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**Joint Polar Satellite System (JPSS)
Operational Algorithm Description
(OAD)
Document for VIIRS Vegetation Index
(VI) Environmental Data Records
(EDR) Software**

For Public Release

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**Goddard Space Flight Center
Greenbelt, Maryland**

National Aeronautics and
Space Administration

**Joint Polar Satellite System (JPSS)
Operational Algorithm Description (OAD)
Document for VIIRS Vegetation Index (VI) Environmental
Data Records (EDR) Software
JPSS Electronic Signature Page**

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Preface

This document is under JPSS Ground Algorithm ERB configuration control. Once this document is approved, JPSS approved changes are handled in accordance with Class I and Class II change control requirements as described in the JPSS Configuration Management Procedures, and changes to this document shall be made by complete revision.

Any questions should be addressed to:

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Change History Log

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Revision A	01/18/2012	474-CCR-11-0256: This version baselines 474-00063, Joint Polar Satellite System (JPSS) Operational Algorithm Description (OAD) Document for VIIRS Vegetation Index (VI) Environmental Data Records (EDR) Software, for the Mx 6 IDPS release. This CCR was approved by the JPSS Algorithm ERB on January 18, 2012.
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Revision C	04/30/2014	474-CCR-14-1702: This version authorizes 474-00063, JPSS OAD Document for VIIRS VI EDR Software, for the Mx 8.4 IDPS release. Includes Raytheon PCR037360; CHILD: PRO: OAD: 474-CCR-13-1218: Additional QFs for VI EDR & Correct Low Sun Angle in Documents (DRs 7038, 4377), in section 2.1.1.1 and Tables 3 & 7.
Revision D	03/13/2017	474-CCR-17-3243 (ECR-CGS-0714): This version authorizes 474-00063, JPSS OAD Document for VIIRS VI EDR Software, for the Block 2.0 IDPS release. Includes: 1). Raytheon PCR045579: Block 2.0: PRO: OAD: VI OAD Updates per CCR-15-2382, in numerous sections. 2). Raytheon PCR045678: Block 2.0: PRO: OAD: CCR: 474-CCR-15-2444: General OAD Clean-up CCR/PCR, affects all 35/37 OADs. All sections and tables may be affected.



NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM (NPOESS)

OPERATIONAL ALGORITHM DESCRIPTION FOR VEGETATION INDEX (VI) EDR

**SDRL No. S141
SYSTEM SPECIFICATION SS22-0096**

**RAYTHEON COMPANY
INTELLIGENCE AND INFORMATION SYSTEMS (IIS)
NPOESS PROGRAM
OMAHA, NEBRASKA**

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A4	7-1-05	Under Section 1.3.3, Source Code and Test Data References, inserted a more detailed table listing paths to find applicable source code within the ClearCase configuration management tool.	Pg 2
A5	7-12-05	Per Dan Antzoulatos' request, changed the wording of information added by the 01 Jul 2005 Revision/Change Record line.	Pg 2
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C	5-19-10	Prepared for TIM/ARB/ACCB	All
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D2	09-27-11	Updated OAD for PCR026626.	ALL

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1.0 INTRODUCTION

1.1 Objective

The purpose of the Operational Algorithm Description (OAD) document is to express, in computer-science terms, the remote sensing algorithms that produce the Joint Polar Satellite System (JPSS) end-user data products. These products are individually known as Raw Data Records (RDRs), Temperature Data Records (TDRs), Sensor Data Records (SDRs) and Environmental Data Records (EDRs). In addition, any Intermediate Products (IPs) produced in the process are also described in the OAD.

The science basis of an algorithm is described in a corresponding Algorithm Theoretical Basis Document (ATBD). The OAD provides a software description of that science as implemented in the operational ground system.

The purpose of an OAD is two-fold:

1. Provide initial implementation design guidance to the operational software developer.
2. Capture the “as-built” operational implementation of the algorithm reflecting any changes needed to meet operational performance/design requirements.

