessons learned from the S-NPP post-launch product validations, proposed post-launch xDR product validation plans, and schedules for JPSS-1 are also discussed in this paper.

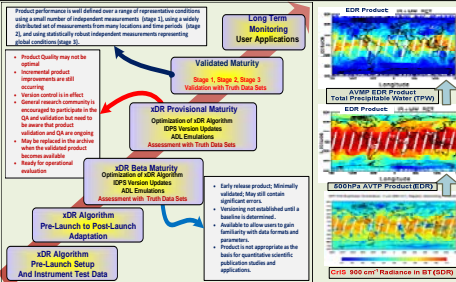
## JPSS-STAR SDR/EDR Teams



## STAR Cal/Val and AIT Team Interactions



## SNPP/JPSS xDRs: Product Maturity Verification & Validation



## Test Data Utility for J1 Algorithm Development

- JPSS STAR Science teams coordinated with Test Data Working Group (TDWG) team and requested for J1 RDRs identifying requirements, desired data sets and needed ancillary data to verify S-NPP algorithms work with J1 RDRs. The STAR SDR teams have convenient tools to manipulate the data sets and create new proxy data sets to verify algorithms at several levels
  - Functional
  - Missing data
  - Instrument anomaly
  - Scientific verification
- TDWG
  - Generated Block 2.0 Mission Data Requests (MDRs) for J1 RDRs as needed by STAR-SDR teams.
  - Formulated S-NPP 17 Day Capture Quality Science/Diagnostic Recorded On Orbit Data (ROOD) data sets for J1

## STAR JPSS-1 Algorithm Deliveries



## Summary and Conclusions

- The STAR cal/val teams have all of the expertise needed to develop, improve, and refine xDR science product algorithms to meet J1 science requirement.
- The STAR JPSS Science teams in association with STAR JPSS-AIT team have all the infrastructure needed for routing J1/Uppers xDR algorithm(s), improvements and updates to the DPES in compliance with the Algorithm Change Management Plan (ACMP).
- STAR has existing S-NPP experience on the development and utility of test data sets, testing tools, data analysis, and algorithm maturity review processes.
- Leveraging this experience, the STAR JPSS Program teams in association with AMP/DPES are ready to assure an unmitigated success towards:
  - Coordinated activities with SDR/EDR cal/val and other science teams
  - Providing updated algorithms mitigating J1 instrument waivers, and new algorithms for J1 Uppers.
  - Scientific evaluation and validation of Block 2.0 SDR/EDR products derived from IDPS (or any other platform; NDE).
  - Plan, monitoring budget, schedules, identifying challenges/issues and risk mitigation.

## JPSS SDR/EDR Products & Priorities

Instrument	Priority 1 Algorithms	Priority 2 Algorithms	Priority 3 Algorithms	Priority 4 Algorithms
ATMS SDR	Ocean Color / Chlorophyll	OMPS SDR	Active Fires	Aerosol Optical Thickness
CrIS SDR	VIIRS Sea Surface Temperature	OMPS SDR	Atmospheric Sounding	Aerosol Particle Size Parameter
VIIRS SDR	VIIRS Cloud Mask	VIIRS Cloud ICD, CCL, COT, and CFI	VIIRS Cloud Mask	Surface Albedo
VIIRS Imagery EDR	Ozone Nadir Profile	VIIRS Cloud Mask	VIIRS Cloud Mask	VIIRS Cloud (CBH, CTP, and CFI)
	Ozone Total Column	VIIRS Sea Ice	VIIRS Sea Ice	Ice Surface Temperature
	VIIRS Snow Cover	VIIRS Snow Cover	VIIRS Snow Cover	Land Surface Temperature
	Suspended Matter	VIIRS Snow Cover	VIIRS Snow Cover	Quarterly Surface Type
		VIIRS Snow Cover	VIIRS Snow Cover	VIIRS Surface Type
		VIIRS Snow Cover	VIIRS Snow Cover	Vegetation Indices
		VIIRS Snow Cover	VIIRS Snow Cover	Surface Reflectance

