

NOAA STAR JPSS Enterprise Algorithm Workshop Meeting Report

JPSS STAR (JSTAR) Program
NOAA NESDIS STAR

On March 30-31, STAR JPSS Management hosted the STAR JPSS Enterprise Algorithms Workshop with the purpose of:

1. Identifying and evaluating the progress of Level 2 JPSS product transition to the NDE operational environment.
2. Discussing the progress toward creating JPSS Enterprise Algorithms.

NESDIS is currently transitioning into a new ground system paradigm where data product processing is consistent across all possible sensor suites by leveraging Enterprise Algorithm approaches for products. This effort will provide both cost savings in Enterprise processing hardware as well as development time for Center for Satellite Applications and Research (STAR) algorithm teams since redundant and slightly different data product approaches will not be needed. Since October 2014 STAR JPSS science teams have been given the direction by NOAA JPSS Office (NJO) to continue work on Enterprise science algorithms for Level 2 (L2) products.

This workshop was hosted to share the progress made and lessons learned during the transition process and discuss detailed path forward for future developments of NOAA Enterprise Algorithms. High focus was given to the L2 Land Products yet to be transitioned out of IDPS, as well as product precedence and interdependency topics. Most important were the connections made between algorithm developers and discussions comparing the current operational products to the planned Enterprise algorithms.

Enterprise Algorithms are defined as algorithms that use a common science across all satellite platforms, while recognizing the platforms unique contributions to analysis. While some algorithms can easily be adapted to multiple platforms, others depend highly on sensor differences and performance, resulting in different data quality maturity levels during the adaptation phase. Despite these differences, implementing algorithms for multiple platforms in a common framework opens the door for quality control at the algorithm science level.

Algorithm presentations began with NUCAPS, MIRS, and OMPS Ozone – algorithm products already proven over multiple sensor platforms. Next, the Ocean Color and Sea Surface temperature shared their experience moving products out of the IDPS environment to other platforms. The SST team questioned the quality control and system stability, as NDE does not process repaired granules, and JPSS seems to have a higher incidence of data gaps as compared to other platforms. This is one of many review items currently being tracked (see Appendix) and will be further discussed in the science reprocessing workshop in May 2016.

Additionally, the SST explained that they aggregate granules at the start of processing into a ten minute granule. The team questioned whether SDR aggregation could be part of processing or reprocessing, and whether the aggregation scale should be consistent among teams. The Aerosol team also mentioned that users prefer aggregated products, but do so at different scales. Aggregation has been identified as a key discussion topic for the scheduled reprocessing workshop in May.

With the discussion of the Enterprise Cloud Mask, changes and upgrades to the algorithm were highlighted and introduced. Notable changes include the advancement to a continuous cloud presence probability (as opposed to four step) and a mask for each test condition as opposed to a single combined mask. While the basic outputs of the IDPS products remain intact, these enhancements will allow

algorithm developers greater insight and flexibility in identifying and utilizing cloudy and clear pixels. The team interaction at this workshop allowed downstream users to identify and question the missing thin cirrus flag and opened a dialog to use the test (which is still present under a different name) or continue development to reintroduce the named flag. These types of user interactions were a key focus of the workshop. In the presentation for Enterprise Clouds, it was addressed that well calibrated sensor products are the corner stone for all the EDR products; and the calibration error can impact the quality of the L2 products. It was also brought up the importance to include multi-sensor observations into the future Enterprise algorithm development, i.e. using ATMS to enhance the retrieval approach for deriving the night time cloud optical properties.

Finally, the Cloud team identified an impact issue regarding the M5 and M7 calibration. VIIRS calibration issues may impact specification compliance for thick clouds. VIIRS M5 and M7 Calibration are still off relative to MODIS and this impacts our consistency across the “Enterprise” sensor suite.