An individual OAD document describes one or more algorithms used in the production of one or more data products. There is a general, but not strict, one-to-one correspondence between OAD and ATBD documents. This particular document describes operational software implementation for the Visible/infrared Imager/Radiometer Suite (VIIRS) Vegetation Index (VI) Environmental Data Record (EDR).

1.2 Scope

The scope of this document is limited to the description of the core operational algorithms required to create the VIIRS VI EDR. It provides a general overview and is intended to supplement in-line software documentation and interface control documentation for maintenance of the operational software. The theoretical basis for this algorithm is described in Section 3.3 of the VIIRS Vegetation Index (VI) Algorithm Theoretical Basis Document ATBD, D0001-M01-S01-025.

1.3 References

1.3.1 Document References

The science and system engineering documents relevant to the algorithms described in this OAD are listed in Table 1.

Table 1. Reference Documents

Document Title	Document Number/Revision	Revision Date
VIIRS Vegetation Index (VI) Algorithm Theoretical Basis Document (ATBD)	D0001-M01-S01-025	Latest
VIIRS Vegetation Index Unit Level Detailed Design	Y2499 Ver. 5 Rev. 4	May 2003
VIIRS Radiometric Calibration Algorithm Theoretical Basis Document (ATBD)	D0001-M01-S01-003	Latest

Document Title	Document Number/Revision	Revision Date
Joint Polar Satellite System (JPSS) Algorithm Specification Part 18	474-00448-01-18_JPSS-SRS-Vol-I-Part-18 474-00448-02-18_JPSS-DD-Vol-2-Part-18 474-00448-03-18_JPSS-OAD-Vol-III-Part-18 474-00448-04-18_JPSS-SRSPF-Vol-IV-Part-18	Latest
Joint Polar Satellite System (JPSS) Algorithm Specification for VIIRS RDR/SDR - Block 2.0.0	474-00448-02-06	Latest
Joint Polar Satellite System (JPSS) Algorithm Specification for the Aerosol Products - Block 2.0.0	474-00448-02-12	Latest
Joint Polar Satellite System (JPSS) Algorithm Specification for the Surface Reflectance	474-00448-02-15	Latest
Joint Polar Satellite System (JPSS) Program Lexicon	470-00041	Latest
NGST/SE technical memo – VegIndex_QF_Memo	NP-EMD-2005.510.0025	17 Jan 2005
NGST/SE technical memo – NPP_VIIRS_VI_EVI_Range	NP-EMD-2006.510.0042	28 Jun 2006
NGST/SE technical memo – _Cirrus_flag_testing_update_for_Vegetation_Index	NP-EMD.2008.510.0006	18 Jan 2008
Operational Algorithm Description Document for VIIRS Surface Reflectance IP	474-00069	Latest
NGAS/SE technical memo – Vegetation_Index_fill_Value_Processing_Update	NP-EMD.2009.510.0069	03 Dec 2009
NGAS/SE technical memo – Granule-Level Summary Exclusion Flag Definition Rev. C	NP-EMD-2010.510.0005.Rev-C	02 Mar 2010
Joint Polar Satellite System (JPSS) Common Ground System (CGS) IDPS Pro Software User's Manual Part 2	UG60917-IDP-1005	Latest

1.3.2 Source Code References

The science and operational code and associated documentation relevant to the algorithms described in this OAD are listed in Table 2.

