HDF to GeoTIFF Science Processing Algorithm (H2G_SPA) User's Guide

Version 2.5

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1 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

2 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 an algorithm to which the wrapper has been applied. 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.

3 Software Description

This DRL software package contains the H2G_SPA (Hierarchical Data Format [HDF] to Georeferenced Tagged Image File Format [GeoTIFF] Converter Science Processing Algorithm). H2G_SPA is specially designed for Direct Readout applications and can create geolocated GeoTIFF images, jpeg browse images, and png browse images for various parameter datasets in SNPP and NOAA-20 (JPSS-1) VIIRS/ATMS/CrIS/OMPS SPA products and Terra/Aqua MODIS Level 2 SPA products. H2G also creates standard true color images from supported VIIRS and MODIS science products. The H2G_SPA functions in two modes: Standalone, or as an IPOPP plug-in.

The geolocated GeoTIFF images are Geographic Information System (GIS)-ingestible and can also be opened by standard image viewers. The non-geolocated jpeg and png images are more suitable as browse images. These browse images are enhanced with vector overlays of land/sea boundaries, political boundaries, and latitude/longitude lines.

H2G_SPA incorporates the following features to enhance output images and facilitate scientific interpretation:

- 186 pre-configured image products spanning multiple missions and multiple instruments.
- GIS-ingestible geotiffs.
- Pre-defined color map and scales for appropriate science product representation.
- Choice of either geographic or stereographic projection for the output image. Inclusion of other projections is under consideration for future releases of H2G_SPA.
- Use of appropriate land/water masks when applicable for better science product representation.
- Subsetting of swaths into user-defined regions of interest.
- Mosaicing of multiple swaths.
- jpeg and png browse images with legends, vector overlays, and latitude/longitude overlays.
- Fire pixel overlays on H2G geotiffs (e.g., fire pixel overlays on True Color image).
- The capability to configure H2G for new products, user-defined parameter scales, colormaps and masks. Documentation can be made available on request.

4 Software Version

Version 1.4 of the DRL algorithm wrapper was used to package the SPA described in this document. The SPA uses H2G processing code (Version 2.5, April 2018). The H2G_SPA stereographic projection capability utilizes the JPROJ.4 Java Native Interface (JNI) to the PROJ.4 Cartographic Projections Library. This library was initially developed by the U.S. Geological Survey (USGS) and is currently being maintained/enhanced by the Open Source Geospatial Foundation (OSGeo).

Enhancements to this SPA include:

- Added support for NOAA-20 (JPSS-1) VIIRS/ATMS/CrIS image processing.
- Updated testdata and testscripts.

- The capability to generate high resolution VIIRS and MODIS sharpened True Color imagery now resides in the BlueMarble_SPA, which may be used to produce VIIRS/MODIS-scan-geometry consistent high resolution products. High resolution NDVI/EVI generation capability is being considered for inclusion into BlueMarble_SPA.
- Improved fire mask capability that leverages the VIIRS-AF and VFIRE375 algorithms.

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

5 Credits

H2G was developed by the DRL at NASA/GSFC.

6 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 the bin directory of your Java installation in your PATH environment variable.

7 Program Inputs and Outputs

H2G_SPA supports VIIRS SDR, ATMS SDR, CrIS SDR, OMPS, and various VIIRS EDR/IP and Level 2 MODIS products as input. H2G_SPA has been pre-configured to produce 186 image products spanning multiple missions and multiple instruments.

8 Installation and Configuration

H2G_SPA can be run either as a standalone application or can be installed dynamically into an IPOPP framework as a plug-in.

8.1 Installing as a Standalone Application

Download the H2G_2.5_SPA_1.4.tar.gz and H2G_2.5_SPA_1.4_testdata.tar.gz (optional) files into the same directory.

Decompress and un-archive the H2G_2.5_SPA_1.4.tar.gz and H2G_2.5_SPA_1.4_testdata.tar.gz (optional) files:

```
$ tar -xzf H2G_2.5_SPA_1.4.tar.gz
$ tar -xzf H2G_2.5_SPA_1.4_testdata.tar.gz
```

This will create the following subdirectories:

```
SPA
    h2g
        algorithm
        station
        wrapper
        ancillary
        testscripts
        testdata
```

H2G_SPA was compiled with Java 1.6. H2G_SPA is configured to run with a maximum Java heap size of 2GB. H2G_SPA can fail on a computer with inadequate memory. Users may increase or decrease the memory specifications. Refer to Appendix B for instructions.

NOTE: Examples supplied from this point forward assumes that the SPA was installed into /home/ipopp/drl.

8.2 Installing into an IPOPP Framework

This SPA can also be installed dynamically into an IPOPP framework to automate production of H2G_SPA image products. The SPA installation process will install 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 SPA services are contained in the IPOPP User's Guide (available on the DRL Web Portal). The SPA service(s) associated with this SPA are listed in Appendix A.

Configuring H2G projection: H2G_SPA is pre-configured to produce geographically projected GeoTIFFs in IPOPP Mode. Users can configure H2G_SPA in IPOPP Mode from the IPOPP Dashboard. Open up the IPOPP Dashboard and use “Mode”>“IPOPP Configuration Editor” to change to Configuration Editor Mode. Now use “Actions”>”Configure Projection” to select the desired projection.

H2G_SPA is now configured and installed into the IPOPP framework. Refer to the IPOPP User's Guide for IPOPP operation.

9 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 H2G_2.5_SPA_1.4_testdata.tar.gz file is required to execute these testing procedures.

Step 1: cd into the testscripts directory.

Step 2: Run the 'run_h2g_lst-tiff' script by typing:

$./run_h2g_lst.sh

A successful execution usually takes some time, so if the execution seems to get stuck, do not become impatient. If everything is working properly, the script will terminate with a message such as:

Output h2gout is /home/ipopp/drl/SPA/h2g/testdata/output/LST.GEOG.tif

You can cd to the output directory to verify that the science product (in this example the Land Surface Temperature [LST] GeoTIFF image) exists. If it does exist, then the process executed successfully. 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. Test output file(s) are provided for comparison in the testdata/output/h2g_standard_outputs directory. The output products serve as an indicator of expected program output. Use a comparison utility (such as a standard image viewer) to compare your output(s) to those provided in the testdata/output/h2g_standard_outputs subdirectory.

10 Program Operation

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

10.1 To Use the Run Scripts

Identify the 'run' script: The wrapper directory within this package contains the h2g subdirectory. You must execute the 'run' within the h2g/wrapper/h2g subdirectory to execute H2G_SPA. Note that to execute 'run', you need to have java on your path.

Specify input parameters using <label value> pairs: To execute the 'run' script, you must supply the required input and output parameters. Input and output parameters are usually file paths or other values (e.g., the output type). 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. The <label value> pairs must be specified on the command line in order for H2G_SPA to execute. Some of these pairs are optional, meaning the process would still be able to execute even if that parameter is not supplied. There are three types of <label value> pairs that the H2G_SPA uses, as follows:

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

b) Parameter label/values. These are parameters that need to be passed onto the SPA (e.g., the image output type).

c) Output file labels. These are output files that are produced by the SPA. Values are the relative/absolute paths of the files you want to generate.

The following table lists and describes the labels associated with the SPA. Section 11, "H2G Image Products" contains detailed descriptions and examples of usage of these labels.

Table 1. Labels and Descriptions Required by H2G

Input File Labels	Description
input.data	Path to the supported sensor data product (HDF4/HDF5 file) that contains the parameter dataset for which the image is being created.
input.data*n* (n=2,3..10)	Path to the nth supported sensor data product (HDF4/HDF5 file) that contains the parameter dataset for which a mosaiced image is being created.
red.data	Path to the supported sensor data product (HDF4/HDF5 file) that contains the dataset which would be used as the red band during rgb image generation. This label is used along with green.data and blue.data labels when the red, green and blue bands are in different HDF files.

red.data*n* (n=2,3..10)	Path to the nth supported sensor data product (HDF4/HDF5 file) that contains the dataset which would be used as the red band during a mosaiced rgb image generation. This label is used along with the corresponding nth green.data*n* and blue.data*n* labels when the red, green and blue bands are in different HDF files.
green.data	Path to the supported sensor data product (HDF4/HDF5 file) that contains the dataset which would be used as the green band during rgb image generation. This label is used along with red.data and blue.data labels when the red, green and blue bands are in different HDF files.
green.data*n* (n=2,3..10)	Path to the nth supported sensor data product (HDF4/HDF5 file) that contains the dataset which would be used as the green band during a mosaiced rgb image generation. This label is used along with the corresponding nth red.data*n* and blue.data*n* labels when the red, green and blue bands are in different HDF files.
blue.data	Path to the supported sensor data product (HDF4/HDF5 file) that contains the dataset which would be used as the blue band during rgb image generation. This label is used along with green.data and red.data labels when the red, green and blue bands are in different HDF files.
blue.data*n* (n=2,3..10)	Path to the nth supported sensor data product (HDF4/HDF5 file) that contains the dataset which would be used as the blue band during a mosaiced rgb image generation. This label is used along with the corresponding nth green.data*n* and red.data*n* labels when the red, green and blue bands are in different HDF files.
mask (optional)	Path to the supported sensor data product (HDF4/HDF5 file) that contains the mask dataset used as a mask for the image being created. mask is not needed if either no mask is being used or the mask dataset is contained within input.data.
mask*n* (n=2,3..10)	Path to the nth supported sensor data product (HDF4/HDF5 file) that contains the mask dataset used as a mask for the mosaiced image being created. mask*n* is not needed if either no mask is being used or the mask dataset is contained within input.data.
geo (optional)	Path to the supported sensor geolocation data product (HDF4/HDF5 file) or the HDF file which contains the latitude and longitude datasets for the same swath. geo is not needed only when the geolocation information is within the input.data file (e.g., HDF outputs from IMAPP_SPA have their own geolocation).
geo*n* (n=2,3..10)	Path to the nth supported sensor geolocation data product (HDF4/HDF5 file) or the HDF file which contains the latitude and longitude datasets for the nth swath product during mosaicing. geo*n* is not needed only when the geolocation information is within the input.data*n* file (e.g., HDF outputs from IMAPP_SPA have their own geolocation).
fireloc (optional)	Path to the fire-location text file. The fire-location text file is

