

OMPSNADIR Science Processing Algorithm (OMPSNADIR_SPA) User's Guide

Version 2.7.1

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**GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND**

OMPSNADIR Science Processing Algorithm

OMPSNADIR_SPA

General

The NASA Goddard Space Flight Center's (GSFC) Direct Readout Laboratory (DRL) developed this software for the International Planetary Observation Processing Package (IPOPP). IPOPP maximizes the utility of Earth science data for making real-time decisions by giving fast access to instrument data and derivative products from the NOAA-20, NOAA-21 [Joint Polar Satellite System 1 (JPSS-1) and JPSS-2], Suomi National Polar-orbiting Partnership (SNPP), Aqua, and Terra missions.

Users must agree to all terms and conditions in the Software Usage Agreement on the DRL Web Portal before downloading this software.

Software and documentation published on the DRL Web Portal may occasionally be updated or modified. The most current versions of DRL software are available at the DRL Web Portal:

<https://directreadout.sci.gsfc.nasa.gov/?id=software>

Questions relating to the contents or status of this software and its documentation should be addressed to the DRL via the Contact DRL mechanism at the DRL Web Portal:

<https://directreadout.sci.gsfc.nasa.gov/?id=dspContent&cid=66>

Algorithm Wrapper Concept

The DRL has developed an algorithm wrapper to provide a common command and execution interface to encapsulate multi-discipline, multi-mission science processing algorithms. The wrapper also provides a structured, standardized technique for packaging new or updated algorithms with minimal effort.

A Science Processing Algorithm (SPA) is defined as a wrapper and its contained algorithm. SPAs will function within IPOPP to serve the needs of the broad Direct Readout community. Detailed information about SPAs and other DRL technologies is available at the DRL Web Portal.

Software Description

The OMPSNADIR_SPA software package processes Suomi National Polar-orbiting Partnership (SNPP), NOAA-20 (JPSS-1) and NOAA-21 (JPSS-2) Ozone Mapping and Profiler Suite (OMPS) Level 0 Production Data Set (PDS) files into Level 1A (L1A), Level 1B (L1B) and Level 2 (L2) data and imagery products.

The L1B data products provide geolocated and calibrated radiances from the OMPS Nadir Mapper (NM) and Nadir Profiler (NP) instruments. The L2 products include an Ozone and a Sulfur Dioxide (SO₂) product. The L2 Ozone product provides total column ozone and aerosol index retrievals from normalized Nadir Mapper radiance measurements. The L2 SO₂ product provides volcanic and anthropogenic Sulfur Dioxide (SO₂) retrievals from NM instrument

measurements. Processed using the GSFC Principal Component Analysis (PCA) trace gas retrieval algorithm, the SO₂ product offers great consistency with the NASA standard Aura/Ozone Monitoring Instrument (OMI) SO₂ product that also uses the same PCA algorithm. The PCA-based SO₂ product provides continuity between OMI and the follow-up OMPS instrument on board the NOAA-20 and NOAA-21 satellites.

The SPA functions as an IPOPP plug-in (IPOPP v5.0 with Patch 1 required).

Software Version

Version 2.1 of the DRL algorithm wrapper was used to package the SPA described in this document. The SPA includes SNPP OMPSnadir algorithm version 2.7.1, NOAA-20 OMPSnadir algorithm version 0.9.0 and NOAA-21 algorithm version 1.0.0.

Enhancements to this SPA include:

- Incorporation of the OMPSnadir NOAA-21 algorithm (version 1.0.0) to add support for processing NOAA-21 OMPS data.

This software will execute on a 64-bit computer. This software has been tested on a computer with 32GB of RAM and an Ubuntu 20.04.5 LTS operating system.

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Credits

The OMPSnadir algorithm was provided to the DRL by the Ozone Science Investigator-led Processing System (OSIPS).

Prerequisites

This package contains 64-bit binaries statically pre-compiled on an x86-compatible 64-bit computer running under CentOS 7, using gcc 4.8.5.

NOTE: This SPA may fail to produce outputs if installed into an IPOPP processing framework hosted on an older Central Processing Unit (CPU) (e.g., Opteron AMD with Piledriver architecture), resulting in the error message:

Program received signal SIGILL: Illegal instruction.

