L2GEN Science Processing Algorithm (L2GEN_SPA) User's Guide

Version 9.3.0

August 2018

GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

L2GEN Science Processing Algorithm

L2GEN_SPA

General

The NASA Goddard Space Flight Center's (GSFC) Direct Readout Laboratory (DRL), Code 606.3 developed this software for the International Polar Orbiter 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 Joint Polar Satellite System (JPSS), 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 in a standalone, cross-platform environment 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

This software package contains the L2GEN_SPA. The L2GEN algorithm was extracted from the Ocean Biology Processing Group's (OBPG) SeaWiFS Data Analysis System (SeaDAS). This SPA produces Moderate Resolution Imaging Spectroradiometer (MODIS) Level 2 Ocean Color (daytime product, includes Chlorophyll-a [CHLOR_A] concentration) and Sea Surface Temperature (SST) products from inputs of MODIS Level 1B 1km (MOD021KM/MYD021KM) products, MODIS Geolocation (MOD03/MYD03) products, and other optional ancillary files. This SPA also produces Visible Infrared Imaging Radiometer Suite (VIIRS) Ocean Color (daytime product, includes Chlorophyll-a [CHLOR_A] concentration) and Sea Surface Temperature (SST) products from inputs of VIIRS Sensor

Data Record (SDR) products, the VIIRS Moderate Resolution Terrain Corrected Geolocation product and optional ancillaries.

This implementation serves as a source of scientific algorithms for the MODIS and VIIRS SST and Ocean Color products only. For more information on the complete SeaDAS Processing Package, you may refer to the OBPG's site located at:
https://seadas.gsfc.nasa.gov/

The L2GEN_SPA functions in two modes: Standalone, or as an IPOPP plug-in.

Software Version

Version 1.6 of the DRL algorithm wrapper was used to package the SPA described in this document. The SPA uses the L2GEN (Version 9.3.0) processing code embedded within the SeaDAS (Version 7.5) to generate MODIS and VIIRS Ocean products. This SPA represents MODIS Collection 6.

Enhancements to this SPA include:

- update to version 9.3.0 of the OBPG l2gen algorithm;
- updated parameter files, test scripts, and test data;
- updated input file labels for VIIRS ancillaries (ncep_met_*, obpg.noaa_toast_*) to make them consistent with MODIS ancillary file labels;
- preliminary framework implementation for NOAA-20 (JPSS-1) VIIRS processing.

This software will execute on a 64-bit computer and has been tested on computers with 32GB of RAM and a CentOS Linux 7 X86_64 operating system.

Credits

SeaDAS and its component L2GEN algorithm were provided to the DRL by the OBPG at the NASA Goddard Space Flight Center.

Prerequisites

To run this package, you must have the Java Development Kit (JDK) or Java Runtime Engine (JRE) (Java 1.6.0_25 or higher) installed on your computer, and have the Java installation bin/ subdirectory in your PATH environment variable.

Program Inputs and Outputs

This SPA's MODIS processing component uses the MODIS 1km L1B Calibrated Geolocated Radiances (MOD021KM, MYD021KM) HDF product and the MODIS Geolocation HDF product (MOD03, MYD03), along with ancillary meteorology, ozone, sea ice and SST files as inputs. Outputs are the MODIS Level 2 SST and Ocean Color products.

This SPA's VIIRS processing component uses the VIIRS moderate resolution SDR products

(Bands M1-M16), the VIIRS Moderate Resolution Terrain Corrected Geolocation product, along with ancillary leapsec, meteorology, ozone, sea ice and SST files as inputs. Outputs are the VIIRS Level 2 Sea Surface Temperature and Ocean Color products.

Installation and Configuration

Installing as a Standalone Application:

Download the L2GEN_9.3.0_SPA_1.6.tar.gz and L2GEN_9.3.0_SPA_1.6_testdata.tar.gz (optional) files into the same directory.