	produced by the MOD14_SPA. fireloc can be used to overlay fire pixels on the output image. fireloc can be used only when the image output type is geotiff.argb, jpeg.argb or png.argb. (See output.type label description below.)
fireloc*n* (n=2,3..10)	Path to the nth fire-location text file. The fire-location text file is produced by the MOD14_SPA. fireloc*n* can be used to overlay fire pixels on the mosaiced output image. fireloc*n* can be used only when the image output type is geotiff.argb, jpeg.argb or png.argb. (See output.type label description below.)
Output File Label	**Description**
h2gout	Path to the geotiff, jpeg or png image product generated by H2G.
Parameter Label	**Description**
config.type	Configuration type. Can be (a) 'standard' for the standard H2G products; (b) 'singleband' for a user-defined single band image; or (c) 'rgb' for a user-defined RGB image.
config.name	config.name is either (a) the identifier for the standard H2G products; or (b) the path to the user-defined configuration file.
output.type	output.type can be either (a) geotiff.u8cm (for an 8-bit colormap embedded GeoTIFF image); (b) geotiff.argb (for an RGB GeoTIFF image); (c) jpeg.argb (for an RGB jpeg image); or (d) png.argb (for an RGB png image). **NOTE:** jpeg.argb and png.argb images do not have geolocation information. They are more useful as browse images. jpeg.argb and png.argb images have vector overlays of land/sea/political boundaries and may have legends (refer to Table 2 Notes).
projection (optional)	Projection can be either (a) geographic or (b) stereographic. This parameter is used to override the projection defined for the H2G standard product or in the user-defined configuration file.
resolution (optional)	Used to specify the resolution of the output image product. When using the geographic projection, resolution is in degrees. For the stereographic projection, resolution is in meters.
browse_enhance (optional)	Note that this feature works only when 'output.type' is set to either 'jpeg.argb' or 'png.argb' which is why legends and land/sea/political boundaries are already enabled. 'browse_enhance' can be set to either 'true' or 'false' (default). When set to 'true' it additionally enables overlays of latitude/longitude grid lines.
Subsetting and Mosaicing parameters:	
centerlat centerlon (in degrees)	These two parameters are used for subsetting/mosaicing and represent the center of the output image product. For a

	stereographically projected image, this point also represents the center of projection.
height_km, width_km (in km, used for stereographic projections)	These two parameters are used during subsetting/mosaicing of stereographically projected image products. They represent the height and width of the output image in km. Together with centerlat and centerlon they describe the geographic extent of the output image.
height_lat, width_lon (in degrees, used for geographic projections)	These two parameters are used during subsetting/mosaicing of geographically projected image products. They represent the height and width of the output image in geographic degrees. Together with centerlat and centerlon they describe the geographic extent of the output image.

NOTE: The input.data, geo, mask HDF and fireloc text files must correspond to the same swath. Similarly the nth input.data*n*, geo*n* and mask*n* HDF and fireloc*n* text files must correspond to the same swath.

10.2 To Use the Scripts in the Testscripts Directory

One simple way to run the algorithms from any directory of your choice, using your own data, is to copy the corresponding run-xxx scripts from the testscripts directory to your selected directory. Each of these scripts contains numerous examples. Change the values of the different variables to reflect the file paths of the wrapper directories and the input/output files. Then uncomment the example you wish to run. If required, add more parameters to the command line. Run the scripts to process your data.

11 H2G Image Products

This section describes:

- *What are* H2G *standard products?*
  - *How to generate the standard products?*
  - *How to override the projection and resolution of the standard products?*
- *How to create subsetted and mosaiced image products.*

H2G is pre-configured to generate the standard image products contained in Table 2, as described below in "Standard Products." Detailed instructions to generate standard image products follow. Users are reminded that numerous examples of command-lines are contained within the H2G_2.5_SPA_1.4_testdata.tar.gz archive.

NOTE: H2G can also generate user-defined products. Generation of user-defined (i.e., non-standard) image products, requires the user to undertake the additional step of writing a unique configuration file. These configuration files are simple text

files that supply the user configuration to H2G. Description of user-defined image products is beyond the scope of this User's Guide. Users interested in using H2G's user-defined image capabilities may contact DRL using the link provided at the beginning of this User's Guide.

11.1 Standard Products

The standard outputs can be generated by setting the config.type label to 'standard' and using the correct identifier for the config.name label. Table 2 contains a list of standard outputs, with corresponding config.name identifiers and required input parameters. Table A-1 in Appendix A, "SPA Services," contains the H2G SPA services, filename patterns and locations of the image products when H2G is installed and run in IPOPP mode. H2G standard outputs are by default in geographic projection; instructions to override the default setting are contained in section 11.1.4.

Table 2. H2G Standard Outputs and Corresponding Input Requirements

H2G Product #	'config.name' Identifiers for H2G Standard Products	Parameter (default resolution)	Inputs
	Terra/Aqua MODIS Imagery		
M1	ndvi	NDVI (masks: water and cloud; Resolution: 0.01^0)	input.data <mod13 HDF output from NDVIEVI_SPA> mask <mod14 HDF output from MOD14_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name ndvi output.type <geotiff.u8cm | jpeg.argb | png.argb>
M2	evi	EVI (masks: water and cloud; Resolution: 0.01^0)	input.data <mod13 HDF output from NDVIEVI_SPA> mask <mod14 HDF output from MOD14_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name evi output.type <geotiff.u8cm | jpeg.argb | png.argb >
M3	lst	LST (masks: water and cloud; Resolution: 0.01^0)	input.data <LST HDF output from MODLST_SPA> mask <mod14 HDF output from MOD14_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name lst output.type <geotiff.u8cm | jpeg.argb | png.argb>
M4	fire	Fire Mask (Resolution: 0.01)	input.data <MOD14 HDF output from MOD14_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> fireloc <firelocation text file output from MOD14_SPA; ignored when output.type is geotiff.u8cm> config.type standard config.name fire output.type <geotiff.u8cm | jpeg.argb | png.argb >
M5	sst	Sea Surface Temperature (Mask: SST quality flag; Resolution: 0.01^0)	input.data <SST HDF output from L2GEN_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name sst output.type <geotiff.u8cm | jpeg.argb | png.argb >
M6	chlor	Chlorophyll-a concentration (Mask:	input.data <Chlor HDF output from L2GEN_SPA> geo <MOD03 HDF output from MODISL1DB_SPA>

		l2flags; Resolution: 0.01^0)	h2gout <Path to tif, png or jpeg output image file> config.type standard config.name chlor output.type <geotiff.u8cm | jpeg.argb | png.argb >
M7	aerosol-aod-c6	Aerosol Optical Depth (Dark Target Algorithm) (Resolution: 0.1^0)	input.data <mod04 HDF output from IMAPP_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name aerosol-aod-c6 output.type <geotiff.u8cm | jpeg.argb | png.argb >
M8	aerosol-aod-combined-c6	Aerosol Optical Depth (Merged Dark Target and Deep Blue algorithms) (Resolution: 0.1^0)	input.data <mod04 HDF output from IMAPP_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name aerosol-aod-combined-c6 output.type <geotiff.u8cm | jpeg.argb | png.argb >
M9	aerosol-aod-3km-c6	Aerosol Optical Depth (Aerosol 3km product) (Resolution: 0.03^0)	input.data <3km mod04 HDF output from IMAPP_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name aerosol-aod-3km-c6 output.type <geotiff.u8cm | jpeg.argb | png.argb >
M10	cloudtop-irphase-c6	Cloud Phase (Resolution: 0.05^0)	input.data <mod06 HDF output from IMAPP_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name cloudtop-irphase-c6 output.type <geotiff.u8cm | jpeg.argb | png.argb >
M11	cloudtop-ctp-c6	Cloudtop Pressure (Resolution: 0.05^0)	input.data <mod06 HDF output from IMAPP_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name cloudtop-ctp-c6 output.type <geotiff.u8cm | jpeg.argb | png.argb>
M12	atmprofile-tpw-c6	Total Precipitable Water (Resolution: 0.05^0)	input.data <mod07 HDF output from IMAPP_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name atmprofile-tpw-c6 output.type <geotiff.u8cm | jpeg.argb | png.argb>
M13	cloudmask-c6	Cloudmask (Resolution: 0.01^0)	input.data <mod35 HDF output from IMAPP_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name cloudmask-c6 output.type <geotiff.u8cm | jpeg.argb | png.argb >
M14	tcolor0_01	True Color from corrected reflectances (Resolution: 0.01^0)	input.data <crefl 1km HDF output from CREFL_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name tcolor0_01 output.type <geotiff.argb | jpeg.argb | png.argb >
M15	tcolorfire0_01	True Color with fire pixel overlays from corrected reflectances (Resolution: 0.01^0)	input.data <crefl 1km HDF output from CREFL_SPA> fireloc <firelocation text file output from MOD14_SPA> geo <MOD03 HDF output from MODISL1DB_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name tcolorfire0_01 output.type <geotiff.argb | jpeg.argb | png.argb>
M16	Firetile	MODIS Active Fires Daily Composite (Resolution 0.01^0)	input.data < Level3 Mod14 Daily composite Tiled product (output from BURNSCAR_SPA)> geo <Level 3 Daily Composite Tiled Geolocation (output from BURNSCAR_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name firetile output.type <geotiff.argb | jpeg.argb | png.argb>
M17	tcolortile0_01	MODIS True Color Daily Composite (Resolution 0.01^0)	input.data < Level3 Corrected Reflectance Daily composite Tiled product (output from BURNSCAR_SPA)> geo <Level 3 Daily Composite Tiled Geolocation (output from BURNSCAR_SPA)> h2gout <Path to tif, png or jpeg output image file>

			config.type standard config.name tcolortile0_01 output.type <geotiff.argb | jpeg.argb | png.argb>
M18	fcolortile0_01	MODIS False Color (Using MODIS bands 2, 5 and 7) Daily Composite (Resolution 0.01^0)	input.data < Level3 Corrected Reflectance Daily composite Tiled product (output from BURNSCAR_SPA)> geo <Level 3 Daily Composite Tiled Geolocation (output from BURNSCAR_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name fcolortile0_01 output.type <geotiff.argb | jpeg.argb | png.argb>
	SNPP/NOAA-20 VIIRS Imagery		
V1	vtcolor	VIIRS Top of Atmosphere True Color (Resolution 0.01^0)	red.data <VIIRS SVM05 HDF output from C-SDR_SPA> green.data <VIIRS SVM04 HDF output from C-SDR_SPA > blue.data <VIIRS SVM03 HDF output from C-SDR_SPA > geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vtcolor output.type <geotiff.argb | jpeg.argb | png.argb>
V2	vdnbnight	VIIRS Day/Night Band (configured for nighttime images; Resolution: 0.01^0)	input.data <VIIRS SVDNB HDF output from C-SDR_SPA > geo <VIIRS GDNBO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vdnbnight output.type <geotiff.argb | jpeg.argb | png.argb>
V3	vdnbday	VIIRS Day/Night Band (configured for daytime images; Resolution: $0.01^{0)}$	input.data <VIIRS SVDNB HDF output from C-SDR_SPA > geo <VIIRS GDNBO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vdnbday output.type <geotiff.argb | jpeg.argb | png.argb>
V4	Vcviirs	VIIRS True Color from CVIIRS Corrected Reflectances (Resolution: 0.01^0)	input.data <VIIRS CVIIRS MOD output from CVIIRS_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vcviirs output.type <geotiff.argb | jpeg.argb | png.argb>
V5	vcviirsi	VIIRS Imagery Resolution True Color from CVIIRS Corrected Reflectances (Resolution: 0.005^0)	red.data < CVIIRS IMG output from CVIIRS_SPA> green.data <CVIIRS MOD output from CVIIRS_SPA> blue.data <CVIIRS MOD output from CVIIRS_SPA> geo <VIIRS GITCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vcviirsi output.type <geotiff.argb | jpeg.argb | png.argb>
V6	vimgmfcolor	VIIRS False Color from GTMImagery EDR M1, M4, M9 Band Reflectances (Not projected)	red.data <VIIRS VM010 HDF output from GTMImagery_SPA> green.data <VIIRS VM020 HDF output from GTMImagery_SPA> blue.data <VIIRS VM030 HDF output from GTMImagery_SPA> geo <VIIRS GMGTO HDF output from GTMImagery_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vimgmfcolor output.type <geotiff.argb | jpeg.argb | png.argb>
V7	vimgifcolor	VIIRS False Color from GTMImagery EDR I1, I2, I3 Band Reflectances (Not projected)	red.data <VIIRS VI3BO HDF output from GTMImagery_SPA > green.data <VIIRS VI2BO HDF output from GTMImagery_SPA > blue.data <VIIRS VI1BO HDF output from GTMImagery_SPA > geo <VIIRS GIGTO HDF output from GTMImagery_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vimgifcolor output.type <geotiff.argb | jpeg.argb | png.argb>
V8	vnccalbedo	VIIRS NCC Albedo	input.data <VIIRS VNCCO HDF output from GTMImagery_SPA >