The Aerosol and Cryosphere teams spoke next. These teams along with the Cloud team are all part of the JPSS Risk Reduction project – a project aimed at adapting heritage algorithms into the NDE system. These products will soon become the principle JPSS products, replacing the IDPS products, and so communication to users of the differences between these products and their IDPS counterparts is imperative. The External User Manual (EUM), a part of the Delivered Algorithm Package, will be a key component in user communication. The EUM contains details on the product format, inputs, outputs, and metadata—features which may vary from the IDPS product. However, the EUM is often developed and delivered with the algorithm, and some parts may not be finalized until the Operational Readiness Review.

From here, we moved on to land products, most of which are still awaiting implementation into the NDE. For many of these, the focus was preliminary algorithm design for the JPSS product preparing to move into NDE. The Surface Reflectance product will be moved first as a stand-alone algorithm, allowing other teams to build off the new implementation. The NDVI algorithms, having recently been through an Algorithm Readiness Review for the IDPS implementation, will be integrated into the GVF algorithm framework. These NDVI algorithm transitioning into NDE is the same as the MODIS algorithm, with spectral differences related to the platform, not the science. Several new VI products were identified for potential addition, and the Project Office emphasized the need to demonstrate user need. New algorithm products are listed in the Table 1 below.

Further emphasizing the need for user communication and interaction was the Vegetation Health team’s concern regarding OSPOS’s retirement of AVHRR data distribution. While this is a climatology concern, it does fall to users to object during the retirement process if the data is still needed and used.

New algorithm designs were presented for both Albedo and LST products, as well as a new Emissivity algorithm for LST. Introduced at this meeting was a new gridded land product, which would map all land products onto a common spatial and temporal grid. In addition to identifying and documenting user need for this product, this may also affect latency requirements. The land team is working to identify ways to ensure a consistent, uniform gridded product where possible, and compare methods of projection, aggregation, and processing that have previously been left to individual product team decisions.

The presentations wrapped with discussion of software implementation plan and a draft of the IDPS fly-out plan. A drafted schedule is included in Figure 1. Algorithm interdependency is a key factor in determining how best to shut off the IDPS algorithms and transition JPSS to the NDE products. As algorithms at all parts of the chain are still in development, the importance of tracking changes and notifying science teams of changes before they become operational is imperative.

The Active Fire team, among others, expressed the need for archival plans to be in place in advance of the algorithm transition. It was pointed out by another team lead that much of their research community does not have access to ESPC data and thereby relies on timely data archiving. At present, JPSS management is working on establishing and ensuring an archive agreement, even addressing the need to store both IDPS and NDE data prior to the transition. STAR JPSS management will follow up with JPSS/CLASS to ensure the submission agreement is in place for products generated by the Enterprise algorithms, so that users can access these products from NOAA CLASS.

The workshop achieved its principle purpose and had a number of productive outcomes.

- Algorithm developers consistently expressed a need for user interaction to more cohesively identify user need for some or all products. JPSS STAR management intends to arrange a user workshop to address these issues.
- The Cloud team was able to interact with multiple downstream users of Enterprise Cloud Mask. The team has since initiated a tag-up meeting so they can get product user feedback during development process.
- A uniform framework was identified for algorithm integration. The STAR Algorithm Integration Team discussed their current efforts and successes with the Framework and with stand-alone algorithm integration, through experiences with the JPSS Risk Reduction Project, the NDE Active Fire algorithm, and the OMPS V8TOZ algorithm. The forward path for land teams yet to transition was laid out.
- Algorithm developers expressed a need for algorithm changes to be tracked and communicated to all science teams, in advance of operational implementation, so that interdependency could be addressed.
- Algorithm developers summarized both team-level and project level risks related to Enterprise Algorithm Development.
- Algorithm developers and JPSS STAR management identified proposed Configuration Change Requests (CCR) for LIRD requirement changes to reflect the planned output products from enterprise algorithms. The proposed output products are listed in Table 1.

