Office of Satellite and Product Operations
Environmental Satellite Processing Center

JPSS Risk Reduction Land Surface Albedo External Users' Manual

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Approval Page

Environmental Satellite Processing Center

JPSS Risk Reduction Land Surface Albedo External Users' Manual

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Changes/Revisions Record

This external users' manual is changed as required to reflect system, operational, or organizational changes. Modifications made to this document are recorded in the Changes/Revisions Record below. This record will be maintained throughout the life of the document.

Version Number	Date	Description of Change/Revision	Section/Pages Affected	Changes Made by Name/Title/ Organization
1.0	01/2023	Original Version	All	John Lindeman
1.1	09/2024	Updating to match with current changes in software	All	Hardy
1.2	11/2024	Added links to product monitoring, visualization	3.5, 3.5.1	Augenbaum
1.3	11/06/2024	Transfer contents to latest template, perform minor copy editing and formatting;	All	Hannah Bowie, Technical Writer, ERT
1.3	11/07/2024	Quality Assurance	All	Clint Sherwood, Quality Assurance Manager, ERT

Preface

This document comprises the National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS), Office of Satellite and Product Operations (OSPO), publication of this JPSS Risk Reduction (JRR) Land Surface Albedo (LSA) External Users' Manual (EUM). This document reflects current operations for the DOC/NOAA/NESDIS Environmental Satellite Processing Center (ESPC) (NOAA5045) information technology systems. This document describes the established ESPC procedures for external users of JRR LSA in accordance with Federal, DOC, NOAA, NESDIS and OSPO requirements.

Future updates and revisions to this document will be produced and controlled by DOC/NOAA/NESDIS for ESPC information technology systems.

The published version of this document can be found at the OSPO SharePoint Products Library.

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1. Products

This is an External Users' Manual (EUM) document describing the JPSS Risk Reduction (JRR) Land Surface Albedo (LSA) processing system. The intended users of the EUM are end users of the output files and the product verification and validation (V&V) teams. The purpose of this document is to provide the document's users with information describing how to acquire the product, understand the product's features, and use any data associated with the products. External users are classified as those who do not have direct access to the processing system.

1.1. Product Overview

LSA is defined as the ratio between outgoing and incoming irradiance at the earth's surface, which is a key component of surface energy budget. The VIIRS LSA product applies a two-step approach to produce a new daily granule and gap-filled product based on VIIRS data, which is implemented here. This LSA product is a granule-based product, containing albedo parameter over land and sea-ice surfaces. A direct estimation algorithm was developed to estimate daily mean blue-sky albedo from clear-sky VIIRS observations over land pixels. The direct estimation algorithm uses Top of Atmosphere (TOA) spectral reflectance data [known as VIIRS Sensor Data Record (SDR)] of nine VIIRS bands (M1, M2, M3, M4, M5, M7, M8, M10, and M11) as major inputs. A VIIRS cloud mask Intermediate Product (IP) helps to exclude cloudy-sky pixels. Land cover data, VIIRS ice concentration EDR, and snow mask EDR are used to determine the LUT type deployed on each pixel. There are four land type specified LUTs included in the algorithm: General, Desert, Snow, and Sea-ice. The VIIRS albedo granule data have been validated using field measurements. The accuracy is comparable to existing satellite albedo products.

The VIIRS LSA process consists of two components. The granule albedo is estimated online from a combination of the directly estimated albedo and a historical temporally filtered gap- free albedo; the historical albedo is derived offline using granule albedo previously obtained. The online direct estimation approach, which has been widely used for estimating land surface albedo from a variety of satellite data, is initially used to estimate daily mean blue- sky land surface albedo from clear-sky VIIRS data of TOA spectral reflectance. The offline statistical temporal filter is then applied to combine information from the albedo retrieved with observations of the current day (if existing) and the adjacent days as well as historical climatology to generate a gap-free and noise-reduced albedo data set.

1.1.1. Product Requirements

The processing requirement for LSA products is for them to be made available to users (e.g. on the distribution server) within 3 hours (maximum 6 hours) of observation.

Table 1-1 - LSA Requirements

Attribute	Requirement
Latency	96 min
Timeliness	N/A
Horizontal Cell Size	0.8 km
Vertical Cell Size	N/A
Measurement Accuracy	0.08 albedo units

1.1.2. Product Team

The LSA Development product team consists of members from Office of Common Services (OCS) and Center for Satellite Applications and Research (STAR). The roles and contact information for the different product team members are identified in Table 1-2.