		Color from GTMImagery NCC EDR (Not projected)	geo <VIIRS GNCCO HDF output from GTMImagery_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vnccalbedo output.type <geotiff.argb | jpeg.argb | png.argb>
V9	viirsaf	VIIRS Fire Mask from VIIRS-AF_SPA (Resolution: 0.01^0)	input.data <VIIRS VAF HDF output from VIIRSAF_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name viirsaf output.type <geotiff.argb | jpeg.argb | png.argb>
V10	vfire375	VIIRS Fire Mask from VFIRE375_SPA (Resolution: 0.01^0)	input.data <VIIRS VF375 HDF output from VFIRE375_SPA> geo <VIIRS GITCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vfire375 output.type <geotiff.argb | jpeg.argb | png.argb>
V11	vtcolorfire	VIIRS True Color with fire pixel overlays (Resolution: 0.01^0)	input.data <VIIRS CVIIRS MOD output from CVIIRS_SPA> geo <VIIRS GMTCO output from C-SDR_SPA > fireloc <VIIRS VAF txt output from VIIRSAF_SPA> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vtcolorfire output.type <geotiff.argb | jpeg.argb | png.argb>
V12	vcmmaskh5	VIIRS Cloud Mask (Resolution 0.01^0)	input.data <VIIRS IICMO HDF output from CloudMask_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vcmmaskh5 output.type <geotiff.argb | jpeg.argb | png.argb>
V13	vcmphaseh5	VIIRS Cloud Phase (Resolution 0.01^0)	input.data <VIIRS IICMO HDF outout from CloudMask_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vcmphaseh5 output.type <geotiff.argb | jpeg.argb | png.argb>
V14	vaot550h5d	VIIRS Aerosol Optical Thickness at 550nm (Resolution 0.01^0)	input.data <VIIRS IVAOT HDF output from Aerosol_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vaot550h5d output.type <geotiff.argb | jpeg.argb | png.argb>
V15	vapsh5d	VIIRS Aerosol Particle Size (Resolution 0.01^0)	input.data <VIIRS IVAOT HDF output from Aerosol_SPA > geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vapsh5d output.type <geotiff.argb | jpeg.argb | png.argb>
V16	vsumh5	VIIRS Suspended Matter Type (Resolution 0.01^0)	input.data <VIIRS VSUMO HDF output from Aerosol_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vsumh5 output.type <geotiff.argb | jpeg.argb | png.argb>
V17	vctth5d	VIIRS Cloud Top Temperature (Resolution 0.01^0)	input.data <VIIRS IVIWT HDF output from COP_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vctth5d output.type <geotiff.argb | jpeg.argb | png.argb>
V18	vcoth5d	VIIRS Cloud Optical Thickness (Resolution 0.01^0)	input.data <VIIRS IVCOP HDF output from COP_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vcoth5d output.type <geotiff.argb | jpeg.argb | png.argb>

V19	vepsh5d	VIIRS Cloud Effective Particle Size (Resolution 0.01^0)	input.data <VIIRS IVCOP HDF output from COP_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vepsh5d output.type <geotiff.argb | jpeg.argb | png.argb>
V20	vsnowbinh5	VIIRS Snow Cover Binary Map (Resolution 0.01^0)	input.data <VIIRS VSCMO HDF output from SnowCover_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vsnowbinh5 output.type <geotiff.argb | jpeg.argb | png.argb>
V21	vsnowfrach5	VIIRS Snow Cover Fraction (Resolution 0.01^0)	input.data <VIIRS VSCDO HDF output from SnowCover_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vsnowfrach5 output.type <geotiff.argb | jpeg.argb | png.argb>
V22	vsreflh5d	VIIRS Land Surface Reflectance True Color (Resolution 0.01^0)	input.data <VIIRS IVISR HDF output from SurfReflect_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vsreflh5d output.type <geotiff.argb | jpeg.argb | png.argb>
V23	vndvi-af	VIIRS NDVI (Resolution 0.01^0)	input.data <VIIRS VIVIO HDF output from VegIndex_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > mask <VIIRS VAF HDF from VIIRS-AF_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vndvih5 output.type <geotiff.argb | jpeg.argb | png.argb>
V24	vevi-af	VIIRS EVI (Resolution 0.01^0)	input.data <VIIRS VIVIO HDF output from VegIndex_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > mask <VIIRS VAF HDF from VIIRS-AF_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vevih5 output.type <geotiff.argb | jpeg.argb | png.argb>
V25	vlst-af	VIIRS Land Surface Temperature (Resolution 0.01^0)	input.data <VIIRS VLSTO HDF output from LST_SPA> geo <VIIRS GMTCO HDF output from C-SDR_SPA > mask <VIIRS VAF HDF from VIIRS-AF_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vlsth5 output.type <geotiff.argb | jpeg.argb | png.argb>
V26	viirssst	VIIRS Sea Surface Temperature (from l2gen_SPA) (Resolution 0.01^0)	input.data <VIIRS SST HDF output (from L2GEN_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name viirssst output.type <geotiff.argb | jpeg.argb | png.argb>
V27	viirschlor	VIIRS Chlorophyll Concentration (from l2gen) (Resolution 0.01^0)	input.data <VIIRS Ocean Color HDF output (from L2GEN_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name viirschlor output.type <geotiff.argb | jpeg.argb | png.argb>
V28 to V38	vm*x*refl (*x*=1,2,3,4,5,6,7,8,9,10,11)	VIIRS M*x* band Reflectance (Resolution: 0.01^0) (*x*=1,2,3,4,5,6,7,8,9,10,11)	input.data <VIIRS SVM*XX* HDF output from C-SDR_SPA > geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vm*x*refl output.type <geotiff.argb | jpeg.argb | png.argb> (*XX*=01, 02,03,04,05,06,07,08,09,10,11)
V39 to V43	vm*xx*bt (xx=12, 13, 14, 15, 16)	VIIRS M*XX* Brightness Temperature	input.data <VIIRS SVMXX HDF output from C-SDR_SPA > geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file>

		(Resolution: 0.01^0) (XX=12, 13, 14, 15, 16)	config.type standard config.name vm*xx*bt output.type <geotiff.argb | jpeg.argb | png.argb> (XX=12, 13, 14, 15, 16)
V44 to V46	vix*refl* (*x*=1,2,3)	VIIRS I*x* band Reflectance (Resolution: 0.01^0) (*x*=1,2,3)	input.data <VIIRS SVI*XX* HDF output from C-SDR_SPA > geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vi*x*refl output.type <geotiff.argb | jpeg.argb | png.argb> (*XX*=01, 02, 03)
V47 to V48	vix*bt* (x=4, 5)	VIIRS I*XX* Brightness Temperature (Resolution: 0.01^0) (XX=04, 05)	input.data <VIIRS SVIXX HDF output from C-SDR_SPA > geo <VIIRS GMTCO HDF output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name vi*x*bt output.type <geotiff.argb | jpeg.argb | png.argb> (XX=04, 05)
	SNPP OMPS Imagery		
O1	uvaerosol	OMPS Ultra Violet Aerosol (Resolution 0.1^0)	input.data <OMPS Total Column Total Ozone HDF output (from OMPSnadir_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name uvaerosol output.type <geotiff.argb | jpeg.argb | png.argb>
O2	totalozone	OMPS Total Column Ozone (Resolution 0.1^0)	input.data <OMPS Total Column Total Ozone HDF output (from OMPSnadir_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name totalozone output.type <geotiff.argb | jpeg.argb | png.argb>
O3	uvrefl331	OMPS Ultra Violet Reflectance at 331nm (Resolution 0.1^0)	input.data <OMPS Total Column Total Ozone HDF output (from OMPSnadir_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name uvrefl331 output.type <geotiff.argb | jpeg.argb | png.argb>
O4	ompsso2	OMPS SO_2 concentration (Resolution 0.1^0)	input.data <OMPS Total Column Total SO_2 NRT HDF output (from OMPSnadir_SPA)> h2gout <Path to tif, png or jpeg output image file> config.type standard config.name ompsso2 output.type <geotiff.argb | jpeg.argb | png.argb>
	SNPP/NOAA-20 CrIS Imagery		
C1 to C3	crisbt*x*w (*x*=s,m,l for shortwave, mediumwave and longwave respectively)	CrIS SDR Shortwave, Mediumwave and Longwave Band Brightness Temperature (Resolution 0.05^0)	input.data <CrIS SCRIS SDR output from C-SDR_SPA > geo <CrIS GCRSO Geolocation output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name crisbt*x*w output.type <geotiff.argb | jpeg.argb | png.argb> (*x*=s,m,l for shortwave, mediumwave and longwave respectively)

	SNPP/NOAA-20 ATMS Imagery		
A1 to A22	atmsbtch*x* (*x*=1 to 22)	ATMS SDR Channel *x* Brightness Temperature (Resolution 0.05^0) (*x*=1 to 22)	input.data <ATMS SATMS SDR output from C-SDR_SPA > geo <ATMS GATMO Geolocation output from C-SDR_SPA > h2gout <Path to tif, png or jpeg output image file> config.type standard config.name atmsbtch*x* output.type <geotiff.argb | jpeg.argb | png.argb> (*x*=1 to 22)

NOTE: The input products for H2G_SPA are available from different SPAs as documented in Table 2. Please refer to the corresponding SPA's User Guide for documentation on naming conventions and possible download sources for these products.

11.1.1 Legends

When the image products are generated with 'png.argb' or 'jpeg.argb' set to true (i.e., browse imagery), it enables overlays of legends in image products that represent continuous science parameters. Legends are not generated for RGB imagery (such as MODIS/VIIRS True Color/False Color) and categorical parameters (such as MODIS/VIIRS Fire Mask, MODIS/VIIRS Cloud Phase, MODIS/VIIRS Cloudmask, MODIS/VIIRS Active Fires, VIIRS Suspended Matter Type, and VIIRS Snow Cover).

Pre-generated legends for all continuous and categorical science products are included for reference in the H2G testdata tar file. After untarring the testdata tar file as instructed in section 8.1, the legends will be contained in the SPA/h2g/testdata/legends/ directory. The legends are named according to the convention '<H2G-Product-no(s)>.<config.name>.legend.png'. H2G Product numbers and config.names are available from Table 2.