Table 2. Source Code References

Reference Title	Reference Tag/Revision	Revision Date
VIIRS Vegetation Index (VVI) science-grade software	ISTN_VIIRS_NGST_2.2(OAD Rev ---)	30 May 2003
VIIRS Vegetation Index (VVI) operational software	B1.3 (OAD Rev A3)	15 Jun 2005
VIIRS Vegetation Index (VVI) science-grade software	ISTN_VIIRS_NGST_2.2.1	20 Aug 2007
VIIRS Vegetation Index (VVI) operational software	B1.5 (OAD Rev A8)	04 Jan 2008
NGST/SE technical memo – Cirrus_flag_testing_update_for_Vegetation_Index	NP-EMD.2008.510.0006	18 Jan 2008
VIIRS Vegetation Index (VVI) operational software	Build 1.5.x.1 (OAD Rev A10)	12 Jun 2008
ACCB (no code changes)	OAD Rev A	17 Dec 2008
VIIRS Vegetation Index (VVI) operational software PCRs20193 & 21119	B1.5.post-x (OAD Rev B1)	27 Apr 2009 28 Sep 2009
NGAS/SE technical memo – Vegetation_Index_fill_Value_Processing_Update (PCR22065)	NP-EMD.2009.510.0069 (OAD Rev B2)	03 Dec 2009
ACCB (no code changes)	OAD Rev B	17 Mar 2010
PCR 02283	Sensor Characterization Build SC-8 (OAD Rev C1)	31 Mar 2010
ACCB	OAD Rev C	19 May 2010
Convergence (No Code Updates)	(OAD Rev D1)	13 Oct 2010
PCR026626 (OAD changes for ADL)	(OAD Rev D2)	27 Sep 2011
OAD transitioned to JPSS Program – this table is no longer updated.		

2.0 ALGORITHM OVERVIEW

The VIIRS Vegetation Index (VI) consists of three vegetation indices--Normalized Difference Vegetation Index (NDVI) from top-of-atmosphere (TOA) reflectances, NDVI from top of canopy (TOC) reflectances, and Enhanced Vegetation Index (EVI) from TOC reflectances. These indices are produced at the VIIRS imagery channel resolution (i.e. nominally 375m at nadir).

The VIIRS Vegetation Index EDR is computed after the RDR, SDR, and intermediate products processing is complete. The processing relationship is illustrated in Figure 1 below.

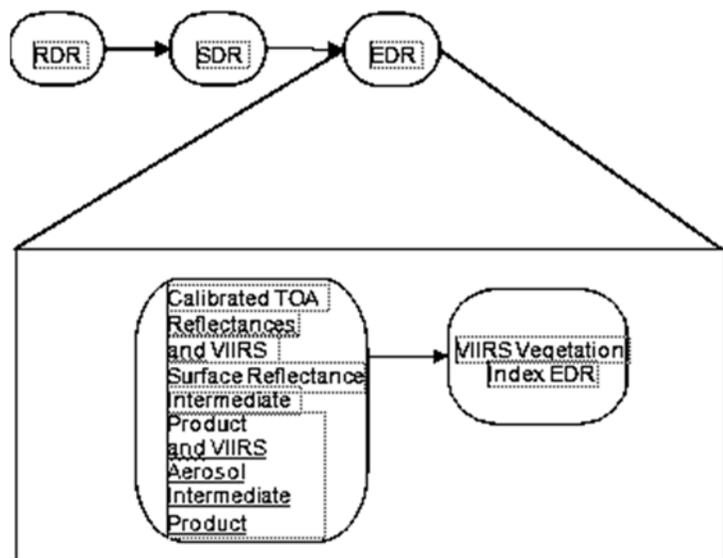


Figure 1. Processing Chain Associated with VIIRS Vegetation Index EDR

2.1 Algorithm: Vegetation Index Environmental Data Record Description

2.1.1 Interfaces

To begin processing the data, the Infrastructure (INF) Software Item (SI) initiates the VIIRS Vegetation Index algorithm. The INF SI provides tasking information to the algorithm indicating which granule is processed. The Data Management Subsystem (DMS) SI provides data storage and retrieval capability. A library of C++ classes is used to implement the SI interfaces. More information regarding these topics is found in document UG60917-IDP-1005 with reference in particular to sections regarding PRO Common (CMN) processing and the IPO Model.

2.1.1.1 Inputs

The VIIRS Vegetation Index (VI) EDR requires: calibrated TOA reflectances (bands I1, I2), SDR auxiliary data (solar zenith angle), and Surface Reflectance (bands I1, I2, M3, Land Quality Flags). The VIIRS VI EDR also uses Aerosol Optical Thickness (Quality Flags).