Table 1-2 - Product Team Members

Team Member	Organization	Role	Contact Information
Walter Wolf	OCS	OCS Product Management Division Chief	walter.wolf@noaa.gov
Yunyue (Bob) Yu	OCS	Science Team Lead	yunyue.yu@noaa.gov
Jingjing Peng	OCS	Science Team	jingjing.peng@noaa.gov
Hanjun Ding	OSPO	OSPO PAL	hanjun.ding@noaa.gov
Shuang Qiu	OSPO	OSPO PAL	shuang.qiu@noaa.gov
Changyi Tan	OSPO	OSPO PAL	changyi.tan@noaa.gov
Isabel Jones	OCS	PPM	isabel.zaragosa@noaa.gov
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Priyanka Roy	OCS	ASSISTT Management Team	priyanka.roy@noaa.gov
Michael Walters	OCS	ASSISTT Regression Testing	michael.walters@noaa.gov
Michael Butler	OCS	ASSISTT Framework Integration Team Lead	michael.butler@noaa.gov
Yuxiang He	OCS	ASSISTT Framework Integration Team	luke.he@noaa.gov
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1.1.3. Product Description

The JRR Land Surface Albedo products will be used as a risk reduction assessment for a cost-effective implementation of common NESDIS algorithms for the JRR system. The OCS Algorithm Scientific Software Integration and System Transition Team (ASSISTT), integration, and python development teams prepared for its implementation into the NESDIS Cloud Common Framework (NCCF). LSA is run operationally by OSPO on NCCF for JPSS satellites. The output products are intended for operational and scientific users. Table 1-3 provides information on the algorithms and products.

Table 1-3 - LSA Algorithms and Products

Product Category	Algorithm	Product
JRR Land Surface Products	Land Surface Albedo	• Primary Clear Albedo • Improved Albedo

1.2. Product History

The LSA algorithms are derived from the NOAA JPSS Risk Reduction (JRR) System. The JRR System produced a total of 26 products in five different product areas: Clouds, Aerosol, Cryosphere, Land Surface, and VIIRS Polar Winds. These product areas are in the process of being separated so that they can be run independently of each other. The JRR products are modified or upgraded versions of GOES-R algorithms adapted to run on S-NPP VIIRS (except for Snow Cover which is GOES heritage).

Visible Infrared Imaging Radiometer Suite (VIIRS) is a 22-band imaging radiometer that, in terms of features, is a cross between Moderate Resolution Imaging Spectroradiometer (MODIS) and Advanced Very High-Resolution Radiometer (AVHRR), with some characteristics of the Operational Linescan System (OLS) on Defense Meteorological Satellite Program (DMSP) satellites. Several unique characteristics of VIIRS will impact the VIIRS JRR products, which include

- a wider swath,
- high spatial resolution,
- constrained pixel growth: better resolution at edge of swath, a visible day-night band (DNB).

1.3. Product Access

The Land Surface Albedo output file contains the estimation of the primary clear albedo and the improved albedo. This file will be archived at NCEI. The LSA products use VIIRS L1B data for daytime and twilight granules from the S-NPP, NOAA-20, and NOAA-21 satellites.

The products are in NetCDF format and undergo compression while being processed. Table 1-4 lists the LSA output file and its format. Table 1-5 lists the detailed content of the output file.

Table 1-4 - Land Surface Albedo Output File Name

Type of File	LSA Product Filename
Land Surface Albedo (LSA)	SURFALB_<version>_<sat>_s<yyyymmddHHMMSSs> _e<yyyymmddHHMMSSs>_c<yyyymmddHHMMSSs>.nc

Where:

<version>	→	Product file version, currently v2r2 for LSA and v3r2 for Cloud Mask
<sat>	→	Satellite ID: j01, j02 (L1B data), n21 (product data), or npp

<yyyymmddHHMMSSs>	→	Timestamp with day/time to the nearest tenth of a second

An example of an output filename is:
SURFALB_v2r2_n21_s201707230444448_e201707230446094_c202210190021543.nc.