The time zone of the underlying Linux installation must be set to UTC. This is in line with IPOPP requirements (refer to IPOPP User's Guide, Appendix A: System Requirements). Check this setting using the `timedatectl` command:

```
$ timedatectl
```

```
Local time: Tue 2021-10-12 18:15:35 UTC
Universal time: Tue 2021-10-12 18:15:35 UTC
RTC time: Tue 2021-10-12 18:15:35
```

Time zone: Etc/UTC (UTC, +0000)
 NTP enabled: yes
 NTP synchronized: yes
 RTC in local TZ: no
 DST active: n/a

If it is not set to UTC use the following command as root on Ubuntu to set it to UTC:
 \$ timedatectl set-timezone UTC

Program Inputs and Outputs

The SNPP OMPSnadir algorithm takes the following as input:

- SNPP Spacecraft APID 0008 construction record (filename P1570008*0.PDS)
- SNPP Spacecraft APID 0011 construction record (filename P1570011*0.PDS)
- SNPP Spacecraft APID 0008 packet file (filename P1570008*1.PDS)
- SNPP Spacecraft APID 0011 packet file (filename P1570011*1.PDS)
- SNPP OMPS APID 0560 construction record (filename P1570560*0.PDS)
- SNPP OMPS APID 0561 construction record (filename P1570561*0.PDS)
- SNPP OMPS APID 0560 packet file (filename P1570560*1.PDS)
- SNPP OMPS APID 0561 packet file (filename P1570561*1.PDS)
- SNPP OMPS Nadir Mapper (NM) DRK LUT (filename OMPS-NPP_NM-DRK*.h5)
- SNPP OMPS Nadir Profiler (NP) DRK LUT (filename OMPS-NPP_NP-DRK*.h5)
- leapsec ancillary file
- utcpole ancillary file

and produces the following output products:

Description	Output Description	Format
SNPP OMPS Nadir Mapper (NM) Earth View (EV) L1A (OMPS-NPP_NMEV_L1A)	Refer to documents under algorithm/docs	
SNPP OMPS Nadir Mapper (NM) Earth View (EV) L1B HDF5 (OMPS-NPP_NMEV_L1B)		
SNPP OMPS Nadir Mapper (NM) Total Column Ozone (TO3) L2 HDF5 (OMPS-NPP_NMTO3-L2)		
SNPP OMPS Nadir Mapper (NM) Total SO ₂ L2 HDF5 (OMPS_NPP_NMSO2_PCA_L2)		
SNPP OMPS Nadir Profiler (NP) Earth View (EV) L1A HDF5 (OMPS-NPP_NPEV_L1A)		
SNPP OMPS Nadir Profiler (NP) Earth View (EV) L1B HDF5 (OMPS-NPP_NPEV_L1B)		

SNPP PNG image for Ozone	
SNPP PNG image for Reflectivity at 331nm	
SNPP PNG image for Ultraviolet Aerosol	

The NOAA-20 OMPSnadir algorithm takes the following as input:

- NOAA-20 Spacecraft APID 0000 construction record (filename P1590000*0.PDS)
- NOAA-20 Spacecraft APID 0008 construction record (filename P1590008*0.PDS)
- NOAA-20 Spacecraft APID 0011 construction record (filename P1590011*0.PDS)
- NOAA-20 Spacecraft APID 0000 packet file (filename P1590000*1.PDS)
- NOAA-20 Spacecraft APID 0008 packet file (filename P1590008*1.PDS)
- NOAA-20 Spacecraft APID 0011 packet file (filename P1590011*1.PDS)
- NOAA-20 OMPS APID 0616 construction record (filename P1590616*0.PDS)
- NOAA-20 OMPS APID 0617 construction record (filename P1590617*0.PDS)
- NOAA-20 OMPS APID 0616 packet file (filename P1590616*1.PDS)
- NOAA-20 OMPS APID 0617 packet file (filename P1590617*1.PDS)
- NOAA-20 OMPS Nadir Mapper (NM) DRK LUT (filename OMPS-N20_NM-DRK*.h5)
- NOAA-20 OMPS Nadir Profile (NP) DRK LUT (filename OMPS-N20_NP-DRK*.h5)
- leapsec ancillary file
- utcpole ancillary file

and produces the following output products:

Description	Output Description	Format
NOAA-20 OMPS Nadir Mapper (NM) Earth View (EV) L1A (OMPS-N20_NMEV_L1A) HDF5	Refer to documents under algorithm/docs	
NOAA-20 OMPS Nadir Mapper (NM) Earth View (EV) L1B (OMPS-N20_NMEV_L1B) HDF5		
NOAA-20 OMPS Nadir Mapper (NM) Total Column Ozone (TO3) L2 (OMPS-N20_NMTO3-L2) HDF5		
NOAA-20 OMPS Nadir Mapper (NM) Total SO ₂ L2 (OMPS_N20_NMSO2_PCA_L2) HDF5		
NOAA-20 OMPS Nadir Profiler (NP) Earth View (EV) L1A (OMPS-N20_NPEV_L1A) HDF5		
NOAA-20 OMPS Nadir Profiler (NP) Earth View (EV) L1B (OMPS-N20_NPEV_L1B) HDF5		
NOAA-20 PNG image for Ozone		

NOAA-20 PNG image for Reflectivity at 331nm	
NOAA-20 PNG image for Ultraviolet Aerosol	

The NOAA-21 OMPSnadir algorithm takes the following as input:

- NOAA-21 Spacecraft APID 0037 construction record (filename P1590037*0.PDS)
- NOAA-21 Spacecraft APID 0030 construction record (filename P1590030*0.PDS)
- NOAA-21 Spacecraft APID 0011 construction record (filename P1590011*0.PDS)
- NOAA-21 Spacecraft APID 0037 packet file (filename P1590037*1.PDS)
- NOAA-21 Spacecraft APID 0030 packet file (filename P1590030*1.PDS)
- NOAA-21 Spacecraft APID 0011 packet file (filename P1590011*1.PDS)
- NOAA-21 OMPS APID 0608 construction record (filename P1590608*0.PDS)
- NOAA-21 OMPS APID 0608 packet file (filename P1590608*1.PDS)
- NOAA-21 OMPS Nadir Mapper (NM) DRK LUT (filename OMPS-N21_NM-DRK*.h5)
- NOAA-21 OMPS Nadir Profile (NP) DRK LUT (filename OMPS-N21_NP-DRK*.h5)
- leapsec ancillary file
- utcpole ancillary file

and produces the following output products:

Description	Output Description	Format
NOAA-21 Spacecraft Diary L1A (OMPS-N21_L1A-DIARY) HDF5	Refer to documents under algorithm/docs	
NOAA-21 OMPS Nadir Mapper (NM) Earth View (EV) L1A (OMPS-N21_NMEV_L1A) HDF5		
NOAA-21 OMPS Nadir Mapper (NM) Earth View (EV) L1B (OMPS-N21_NMEV_L1B) HDF5		
NOAA-21 OMPS Nadir Mapper (NM) Total Column Ozone (TO3) L2 (OMPS-N21_NMTO3-L2) HDF5		
NOAA-21 OMPS Nadir Mapper (NM) Total SO ₂ L2 (OMPS_N21_NMSO2_PCA_L2) HDF5		
NOAA-21 PNG image for Ozone		
NOAA-21 PNG image for Reflectivity at 331nm		
NOAA-21 PNG image for Ultraviolet Aerosol		

The SPA also includes the capability to produce the following geotiff imagery from the mission-specific Total Column Ozone and Total SO₂ Level 2 data products.

Description	Output Description	Format
SNPP OMPS Ultraviolet Aerosol Index geotiff	Legends for the geotiff imagery are under algorithm/DRL_scripts/	
SNPP OMPS Middle Troposphere SO ₂ geotiff		
SNPP OMPS Total Ozone geotiff		
SNPP OMPS Reflectivity at 331nm geotiff		
NOAA-20 OMPS Ultraviolet Aerosol Index geotiff		
NOAA-20 OMPS Middle Troposphere SO ₂ geotiff		
NOAA-20 OMPS Total Ozone geotiff		
NOAA-20 OMPS Reflectivity at 331nm geotiff		
NOAA-21 OMPS Ultraviolet Aerosol Index geotiff		
NOAA-21 OMPS Middle Troposphere SO ₂ geotiff		
NOAA-21 OMPS Total Ozone geotiff		
NOAA-21 OMPS Reflectivity at 331nm geotiff		

NOTE: This version of the NOAA-21 OMPSnadir algorithm produces night-time products when required input PDSs are available. However, OMPSnadir is a daytime algorithm and users should disregard night-time NOAA-21 products and corresponding imagery.