Decompress and un-archive the L2GEN_9.3.0_SPA_1.6.tar.gz and L2GEN_9.3.0_SPA_1.6_testdata.tar.gz (optional) files:

```
$ tar –xzf L2GEN_9.3.0_SPA_1.6.tar.gz
$ tar –xzf L2GEN_9.3.0_SPA_1.6_testdata.tar.gz
```

This will create the following subdirectories:

- SPA
  - l2gen
    - algorithm
    - ancillary
    - station
    - testdata
    - testscripts
    - wrapper

Installing into an IPOPP Framework: This SPA can also be installed dynamically into an IPOPP framework to automate production of MODIS/VIIRS Sea Surface Temperature and Ocean Color Level 2 data 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. Once this SPA is installed, users must enable the SPA service(s) corresponding to this SPA along with any other prerequisite SPA service(s). Instructions for installing an SPA and enabling its services are contained in the IPOPP User's Guide (available on the DRL Web Portal). The SPA services associated with this SPA are listed in Appendix A.

Software Package Testing and Validation

The testscripts subdirectory contains test scripts that can be used to verify that your current installation of the SPA is working properly, as described below. Note that the optional L2GEN_9.3.0_SPA_1.6_testdata.tar.gz file is required to execute these testing procedures.

Step 1: cd into the testscripts directory.
Step 2: There are scripts in this directory corresponding to each supported spacecraft. Run the scripts one by one. For example, to run the MODIS Ocean Color algorithm for Aqua and Terra, use:

```
$ ./run_AQUA_chlor_a.sh
$ ./run_TERRA_chlor_a.sh
```

to run the MODIS Sea Surface Temperature algorithm for Aqua and Terra, use:

```
$ ./run_AQUA_sst.sh
$ ./run_TERRA_sst.sh
```

to run the SNPP VIIRS Ocean Color algorithm, use:

```
$ ./run_SNPP_l2gen_viirs-oc.sh
```

to run the SNPP VIIRS Sea Surface Temperature algorithm, use:

```
$ ./run_SNPP_l2gen_viirs-sst.sh
```

A successful execution usually requires 30 minutes or more for all four scripts, depending on the speed of your computer. If everything is working properly, the scripts will terminate with messages such as:

Output modis.chlor_a is /home/ipopp/drl/SPA/l2gen/testdata/output/CHLOR_A_aqua.hdf

Output modis.chlor_a is /home/ipopp/drl/SPA/l2gen/testdata/output/CHLOR_A_terra.hdf

Output modis.sst is /home/ipopp/drl/SPA/l2gen/testdata/output/SST_aqua.hdf

Output modis.sst is /home/ipopp/drl/SPA/l2gen/testdata/output/SST_terra.hdf

Output viirs.oc.hdf is /home/ipopp/drl/SPA/l2gen/testdata/output/VIIRS-OC_npp.hdf

Output viirs.sst.hdf is /home/ipopp/drl/SPA/l2gen/testdata/output/VIIRS-SST_npp.hdf

You can cd to the output directory to verify that the science products exist. Test output product(s) are available for comparison in the testdata/output directory. These test output product(s) were generated on a 64-bit PC architecture computer running CentOS 7. The output products serve as an indicator of expected program output. Use a comparison utility (such as hdiff) to compare your output product(s) to those provided in the testdata/output directory. Locally generated files may differ slightly from the provided output files because of differences in machine architecture or operating systems.

If there is a problem and the code terminates abnormally, the problem can be identified using the log files. Log files are automatically generated within the directory used for execution. They start with stdfile* and errfile*. Other log and intermediate files may be generated automatically within the directory used for execution. They are useful for traceability and debugging purposes. However it is strongly recommended that users clean up log files and intermediate files left behind in the run directory before initiating a fresh execution of the SPA. Intermediate files from a previous run may affect a successive run and produce ambiguous results. Please report any errors that cannot be fixed to the DRL.

Program Operation

In order to run the package using your own input data, you can either use the run scripts within the wrapper subdirectories, or modify the test scripts within the testscripts subdirectory.