11.1.2 Generating H2G Standard Products

Command line examples to generate standard H2G products from the testscripts directory are provided below.

Example 1.1: MODIS TrueColor 0.01 degree Geotiff (run from the testscripts directory)

```
$../wrapper/h2g/run \
    config.type standard \
    config.name tcolor0_01 \
    input.data ../testdata/input/MYDcrefl.1km.08085190000.hdf \
    geo ../testdata/input/MYD03.A2008085.1900.005.2009312103605.hdf \
    h2gout ../testdata/output/MXDcrefl_TrueColor.GEOG.tif \
    output.type geotiff.argb
```

Example 1.2: VIIRS SDR Top of Atmosphere True Color 0.01 degree Geotiff (run from the testscripts/ directory)

```
$../wrapper/h2g/run \
config.type standard \
config.name vtcolor \
red.data ../testdata/input/SVM05_npp_d20130323_t1851552_e1853194_b07270_c20130329144411503651_noaa_ops.h5 \
green.data ../testdata/input/SVM04_npp_d20130323_t1851552_e1853194_b07270_c20130329144448698975_noaa_ops.h5 \
blue.data ../testdata/input/SVM03_npp_d20130323_t1851552_e1853194_b07270_c20130329144447345002_noaa_ops.h5 \
geo ../testdata/input/GMTCO_npp_d20130323_t1851552_e1853194_b07270_c20130329144438416689_noaa_ops.h5 \
h2gout ../testdata/output/SVM0X.TOA-TCOLOR.GEOG.tif \
output.type geotiff.argb
```

NOTE: Example 1.2 shows how to run H2G when the red, green and blue bands needed to create an RGB image are in different files.

Example 2: MODIS EVI 0.01 degree Geotiff (run from the testscripts directory)

```
$ ../wrapper/h2g/run \
    config.type standard \
    config.name evi  \
    input.data ../testdata/input/MYD013.08085185938.hdf \
    geo ../testdata/input/MYD03.08085185938.hdf \
    mask ../testdata/input/MYD014.08085185938.hdf \
    h2gout  ../testdata/output/MXD13.EVI.GEOG.tif \
    output.type geotiff.u8cm
```

A successful execution usually takes some time, so if the execution seems to get stuck, do not become impatient. 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 the problem and run again. The problem can also be identified using the stdfile* and errfile* log files. Log files are automatically generated within the directory used for execution.

NOTES:

1. Command line examples for generating all H2G standard outputs are provided in the run_h2g-standard-outputs.sh file within the testscripts directory. All command lines are commented. Please uncomment the desired command line (the product # from Table 2 matches the “Eg #” in the script) and then type ”./run_h2g_standard-outputs.sh” to execute the command. H2G standard output products are available for comparison in the testdata/output/h2g_standard_outputs subdirectory.

2. The IMAPP aerosol product may produce insufficient geolocation data at higher latitudes. H2G would fail to produce correct aerosol image products in such cases.

3. Please see Appendix C for additional information on standard products, such as: (a) how the products were scaled into 8-bit images; (b) how the masks were used; and (c) how to retrieve actual parameter values from the GeoTIFF images.

11.1.3 Overriding Projection and Resolution of Standard Products

H2G standard products are by default in geographic projection. In order to override this default projection and use any other projection (currently the only other projection is stereographic), you should use the projection and resolution parameter labels on the command line. Note that the geographic projection requires resolution in latitude/longitude degree units, while the stereographic projection requires resolution in meter units. You may also override only the resolution label to get a geographically projected image in a different resolution.

Example 3: MODIS TrueColor Stereographic 5000 meter png (run from the testscripts directory)

```
$../wrapper/h2g/run \
    config.type standard \
    config.name tcolor0_01 \
    input.data ../testdata/input/MYDcrefl.1km.08085190000.hdf \
    geo ../testdata/input/MYD03.A2008085.1900.005.2009312103605.hdf \
    h2gout ../testdata/output/MXDcrefl_TrueColor.STEREO.png \
    output.type png.argb \
    projection stereographic resolution 5000 \
    browse_enhance true
```

Example 4: MODIS EVI Stereographic 5000m png (run from the testscripts directory)

```
$../wrapper/h2g/run \
    config.type standard \
    config.name evi  \
    input.data ../testdata/input/MYD013.08085185938.hdf \
    geo ../testdata/input/MYD03.08085185938.hdf \
    mask ../testdata/input/MYD014.08085185938.hdf \
    h2gout ../testdata/output/MXD13.EVI.STEREO.png \
    output.type png.argb \
    projection stereographic resolution 5000 \
    browse_enhance true
```

Example 5: MODIS EVI Geographic 0.05 degree png browse (run from the testscripts directory)

```
$ ../wrapper/h2g/run \
```

```
config.type standard \
config.name evi  \
input.data ../testdata/input/MYD013.08085185938.hdf \
geo ../testdata/input/MYD03.08085185938.hdf \
mask ../testdata/input/MYD014.08085185938.hdf \
h2gout ../testdata/output/MXD13.EVI.GEOG-0.05.png \
output.type png.argb \
browse_enhance true \
resolution 0.05
```

NOTES:

1. The center of projection for the stereographic projection (for non-subset and non-mosaic images) is automatically selected by H2G at approximately the midpoint of the image.

2. When you override the default projection, be sure to also specify the resolution label along with the projection label. Care should be taken while specifying the resolution, as the resolution units of the geographic (degrees) and stereographic (meters) projections are different.

11.2 Subsetting and Mosaicing

Subsetting is the extraction of a region of interest from an input swath for purposes of creating an output image product. Mosaicing is the stitching of multiple input swaths for purposes of creating a concatenated output image product. In H2G, subsetting and mosaicing use a similar paradigm. To perform these operations users must define a region of interest. This is achieved by specifying an additional set of parameter labels on the command line. The labels 'centerlat' and 'centerlon', used for both geographic and stereographic projections, specify the center of the output image in latitude and longitude degrees respectively. (For stereographic projections these labels also define the center of projection). The labels 'height_lat' and 'width_lon', used only for geographic projections, specify the width and height of the image in latitude and longitude degrees. However for stereographic projections, the 'height_km' and width_km' labels are used (instead of the 'height_lat' and width_lon' labels) to specify the vertical and horizontal extents of the output image in kilometers.

Mosaicing is an extension of subsetting. Users need to employ the additional input.data*n*, geo*n*, mask*n*, fireloc*n*, red.data*n*, blue.data*n*, green.data*n* (n=1,2,…10) labels as necessary to specify multiple swath datasets to H2G.

NOTE: More command line examples for subsetting and mosaicing can be found in the run_h2g_subset-egs.sh and run_h2g_mosaic-egs.sh scripts in testscripts/. All command lines are commented. Uncomment the desired command line and then type $./run_h2g_subset-egs.sh or $./run_h2g_mosaic-egs.sh to execute the

command. H2G subsetted/mosaiced output products are available for comparison in the testdata/output/h2g_subset_mosaic_examples subdirectory.

NOTE: Users can provide up to 10 swaths for mosaicing using the input.data*n*, geo*n*, mask*n*, fireloc*n*, red.data*n*, blue.data*n*, green.data*n* labels.

Example 6: Subsetting MODIS TrueColor Geographic 0.01 degree tif (run from the testscripts directory)

```
$../wrapper/h2g/run \
config.type standard config.name tcolor0_01 \
input.data ../testdata/input/MYDcrefl.1km.08085190000.hdf \
geo ../testdata/input/MYD03.A2008085.1900.005.2009312103605.hdf \
h2gout ../testdata/output/MXDcrefl_TrueColor.GEOG.SUBSET.tif \
output.type geotiff.argb \
centerlat 45.0 centerlon -95.0 height_lat 20.0 width_lon 20.0
```

Example 7: Subsetting MODIS Cloudtop Pressure Stereographic 5000m jpg (run from the testscripts/ directory)

```
$../wrapper/h2g/run \
    config.type standard config.name cloudtop-ctp-c6 \
    input.data ../testdata/input/CLOUDTOP.10060152500.hdf \
    geo  ../testdata/input/MOD03.A2010060.1525.005.2010264155619.hdf \
    h2gout ../testdata/output/CLOUDTOP.CTP.STEREO.SUBSET.jpg \
    output.type jpeg.argb \
    projection stereographic resolution 5000 \
    centerlat 60.0 centerlon -60.0 height_km 2000 width_km 2000
```

Example 8: Mosaicing VIIRS Top-of-Atmosphere TrueColor Stereographic 750m tif (run from the testscripts/ directory)

```
$../wrapper/h2g/run config.type standard config.name vtcolor  \
red.data ../testdata/input/SVM05_npp_d20120925_t1804560_e1817535.h5 \
green.data ../testdata/input/SVM04_npp_d20120925_t1804560_e1817535.h5 \
blue.data ../testdata/input/SVM03_npp_d20120925_t1804560_e1817535.h5 \
geo ../testdata/input/GMTCO_npp_d20120925_t1804560_e1817535.h5 \
red.data2 ../testdata/input/SVM05_npp_d20130323_t1851552_e1853194_b07270_c20130329144411503651_noaa_ops.h5 \
green.data2  ../testdata/input/SVM04_npp_d20130323_t1851552_e1853194_b07270_c20130329144448698975_noaa_ops.h5
\
blue.data2 ../testdata/input/SVM03_npp_d20130323_t1851552_e1853194_b07270_c20130329144447345002_noaa_ops.h5 \
geo2 ../testdata/input/GMTCO_npp_d20130323_t1851552_e1853194_b07270_c20130329144438416689_noaa_ops.h5 \
h2gout ../testdata/output/SVM0X.TOA-TCOLOR.STEREO.MOSAIC.tif \
output.type geotiff.argb \
projection stereographic resolution 750 \
centerlat 38.99 centerlon -76.85 \
height_km 6000 width_km 6000
```

Example 9: Mosaicing MODIS TrueColor Fire Geographic 0.05 degree png (run

from the testscripts/ directory)

```
$../wrapper/h2g/run config.type standard config.name tcolorfire0_01  \
input.data ../testdata/input/MODcrefl.1km.14247170632.hdf \
geo ../testdata/input/MOD03.14247170632.hdf \
input.data2 ../testdata/input/MYDcrefl.1km.08085190000.hdf \
geo2 ../testdata/input/MYD03.A2008085.1900.005.2009312103605.hdf \
fireloc2 ../testdata/input/MYD14.08085190000.txt \
h2gout ../testdata/output/MXDcrefl_TrueColorFire.GEOG.MOSAIC.png \
output.type png.argb \
resolution 0.05 \
centerlat 38.99 centerlon -76.85 \
height_lat 45 width_lon 45
```

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 (also listed in Table A-1) will need to be enabled to allow IPOPP to automate production of the H2G image data products. The SPAs containing the prerequisite SPA services listed in Table A-1 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