Installation and Configuration

SPAs will be automatically executed by the IPOPP processing framework. IPOPP will autonomously:

- discover and register raw sensor data;
- retrieve ancillaries from the DRL's real-time and archived ancillary repositories;
- register ancillaries in its Ancillary File Cache;
- schedule SPA executions;
- fulfill science data/ancillary requests from SPAs;
- generate science data products; and
- manage the IPOPP file system.

Installing into an IPOPP Framework:

This SPA can be installed dynamically into an IPOPP framework to automate production of OMPSnadir data and imagery products. The SPA installation process will install its SPA service(s) into IPOPP. An SPA service is an IPOPP agent that provides the mechanism necessary for running an SPA automatically within the IPOPP framework.

Download the OMPSNADIR_2.7.1_SPA_2.1.tar.gz. and follow the instructions as contained in the IPOPP User Guide (available on the DRL Web Portal) for installing an SPA.

Running the SPA in the IPOPP Framework: Once this SPA is installed, users must enable the SPA service(s) corresponding to this SPA along with any other prerequisite SPA service(s). Furthermore, users who wish to generate image products from the data products generated by this SPA will need to enable the downstream image-generating SPA services. Please refer to the IPOPP User Guide for instructions on how to enable the SPA services. Table 1 lists the SPA services available in this SPA. Table 2 and Table 3 lists the prerequisite and the image-generating SPA services respectively. The SPAs containing the prerequisite and the image-generating SPA services listed in Tables 2 and 3 can be downloaded from the DRL Web Portal, in case they are not already available in your IPOPP installation. Details about these other SPAs are available in the respective SPA User Guides.

Table 1. SPA Services

SNPP SPA Services and Data Products		
SPA Services	Data Products Produced	
OMPSnadir-normal (SNPP-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Nadir Mapper (NM) Earth View (EV) L1A (OMPS-NPP_NMEV_L1A)	gsfcddata/npp/omps/level1/OMPS-NPP-NMEV-L1A_v2.0_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Earth View (EV) L1B (OMPS-NPP_NMEV_L1B)	gsfcddata/npp/omps/level1/OMPS-NPP-NMEV-L1B-p000_v2.0_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Total Column Ozone (TO3) L2 (OMPS-NPP_NMTO3-L2)	gsfcddata/npp/omps/level2/OMPS-NPP_NMTO3-L2_v2.1_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Total SO ₂ L2 (OMPS_NPP_NMSO2_PCA_L2)	gsfcddata/npp/omps/level2/OMPS-NPP-NMSO2-PCA-L2_v1.1_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Profiler (NP) Earth View (EV) L1A (OMPS-NPP_NPEV_L1A)	gsfcddata/npp/omps/level1/OMPS-NPP-NPEV-L1A_v2.0_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Profiler (NP) Earth View (EV) L1B (OMPS-NPP_NPEV_L1B)	gsfcddata/npp/omps/level1/OMPS-NPP-NPEV-L1B-p000_v2.0_starttime_orbit_creationtime.h5 ¹
	Total Column Ozone PNG	gsfcddata/npp/omps/level2/OMPS-NPP_NMTO3-L2-Ozone-Image_v2.1-starttime-orbit-creationtime.png ¹
	Reflectivity at 331nm PNG	gsfcddata/npp/omps/level2/OMPS-NPP_NMTO3-L2-Reflectivity331-Image_v2.1_starttime-orbit-