To Use the Run Scripts

Identify the 'run' scripts: The wrapper directory within this package contains subdirectories for generating each of the four products (i.e., the MODIS Ocean Color, MODIS Sea Surface Temperature, VIIRS Ocean Color, and VIIRS Sea Surface Temperature products). The subdirectories each contain an executable called 'run'. Execute 'run' within the correct wrapper subdirectory to generate the corresponding product. For instance, the 'run' within wrapper/sst, wrapper/chlor_a, wrapper/l2gen_viirs-sst, and wrapper/l2gen_viirs-oc is used for creating the MODIS Sea Surface Temperature, MODIS Ocean Color, VIIRS Sea Surface Temperature, and VIIRS Ocean Color products respectively. Note that to execute 'run', you need to have java on your path.

Specify input parameters using <label value> pairs: To execute the 'run' scripts, you must supply the required input and output parameters. Input and output parameters are usually file paths or other values (e.g., a scan time parameter). Each parameter is specified on the command line by a <label value> pair. Labels are simply predefined names for parameters. Each label must be followed by its actual value. Each process has its own set of <label value> pairs that must be specified in order for it to execute. Some of these pairs are optional, meaning the process would still be able to execute even if that parameter is not supplied. The three types of <label value> pairs that the L2GEN_SPA uses are:

a) Input file label/values. These are input file paths. Values are absolute or relative paths to the corresponding input file.

b) Output file label/values. These are output files that are produced by the SPA. Values are absolute or relative paths of the files you want to generate.

c) Parameter label/values. These are parameters that need to be passed onto the SPA.

The following tables contain labels, and their descriptions, required by the L2GEN_SPA.

Input File Labels & Parameters (MODIS-exclusive)	Description	Source
modis.mxd021km	MODIS 1km L1B Calibrated Geolocated Radiances HDF file (MOD021KM, MYD021KM)	1. The MODISL1DB_SPA can be used to create this product. 2. Real time MODIS L1B products over the eastern US region are available from the DRL ftp site at: ftp://is.sci.gsfc.nasa.gov/gsfcdata/aqua/modis/level1/MYD021KM.YYDDDhhmmss.hdf (Aqua) ftp://is.sci.gsfc.nasa.gov/gsfcdata/terra/modis/level1/MOD021KM.YYDDDhhmmss.hdf (Terra) Where YY, DDD represents the year and day of year for the start of the swath; and hh, mm, ss represents the hour, minutes, seconds for the start of the swath. 3. MODIS L1B products for other locations and times are available for download at https://search.earthdata.nasa.gov/
modis.mxd03	MODIS Geolocation HDF file (MOD03, MYD03)	1. The MODISL1DB_SPA can be used to create this product. 2. Real time MODIS Geolocation products over the eastern US region are available from the DRL ftp site at: ftp://is.sci.gsfc.nasa.gov/gsfcdata/aqua/modis/level1/MYD03.YYDDDhhmmss.hdf (Aqua) ftp://is.sci.gsfc.nasa.gov/gsfcdata/terra/modis/level1/MOD03.YYDDDhhmmss.hdf (Terra) Where YY, DDD represents the year and day of year for the start of the swath; and hh, mm, ss represents the hour, minutes, seconds for the start of the swath. 3. MODIS Geolocation products for other locations and times are available for download at https://search.earthdata.nasa.gov/

Input File Labels & Parameters (MODIS-exclusive)	Description	Source
platform	Value can be either ‘aqua’ or ‘terra’ (all uppercase is fine too: ‘AQUA’ and ‘TERRA’). Indicates the spacecraft of the MODIS L1B and Geolocation files used as input.	

Input File Labels & Parameters (VIIRS-exclusive)	Description	Source
viirs.svmxx (where xx = 01 to 16)	VIIRS 750m M1-M16 band SDR HDF5 file path	1. The C-SDR_SPA can be used to create these products. 2. Real time VIIRS SDR products over the eastern US region are available from the DRL ftp site at: ftp://is.sci.gsfc.nasa.gov/gsfcdata/npp/viirs/level1/SVMXX_npp_dyyyymmdd_thhmmssS_ehhmmssS*.h5 (where XX = 01 to 16) Where yyyy, mm, dd represents the year, month, and day of month for the start of the swath; the first hh, mm, ss, S represents the hour, minutes, seconds, and 10th of a second for the start of the swath and the second hh, mm, ss, S represents the end time of the swath. 3. VIIRS SDR products for other locations and times are available for download at www.class.noaa.gov
viirs.gmtco	VIIRS 750m Terrain Corrected Geolocation HDF5 file path	1. The C-SDR_SPA can be used to create this product. 2. Real time VIIRS Geolocation products over the eastern US region are available from the DRL ftp site at: ftp://is.sci.gsfc.nasa.gov/gsfcdata/npp/viirs/level1/GMTCO_npp_dyyyymmdd_thhmmssS_ehhmmssS*.h5 (where XX = 01 to 16) Where yyyy, mm, dd represents the year, month, and day of month for the start of the swath; the first hh,