VIIRS VI is calculated for all land retrievals with a solar zenith angle less than or equal to 85 degrees but is required to meet specification performance at angles less than 65 degrees. “Land” is allowed to include inland water bodies, rivers, and coastal areas. Pixels labeled as “confidently clear”, “probably clear”, “probably cloudy”, or “confidently cloudy” by the Surface

Reflectance Land Quality Flags are processed but flagged accordingly. This same quality flag also indicates whether sufficient aerosol is present to warrant flagging the pixel as obscured, i.e., AOT>1. 474-00448-01-18_JPSS-SRS-Vol-I-Part-18, Table 3 describes the VIIRS VI EDR Inputs. Refer to the list and references below for a detailed description of the inputs.

Table 3. VIIRS VI EDR Inputs

Input	Description	Reference Document
Reflectance_Img	Calibrated TOA Reflectances for band I1	474-00448-02-06_JPSS-DD-Vol-II-Part-06
Reflectance_Img	Calibrated TOA Reflectances for band I2	474-00448-02-06_JPSS-DD-Vol-II-Part-06
SolZenAng_Img	Solar zenith angle at each pixel from VIIRS SDR IMG geolocation structure	474-00448-02-06_JPSS-DD-Vol-II-Part-06
VIIRS Surface Reflectance IP	Surface Reflectance (TOC) for band I1	474-00448-02-15_JPSS-DD-Vol-II-Part-15
VIIRS Surface Reflectance IP	Surface Reflectance (TOC) for band I2	474-00448-02-15_JPSS-DD-Vol-II-Part-15
VIIRS Surface Reflectance IP	Surface Reflectance (TOC) for band M3	474-00448-02-15_JPSS-DD-Vol-II-Part-15
VIIRS Surface Reflectance IP	Land Quality Flags in 7 moderate resolution 8-bit unsigned integer arrays	474-00448-02-15_JPSS-DD-Vol-II-Part-15
VIIRS VI Retrieval Coefficients	Vegetation Index Coefficients for TOC EVI processing, I1, M3, and C	474-00448-02-15_JPSS-DD-Vol-II-Part-18
VI DQTT	Reports erroneous pixels through a DQN	474-00448-02-15_JPSS-DD-Vol-II-Part-18
VIIRS Aerosol Optical Thickness [DAR1]IP	Aerosol Quality Flags	474-00448-02-12_JPSS-DD-Vol-II-Part-12

2.1.1.2 Outputs

2.1.1.2.1 Granule Level Summary Quality Flags

There are two granule level summary quality flags each for TOA NDVI, TOC NDVI and TOC EVI--the percent of retrievals with high quality and the percent of pixels with one or more exclusion condition. Refer to 474-00448-04-18_JPSS-SRSPF-Vol-IV-Part-18 for details on the QF logic.

2.1.1.2.2 VIIRS VI Output Contents

The VIIRS VI EDR contains three fields that are written to the DMS in internal IDPS data format. Refer to 474-00448-01-18_JPSS-SRS-Vol-I-Part-18, Table 3-1 for the list of VI outputs. For a detailed description of the outputs (including QFs), refer to 474-00448-02-18_JPSS-DD-Vol-II-Part-18, Section 5.1.

2.1.2 Algorithm Processing

This section provides a summary of the as-built VIIRS VI operational code. Figure 2 shows the Vegetation Index Data Flow.