		creationtime.png ¹
	UV aerosol PNG	gsfcddata/npp/omps/level2/OMPS-NPP_NMTO3-L2-UVaerosolIndex-Image_v2.1_starttime-oorbit-creationtime.png ¹
so2-geotiff (SNPP-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Middle Troposphere SO ₂ geotiff	gsfcddata/npp/omps/level2/SNPP_NMSO2-PCA-L2.dyddyMMdd_tHHmmssS_eHHmmssS.SO2-TRM.tif ²
aot-geotiff (SNPP-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Ultraviolet Aerosol Index geotiff	gsfcddata/npp/omps/level2/SNPP_NMTO3-L2.dyddyMMdd_tHHmmssS_eHHmmssS.UV-AEROSOL.tif ²
tozone-geotiff (SNPP-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Total Ozone geotiff	gsfcddata/npp/omps/level2/SNPP_NMTO3-L2.dyddyMMdd_tHHmmssS_eHHmmssS.OZONE.tif ²
refl331-geotiff (SNPP-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Reflectivity at 331nm geotiff	gsfcddata/npp/omps/level2/SNPP_NMTO3-L2.dyddyMMdd_tHHmmssS_eHHmmssS.REFL331.tif ²
NOAA-20 SPA Services and Data Products		
SPA Services	Data Products Produced	
OMPSnadir (JPSS-1-VIIRS tab)	OMPS Nadir Mapper (NM) Earth View (EV) L1A (OMPS-N20_NMEV_L1A)	gsfcddata/jpss1/omps/level1/OMPS-N20-NMEV-L1A_v0.0_starttime_oorbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Earth View (EV) L1B (OMPS-N20_NMEV_L1B)	gsfcddata/jpss1/omps/level1/OMPS-N20-NMEV-L1B-p000_v1.3_starttime_oorbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Total Column Ozone (TO3) L2 (OMPS-N20_NMTO3-L2)	gsfcddata/jpss1/omps/level2/OMPS-N20_NMTO3-L2_v1.3_starttime_oorbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Total SO ₂ L2 (OMPS_N20_NMSO2_PCA_L2)	gsfcddata/jpss1/omps/level2/OMPS-N20-NMSO2-PCA-L2_v0.1_starttime_oorbit_creationtime.h5 ¹
	OMPS Nadir Profiler (NP) Earth View (EV) L1A (OMPS-N20_NPEV_L1A)	gsfcddata/jpss1/omps/level1/OMPS-N20-NPEV-L1A_v0.0_starttime_oorbit_creationtime.h5 ¹
	OMPS Nadir Profiler (NP) Earth	gsfcddata/jpss1/omps/level1/OMPS-N20-

	View (EV) L1B (OMPS-N20_NPEV_L1B)	NPEV-L1B- p000_v1.3_starttime_orbit_creationtime.h5 ¹
	Total Column Ozone PNG	gsfcddata/jpss1/omps/level2/OMPS- N20_NMTO3-L2-Ozone-Image_v1.3- starttime-orbit-creationtime.png ¹
	Reflectivity at 331nm PNG	gsfcddata/jpss1/omps/level2/OMPS- N20_NMTO3-L2-Reflectivity331- Image_v1.3_starttime-orbit- creationtime.png ¹
	UV aerosol PNG	gsfcddata/jpss1/omps/level2/OMPS- N20_NMTO3-L2-UVAerosolIndex- Image_v1,3_starttime-orbit- creationtime.png ¹
so2-geotiff (JPSS-1-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Middle Troposphere SO ₂ geotiff	gsfcddata/jpss1/omps/level2/JPSS1_NMSO2- PCA-L2. dyyyyMMdd_tHHmmssS_eHHmmssS.SO2- TRM.tif ²
aot-geotiff (JPSS-1-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Ultraviolet Aerosol Index geotiff	gsfcddata/jpss1/omps/level2/JPSS1_NMTO3- L2.dyyyMMdd_tHHmmssS_eHHmmssS.UV- AEROSOL.tif ²
tozone-geotiff (JPSS-1-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Total Ozone geotiff	gsfcddata/jpss1/omps/level2/JPSS1_NMTO3- L2.dyyyMMdd_tHHmmssS_eHHmmssS.OZONE.tif ²
refl331-geotiff (JPSS-1-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	Reflectivity at 331nm geotiff	gsfcddata/jpss1/omps/level2/JPSS1_NMTO3- L2.dyyyMMdd_tHHmmssS_eHHmmssS.REFL331.tif ²
NOAA-21 SPA Services and Data Products		
SPA Services	Data Products Produced	
OMPSnadir (JPSS-2-VIIRS tab)	Spacecraft Diary L1A (OMPS-N21_L1A-DIARY)	gsfcddata/jpss2/omps/level1/OMPS-N21_L1A- DIARY_v0.0_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Earth View (EV) L1A (OMPS-N21_NMEV_L1A)	gsfcddata/jpss2/omps/level1/OMPS-N21- NMEV- L1A_v0.0_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Earth View (EV) L1B (OMPS-N21_NMEV_L1B)	gsfcddata/jpss2/omps/level1/OMPS-N21- NMEV-L1B- p002_v2.0_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Total Column Ozone (TO3) L2	gsfcddata/jpss2/omps/level2/OMPS- N21_NMTO3-