		mm, ss, S represents the hour, minutes, seconds, and 10th of a second for the start of the swath and the second hh, mm, ss, S represents the end time of the swath. 3. VIIRS Geolocation products for other locations and times are available for download at www.class.noaa.gov
leapsec (optional)	Leapsec ancillary file	DRL ftp site for leapsec files: ftp://is.sci.gsfc.nasa.gov/ancillary/temporal/leapsec.yyyymmddhh.dat Where yyyy, mm, dd, hh represents the year, month, day, and hour for the leapsec ancillary file.
platform (optional)	Value defaults to 'SNPP'. This indicates the spacecraft of the VIIRS files used as input. In the future, 'JPSS-1' will be fully supported as well.	

Input File Labels & Parameters (common to MODIS & VIIRS)	**Description**	**Source**
ncep_met_1 (optional)	Directory path and filename of the Near-Real Time (NRT) National Centers for Environmental Prediction (NCEP) meteorological ancillary data product available for the nearest time preceding the time of the input swath's first scan line.	For recent meteorological ancillary files: ftp://is.sci.gsfc.nasa.gov/ancillary/temporal/global/oceansmet/SyyyyDDDhh_NCEP.MET For archived meteorology ancillary files: ftp://is.sci.gsfc.nasa.gov/ArchivedAncillary/temporal/global/oceansmet/SyyyyDDDhh_NCEP.MET where yyyy, DDD, hh represents the year, day of year, and hour for the ancillary file.
ncep_met_2 (optional)	Directory path and filename of the NRT NCEP meteorological ancillary data product available following the time of the input swath's first scan line.	
ncep_met_3 (optional)	Directory path and filename of the NRT NCEP meteorological ancillary data product for the nearest time following the time of the input swath's last scan line.	
obpg.noaa_toast_1 (optional)	Directory path and filename of the climatological product or the NRT ozone ancillary data product available for the nearest	For recent ozone ancillary files: ftp://is.sci.gsfc.nasa.gov/ancillary/temporal/global/oceanstoast/SyyyyDDD00DDDhh_TOAST.OZONE

	time preceding the time of the input swath's first scan line. Ancillary ozone data can come from the Earth Probe Total Ozone Mapping Spectrometer (EPTOMS) or Total Ozone Analysis using SBUV/2 and TOVS (TOAST).	For archived ozone ancillary files: ftp://is.sci.gsfc.nasa.gov/ArchivedAncillary/temporal/global/oceanstoast/SyyyyDDD00DDDhh_TOAST.OZONE where yyyy, DDD, hh represents the year, day of year, and hour for the ancillary file.
opbg.noaa_toast_2 (optional)	Directory path and filename of the NRT ozone ancillary data product (EPTOMS or TOAST) available for the nearest time following the time of the input swath's first scan line.	
obpg.noaa_toast_3 (optional)	Directory path and filename of the NRT ozone ancillary data product (EPTOMS or TOAST) for the nearest time following the time of the input swath's last scan line.	
noaa_oisst (optional)	Directory path and filename of the weekly NOAA Optimum Interpolated SST (OISST) ancillary input for the nearest time prior to the time period corresponding to the input swath.	For recent OISST ancillary files: ftp://is.sci.gsfc.nasa.gov/ancillary/temporal/global/sst/oisst.yyyymmdd For archived OISST ancillary files: ftp://is.sci.gsfc.nasa.gov/ArchivedAncillary/temporal/global/sst/oisst.yyyymmdd where yyyy, mm, dd represents the year, month, and day of month for the ancillary file.
obpg_seaice (optional)	Directory path and filename of the daily NSIDC Sea Ice ancillary input for the nearest time prior to the period corresponding to the input swath.	For recent SEAICE ancillary files: ftp://is.sci.gsfc.nasa.gov/ancillary/temporal/global/oceansice/NyyyyDDD00_SEAICE_NSIDC_24h.hdf For archived SEAICE ancillary files: ftp://is.sci.gsfc.nasa.gov/ArchivedAncillary/temporal/global/oceansice/NyyyyDDD00_SEAICE_NSIDC_24h.hdf where yyyy, DDD represents the year and day of year for the ancillary file.