Table 1-5 - Land Surface Albedo Output File

Variable	Type	Description	Dim	Units	Range
AlbOff	Float	VIIRS LSA Albedo offset	0	None	NA
AlbScl	Float	VIIRS LSA Albedo Scale Factor	0	None	NA
CldCnfCld	Int	VIIRS LSA Cloud Condition: Confidently Cloudy	0	None	NA
CldCndClr	Int	VIIRS LSA Cloud Condition: Confidently Clear	0	None	NA
CldProbCld	Int	VIIRS LSA Cloud Condition: Probably Cloudy	0	None	NA
CldProbClr	Int	VIIRS LSA Cloud Condition: Probably Clear	0	None	NA
DataQualityFlag	Byte	VIIRS LSA 2-bit High-Quality Flag	2	None	0, 2
Latitude	Float	Pixel latitude in field latitude	2	Degrees north	-90, 90.
Longitude	Float	Pixel longitude in field longitude	2	Degrees east	-180, 180.
MaxLSA	Double	Max LSA	0	None	NA
MeanLSA	Double	Mean LSA	0	None	NA
MinLSA	Double	Min LSA	0	None	NA
OnFltFltd	Int	VIIRS LSA Online Filter: Online Filtered	0	None	NA
OnFltNoFlt	Int	VIIRS LSA Online Filter: No Online Filter	0	None	NA
OvQltyHghQltyRtr	Int	VIIRS LSA Overall Quality: High Quality Retrieval	0	None	NA
OvQltyNoRtr	Int	VIIRS LSA Overall Quality: No Retrieval	0	None	NA
OvQltyRtr	Int	VIIRS LSA Overall Quality: Retrieval	0	None	NA
PercentClearPixels	Double	Percentage of clear pixels	0	Percent	[0,100]
PercentFilteredPixel	Double	Percentage of filtered pixels over all valid retrievals	0	Percent	[0,100]
PercentHighQuality	Double	Percentage of high quality retrievals over all valid retrievals	0	Percent	[0,100]
PercentLandPixels	Double	Percentage of land pixels	0	Percent	[0,100]

Variable	Type	Description	Dim	Units	Range
PercentLargeSZAPixels	Double	Percentage of large solar zenith angle pixels	0	Percent	[0,100]
PercentLargeVZAPixels	Double	Percentage of large view zenith angle pixels	0	Percent	[0,100]
PercentSeaicePixels	Double	Percentage of seaice pixels	0	Percent	[0,100]
PercentWaterPixels	Double	Percentage of water pixels	0	Percent	[0,100]
ProductQualityInformation	Short	VIIRS LSA 2-byte Quality Flag	2	None	0, 32767
RtrPthDst	Int	VIIRS LSA Retrieval Path: Desert	0	None	NA
RtrPthGen	Int	VIIRS LSA Retrieval Path: Generic	0	None	NA
RtrPthNoRtr	Int	VIIRS LSA Retrieval Path: No Retrieval	0	None	NA
RtrPthSI	Int	VIIRS LSA Retrieval Path: Sea Ice	0	None	NA
RtrPthSnw	Int	VIIRS LSA Retrieval Path: Snow	0	None	NA
SZAFav	Int	VIIRS LSA Solar Zenith Angle: Favorable SZA	0	None	NA
SZALge	Int	VIIRS LSA Solar Zenith Angle: Very Large SZA	0	None	NA
StdLSA	Double	Std. deviation of LSA	0	None	NA
TFDegRtr	Int	VIIRS LSA Temporal Filter Flag: Degraded Retrieval	0	None	NA
TFHghRtr	Int	VIIRS LSA Temporal FilterFlag: High-Quality Retrieval	0	None	NA
TFNoRtr	Int	VIIRS LSA Temporal FilterFlag: No Retrieval	0	None	NA
VIIRS_Albedo_EDR	Short	Improved VIIRS Land Surface Albedo	2	None	0, 10000
VIIRS_Albedo_IP	Short	Primary VIIRS Land Surface Albedo Clear	2	None	0, 10000
VZAFav	Int	VIIRS LSA View Zenith Angle: Favorable VZA	0	None	NA
VZALge	Int	VIIRS LSA View Zenith Angle: Very Large LZA	0	None	NA

The LSA product output file contains metadata displayed in Table 1-6.