H2G Product #	SPA services for this SPA	Data Products produced	Output Destination	Prerequisite SPA services (SPA in which they are available)
H2G SPA Services for Terra/Aqua MODIS Imagery[3]				
M1	ndvi-geotiff	MODIS NDVI geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/M<O|Y>D13.yyDDDhhmmss.NDVI.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) crefl (CREFL_SPA) MOD14 (MOD14_SPA) ndvievi (NDVIEVI_SPA)
M2	evi-geotiff	MODIS EVI geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/M<O|Y>D13.yyDDDhhmmss.EVI.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) crefl (CREFL_SPA) MOD14 (MOD14_SPA) ndvievi (NDVIEVI_SPA)
M3	lst-geotiff	MODIS LST geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/LST.yyDDDhhmmss.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) MOD14 (MOD14_SPA) MODLST (MODLST_SPA)
M4	fire-geotiff	MODIS Fire Mask geotiff	$HOME/drl/data/pub/gsfcdata/<terra|a	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA)

			qua>/modis/level2/M<O|Y>D14.yyDDDhhmmss.tif[1]	l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) MOD14 (MOD14_SPA)
M5	sst-geotiff	MODIS Sea Surface Temperature geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/SST.yyDDDhhmmss.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) sst (L2GEN_SPA)
M6	chlor_a-geotiff	MODIS Chlorophyll-a concentration geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/CHLOR_A.yyDDDhhmmss.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) chlor_a (L2GEN_SPA)
M8, M9	aerosols-geotiff	MODIS Aerosol Optical Depth Combined (Dark Target and Deep Blue)	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/AEROSOL.yyDDDhhmmss.AOD.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) IMAPP (IMAPP_SPA)
		MODIS Aerosol 3km Aerosol Optical Depth	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/AEROSOL3KM.yyDDDhhmmss.AOD.tif[1]	
M10	irphase-geotiff	MODIS Cloud Phase geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/CLOUDTOP.yyDDDhhmmss.IRPHASE.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) IMAPP_Cloudtop (IMAPP_SPA)
M11	ctp-geotiff	MODIS Cloudtop Pressure geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/CLOUDTOP.yyDDDhhmmss.CTP.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) IMAPP_Cloudtop (IMAPP_SPA)
M12	atmprofile-geotiff	MODIS Total Precipitable Water geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/PROFILES.yyDDDhhmmss.TPW.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) IMAPP (IMAPP_SPA)
M13	cloudmask-geotiff	MODIS Cloudmask geotiff	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/CLOUDMASK.yyDDDhhmmss.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) IMAPP (IMAPP_SPA)
M14	creflrgb-geotiff	MODIS True Color from corrected reflectances	$HOME/drl/data/pub/gsfcdata/<terra|aqua>/modis/level2/M<O|Y>Dcrefl_TrueColor.yyDDDhhmmss.tif[1]	gbad (GBAD_SPA) l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) crefl (CREFL_SPA)
M15	creflrgbfire-geotiff	MODIS True	$HOME/drl/data/pu	gbad (GBAD_SPA)

		Color with fire pixel overlays from corrected reflectances	b/gsfcdata/<terra|aqua>/modis/level2/M<O|Y>Dcrefl_TrueColorFire.yyDDDhhmmss.tif[1]	l0l1terra (MODISL1DB_SPA) l0l1aqua (MODISL1DB_SPA) l1atob (MODISL1DB_SPA) crefl (CREFL_SPA) MOD14 (MOD14_SPA)
H2G SPA Services for SNPP/NOAA-20 VIIRS Imagery[3]				
V1	vtoatcolor-geotiff	VIIRS Top of Atmosphere True Color geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level1/NPP_TCOLOR_SDR.yyDDDhhmmss.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level1/J01_SVM0X.dyyyyMMDD_thhmmssS_ehhmmssS.TOA-TCOLOR.tif[2]	VIIRS_C-SDR (C-SDR_SPA)
V4	vcviirs-geotiff	VIIRS True Color geotiff from CVIIRS Corrected Reflectances	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_CVIIRS_L2.yyDDDhhmmss.TCOLOR.h5.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_CVIIRSM.dyyyyMMDD_thhmmssS_ehhmmssS.CREFL-TCOLOR.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CVIIRS (CVIIRS_SPA)
V6	vimgmfcolor-geotiff	VIIRS False Color tiff from GTMImagery EDR M1, M4, M9 Band Reflectances	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_imagery.yyDDDhhmmss.MFCOLOR.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VM0XO.dyyyyMMDD_thh	VIIRS_C-SDR (C-SDR_SPA) GTM_MBand (GTMIMAGERY_SPA)

			mmssS_ehhmmss S.MFCOLOR.tif[2]	
V7	vimgifcolor-geotiff	VIIRS False Color tiff from GTMImagery EDR I1, I2, I3 Band Reflectances	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_imagery.yyDDDhhmmss.IFCOLOR.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VIXBO.dyyyyMMDD_thhmmssS_ehhmmssS.IFCOLOR.tif[2]	VIIRS_C-SDR (C-SDR_SPA) GTM_IBand (GTMIMAGERY_SPA)
V8	vimgncc-geotiff	VIIRS NCC Albedo geotiff from GTMImagery NCC EDR	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_imagery.yyDDDhhmmss.NCCALBEDO.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VNCCO.dyyyyMMDD_thhmmssS_ehhmmssS.NCCALBEDO.tif[2]	VIIRS_C-SDR (C-SDR_SPA) GTM_NCCBand (GTMIMAGERY_SPA)
V9	viirsaf-geotiff	VIIRS Fire Mask geotiff from VIIRS-AF_SPA	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VAF_L2.yyDDDhhmmss.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VAF.dyyyyMMDD_thhmmssS_ehhmmssS.FIRE.tif[2]	VIIRS_C-SDR (C-SDR_SPA) VIIRS-AF (VIIRS-AF_SPA)
V10	vfire375-geotiff	VIIRS Fire Mask geotiff from VFIRE375_SPA	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VF375_L2.yyDDDhhmmss. tif[1]	VIIRS_C-SDR (C-SDR_SPA) VFIRE375 (VFIRE375_SPA)

			For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VF375.dyyyyMMDD_thhmmssS_ehhmmssS.FIRE.tif[2]	
V11	vcviirsfire-geotiff	VIIRS True Color geotiff with fire pixel overlays	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_TCOLORFIRE.yyDDDhhmmss.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VAF.dyyyyMMDD_thhmmssS_ehhmmssS.TCOLORFIRE.tif[2]	VIIRS_C-SDR (C-SDR_SPA) VIIRS-AF (VIIRS-AF_SPA) CVIIRS (CVIIRS_SPA)
V12	vcmmaskh5-geotiff	VIIRS Cloud Mask geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_CMIP_L2.yyDDDhhmmss.CLOUDMASK.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_IICMO.dyyyyMMDD_thhmmssS_ehhmmssS.CLOUDMASK.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA)
V13	vcmphaseh5-geotiff	VIIRS Cloud Phase geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_CMIP_L2.yyDDDhhmmss.PHASE.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_IICMO.dyyyyMMDD_thhmmssS_ehhmmssS.PHASE.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA)

V14	vaoth5d-geotiff	VIIRS Aerosol Optical Thickness at 550nm geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VAOTIP_L2.yyDDDhhmmss.AOT.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_IVAOT.dyyyyMMDD_thhmmssS_ehhmmssS.AOT.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) Aerosol (AEROSOL_SPA)
V15	vapsh5d-geotiff	VIIRS Aerosol Particle Size geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VAOTIP_L2.yyDDDhhmmss.APS.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_IVAOT.dyyyyMMDD_thhmmssS_ehhmmssS.APS.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) Aerosol (AEROSOL_SPA)
V16	vsumh5-geotiff	VIIRS Suspended Matter Type geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VSUM_L2.yyDDDhhmmss.SMTYPE.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VSUMO.dyyyyMMDD_thhmmssS_ehhmmssS.SMTYPE.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) Aerosol (AEROSOL_SPA)
V17	vctth5d-geotiff	VIIRS Cloud Top Temperature geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_WCTTIP_L2.yyDDDhhmmss.CTT.tif[1] For NOAA-20: $HOME/drl/data/pu	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) COP (COP_SPA)

			b/gsfcdata/jpss1/viirs/level2/J01_IVIWT.dyyyyMMDD_thhmmssS_ehhmmssS.CTT.tif[2]	
V18	vcoth5d-geotiff	VIIRS Cloud Optical Thickness geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_COPIP_L2.yyDDDhhmmss.COT.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_IVCOP.dyyyyMMDD_thhmmssS_ehhmmssS.COT.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) COP (COP_SPA)
V19	vepsh5d-geotiff	VIIRS Cloud Effective Particle Size geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_COPIP_L2.yyDDDhhmmss.EPS.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_IVCOP.dyyyyMMDD_thhmmssS_ehhmmssS.EPS.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) COP (COP_SPA)
V20, V21	vsnowh5-geotiff	VIIRS Snow Cover Binary Map	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VSCM_L2.yyDDDhhmmss.SNOWCOVER.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VSCMO.dyyyyMMDD_thhmmssS_ehhmmssS.SNOWCOVER.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) Aerosol (AEROSOL_SPA) SnowCov (SNOWCOV_SPA)

		VIIRS Snow Fraction geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VSCD_L2.yyDDDhhmmss.SNOWFRACTION.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VSCDO.dyyyyMMDD_thhmmssS_ehhmmssS.SNOWFRACTION.tif[2]	
V22	vsurfreflh5d-geotiff	VIIRS Land Surface Reflectance True Color geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_SRFLMIP_L2.yyDDDhhmmss.TCOLOR.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_IVISR.dyyyyMMDD_thhmmssS_ehhmmssS.SREFL-TCOLOR.tif[2]	VIIRS_C-SDR (C-SDR_SPA) CloudMask (CLOUDMASK_SPA) Aerosol (AEROSOL_SPA) SurfReflect (SURFREFLECT_SPA)
V23	vndvih5-geotiff	VIIRS NDVI geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VRVI_L2.yyDDDhhmmss.NDVI.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VIVIO.dyyyyMMDD_thhmmssS_ehhmmssS.NDVI.tif[2]	VIIRS_C-SDR (C-SDR_SPA) ActiveFires (VIIRS-AF_SPA) CloudMask (CLOUDMASK_SPA) Aerosol (AEROSOL_SPA) SurfReflect (SURFREFLECT_SPA) VegIndex (VEGINDEX_SPA)
V24	vevih5-geotiff	VIIRS EVI geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VRVI_L2.yyDDDhhmmss.EVI.tif[1]	VIIRS_C-SDR (C-SDR_SPA) ActiveFires (VIIRS-AF_SPA) CloudMask (CLOUDMASK_SPA) Aerosol (AEROSOL_SPA) SurfReflect