Output File Labels (MODIS-exclusive)	Description	Output Format Description
modis.chlor_a (only required for MODIS Ocean Color processing)	MODIS Ocean Color output HDF file path (Daytime only)	Please refer to https://oceancolor.gsfc.nasa.gov/docs/format/
modis.sst (only required for MODIS Sea Surface Temperature processing)	MODIS Sea Surface Temperature output HDF file path	
Output File Labels (VIIRS-exclusive)	**Description**	**Output Format Description**
viirs.oc.hdf (only required for VIIRS Ocean Color processing)	VIIRS Ocean Color output HDF file path (Daytime only)	Please refer to https://oceancolor.gsfc.nasa.gov/docs/format/
viirs.sst.hdf (only required for VIIRS Sea Surface Temperature processing)	VIIRS Sea Surface Temperature output HDF file path	

Execute the 'run': The following are examples of command lines to run the MODIS Ocean Color, MODIS Sea Surface Temperature, VIIRS Ocean Color, and VIIRS Sea Surface Temperature algorithms respectively from the testscripts directory. The examples are for Terra MODIS and SNPP VIIRS respectively:

```
$ ../wrapper/chlor_a/run \
modis.mxd021km ../testdata/input/MOD021KM.A2018154.1625.006.2018155045206.hdf \
modis.mxd03 ../testdata/input/MOD03.A2018154.1625.006.2018155044835.hdf \
modis.chlor_a ../testdata/output/CHLOR_A_terra.hdf \
platform terra \
ncep_met_1 ../testdata/input/S201815412_NCEP.MET \
obpg.noaa_toast_1 ../testdata/input/S20181540015423_TOAST.OZONE \
noaa_oisst ../testdata/input/oisst.20180530 \
obpg_seaice ../testdata/input/N201815400_SEAICE_NSIDC_24h.hdf


$ ../wrapper/sst/run \
modis.mxd021km ../testdata/input/MOD021KM.A2018154.1625.006.2018155045206.hdf \
modis.mxd03 ../testdata/input/MOD03.A2018154.1625.006.2018155044835.hdf \
modis.sst ../testdata/output/SST_terra.hdf \
```