Table 1-6 - Land Surface Albedo Metadata

Attribute	Description	Type	Array Size
_NCProperties	NetCDF and HDF version numbers, will be automatically generated	String	Scalar
Conventions	Conventions used here	String	Scalar
Metadata_Conventions	Metadata conventions used here	String	Scalar
Metadata_Link	Contains a URL where detailed metadata or a product information page is located	String	Scalar

Attribute	Description	Type	Array Size
ascend_descend_data_flag	Flag indicate whether satellite ascending or descending	Integer	Scalar
cdm_data_type	States the geographic category the product represents	String	Scalar
date_created	UTC time the product file was created in 4-digit year, 2-digit month, 2-digit day, 2-digit hour, 2-digit minute, 2-digit second format	String	Scalar
day_night_data_flag	flag which indicates whether it is day or night	String	Scalar
geospatial_bounds	Describes the shape and bounding corner locations of the domain	string	1
geospatial_first_scanline_first_fov_lat	The first latitude at the first scanline	float	scalar
geospatial_first_scanline_first_fov_lon	The first longitude at the first scanline	float	scalar
geospatial_first_scanline_last_fov_lat	The last latitude at the first scanline	float	scalar
geospatial_first_scanline_last_fov_lon	The last longitude at the first scanline	float	scalar
geospatial_last_scanline_first_fov_lat	The first latitude at the last scanline	float	scalar
geospatial_last_scanline_first_fov_lon	The first longitude at the last scanline	float	scalar
geospatial_last_scanline_last_fov_lat	The last latitude at the last scanline	float	scalar
geospatial_last_scanline_last_fov_lon	The last longitude at the last scanline	float	scalar
geospatial_lat_units	Indicates unit associated with geospatial latitude	String	Scalar
geospatial_lon_units	Indicates unit associated with geospatial longitude	String	Scalar
history	Indicates algorithm name and version responsible for creating the file	String	Scalar
history_package	The delivery package version number	string	scalar
id	Unique identifier for the product	String	Scalar
institution	Indicates institution responsible for product file	String	Scalar
instrument_name	Name of the relevant satellite instrument	string	scalar
naming_authority	Organization responsible for providing the "id" attribute	String	Scalar
processing_level	Level of processing associated with product file	String	Scalar
production_environment	Processing string responsible for generating the product	String	Scalar
production_site	Processing site for the product	String	Scalar
project	Indicates the name(s) of the project(s) responsible for generating the original data used as input to the processing system	String	Scalar
references	Contact info	String	Scalar
resolution	horizontal resolution	string	Scalar
satellite_name	Name of the satellite	string	scalar
sensor_band_central_radiation_wavelength	Central wavelength of the satellite instrument	string	1
sensor_band_identifier	Band number of the satellite instrument	string	1
standard_name_vocabulary	Provides the name and corresponding version number of the controlled vocabulary used	String	Scalar
start_orbit_number	The number of the satellite orbit	integer	scalar
summary	Provides a brief summary of the product	String	Scalar
time_coverage_end	Indicates the end time of the observation associated with the file in 4-digit year, 2-digit month, 2-digit day, 2-digit hour, 2-digit minute, 2-digit second format	String	Scalar

Attribute	Description	Type	Array Size
time_coverage_start	Indicates the start time of the observation associated with the file in 4-digit year, 2-digit month, 2-digit day, 2-digit hour, 2-digit minute, 2-digit second format	String	Scalar
title	Provides the short name for the product	String	Scalar

2. Algorithm

This section of the EUM provides an overview of the Science Algorithm (SA) responsible for generating the VIIRS NDE Surface Albedo expected output products. For further details concerning the SA's processing, please refer to the VIIRS NDE Surface Albedo Algorithm Theoretical Basis Document (ATBD) (NESDIS/STAR, 2018).

2.1. Algorithm Overview

The implementation of the gridded VIIRS albedo product consists of two major steps: direct retrieval and temporal filtering. The direct retrieval procedure is granule-driven and employs the improved direct estimation algorithm to generate daily mean albedo granule from VIIRS clear-sky SDR data. The albedo granule directly retrieved from the first step will then be gridded and converted to a sinusoidal map projection. The gridded data will serve as the input of the temporal filtering step. The temporal filtering process is tile-driven and executed at the end of each day, which mainly implements a statistical temporal filter algorithm to combine albedo from the current and temporally neighboring days and climatology information to generate a gap-filled and noise-reduced albedo product.