			For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VIVIO.dyyyyMMDD_thhmmssS_ehhmmssS.EVI.tif[2]	(SURFREFLECT_SPA) VegIndex (VEGINDEX_SPA)
V25	vlsth5-geotiff	VIIRS Land Surface Temperature geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VLST_L2.yyDDDhhmmss. tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VLSTO.dyyyyMMDD_thhmmssS_ehhmmssS.LST.tif[2]	VIIRS_C-SDR (C-SDR_SPA) ActiveFires (VIIRS-AF_SPA) CloudMask (CLOUDMASK_SPA) LST (LST_SPA)
V26	viirssst-geotiff	VIIRS Sea Surface Temperature (from l2gen_SPA) geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VIIRSSST_L2.yyDDDhhmmss.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VIIRS-SST.dyyyyMMDD_thhmmssS_ehhmmssS.SST.tif[2]	VIIRS_C-SDR (C-SDR_SPA) l2gen_viirs-sst (L2GEN_SPA)
V27	viirschlor-geotiff	VIIRS Chlorophyll Concentration (from l2gen) geotiff	For SNPP: $HOME/drl/data/pub/gsfcdata/npp/viirs/level2/NPP_VIIRSCHLOR_L2.yyDDDhhmmss.tif[1] For NOAA-20: $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level2/J01_VIIRS-OC.dyyyyMMDD_thhmmssS_ehhmmssCHLOR.tif[2]	VIIRS_C-SDR (C-SDR_SPA) l2gen_viirs-oc (L2GEN_SPA)

V39	vm12h5-geotiff	VIIRS M12 Brightness Temperature geotiff	<u>For SNPP:</u> $HOME/drl/data/pub/gsfcdata/npp/viirs/level1/NPP_M12BT_SDR.yyDDDhhmmss.tif[1] <u>For NOAA-20:</u> $HOME/drl/data/pub/gsfcdata/jpss1/viirs/level1/J01_SVM12.dyyyyMMDD_thhmmssS_ehhmmssS.M12BT.tif[2]	VIIRS_C-SDR (C-SDR_SPA)
H2G SPA Services for SNPP OMPS Imagery[3]				
O1	ompsaot-geotiff	OMPS Ultra Violet Aerosol geotiff	$HOME/drl/data/pub/gsfcdata/npp/omps/level2/OMPS_AEROSOL_L2.yyDDDhhmmss.tif[1]	OMPSnadir (OMPSNADIR_SPA)
O2	ompstozone-geotiff	OMPS Total Column Ozone geotiff	$HOME/drl/data/pub/gsfcdata/npp/omps/level2/OMPS_OZONE_L2.yyDDDhhmmss.tif[1]	OMPSnadir (OMPSNADIR_SPA)
O3	ompsrefl331-geotiff	OMPS Ultra Violet Reflectance at 331nm geotiff	$HOME/drl/data/pub/gsfcdata/npp/omps/level2/OMPS_REFL331_L2.yyDDDhhmmss.tif[1]	OMPSnadir (OMPSNADIR_SPA)
O4	ompsso2-geotiff	OMPS SO_2 concentration geotiff	$HOME/drl/data/pub/gsfcdata/npp/omps/level2/OMPS_SO2_L2.yyDDDhhmmss.tif[1]	OMPSnadir (OMPSNADIR_SPA)
H2G SPA Services for SNPP/NOAA-20 ATMS Imagery[3]				
A1 to A22	ATMS-SDR-geotiff	ATMS SDR Channel *x* Brightness Temperature geotiffs (*x*=1 to 22)	<u>For SNPP:</u> $HOME/drl/data/pub/gsfcdata/npp/atms/level1/NPP_ATMSBT_CH*x*.yyDDDhhmmss.tif[1] <u>For NOAA-20:</u> $HOME/drl/data/pub/gsfcdata/jpss1/atms/level1/J01_SAT	ATMS_C-SDR (C-SDR_SPA)

			MS.dyyyyMMDD_thhmmssS_ehhmmssS.BT-CHx.tif[2]	
H2G SPA Services for SNPP/NOAA-20 CrIS Imagery[3]				
C1, C2, C3	CrIS-SDR-geotiff	CrIS SDR Shortwave, Mediumwave and Longwave Band Brightness Temperature geotiffs	<u>For SNPP:</u> $HOME/drl/data/pub/gsfcdata/npp/cris/level1/NPP_CrISBT_*xW*.yyDDDhhmmss.tif[1] <u>For NOAA-20:</u> $HOME/drl/data/pub/gsfcdata/jpss1/cris/level1/J01_SCRIS.dyyyyMMDD_thhmmssS_ehhmmssS.BT-xW.tif (*x*=S,M,L for Shortwave, Mediumwave and Longwave respectively)	CRIS_C-SDR (C-SDR_SPA)

[1]yy, DDD, hh, mm, ss represents the 2-digit year, day-of-the-year, hour, minute, and second respectively.

[2]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]SPA Services for Terra/Aqua MODIS Imagery are available on the “EOS” tab of the IPOPP Dashboard. SPA Services for SNPP and NOAA-20 VIIRS Imagery are available on the “SNPP-VIIRS” and “JPSS-1-VIIRS” tabs of the IPOPP Dashboard respectively. SPA Services for SNPP and NOAA-20 ATMS/CrIS/OMPS Imagery are available on the “SNPP-ATMS/CrIS/OMPS” and “JPSS-1-ATMS/CrIS/OMPS” tabs of the IPOPP Dashboard respectively.

Appendix B
Modifying Maximum Java Heap Size

To increase/decrease maximum Java heap size, cd into algorithm/bin and open the file h2g.sh. Edit the line '-Xmx2g' to the required value. For example, to decrease maximum Java heap size to 1G, edit it to '-Xmx1g'. To increase it to 4G, edit it to '-Xmx4g'.

CAUTION: Decreasing Java heap size may cause some high-resolution image generations to fail.

Appendix C
H2G Standard Product Descriptions

This appendix describes the scaling used to convert Scientific Dataset (SDS) values in the SPA HDF products into 8-bit values in the standard GeoTIFF products. Pseudocodes for converting the GeoTIFF values back into actual parameter values are also provided. Please note that the parameter values obtained by inverse scaling GeoTIFF values will not be exactly equal to the parameter values obtained from actual SDS values (from the HDF products), but they should be close. Use of 8-bit integers in our GeoTIFF products may cause loss of precision. Further, values below and above the SDS data range being scaled into 1-255 are set to 1 and 255 respectively in the GeoTIFF output. Interpolation used during re-projection of swath data may also be a source of difference. The descriptions are organized by H2G product numbers as defined in Table 2.

M1/M2. MODIS NDVI/EVI

HDF SDS: NDVI/EVI (generated by NDVIEVI_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from -1000 to 10000 are scaled linearly to 1-255 in GeoTIFF output. Fill values (-999) are set to 0.

```
if hdf_value = -999
    geotiff_value=0
elseif pixel has CLOUD or WATER (identified using Active Fire HDF product)
   geotiff_value=0
else
   geotiff_value=1+round((254/11000)*(hdf_value+1000)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: -0.1 to 1.0):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*11000/254]-1000   //scale 1-255 to -1000 to 10000
   parameter_value=hdf_value*0.0001   //apply scaling and offset factors
else //geotiff_value=0
   hdf_value=-999
  parameter_value=NO_RETRIEVAL
end
```

M3. MODIS Land Surface Temperature

HDF SDS: LST (generated by MODLST_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 2300-3400 (equivalent to 230K-340K) are scaled linearly to 1-255 in GeoTIFF output. Fill values (0) are set to 0.

```
if hdf_value = 0
    geotiff_value=0
elseif (pixel has CLOUD or WATER) (identified using Active Fire HDF product)
   geotiff_value=0
else
   geotiff_value=1+round((254/1100)*(hdf_value-2300)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: K; range: 230K to 340K):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*1100/254]+2300   //scale 1-255 to 2300-3400
   parameter_value=hdf_value*0.1   //apply scaling and offset factors
else //geotiff_value=0
   hdf_value=0
  parameter_value=NO_RETRIEVAL
end
```

M4. MODIS FIRE

HDF SDS: fire mask (generated by MOD14_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
geotiff_value=hdf_value
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter flags (units: dimensionless):

```
hdf_value=geotiff_value
(Flag interpretation:  0– missing, 1- not processed, 2- not processed, 3- water, 4- cloud, 5-non-
```

fire, 6-unknown, 7- low confidence fire, 8- nominal confidence fire, 9- high confidence fire)

M5. MODIS Sea Surface Temperature

HDF SDS: sst (generated by L2GEN_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from -400 to 9000 (equivalent to -2ºC to 45ºC) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-32767) are set to 0.

```
if hdf_value = -32767
    geotiff_value=0
elseif qual_sst>=3 (identified using qual_sst sds)
   geotiff_value=0
else
   geotiff_value=1+round((254/9400)*(hdf_value+400)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: ºC; range: -2ºC to 45ºC):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*9400/254]-400   //scale 1-255 to -400 to 9000
   parameter_value=hdf_value*0.005    //apply scaling and offset factors as specified in the HDF
SDS
else //geotiff_value=0
   hdf_value=-32767
  parameter_value=NO_RETRIEVAL
end
```

M6. MODIS Chlorophyll-a Concentration

HDF SDS: chlor_a (generated by L2GEN_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
if(hdf_value=-32767 or l2flag = Chl_warn or l2flag=Chl_fail)
   geotiff_value=0
else
  if(hdf_value<0.01)
      hdf_value=0.01
```

```
    endif
  if(hdf_value>100)
     hdf_value=100
  endif
  geotiff_value= round(128+(63.5*(log10(hdf_value))
end
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: mg/m^3; range: 0.01 to 100):

```
if (geotiff_value=0)
  hdf_value=-1
  parameter_value=NO_RETRIEVAL
else
   hdf_value=10^[(geotiff_value-128)/63.5]
   parameter_value=hdf_value
end
```

M7/M8/M9. MODIS Aerosol Optical Depth

HDF SDS names:
Optical_Depth_Land_And_Ocean (from the MOD04 or MOD04 3km product generated by IMAPP_SPA)
AOD_550_Dark_Target_Deep_Blue_Combined (from the MOD04 product generated by IMAPP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0-5000 are scaled linearly to 1-255 in GeoTIFF output. Fill values (-9999) in SDS are set to 0 in geotiff.

```
if hdf_value = -9999
    geotiff_value=0
else
   geotiff_value=1+round((254/5000)*hdf_value) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: 0-5):

```
if geotiff_value>0
   hdf_value=(geotiff_value-1)*5000/254   //scale 1-255 to 0-5000
   parameter_value=hdf_value*0.001   //apply scaling/offset factors
else //geotiff_value=0
```

```
    hdf_value=-9999
   parameter_value=NO_RETRIEVAL
end
```

M10. MODIS Cloud Phase

HDF SDS: Cloud_Phase_Infrared (generated by IMAPP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0 to 6 are scaled to 1-7 in GeoTIFF output. Fill Values (127) is set to 0.