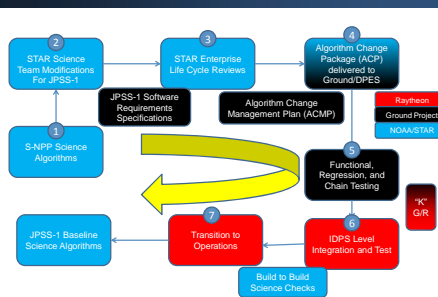
## J1 Test Data from TDWG

Product Name	Instrument	Algorithm Description	Priority
CrIS Full Spectrum RDRs - MDR 21	CrIS	One of the S-NPP full resolution data set acquired on 8/27/2013 and 8/28/2013, corresponding S/C Daily RDRs, TLE, and Polar Wanderers.	High
CrIS J1 TVAC EDRs - MDR 22	CrIS	72 Hour J1 CrIS HDF5 RDR Dataset. Must include one orbit (1703 minutes) of full resolution J1 TVAC from the scan scenario.	High
OMPS Early Block 2.0 J1 RDRs - MDR 23	OMPS	Generate 3 Orbits of RDRs from the OMPS_43_Data (next study) using a recent Block 2.0 Development Build	High
OMPS_43_Data RDRs - MDR 24	OMPS	Generate Block 2.0 J1 OMPS RDR set with the entire OMPS_43_Data using Block 2.0 S/NPP 4 build with the latest J1 OMPS_43 updates.	High
OMPS Earthview RDRs - MDR 42	OMPS	Test NPP J1 (nominal and hived) data with the updated FSW 6.0 header/12 Data sets for NPP and J1, compressed and uncompressed	High
ATMS Early Block 2.0 J1 RDRs - MDR 25	ATMS	Generate 3 Orbits of J1 ATMS RDRs from the 17 Day Version 2 dataset using S/NPP 4 DPES, include S/C Daily RDRs, HDF5 Format.	High
ATMS J1 TVAC EDRs - MDR 26	ATMS	Generate Block 2.0 J1 ATMS RDR set select TVAC data. Include S/C Daily RDRs; HDF5 Format.	High
VIIRS Block 2.0 J1 TVAC RDRs - MDR 27	VIIRS	Generate Block 2.0 J1 RDRs using J1 VIIRS Full 22-hour data in the testing J1 TVAC acquired in August 2014. Include S/C Daily RDRs.	High
VIIRS S-NPP Modified RDRs - MDR 28	VIIRS	Generate Block 2.0 J1 RDRs using S-NPP VIIRS packets modified to J1 format specification; include corresponding S/C Daily RDRs.	High
VIIRS F16 MDR 29	VIIRS	Generate Block 2.0 J1 RDRs using F16 data with updated daylight modes	High

## J1 SDRs & Schedules

Product Name	Description of Improvement(s)	PR	AIT to DPES	DPES to J1	Ready for J1	Ready for Merge	Ready for Release
ATMS	ATMS Pre-launch Characterization Package	06/18/15	07/15/15	08/25/15	10/16/15	10/16/15	09/07/16
OMPS	OMPS NP & TV-SDR algorithm update based on sensor characterization	11/14/14	01/13/15	02/20/15	03/13/15	03/13/15	09/07/16
CrIS	CrIS Algorithm LUTs/EDR updates based on sensor characterization	07/15/14	07/16/14	08/14/14	09/10/14	09/10/14	09/07/16
VIIRS	VIIRS Algorithm LUTs/EDR updates based on sensor characterization	08/01/13	08/01/13	02/04/14	02/04/14	02/04/14	09/07/16