The direct retrieval and temporal filtering algorithms are implemented into two separate modules in the software development. The online processing part employs the direct retrieval algorithm to generate Primary Surface Albedo ("VIIRS_Albedo_IP") from VIIRS clear-sky observations. Data gaps in the clear-sky albedo granule are then filled using the historical albedo information, which come from the temporal filtering algorithm (the offline processing part). The gap-filled albedo granule is also known as Improved Surface Albedo ("VIIRS_Albedo_EDR").

The offline processing part mainly implemented the temporal filtering algorithm with the albedo tiles gridded from Primary Surface Albedo during a 9-day window (precedent 8 days plus the current day) as the main input. The offline processing updates the historical albedo data that are used in the online processing part.

2.1.1. Pre-Processing Steps

For Land Surface Albedo products, the HDF5 format L1b satellite data is directly read into the framework. Note that unlike previous versions of the framework, there is no gap filling of the granules and the L1b satellite data is no longer converted to NetCDF format before being used by LSA.

There are two main components of VIIRS LSA processing – online and offline. This is done because of time constraints – the offline component takes a significant amount of time to execute and is run only once per day. The Offline LSA component generates a dynamic global albedo map which is used as ancillary data for Online LSA (section 2.3). This map is created by the daily offline LSA algorithm

that produces gridded, temporal-filtered global LSA tiles. Online LSA generates the products described in this document.

The trigger for Gridded Land processing is time-based. Processing for the preliminary step should begin once JPSS Risk Reduction processing is complete and the LSA product is available for all granules for a given day. Processing for the final step begins as soon as the preliminary step has finished.

2.2. Input Satellite Data

2.2.1. Satellite Instrument Overview

The JRR LSA processing system uses VIIRS data to comprehensively create the expected output files. This data includes the VIIRS Science Data Records (SDR) Moderate Resolution Bands 01-11 (except 06 and 09) and the Moderate Resolution Terrain Corrected Geolocation data.

2.2.2. Satellite Data Preprocessing Overview

There must be at least one YAML file present in the algorithm package responsible for guiding the inner script as it chooses what processing or preprocessing steps will occur, which granule will be processed, and which span of time will be observed.

2.2.3. Input Satellite Data Description

The Land Surface Albedo processing system ingests VIIRS data shown Table 2-1.

Table 2-1 - LSA Online Input Data

Type of File	File Naming Conventions
VIIRS L1B	GMTCO_<sat>_d<YYYYMMDD>_t<HHMMSSs>_e<HHMMSSs>_b<orbit>_c<yymmddHHMMSSssssss>_noac_ops.h5 <SVMxx>_<sat>_d<YYYYMMDD>_t<HHMMSSs>_e<HHMMSSs>_b<orbit>_c<yymmddHHMMSSssssss>_noac_ops.h5
Cloud Mask	JRR-CloudMask_<version>_<sat>_s<yyyymmddHHMMSSs>_e<yyyymmddHHMMSSs>_c<yyyymmddHHMMSSs>.nc

Where:

<version>	→	Product file version, currently v2r2 for LSA and v3r2 for Cloud Mask
<sat>	→	Satellite ID: j01, j02 (L1B data), n21 (product data), or npp
<yyyymmddHHMMSSs>	→	Timestamp with day/time to the nearest tenth of a second
<yyyyjjj>	→	Year and day of year
<YYYYMMDD>	→	Date with year/month/day

<HHMMSSs>	→	Time to the nearest tenth of a second
<YYMMDD>	→	Date with two-digit year
<SVMxx>	→	L1B Channel ID, where xx is 01-11 or 15

Table 2-2 lists the input data required to execute the LSA Offline science algorithm's processing and the source of each input.

Table 2-2 - LSA Offline Input Data

Source	File Name
LSA	SURFALB_<version>_<sat>_s<yyyymmddHHMMSSs>_e<yyyymmddHHMMSSs>_c<yyyymmddHHMMSSs>.nc

Where:

<version>	→	Product file version, currently v2r2 for LSA and v3r2 for Cloud Mask
<sat>	→	Satellite ID: j01, j02 (L1B data), n21 (product data), or npp
<yyyymmddHHMMSSs>	→	Timestamp with day/time to the nearest tenth of a second

2.3. Ancillary Data Files

The Online LSA requires a snow mask input file. The preferred snow mask is IMS/SSMI Snow Mask. If this is not available, the executable can generate NWP Snow Mask from SVM15, GFS, and CMC SST data. If IMS/SSMI Snow Mask is used, data from the same day as the granule is preferred, but data from the previous day is acceptable. If the files needed for NWP Snow Mask are also provided, they will be ignored.