```
if hdf_value=127
   geotiff_value=0
else
  geotiff_value=1+hdf_value
end
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter flags (units: dimensionless):

```
if(geotiff_value>0)
   hdf_value=geotiff_value-1
   parameter_flag=hdf_value  (clear = 0; water = 1 or 5; ice = 2 or 4; mixed = 3; uncertain = 6)
else
  hdf_value=127
 parameter_flag=NO_RETRIEVAL
end
```

M11. MODIS Cloud Top Pressure

HDF SDS: Cloud_Top_Pressure (generated by IMAPP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 10-11000 are scaled linearly to 1-255 in GeoTIFF output. Fill values (-32768) are set to 0.

```
if hdf_value = -32768
    geotiff_value=0
else
   geotiff_value=1+round((254/10990)*(hdf_value-10)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: hPa; range: 1-1100 hPa):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*10990/254]+10   //scale 1-255 to 10-11000
   parameter_value=hdf_value*0.1   //apply scaling and offset
else //geotiff_value=0
   hdf_value=-32768
  parameter_value=NO_RETRIEVAL
end
```

M12. MODIS Total Precipitable Water

HDF SDS: Water_Vapor (generated by IMAPP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0-20000 are scaled linearly to 1-255 in GeoTIFF output. Fill values (-9999) are set to 0.

```
if hdf_value = -9999
    geotiff_value=0
else
   geotiff_value=1+round((254/20000)*hdf_value) //scale from 1 to 255
   if(geotiff_value<1)
       geotiff_value=1
   endif
   if(geotiff_value>255)
      geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: cm; range: 0-20 cm):

```
if geotiff_value>0
   hdf_value=(geotiff_value-1)*20000/254   //scale 1-255 to 0-20000
   parameter_value=hdf_value*0.001   //apply scaling and offset factors as specified in the HDF SDS
else //geotiff_value=0
   hdf_value=-9999
  parameter_value=NO_RETRIEVAL
end
```

M13. MODIS Cloudmask

HDF SDS: Cloud_Mask (generated by IMAPP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
Retrieve bit 0 from byte_1 in HDF SDS
if (bit0 = 0)
  geotiff_value=0
else
   Retrieve bits 2 and 1 (bit21) from byte_1 in HDF SDS
   if (bit21=00)//Cloudy
         geotiff_value=1
    elseif (bit21=01) //Uncertain
        geotiff_value=2
    elseif (bit21=10) //Probably Clear
        geotiff_value=3
    elseif (bit21=11) //Clear
         geotiff_value=4
     endif
endif
```

Pseudo-code to convert GeoTIFF values to actual parameter flags (units: dimensionless):

```
if (geotiff_value=1)
    parameterflag=CLOUDY
elseif (geotiff_value=2)
    parameterflag=UNCERTAIN
elseif (geotiff_value=3
    parameterflag=PROBABLY_CLEAR
elseif (geotiff_value=4)
    parameterflag=CLEAR
elseif (geotiff_value=0)
    parameterflag=NO_RETRIEVAL
endif
```

M14. MODIS True Color Images

MODIS corrected reflectances in bands 1, 4 and 3 generated by CREFL_SPA are used to create the CREFL true color images. The scalings used on the red, green and blue bands to create aesthetically pleasing true color images were inspired by Gumley, Descloitres and Schmaltz (2007), "Creating Reprojected True Color MODIS Images: A Tutorial."

M15. MODIS True Color Images with Fire Pixel Overlays

MODIS True Color Images (as described above) are enhanced with fire pixels.

V1. VIIRS Top of Atmosphere True Color

VIIRS Top of Atmosphere (TOA) reflectances in bands M5, M4 and M3 generated by C-SDR are used to create the VIIRS TOA true color images. The scalings used were inspired by Gumley, Descloitres and Schmaltz (2007), "Creating Reprojected True Color MODIS Images: A Tutorial."

V2. VIIRS DNB Radiance (Night time)

HDF SDS: /All_Data/VIIRS-DNB-SDR_All/Radiance (in SVDNB product)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0 to 1E-7 (W/(cm^2 sr)) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-999.9 to -999.0) are set to 0.

```
if hdf_value >= -999.9 and hdf_value<=-999.0
    geotiff_value=0
else
   geotiff_value=1+round((254/0.0000001)*(hdf_value)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: W/(cm^2 sr); range: 0 to 0.0000001):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)* 0.0000001/254]   //scale 1-255 to 0 to 0.0000001
   parameter_value=hdf_value
else //geotiff_value=0
   hdf_value=FILL_VALUE
  parameter_value=NO_RETRIEVAL
end
```

V3. VIIRS DNB Radiance (Day time)

HDF SDS: /All_Data/VIIRS-DNB-SDR_All/Radiance (in SVDNB product)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0-0.01 (W/(cm^2 sr)) are scaled linearly to 1-255 in GeoTIFF output.
Fill values (-999.9 to -999.0) are set to 0.

```
if hdf_value >= -999.9 and hdf_value<=-999.0
    geotiff_value=0
else
   geotiff_value=1+round((254/0.01)*(hdf_value)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: W/(cm^2 sr); range: 0 to 0.01):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*0.01/254]   //scale 1-255 to 0 to 0.01
   parameter_value=hdf_value
else //geotiff_value=0
   hdf_value=FILL_VALUE
  parameter_value=NO_RETRIEVAL
end
```

V4/V5. VIIRS CVIIRS True Color

VIIRS corrected reflectances in bands M5 (or I1), M4 and M3 generated by CVIIRS_SPA are used to create the VIIRS true color images. The scalings used were inspired by Gumley, Descloitres and Schmaltz (2007), "Creating Reprojected True Color MODIS Images: A Tutorial."

V6. VIIRS Imagery M Band False Color

VIIRS imagery EDRs for bands M1, M4 and M9 generated by the GTMImagery_SPA are used to create the VIIRS false color images.

V7. VIIRS Imagery I Band False Color

VIIRS imagery EDRs for bands I1, I2 and I3 generated by the GTMImagery_SPA are used to create the VIIRS false color images.

V8. VIIRS Imagery NCC Albedo

HDF SDS: /All_Data/VIIRS-NCC-EDR_All/Albedo (in VNCCO product generated by GTMImagery_SPA).

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0-13105 (equivalent to 0 - 1) are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535) are set to 0.

```
if hdf_value >= 65528 and hdf_value<=65535
    geotiff_value=0
else
   geotiff_value=1+round((254/13105)*(hdf_value)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (unitless, range: 0 to 1):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*13105/254]   //scale 1-255 to 14694 to 54407
   parameter_value=hdf_value*0.00007630442    //apply scaling and offset factors as specified in
the HDF SDS
else //geotiff_value=0
   hdf_value=FILL_VALUE
  parameter_value=NO_RETRIEVAL
end
```

V9. VIIRS-AF Fire Mask

HDF SDS: fire mask (generated by VIIRS-AF_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
geotiff_value=hdf_value
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter flags (units: dimensionless):

```
hdf_value=geotiff_value
(Flag interpretation:  0– missing, 1- not processed, 2- not processed, 3- water, 4- cloud, 5-non-
```

fire, 6- unknown, 7- low confidence fire, 8- nominal confidence fire, 9- high confidence fire)

V10. VFIRE375 Fire Mask

HDF SDS: fire mask (generated by VFIRE375_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

geotiff_value=hdf_value

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter flags (units: dimensionless):

hdf_value=geotiff_value
(Flag interpretation: 0– missing, 1- not processed, 2- not processed, 3- water, 4- cloud, 5-non-fire, 6- unknown, 7- low confidence fire, 8- nominal confidence fire, 9- high confidence fire)

V11. VIIRS CVIIRS True Color with Fire Pixel Overlays

VIIRS true color images generated from CVIIRS (as described above) are enhanced with fire pixel overlays.

V12. VIIRS Cloud Mask

HDF SDS: /All_Data/VIIRS-CM-IP_All/QF1_VIIRSCMIP (from IICMP product generated by CLOUDMASK_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
Retrieve bit 0 and 1 (bit01) in HDF SDS
if (bit01 = 0)
  geotiff_value=0
else
   Retrieve bits 2 and 3 (bit23) in HDF SDS
   if (bit23=00) //Clear
         geotiff_value=1
    elseif (bit21=01) //Probably Clear
        geotiff_value=2
    elseif (bit21=10) //Probably Cloudy
        geotiff_value=3
    elseif (bit21=11) //Confident Cloudy
         geotiff_value=4
     endif
endif
```

Pseudo-code to convert GeoTIFF values to actual parameter flags (units: dimensionless):

```
if (geotiff_value=1)
   parameterflag=CLEAR
elseif (geotiff_value=2)
   parameterflag=PROBABLY_CLEAR
elseif (geotiff_value=3
   parameterflag=PROBABLY_CLOUDY
elseif (geotiff_value=4)
   parameterflag=CONFIDENT_CLOUDY
elseif (geotiff_value=0)
   parameterflag=NO_RETRIEVAL
endif
```

V13. VIIRS Cloud Phase

HDF SDS: /All_Data/VIIRS-CM-IP_All/QF6_VIIRSCMIP (from IICMP product generated by CLOUDMASK_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
Retrieve bit 0,1 and 2 (bit012) in HDF SDS
if (bit012 = 000)
  geotiff_value=0
elseif (bit012=001) //Clear
        geotiff_value=1
elseif (bit012=010) //Partly Cloudy
       geotiff_value=2
 elseif (bit012=011) //Water Cloud
       geotiff_value=3
 elseif (bit012=100) //Supercooled Water/Mixed
        geotiff_value=4
elseif (bit012=101) //Opaque Ice Cloud
         geotiff_value=5
elseif (bit012=110) //Cirrus Cloud
         geotiff_value=6
elseif (bit012=111) //Cloud Overlap
         geotiff_value=7
endif
```

Pseudo-code to convert GeoTIFF values to actual parameter flags (units: dimensionless):

```
if (geotiff_value=1)
   parameterflag=CLEAR
elseif (geotiff_value=2)
   parameterflag=PARTLY_CLOUDY
elseif (geotiff_value=3
   parameterflag=WATER_CLOUD
elseif (geotiff_value=4)
   parameterflag=MIXED_CLOUD
elseif (geotiff_value=5
```

```
    parameterflag=ICE_CLOUD
elseif (geotiff_value=6
    parameterflag=CIRRUS_CLOUD
elseif (geotiff_value=7)
    parameterflag=CLOUD_OVERLAP
elseif (geotiff_value=0)
    parameterflag=NO_RETRIEVAL
endif
```

V14. VIIRS Aerosol Optical Thickness

HDF SDS: /All_Data/VIIRS-Aeros-Opt-Thick-IP_All/faot550 (in IVAOT product generated by Aerosol_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0.0 to 5.0 are scaled linearly to 1-255 in GeoTIFF output. Fill values (-999) in SDS are set to 0 in geotiff.

```
if hdf_value = -999
     geotiff_value=0
else
 geotiff_value=1+round((254/5.0)*hdf_value) //scale from 1 to 255
    if(geotiff_value<1)
         geotiff_value=1
    endif
    if(geotiff_value>255)
        geotiff_value=255
    endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: 0-5):

```
if geotiff_value>0
    hdf_value=(geotiff_value-1)*5.0/254   //scale 1-255 to 0-5.0
    parameter_value=hdf_value
else //geotiff_value=0
    hdf_value=-999
   parameter_value=NO_RETRIEVAL
end
```

V15. VIIRS Aerosol Particle Size

HDF SDS: /All_Data/VIIRS-Aeros-Opt-Thick-IP_All/angexp (in IVAOT product generated by Aerosol_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from

0.0 to 3.0 are scaled linearly to 1-255 in GeoTIFF output. Fill values (-999) in SDS are set to 0 in geotiff.