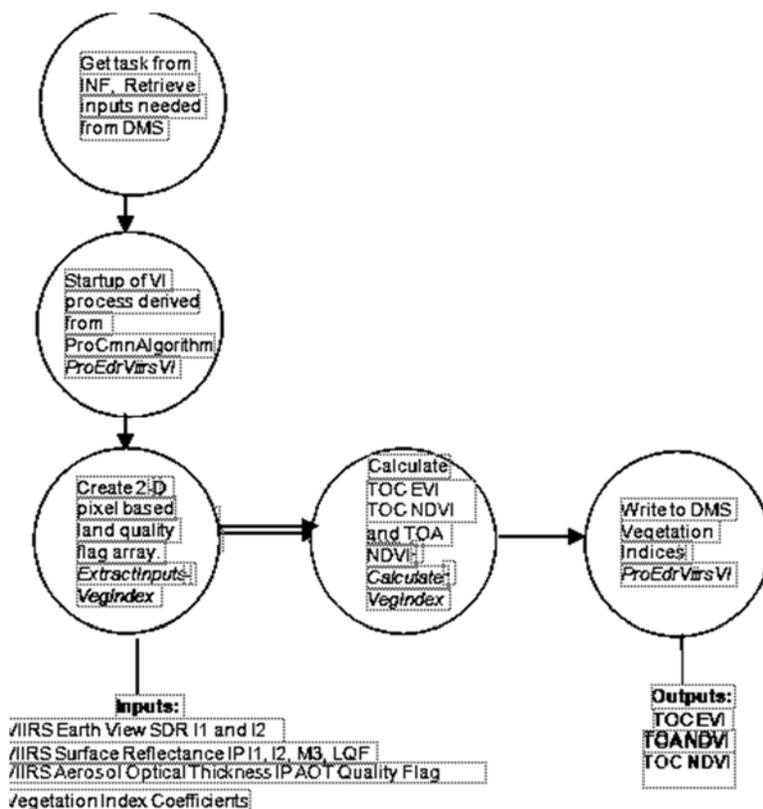


Figure 2. Data Flow Diagram of Overall VIIRS VI EDR Call Sequence from the Main Program

2.1.2.1 Main Module - ProEdrViirsVI.cpp

This is the Vegetation Index derived algorithm and is a subclass from the ProCmnAlgorithm of the common I/O design. ProEdrViirsVI creates a list of input data items that are read from DMS and passes all of the required data into the algorithm for processing. The input list includes a Vegetation Index Data Quality Threshold Table (DQTT) and the output includes a list of Data Quality Notifications if any were produced. When the algorithm has finished, the output data items are written to DMS. Refer to UG60917-IDP-1005 for more information.

2.1.2.2 Calculate_VegIndex

This function calculates: (1) the top of canopy EVI from VIIRS bands M3, I1, and I2 and (2) the top of atmosphere NDVI from VIIRS bands I1 and I2.

2.1.2.2.1 TOC EVI

The following algorithm is used to calculate the top of canopy EVI:

$$\text{TOC EVI} = (1 + \text{VegIndex_Coeffs.EVI}) * (\text{SurfReflect.I2} - \text{SurfReflect.I1}) / (\text{SurfReflect.I2} + \text{VegIndex_Coeffs.EVI.I1} * \text{SurfReflect.I1} - \text{VegIndex_Coeffs.EVI.M3} * \text{SurfReflect.M3} + \text{VegIndex_Coeffs.EVI})$$

Where VegIndex_Coeffs.EVI are unitless coefficients used to compute EVI. EVI ranges from -1 to 4; pixels with EVI values outside of this range are assigned a fill value of 65528.

Note that under thin cirrus conditions for a given pixel no Surface Reflectance IP value is produced and so accordingly no EVI may be computed.

2.1.2.2.2 TOA NDVI

The following algorithm is used to calculate the top of atmosphere NDVI:

$$\text{TOA NDVI} = (\text{TOAReflect.I2} - \text{TOAReflect.I1}) / (\text{TOAReflect.I2} + \text{TOAReflect.I1})$$

TOA NDVI ranges from -1 to 1; pixels with TOA NDVI values outside of this range are assigned a fill value of 65528.

2.1.2.2.3 TOC NDVI

The following algorithm is used to calculate the top of canopy NDVI:

$$\text{TOC NDVI} = (\text{SurfReflect.I2} - \text{SurfReflect.I1}) / (\text{SurfReflect.I2} + \text{SurfReflect.I1})$$

TOC NDVI ranges from -1 to 1; pixels with TOC NDVI values outside of this range are assigned a fill value of 65528.