If NWP Snow Mask is generated, SVM15 and GFS are required; CMC SST is not required but will result in a degraded product if missing. Two GFS files are needed with specific forecast and model times; see the appendix for the description of which files are needed. The CMC SST file that is provided should be the most recently available file within the past 7 days.

Table 2-3 - LSA Ancillary Data File Naming Conventions

File	Naming Convention
IMS/SSMI Snow Mask	snow_map_4km_<YYMMDD>.nc
GFS	gfs.t<hh>z.pgrb2.0p25.f<fff>.<YYYYMMDD>
CMC SST	<YYYYMMDD>120000-CMC-L4_GHRSST-SSTfnd-CMC0.1deg-GLOB-v02.0-fv03.0
LSA Primary Tile*	<tilesat>_VIIRS_LSA_<yyyyjjj>_<hxxvxx>.nc
LSA Filtered Tile*	<tilesat>_VIIRS_LSA_<hxxvxx>_<yyyyjjj>_FLT.nc

Where:

<YYYYMMDD>	→	Date with year/month/day
<YYMMDD>	→	Date with two-digit year
<hh>	→	GFS model run hour
<fff>	→	GFS forecast hour
<tilesat>	→	Satellite name: NOAA20, NOAA21, or NPP
<yyyyjjj>	→	Year and day of year
<hxxvxx>	→	Tile grid ID, where xx are two digit numbers

*The filtered Offline LSA tiles products are technically ancillary data for the LSA Online component, which is generated from the Offline component using the previous day's LSA as inputs.

2.3.1. Static Ancillary Data

The static ancillary data needed for this unit are located in the following directories:

- DATA/ancillary_data/algorithm_ancillary
- DATA/ancillary_data/framework_ancillary

2.3.2. Other Required Inputs

There must be at least one YAML file present in the algorithm package that contains information concerning the setup of the Docker run command. For convenience, all items in the file that have a possibility of variation or are system specific will be located at the top of the YAML file as anchors.

3. Performance

3.1. Product Testing

3.1.1. Test Data Description

Test cases will be provided with each delivery of the processing system to ensure product verification can occur before the system becomes operational. Each test case will provide satellite input data, static ancillary data, dynamic ancillary data, and any additional resulting product datasets. All requirements listed in the Requirements Allocation Document (RAD) associated with each science algorithm within the processing system must be met during testing. Once end users of the products are satisfied that all requirements have been sufficiently met, the products will be transitioned into operations.

3.1.2. Unit Test Plans

Testing of the algorithm package's products occur with each update to the algorithm package. The science teams, who develop these products, test them for accuracy and validation. The STAR group tests the algorithm and scripts to ensure that requirements are met. Then, operations must test these products to make sure that they run successfully on their systems. If there are problems in any one of these testing procedures, then the relevant groups must work together to "iron-out" any issues.

3.2. Product Accuracy

3.2.1. Test Results

The Algorithm Theoretical Basis Document (ATBD) associated with the Land Surface Albedo algorithms contain the results of the science team's algorithm validation tests. Please note that each science algorithm will have its own separate ATBD.

3.2.2. Product Accuracy

All Land Surface Albedo products are validated against observations to ensure they meet accuracy and precision specifications. For more information concerning any product's accuracy, please contact the appropriate Product Area Lead (PAL) at STAR.

3.3. Product Quality Output

The retrieval process of albedo will be monitored and the retrieval quality will be assessed. A set of quality flags and metadata will be generated with the albedo product for retrieval diagnostics. These flags will indicate the retrieval conditions as well as the data quality. The QC flag is located within the Online LSA output file as the variable ProductQualityInformation.

Quality flags are expected to be zero, which means no error. Each failure is associated with a unique "flag" value that is saved in the LSA output files. The output files have a number of failure codes. Table 3-1 describes the control codes of the quality flags for the products.