platform terra \
ncep_met_1 ../testdata/input/S201815412_NCEP.MET \
obpg.noaa_toast_1 ../testdata/input/S20181540015423_TOAST.OZONE \
noaa_oisst ../testdata/input/oisst.20180530 \
obpg_seaice ../testdata/input/N201815400_SEAICE_NSIDC_24h.hdf

```
$../wrapper/l2gen_viirs-oc/run \
viirs.svm01 ../testdata/input/SVM01_npp_d20180603_t1905022_e1906264_b34198_c20180604194232009470_nobc_ops.h5 \
viirs.svm02 ../testdata/input/SVM02_npp_d20180603_t1905022_e1906264_b34198_c20180604194254379683_nobc_ops.h5 \
viirs.svm03 ../testdata/input/SVM03_npp_d20180603_t1905022_e1906264_b34198_c20180604194240508688_nobc_ops.h5 \
viirs.svm04 ../testdata/input/SVM04_npp_d20180603_t1905022_e1906264_b34198_c20180604194301896024_nobc_ops.h5 \
viirs.svm05 ../testdata/input/SVM05_npp_d20180603_t1905022_e1906264_b34198_c20180604194310765225_nobc_ops.h5 \
viirs.svm06 ../testdata/input/SVM06_npp_d20180603_t1905022_e1906264_b34198_c20180604194250573727_nobc_ops.h5 \
viirs.svm07 ../testdata/input/SVM07_npp_d20180603_t1905022_e1906264_b34198_c20180604194305576462_nobc_ops.h5 \
viirs.svm08 ../testdata/input/SVM08_npp_d20180603_t1905022_e1906264_b34198_c20180604194220344531_nobc_ops.h5 \
viirs.svm09 ../testdata/input/SVM09_npp_d20180603_t1905022_e1906264_b34198_c20180604194306617406_nobc_ops.h5 \
viirs.svm10 ../testdata/input/SVM10_npp_d20180603_t1905022_e1906264_b34198_c20180604194303987894_nobc_ops.h5 \
viirs.svm11 ../testdata/input/SVM11_npp_d20180603_t1905022_e1906264_b34198_c20180604194255097394_nobc_ops.h5 \
viirs.svm12 ../testdata/input/SVM12_npp_d20180603_t1905022_e1906264_b34198_c20180604194252672595_nobc_ops.h5 \
viirs.svm13 ../testdata/input/SVM13_npp_d20180603_t1905022_e1906264_b34198_c20180604194230475286_nobc_ops.h5 \
viirs.svm14 ../testdata/input/SVM14_npp_d20180603_t1905022_e1906264_b34198_c20180604194300667864_nobc_ops.h5 \
viirs.svm15 ../testdata/input/SVM15_npp_d20180603_t1905022_e1906264_b34198_c20180604194243413132_nobc_ops.h5 \
viirs.svm16 ../testdata/input/SVM16_npp_d20180603_t1905022_e1906264_b34198_c20180604194242911045_nobc_ops.h5 \
viirs.gmtco ../testdata/input/GMTCO_npp_d20180603_t1905022_e1906264_b34198_c20180604194312303534_nobc_ops.h5 \
viirs.oc.hdf ../testdata/output/VIIRS-OC_npp.hdf \
ncep_met_1 ../testdata/input/S201815418_NCEP.MET \
obpg.noaa_toast_1 ../testdata/input/S20181540015423_TOAST.OZONE \
noaa_oisst ../testdata/input/oisst.20180530 \
leapsec ../testdata/input/leapsec.2018060300.dat \
obpg_seaice ../testdata/input/N201815400_SEAICE_NSIDC_24h.hdf \
platform SNPP

$../wrapper/l2gen_viirs-sst/run \
viirs.svm01 ../testdata/input/SVM01_npp_d20180603_t1905022_e1906264_b34198_c20180604194232009470_nobc_ops.h5 \
viirs.svm02 ../testdata/input/SVM02_npp_d20180603_t1905022_e1906264_b34198_c20180604194254379683_nobc_ops.h5 \
viirs.svm03 ../testdata/input/SVM03_npp_d20180603_t1905022_e1906264_b34198_c20180604194240508688_nobc_ops.h5 \
viirs.svm04 ../testdata/input/SVM04_npp_d20180603_t1905022_e1906264_b34198_c20180604194301896024_nobc_ops.h5 \
viirs.svm05 ../testdata/input/SVM05_npp_d20180603_t1905022_e1906264_b34198_c20180604194310765225_nobc_ops.h5 \
viirs.svm06 ../testdata/input/SVM06_npp_d20180603_t1905022_e1906264_b34198_c20180604194250573727_nobc_ops.h5 \
viirs.svm07 ../testdata/input/SVM07_npp_d20180603_t1905022_e1906264_b34198_c20180604194305576462_nobc_ops.h5 \
viirs.svm08 ../testdata/input/SVM08_npp_d20180603_t1905022_e1906264_b34198_c20180604194220344531_nobc_ops.h5 \
viirs.svm09 ../testdata/input/SVM09_npp_d20180603_t1905022_e1906264_b34198_c20180604194306617406_nobc_ops.h5 \
viirs.svm10 ../testdata/input/SVM10_npp_d20180603_t1905022_e1906264_b34198_c20180604194303987894_nobc_ops.h5 \
viirs.svm11 ../testdata/input/SVM11_npp_d20180603_t1905022_e1906264_b34198_c20180604194255097394_nobc_ops.h5 \
viirs.svm12 ../testdata/input/SVM12_npp_d20180603_t1905022_e1906264_b34198_c20180604194252672595_nobc_ops.h5 \
viirs.svm13 ../testdata/input/SVM13_npp_d20180603_t1905022_e1906264_b34198_c20180604194230475286_nobc_ops.h5 \
viirs.svm14 ../testdata/input/SVM14_npp_d20180603_t1905022_e1906264_b34198_c20180604194300667864_nobc_ops.h5 \
viirs.svm15 ../testdata/input/SVM15_npp_d20180603_t1905022_e1906264_b34198_c20180604194243413132_nobc_ops.h5 \
viirs.svm16 ../testdata/input/SVM16_npp_d20180603_t1905022_e1906264_b34198_c20180604194242911045_nobc_ops.h5 \
viirs.gmtco ../testdata/input/GMTCO_npp_d20180603_t1905022_e1906264_b34198_c20180604194312303534_nobc_ops.h5 \
viirs.sst.hdf ../testdata/output/VIIRS-SST_npp.hdf \
ncep_met_1 ../testdata/input/S201815418_NCEP.MET \
obpg.noaa_toast_1 ../testdata/input/S20181540015423_TOAST.OZONE \
noaa_oisst ../testdata/input/oisst.20180530 \
leapsec ../testdata/input/leapsec.2018060300.dat \
obpg_seaice ../testdata/input/N201815400_SEAICE_NSIDC_24h.hdf \
platform SNPP
```