	(OMPS-N21_NMTO3-L2)	L2_v2.0_starttime_orbit_creationtime.h5 ¹
	OMPS Nadir Mapper (NM) Total SO ₂ L2 (OMPS_N21_NMSO2_PCA_L2)	gsfcddata/jpss2/omps/level2/OMPS-N21-NMSO2-PCA-L2_v0.1_starttime_orbit_creationtime.h5 ¹
	Total Column Ozone PNG	gsfcddata/jpss2/omps/level2/OMPS-N21_NMTO3-L2-Ozone-Image_v2.0-starttime-orbit-creationtime.png ¹
	Reflectivity at 331nm PNG	gsfcddata/jpss2/omps/level2/OMPS-N21_NMTO3-L2-Reflectivity331-Image_v2.0_starttime-orbit-creationtime.png ¹
	UV aerosol PNG	gsfcddata/jpss2/omps/level2/OMPS-N21_NMTO3-L2-UVAerosolIndex-Image_v2.0_starttime-orbit-creationtime.png ¹
so2-geotiff (JPSS-2-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Middle Troposphere SO ₂ geotiff	gsfcddata/jpss2/omps/level2/JPSS2_NMSO2-PCA-L2.dyymmmMMdd_tHHmmssS_eHHmmssS.SO2-TRM.tif ²
aot-geotiff (JPSS-2-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Ultraviolet Aerosol Index geotiff	gsfcddata/jpss2/omps/level2/JPSS2_NMTO3-L2.dyymmmMMdd_tHHmmssS_eHHmmssS.UV-AEROSOL.tif ²
tozone-geotiff (JPSS-2-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	OMPS Total Ozone geotiff	gsfcddata/jpss2/omps/level2/JPSS2_NMTO3-L2.dyymmmMMdd_tHHmmssS_eHHmmssS.OZONE.tif ²
refl331-geotiff (JPSS-2-VIIRS tab)	Product Name	Destination (from \$HOME/drl/data/pub)
	Reflectivity at 331nm geotiff	gsfcddata/jpss2/omps/level2/JPSS2_NMTO3-L2.dyymmmMMdd_tHHmmssS_eHHmmssS.REFL331.tif ²

¹*starttime* is a time stamp for the start of swath. *creationtime* is a time stamp for when the product was created. They are formatted as *yyyyMMddtHHmmss*, where *yyyy* is the year, *MMdd* are the month and day, and *HHmmss* are the hour, minute and second. *orbit* is the orbit number, formatted as five digits. The orbit field is not currently used in IPOPP and is set to 00001.

²*yyyyMMdd* is the start date of the swath, where *yyyy* is the year, *MM*, *dd* are the month and day. The first *HHmmssS* is the start time of the swath and the second *HHmmssS* is the end time of the swath, where *HH*, *mm*, *ss*, *S* are the hour, minute, second and tenth of a second respectively.

Table 2. Prerequisite SPA services

Prerequisite SPA services	SPA in which they are available
None. (Use IPOPP to ingest SNPP, NOAA-20, and NOAA-21 OMPS and Spacecraft PDS files. Refer to the IPOPP User's Guide. The Real-time Software Telemetry Processing System [RT-STPS], v7.0 or later, can be used to create OMPS and Spacecraft PDS files.)	N/A

Table 3. Image-generating SPA services

Image-generating services	SPA in which they are available
N/A	N/A