Table 3-1 - LSA Product Quality Information QC Variable

byte	bit	Flag description	Meaning
0	0-1	Overall quality of product	00=high quality retrieval, 01=retrieval, 10=no retrieval
	2-3	Cloud condition	00=confidently clear, 01=probably clear, 10=probably cloudy, 11=confidently cloudy
	4	SDR quality	0=normal, 1=bad data (VIIRS bad, missing, or not calibrated) (GOES bad, missing, or out of space)
	5	Solar zenith angle flag	0=favorable SZA, 1=SZA larger than 60 deg
	6	View zenith angle flag	0=favorable VZA, 1=VZA larger than 60 deg
	7	Spare	
1	0-2	Retrieval path	000=generic, 001=desert, 010=snow, 011=sea ice, 100=no retrieval
	3-4	Temporal filter quality flag	00=high-quality retrieval, 01=degraded retrieval, 10=no retrieval
	5	Online filter flag	0=non-filtered, 1=filtered

byte	bit	Flag description	Meaning
	6-7	Spare	

3.4. External Product Tools

There are no external product tools supplied with the package. External users can choose their own tools to display and analyze the NetCDF output files.

3.5. Output Files

LSA final products are available on PDA for user subscription. The data retention time on PDA is the standard 7 days.

3.5.1. Product Monitoring and Visualization

Product quality is monitored using the NCCF Product Monitoring Tool at https://nccf.espc.nesdis.noaa.gov/mtool/index.html.

Users can use this page to monitor summaries of the LSA quality based on parameter thresholds determined by the PAL.

The NCCF Products Visualization Page is located at https://origin-east-01-www-ospo.woc.noaa.gov/products/land/lsa/.

LSA products are generated daily.

4. Product Status

4.1. Operations Documentation

NESDIS/STAR (2023), The JRR Land Surface Albedo System Maintenance Manual

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NESDIS/STAR (2022), The NOAA JPSS Risk Reduction (JPSSRR) System - System Maintenance Manual (SMM) v3.1

NESDIS/STAR (2014), JPSS Risk Reduction: Uniform Multi-Sensor Cloud Algorithms for Consistent Products Unit Test Readiness Review

NESDIS/STAR (2012), JPSS Risk Reduction: Requirements Allocation Document

NESDIS/STAR (2013), JPSS Risk Reduction: Uniform Multi-Sensor Cloud Algorithm for Consistent Products Critical Design Review

NESDIS/STAR (2020), GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Surface Albedo

4.2. Maintenance History

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5. Acronyms

Acronym	Definition
ABI	Advanced Baseline Imager
ASSISTT	Algorithm Scientific Software Integration and System Transition Team
ATBD	Algorithm Theoretical Basis Document
AVHRR	Advanced Very High-Resolution Radiometer
DMSP	Defense Meteorological Satellite Program
DNB	Day-Night Band
DOC	Department of Commerce
ERT	Earth Resources Technology, Inc.
ESPC	Environmental Satellite Processing Center
EUM	External Users' Manual
GFS	Global Forecast System
GOES	Geostationary Operational Environmental Satellite
IMS	Interactive Multisensor Snow and Ice Mapping System
IP	Intermediate Product
JPSS	Joint Polar Satellite System
JPSSRR	JPSS Risk Reduction
JRR	JPSS Risk Reduction
LSA	Land Surface Albedo
MODIS	Moderate Resolution Imaging Spectroradiometer
NCCF	NESDIS Common Cloud Framework
NCEI	National Centers for Environmental Information
NESDIS	National Environmental Satellite, Data, and Information Service
NetCDF	Network Common Data Form
NOAA	National Oceanic and Atmospheric Administration
NWP	Numerical Weather Prediction
OCS	Office of Common Services
OLS	Operational Linescan System
OMS	Operations, Maintenance, and Sustainment
OSPO	Office of Satellite and Product Operations
PAL	Product Area Lead
PDA	Product Distribution and Access
PIB	Product Implementation Branch
PPM	Project Portfolio Management
QA	Quality Assurance
QC	Quality Control
R2O	Research to Operations
RAD	Requirements Allocation Document
SA	Science Algorithm
SDR	Science Data Record
SDR	Sensor Data Record
SMM	System Maintenance Manual
S-NPP	Suomi National Polar-orbiting Partnership
SSMI	Special Sensor Microwave Imager
SST	Sea Surface Temperature
STAR	Center for Satellite Applications and Research
SVM	Support Vector Machines
TOA	Top of Atmosphere
V&V	Verification and Validation

Acronym	Definition
VIIRS	Visible Infrared Imaging Radiometer Suite