A successful execution usually requires 21 minutes or more for all four scripts, depending on the speed of your computer. If execution fails, you will see an error message indicating the cause of failure (e.g., a file cannot be found, or a label cannot be recognized). Correct it and run again. If the problem has some other cause, it can be identified using the log files. Log

files are automatically generated within the directory used for execution. They start with stdfile* and errfile* and can be deleted after execution. Other log and intermediate files may be generated automatically within the directory used for execution. They are useful for traceability and debugging purposes. However it is strongly recommended that users clean up log files and intermediate files left behind in the run directory before initiating a fresh execution of the SPA. Intermediate files from a previous run may affect a successive run and produce ambiguous results. The 'run' can be executed from any directory the user chooses. This can be done by prefixing it with the file path for the 'run' script.

NOTES:

1. **Meteorology:** During near-real time Direct Broadcast (DB) processing, you may either use ncep_met_1 (ncep_met1 for VIIRS) only to specify a single meteorology input, or specify no meteorology ancillary inputs at all. In case none of the three optional meteorology inputs is specified, a default climatological meteorology product (included with this package) will be used automatically. However during non-real time processing, the user may use all three meteorological ancillary inputs.
2. **Ozone:** During NRT DB processing, you may either use obpg.noaa_toast_1 (obpg.noaa_toast1 for VIIRS) only to specify a single ozone input, or specify no ozone ancillary inputs at all. In case none of the three optional ozone inputs is specified, a default ozone product (included with this package) will be used automatically. However during non-real time processing, the user may use all three ozone ancillary inputs.
3. **SST and SEAICE:** If the noaa_oisst or the obpg_seaice inputs are not specified, a default climatological SST and SEAICE ancillaries (included with this package) will be used automatically.
4. Leapsec ancillary files are cumulative. Use the latest leapsec file available regardless of the input file date. The leapsec files provided by the DRL are time-stamped as follows: leapsec.yyyymmddhh.dat. If not specified, a default leapsec file (included with this package) will be used automatically.
5. The data products generated by this SPA may be visualized with the DRL's H2G_SPA (Hierarchical Data Format [HDF] to Georeferenced Tagged Image File Format [GeoTIFF] Converter Science Processing Algorithm). H2G is designed specifically for Direct Readout applications to create geolocated GeoTIFF images, jpeg browse images, and png browse images for parameter datasets in JPSS-1, SNPP, and EOS products. H2G_SPA and its User's Guide are available for download from the DRL Web Portal. Please refer to Appendix A for information on enabling image production for this SPA in IPOPP.

To Use the Scripts in the testscripts Directory

One simple way to run the algorithms from the directory of your choice using your own data is to copy a run*.sh script (e.g. run_TERRA_chlor_a.sh) from the testscripts directory to the selected directory. Change the values of the variables like WRAPPERHOME, INPUTHOME and OUTPUTHOME to reflect the file paths of the wrapper directories and the input/output file paths. Then modify the input/output file name variables. Run the script to process your data.