In conclusion, the STAR JPSS Enterprise Algorithms Workshop was a success, with each algorithm team identifying clear progress and a path toward Enterprise solutions. Additionally, proper venues were identified to address and mitigate risks. The meeting allowed face-to-face discussion, solidifying team interactions. Building on lessons learned, STAR JPSS Management will continue to foster communication and coordination between teams, via algorithm tag-ups, user workshops, reprocessing workshops, and the STAR JPSS Annual Science Team Meeting. Presentations are made available through the STAR Meetings webpage: http://www.star.nesdis.noaa.gov/star/meeting_SJEA2016.php

Algorithm Team	Proposed CCR
Vegetation Index	Leaf Area Index (LAI)
	Fraction of Photosynthetically Active Radiation (fPAR)
	Daily Net Photosynthesis (PSN)
	Annual Net Primary Production (NPP)
Land Surface Temperature	Emissivity
Land Team	Gridded Land Products

Table 1 – **Proposed Products** – Included is a list of proposed products that would require a CCR or Level 1 requirements change.

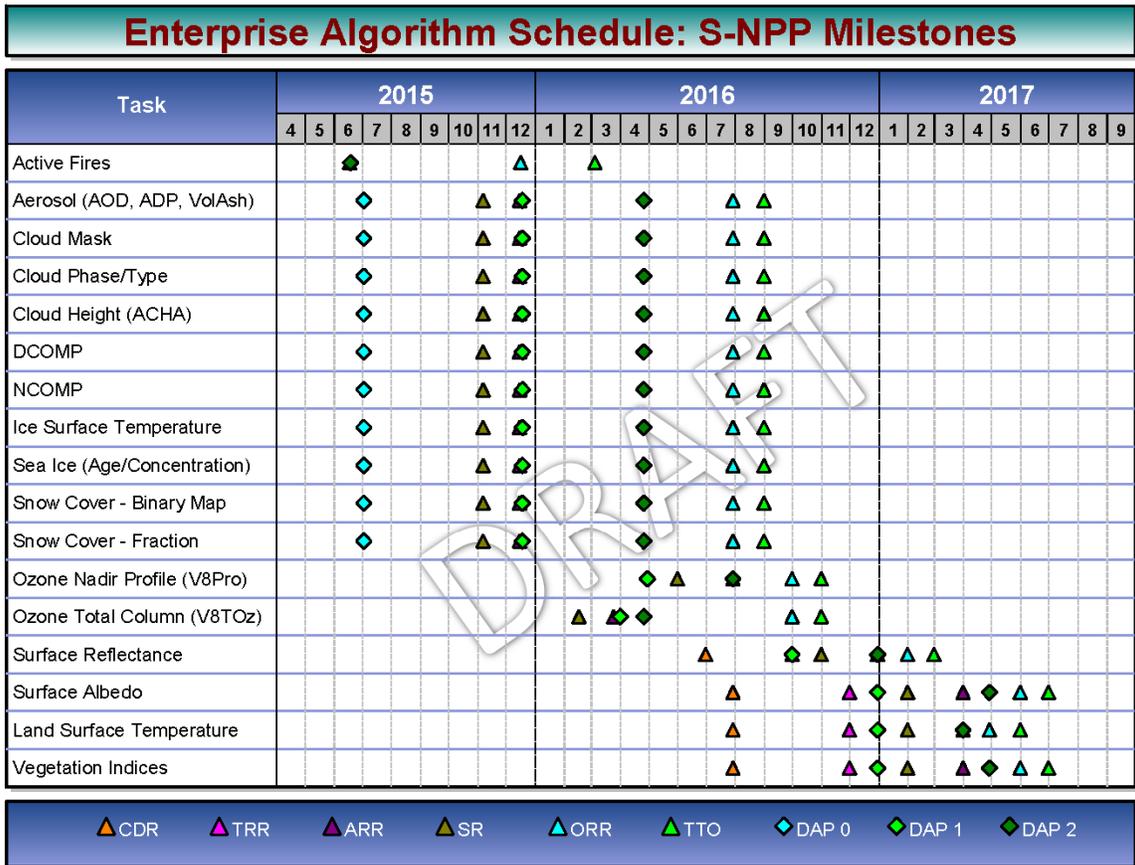


Figure 1 **Draft of IDPS Fly-out** – Above is a drafted schedule of the IDPS fly-out plan. Schedule subject to change based on the Project Plan and schedule.

Appendix: EAW_RevireItems-2016-04-14.xlsx