2.1.3 Graceful Degradation

2.1.3.1 Graceful Degradation Inputs

There is one case where input graceful degradation is indicated in the Vegetation Index EDR

1. An input retrieved for the algorithm has its N_Graceful_Degradation metadata field set to YES (propagation).

2.1.3.2 Graceful Degradation Processing

AOT IP is an "optional" input to the VI EDR algorithm. When AOT IP is missing but Surface Reflectance IP is still produced (in this case Sfc Refl IP will be using other alternative inputs such as VIIRS-ANC-Optical-Depth-Mod-Gran in place of the missing AOT IP), the produced Surface Reflectance IP will be labeled as Gracefully Degraded product with its N_Graceful_Degradation metadata field set to YES. The VI EDR product will still be produced, but will *inherit* the Graceful Degradation condition from the input Surface Reflectance IP and thus will also be labeled as a Gracefully Degraded product.

2.1.3.3 Graceful Degradation Outputs

The VI EDR product is Gracefully Degraded if the input SDR or Surface Reflectance IP is Gracefully Degraded.

2.1.4 Exception Handling

Software was added to check for divide by zero situations for TOA NDVI, TOC EVI, and TOC NDVI.

Pixels trimmed Onboard and Onground are not processed.

TOA NDVI is not calculated if Calibrated Reflectance I1 or I2 contain FILL value. TOA NDVI is instead set to a FILL value.

TOC EVI is not calculated if Surface Reflectance I1, I2, or M3 contain FILL value. TOC EVI is instead set to a FILL value.

TOC NDVI is not calculated if Surface Reflectance I1 or I2 contain FILL value. TOC NDVI is instead set to a FILL value.

2.1.5 Data Quality Monitoring

Each algorithm uses specific criteria contained in a Data Quality Threshold Table (DQTT) to determine when a Data Quality Notification (DQN) is produced. The DQTT contains the threshold used to trigger the DQN as well as the text contained in the DQN. If a threshold is met, the algorithm stores a DQN in DMS indicating the test(s) that failed and the value of the DQN attribute. Refer to 474-00448-02-01_JPSS-DD-Vol-II-Part-1 for more information on Data Quality Notifications.

2.1.6 Computational Precision Requirements

The VIIRS VI algorithm requires input items to be a combination of 32-bit floating-point precision values and unsigned 8-bit integers. The 32-bit floating-point precision items are VIIRS Calibrated TOA Reflectances (bands I1, I2), VIIRS Surface Reflectance IP (bands I1, I2, M3), and the VIIRS VI coefficients. The unsigned 8-bit integer item is the Land Quality Flags from the moderate surface reflectance, and the Aerosol Optical Thickness Quality Flag from the moderate aerosol optical thickness IP.

The output values of the algorithm are unsigned 16-bit integers with a measurement precision of 0.0002 NDVI units.

2.1.7 Algorithm Support Considerations

DMS should be up and running. All the data (primary or secondary) needed for the VIIRS VI calculations must be available in the DMS for the successful completion of the process.

INF must be running so the process can retrieve the tasks send messages to INF upon successful completion or failure to complete the process.

A C++ compiler is necessary to compile the VIIRS VI source code.

The PRO Common library is available.

2.1.8 Assumptions and Limitations

2.1.8.1 Assumptions

The baseline software assumes co-registration exists between the channels, and assumes nesting of the imagery pixels around the moderate pixels.

2.1.8.2 Limitations

Retrievals are not performed under nighttime conditions. This is defined as instances where the solar zenith angle exceeds 85 degrees.

Retrievals are not performed under confident cloudy conditions, but flagged accordingly.

Retrievals are not performed over ocean surfaces.

Retrievals of EVI and other surface parameters are questionable under conditions of extreme aerosol loading, such as events associated with volcanic eruptions or biomass burning, and retrievals of EVI over snow are not guaranteed to meet the performance specification.

If for any reason the TOA or Surface Reflectance data is not available in DMS, the Vegetation Index algorithm is not performed.

3.0 GLOSSARY/ACRONYM LIST

3.1 Glossary

Table 4 contains terms most applicable for this OAD.