Appendix A
SPA Services

Installation of this SPA in IPOPP mode will make the SPA services listed in Table A-1 available to IPOPP. These SPA services along with any other prerequisite SPA services (listed in Table A-2) will need to be enabled to allow IPOPP to automate production of the MODIS/VIIRS Ocean Color and Sea Surface Temperature data products. Furthermore, users who wish to generate image products from the data products generated by this SPA will need to enable the image-generating SPA services listed in Table A-3. The SPAs containing the prerequisite and the image-generating SPA services listed in Tables A-2 and A-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's Guides. Please refer to the IPOPP User's Guide for instructions on how to install an SPA in IPOPP and enable the corresponding SPA services.

Table A-1. SPA Services

<table>
<tr><th>MODIS SPA services for this SPA</th><th>Data Products produced</th></tr>
<tr><td>chlor_a</td><td>
<table>
<tr><th>Product Name</th><th>Destination
(when installed in IPOPP)</th></tr>
<tr><td>MODIS Ocean Color Level 2 (Daytime only)</td><td>$HOME/drl/data /pub/gsfcdata/<aqua|terra>/modis/level2/CHLOR_A.YYDDDhhmmss.hdf</td></tr>
</table>
</td></tr>
<tr><td>sst</td><td>
<table>
<tr><th>Product Name</th><th>Destination
(when installed in IPOPP)</th></tr>
<tr><td>MODIS Sea Surface Temperature Level 2</td><td>$HOME/drl/data /pub/gsfcdata/<aqua|terra>/modis/level2/SST.YYDDDhhmmss.hdf</td></tr>
</table>
</td></tr>
<tr><th>VIIRS SPA services for this SPA</th><th>Data Products produced</th></tr>
<tr><td>l2gen_viirs-oc</td><td>
<table>
<tr><th>Product Name</th><th>Destination
(when installed in IPOPP)</th></tr>
<tr><td>VIIRS Ocean Color Level 2 (Daytime only)</td><td>$HOME/drl/data /pub/gsfcdata/npp/viirs/level2/VIIRS-OC_npp_dyyyymmdd_thhmmssS_ehhmmssS*.hdf</td></tr>
</table>
</td></tr>
<tr><td>l2gen_viirs-sst</td><td>
<table>
<tr><th>Product Name</th><th>Destination
(when installed in IPOPP)</th></tr>
<tr><td>VIIRS Sea Surface Temperature Level 2</td><td>$HOME/drl/data /pub/gsfcdata/npp/viirs/level2/VIIRS-SST_npp_dyyyymmdd_thhmmssS_ehhmmssS*.hdf</td></tr>
</table>
</td></tr>
</table>

MODIS: Where *YY*, *DDD* represents the year and day of year for the start of the swath; and the *hh*, *mm*, *ss* represents the hour, minutes, and seconds for the start of the swath.

VIIRS: Where *yyyy*, *mm*, *dd* represents the year, month and day of month for the start of the swath; the first *hh*, *mm*, *ss*, *S* represents the hour, minutes, seconds and 10th of a second for the start of the swath and the second *hh*, *mm*, *ss*, *S* represents the end time of the swath.

Table A-2. Prerequisite SPA services

Prerequisite SPA services (MODIS)	SPA in which they are available
l0l1aqua (for Aqua MODIS) **l0l1terra (for Terra MODIS)** **l1atob**	MODISL1DB_SPA
gbad (for Aqua MODIS)	GBAD_SPA
Prerequisite SPA services (VIIRS)	SPA in which they are available
VIIRS_C-SDR	C-SDR_SPA

Table A-3. Image-generating SPA services

Image-generating SPA services	SPA in which they are available
chlor_a-geotiff	H2G_SPA
sst-geotiff	H2G_SPA
viirschlor-geotiff	H2G_SPA
viirssst-geotiff	H2G_SPA

NOTE: Please refer to the H2G_SPA User's Guide for more details about the image products, including their locations and filename patterns when they are generated in IPOPP.