## J1 Algorithm Change Implementation Process



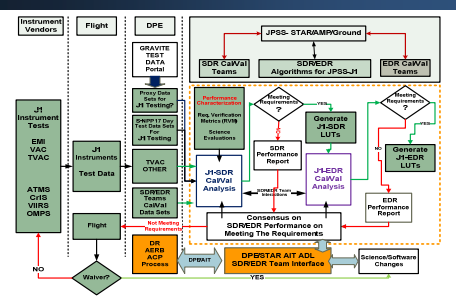
## S-NPP Product Maturity

Product	Algorithm	Operational	Tested	Validated	Approved
ATMS SDR	ATMS SDR	Yes	Yes	Yes	Yes
CrIS SDR	CrIS SDR	Yes	Yes	Yes	Yes
VIIRS SDR	VIIRS SDR	Yes	Yes	Yes	Yes
VIIRS Imagery EDR	VIIRS Imagery EDR	Yes	Yes	Yes	Yes
OMPS SDR	OMPS SDR	Yes	Yes	Yes	Yes
OMPS Earthview RDR	OMPS Earthview RDR	Yes	Yes	Yes	Yes
ATMS J1 TVAC EDR	ATMS J1 TVAC EDR	Yes	Yes	Yes	Yes
CrIS J1 TVAC EDR	CrIS J1 TVAC EDR	Yes	Yes	Yes	Yes
VIIRS J1 TVAC EDR	VIIRS J1 TVAC EDR	Yes	Yes	Yes	Yes
VIIRS S-NPP Modified RDR	VIIRS S-NPP Modified RDR	Yes	Yes	Yes	Yes
VIIRS F16 MDR	VIIRS F16 MDR	Yes	Yes	Yes	Yes

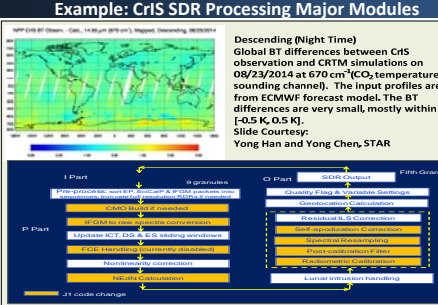
## S-NPP Science Data Products Validation Maturity A predecessor for JPSS-1 Algorithm Maturity Processes

Product Name	Instrument	Algorithm Description	Priority	Status as of 8/27/15	Notes
ATMS SDR	ATMS	ATMS SDR	High	Validated	Approved
CrIS SDR	CrIS	CrIS SDR	High	Validated	Approved
VIIRS SDR	VIIRS	VIIRS SDR	High	Validated	Approved
VIIRS Imagery EDR	VIIRS	VIIRS Imagery EDR	High	Validated	Approved
OMPS SDR	OMPS	OMPS SDR	High	Validated	Approved
OMPS Earthview RDR	OMPS	OMPS Earthview RDR	High	Validated	Approved
ATMS J1 TVAC EDR	ATMS	ATMS J1 TVAC EDR	High	Validated	Approved
CrIS J1 TVAC EDR	CrIS	CrIS J1 TVAC EDR	High	Validated	Approved
VIIRS J1 TVAC EDR	VIIRS	VIIRS J1 TVAC EDR	High	Validated	Approved
VIIRS S-NPP Modified RDR	VIIRS	VIIRS S-NPP Modified RDR	High	Validated	Approved
VIIRS F16 MDR	VIIRS	VIIRS F16 MDR	High	Validated	Approved

## Pathway for J1-xDR Evaluations



## Adapting to JPSS-1: Example: CrIS SDR Processing Major Modules



Acknowledgments: Discussions with many members of STAR SDR/EDR Teams, STAR-AIT Team, and AMP/DPES Teams are thankfully acknowledged

Poster Number: 1.20 - NOAA Satellite Conference: April 27 - May 1, 2015, Greenbelt, MD 20770. Corresponding Author(s): [Liang.Zhou@noaa.gov](mailto:Liang.Zhou@noaa.gov); [Murty.Divakarla@noaa.gov](mailto:Murty.Divakarla@noaa.gov); [Xingpin.Liu@noaa.gov](mailto:Xingpin.Liu@noaa.gov)