Table 4. Glossary

Term	Description
Algorithm	A formula or set of steps for solving a particular problem. Algorithms can be expressed in any language, from natural languages like English to mathematical expressions to programming languages like FORTRAN. On JPSS, an algorithm consists of: <ol style="list-style-type: none"> 1. A theoretical description (i.e., science/mathematical basis) 2. A computer implementation description (i.e., method of solution) 3. A computer implementation (i.e., code)
Algorithm Engineering Review Board (AERB)	Interdisciplinary board of scientific and engineering personnel responsible for the approval and disposition of algorithm acceptance, verification, development and testing transitions. Chaired by the Data Process Algorithm Lead, members include representatives from STAR, DPES, IDPS, and Raytheon.
Algorithm Verification	Science-grade software delivered by an algorithm provider is verified for compliance with data quality and timeliness requirements by Algorithm Team science personnel. This activity is nominally performed at the GRAVITE facility. Delivered code is executed on compatible GRAVITE computing platforms. Minor hosting modifications may be made to allow code execution. Optionally, verification may be performed at the Algorithm Provider's facility if warranted due to technical, schedule or cost considerations.
EDR Algorithm	Scientific description and corresponding software and test data necessary to produce one or more environmental data records. The scientific computational basis for the production of each data record is described in an ATBD. At a minimum, implemented software is science-grade and includes test data demonstrating data quality compliance.
Environmental Data Record (EDR)	<p><i>[IORD Definition]</i> Data record produced when an algorithm is used to convert Raw Data Records (RDRs) to geophysical parameters (including ancillary parameters, e.g., cloud clear radiation, etc.).</p> <p><i>[Supplementary Definition]</i> An Environmental Data Record (EDR) represents the state of the environment, and the related information needed to access and understand the record. Specifically, it is a set of related data items that describe one or more related estimated environmental parameters over a limited time-space range. The parameters are located by time and Earth coordinates. EDRs may have been resampled if they are created from multiple data sources with different sampling patterns. An EDR is created from one or more JPSS SDRs or EDRs, plus ancillary environmental data provided by others. EDR metadata contains references to its processing history, spatial and temporal coverage, and quality.</p>
Model Validation	The process of determining the degree to which a model is an accurate representation of the real-world from the perspective of the intended uses of the model.
Model Verification	The process of determining that a model implementation accurately represents the developer's conceptual description and specifications.
Operational Code	Verified science-grade software, delivered by an algorithm provider and verified by GRAVITE, is developed into operational-grade code by the IDPS IPT.
Operational-Grade Software	Code that produces data records compliant with the System Specification requirements for data quality and IDPS timeliness and operational infrastructure. The software is modular relative to the IDPS infrastructure and compliant with IDPS application programming interfaces (APIs) as specified for TDR/SDR or EDR code.

Term	Description
Raw Data Record (RDR)	<p><i>[IORD Definition]</i> Full resolution digital sensor data, time referenced, with absolute radiometric and geometric calibration coefficients appended, but not applied, to the data. Aggregates (sums or weighted averages) of detector samples are considered to be full resolution data if the aggregation is normally performed to meet resolution and other requirements. Sensor data shall be unprocessed with the following exceptions: time delay and integration (TDI), detector array non-uniformity correction (i.e., offset and responsivity equalization), and data compression are allowed. Lossy data compression is allowed only if the total measurement error is dominated by error sources other than the data compression algorithm. All calibration data will be retained and communicated to the ground without lossy compression.</p> <p><i>[Supplementary Definition]</i> A Raw Data Record (RDR) is a logical grouping of raw data output by a sensor, and related information needed to process the record into an SDR or TDR. Specifically, it is a set of unmodified raw data (mission and housekeeping) produced by a sensor suite, one sensor, or a reasonable subset of a sensor (e.g., channel or channel group), over a specified, limited time range. Along with the sensor data, the RDR includes auxiliary data from other portions of JPSS (space or ground) needed to recreate the sensor measurement, to correct the measurement for known distortions, and to locate the measurement in time and space, through subsequent processing. Metadata is associated with the sensor and auxiliary data to permit its effective use.</p>
Retrieval Algorithm	A science-based algorithm used to 'retrieve' a set of environmental/geophysical parameters (EDR) from calibrated and geolocated sensor data (SDR). Synonym for EDR processing.
Science Algorithm	The theoretical description and a corresponding software implementation needed to produce an NPP/JPSS data product (TDR, SDR or EDR). The former is described in an ATBD. The latter is typically developed for a research setting and characterized as "science-grade".
Science Algorithm Provider	Organization responsible for development and/or delivery of TDR/SDR or EDR algorithms associated with a given sensor.
Science-Grade Software	Code that produces data records in accordance with the science algorithm data quality requirements. This code, typically, has no software requirements for implementation language, targeted operating system, modularity, input and output data format or any other design discipline or assumed infrastructure.
SDR/TDR Algorithm	Scientific description and corresponding software and test data necessary to produce a Temperature Data Record and/or Sensor Data Record given a sensor's Raw Data Record. The scientific computational basis for the production of each data record is described in an Algorithm Theoretical Basis Document (ATBD). At a minimum, implemented software is science-grade and includes test data demonstrating data quality compliance.
Sensor Data Record (SDR)	<p><i>[IORD Definition]</i> Data record produced when an algorithm is used to convert Raw Data Records (RDRs) to calibrated brightness temperatures with associated ephemeris data. Temperature Data Records (TDRs) are geolocated, antenna temperatures with all relevant calibration data counts and ephemeris data to revert from T-sub-a into counts. The existence of the SDRs provides reversible data tracking back from the EDRs to the Raw data.</p> <p><i>[Supplementary Definition]</i> A Sensor Data Record (SDR) is the recreated input to a sensor, and the related information needed to access and understand the record. Specifically, it is a set of incident flux estimates made by a sensor, over a limited time interval, with annotations that permit its effective use. The environmental flux estimates at the sensor aperture are corrected for sensor effects. The estimates are reported in physically meaningful units, usually in terms of an angular or spatial and temporal distribution at the sensor location, as a function of spectrum, polarization, or delay, and always at full resolution. When meaningful, the flux is also associated with the point on the Earth geoid from which it apparently originated. Also, when meaningful, the sensor flux is converted to an equivalent top-of-atmosphere (TOA) brightness. The associated metadata includes a record of the processing and sources from which the SDR was created, and other information needed to understand the data.</p>

Term	Description
Temperature Data Record (TDR)	<p><i>[IORD Definition]</i> Temperature Data Records (TDRs) are geolocated, antenna temperatures with all relevant calibration data counts and ephemeris data to revert from T-sub-a into counts.</p> <p><i>[Supplementary Definition]</i> A Temperature Data Record (TDR) is the brightness temperature value measured by a microwave sensor, and the related information needed to access and understand the record. Specifically, it is a set of the corrected radiometric measurements made by an imaging microwave sensor, over a limited time range, with annotation that permits its effective use. A TDR is a partially-processed variant of an SDR. Instead of reporting the estimated microwave flux from a specified direction, it reports the observed antenna brightness temperature in that direction.</p>

3.2 Acronyms

Table 5 contains terms most applicable for this OAD.

Table 5. Acronyms

Term	Expansion
AM&S	Algorithms, Models & Simulations
AOT	Aerosol Optical Thickness
API	Application Programming Interfaces
ARP	Application Related Product
DMS	Data Management Subsystem
DQTT	Data Quality Test Table
EVI	Enhanced Vegetation Index
GMVI	Gridded Monthly Vegetation Index
GVI	Global Vegetation Index
GWVI	Gridded Weekly Vegetation Index
INF	Infrastructure
ING	Ingest
IP	Intermediate Product
LUT	Look-Up Table
MVI	MODIS Vegetation Index
NDVI	Normalized Difference Vegetation Index
QF	Quality Flag
SDR	Sensor Data Record
SI	International System of Units
TBD	To Be Determined
TBR	To Be Resolved
TOA	Top of the Atmosphere
TOC	Top of canopy
VI	Vegetation Index

4.0 OPEN ISSUES

Table 6. TBXs

TBX ID	Title/Description	Resolution Date
None		