```
if hdf_value = -999
    geotiff_value=0
else
 geotiff_value=1+round((254/3.0)*hdf_value) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: 0-3.0):

```
if geotiff_value>0
   hdf_value=(geotiff_value-1)*3.0/254   //scale 1-255 to 0-3.0
   parameter_value=hdf_value
else //geotiff_value=0
   hdf_value=-999
  parameter_value=NO_RETRIEVAL
end
```

V16. VIIRS Suspended Matter

HDF SDS: /All_Data/VIIRS-SusMat-EDR_All/SuspendedMatterType (from VSUMO product generated by AEROSOL_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
if hdf_value >= 249 and hdf_value<=255
    geotiff_value=0
else
 geotiff_value=1+hdf_value
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to actual parameter flags (units: dimensionless):

```
if (geotiff_value>0)
        hdf_value=geotiff_value-1
elseif (geotiff_value=0)
hdf_value=NO_VALUE
endif
```

V17. VIIRS Cloud Top Temperature

HDF SDS: /All_Data/VIIRS-INWCTT-IP_All/ctt (in IVIWT product generated by COP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 180.0 to 300.0 (equivalent to 180K-300K) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-999) are set to 0.

```
if hdf_value >=-1000 and hdf_value<=-999
    geotiff_value=0
else
   geotiff_value=1+round((254/120)*(hdf_value-180)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: K; range: 180K to 300K):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*120/254]+180   //scale 1-255 to 180 to 300
   parameter_value=hdf_value
else //geotiff_value=0
   hdf_value=FILL_VALUE
  parameter_value=NO_RETRIEVAL
end
```

V18 VIIRS Cloud Optical Thickness

HDF SDS: /All_Data/VIIRS-Cd-Opt-Prop-IP_All/cot (in IVCOP product generated by COP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from

0.0 to 40.0 are scaled linearly to 1-255 in GeoTIFF output. Fill values (-999) in SDS are set to 0 in geotiff.

```
if hdf_value >=-1000 and hdf_value<=-999
        geotiff_value=0
    else
     geotiff_value=1+round((254/40.0)*hdf_value) //scale from 1 to 255
       if(geotiff_value<1)
            geotiff_value=1
       endif
       if(geotiff_value>255)
           geotiff_value=255
       endif
    endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: 0-40.0):

```
    if geotiff_value>0
       hdf_value=(geotiff_value-1)*40.0/254   //scale 1-255 to 0-40.0
       parameter_value=hdf_value
    else //geotiff_value=0
       hdf_value=-999
      parameter_value=NO_RETRIEVAL
end
```

V19. VIIRS Effective Particle Size

HDF SDS: /All_Data/VIIRS-Cd-Opt-Prop-IP_All/eps (in IVCOP product generated by COP_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0.0 to 40.0 (microns) are scaled linearly to 1-255 in GeoTIFF output.
Fill values (-999) in SDS are set to 0 in geotiff.

```
if hdf_value >=-1000 and hdf_value<=-999
        geotiff_value=0
    else
     geotiff_value=1+round((254/40.0)*hdf_value) //scale from 1 to 255
       if(geotiff_value<1)
            geotiff_value=1
       endif
       if(geotiff_value>255)
           geotiff_value=255
       endif
    endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter

values (units: microns; range: 0-40.0):

```
        if geotiff_value>0
           hdf_value=(geotiff_value-1)*40.0/254   //scale 1-255 to 0-40.0
           parameter_value=hdf_value
        else //geotiff_value=0
           hdf_value=-999
          parameter_value=NO_RETRIEVAL
end
```

V20. VIIRS Snow Binary Map

HDF SDS: /All_Data/VIIRS-SCD-BINARY-SNOW-MAP-EDR_All/SnowCoverBinaryMap (from VSCMO product generated by SNOWCOVER_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
        if hdf_value >= 249 and hdf_value<=255
            geotiff_value=0
        elseif  QF1_VIIRSSCDBINARYSNOWMAPEDR is 'BAD' or 'NO-RETRIEVAL'
        geotiff_value=0
        else
         geotiff_value=1+hdf_value
           if(geotiff_value<1)
                geotiff_value=1
           endif
           if(geotiff_value>255)
               geotiff_value=255
           endif
        endif
```

Pseudo-code to convert GeoTIFF values to actual parameter flags (units: dimensionless):

```
    if (geotiff_value>0)
            hdf_value=geotiff_value-1
    elseif (geotiff_value=0)
    hdf_value=NO_VALUE
    endif
```

V21. VIIRS Snow Fraction

HDF SDS: /All_Data/VIIRS-SCD-BINARY-SNOW-FRAC-SDR_All/SnowCoverFraction (generated by SnowCov_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0

to 65527 (equivalent to Snow Fraction values 0.0 to 1.0) are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535) are set to 0.

```
if hdf_value >= 65528 and hdf_value<=65535
    geotiff_value=0
else
   geotiff_value=1+round((254/65527)*hdf_value) //scale from 1 to 255
   if(geotiff_value<1)
       geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: 0.0 to 1.0):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*65527/254]   //scale 1-255 to 0-65527
   parameter_value=hdf_value*0.00001526088 //apply scaling and offset factors
else //geotiff_value=0
   hdf_value=65535
  parameter_value=NO_RETRIEVAL
end
```

V22. VIIRS Land Surface Reflectance True Color

VIIRS land surface reflectances in bands M5, M4 and M3 generated by SurfRefl_SPA are used to create the VIIRS surface reflectance true color images. The scalings used were inspired by Gumley, Descloitres and Schmaltz (2007), "Creating Reprojected True Color MODIS Images: A Tutorial."

V23. VIIRS NDVI

HDF SDS: /All_Data/VIIRS-VI_EDR_All/TOA_NDVI (generated by VegIndex_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 29488 to 65527 (equivalent to NDVI values -0.1 to 1.0) are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535) are set to 0.

```
if hdf_value >=65528 and hdf_value<=65535
    geotiff_value=0
elseif pixel has CLOUD, WATER or FILL (identified using VIIRS-AF HDF product)
   geotiff_value=0
else
   geotiff_value=1+round((254/36039)*(hdf_value-29488)) //scale from 1 to 255
   if(geotiff_value<1)
       geotiff_value=1
```

```
    endif
    if(geotiff_value>255)
        geotiff_value=255
    endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: -0.1 to 1.0):

```
if geotiff_value>0
    hdf_value=[(geotiff_value-1)*36039/254]+29488 //scale 1-255 to 29428-65527
    parameter_value=hdf_value*0.00003052177-1   //apply scaling and offset factors
else //geotiff_value=0
    hdf_value=65535
   parameter_value=NO_RETRIEVAL
end
```

V24. VIIRS EVI

HDF SDS: /All_Data/VIIRS-VI_EDR_All/TOC_EVI (generated by VegIndex_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 11795 to 26211 (equivalent to EVI values -0.1 to 1.0) are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535) are set to 0.

```
if hdf_value >=65528 and hdf_value<=65535
     geotiff_value=0
elseif pixel has CLOUD, WATER or FILL (identified using VIIRS-AF HDF product)
    geotiff_value=0
else
    geotiff_value=1+round((254/14416)*(hdf_value-11795)) //scale from 1 to 255
    if(geotiff_value<1)
         geotiff_value=1
    endif
    if(geotiff_value>255)
        geotiff_value=255
    endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: -0.1 to 1.0):

```
if geotiff_value>0
    hdf_value=[(geotiff_value-1)*14416/254]+11795   //scale 1-255 to 11795 to 26211
    parameter_value=hdf_value*0.00007630442-1   //apply scaling and offset factors
else //geotiff_value=0
    hdf_value=65535
   parameter_value=NO_RETRIEVAL
end
```

V25. VIIRS LST

HDF SDS: /All_Data/VIIRS-LST-EDR_All/LandSurfaceTemperature (generated by LST_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 18385 to 61598 (equivalent to LST values 230K to 340K) are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535) are set to 0.

```
if hdf_value >=65528 and hdf_value<=65535
    geotiff_value=0
elseif pixel has CLOUD, WATER or FILL (identified using VIIRS-AF HDF product)
   geotiff_value=0
else
   geotiff_value=1+round((254/43213)*(hdf_value-18385)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: Kelvin; range: 230K to 340K):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*43213/254]+18385   //scale 1-255 to 18385 to 61598
   parameter_value=hdf_value*0.0025455155+183.2   //apply scaling and offset factors
else //geotiff_value=0
   hdf_value=65535
  parameter_value=NO_RETRIEVAL
end
```

V26. VIIRS L2GEN SST

HDF SDS: sst (generated by L2GEN_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:
HDF SDS data from -400 to 9000 (equivalent to -2^{o}C to 45^{o}C) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-32767) are set to 0.

```
if hdf_value = -32767
    geotiff_value=0
elseif qual_sst>=3 (identified using qual_sst sds)
   geotiff_value=0
else
   geotiff_value=1+round((254/9400)*(hdf_value+400)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: ^{o}C; range: -2^{o}C to 45^{o}C):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*9400/254]-400   //scale 1-255 to -400 to 9000
   parameter_value=hdf_value*0.005    //apply scaling and offset factors as specified in the HDF
SDS
else //geotiff_value=0
   hdf_value=-32767
  parameter_value=NO_RETRIEVAL
end
```

V27. VIIRS L2GEN Chlorophyll-a Concentration

HDF SDS: chlor_a (generated by L2GEN_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values:

```
if(hdf_value=-32767 or l2flag = Chl_warn or l2flag=Chl_fail)
   geotiff_value=0
else
  if(hdf_value<0.01)
      hdf_value=0.01
   endif
  if(hdf_value>100)
     hdf_value=100
  endif
  geotiff_value= round(128+(63.5*(log10(hdf_value))
end
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: mg/m^3; range: 0.01 to 100):

```
if (geotiff_value=0)
  hdf_value=-1
  parameter_value=NO_RETRIEVAL
else
```

```
  hdf_value=10^[(geotiff_value-128)/63.5]
  parameter_value=hdf_value
end
```

V28-V38/V44-V46. VIIRS I/M SDR Reflectances

HDF SDS: /All_Data/VIIRS-M*X*-SDR_All/Reflectance (in SVM*XX* product; *XX*=01-11); All_Data/VIIRS-I*X*-SDR_All/Reflectance (in SVI*XX* product; *XX*=01-03)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data between 0 and 40954 (equivalent to 0-1 reflectance) are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535) are set to 0.

```
if hdf_value == Fill_Value
    geotiff_value=0
else
   geotiff_value=1+round((254/(40954)*(hdf_value)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (unitless: range: 0 to 1):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*(40954)/254 //scale 1-255 to 0-40954
   parameter_value=hdf_value*0.000024417415   //apply scaling and offset factors as specified in
the HDF SDS
else //geotiff_value=0
   hdf_value=FILL_VALUE
  parameter_value=NO_RETRIEVAL
end
```

V39-V43/V47-V48. VIIRS I/M SDR Brightness Temperature

HDF SDS: /All_Data/VIIRS-MXX-SDR_All/BrightnessTemperature (in SVMXX product; XX=12-16); All_Data/VIIRS-IXX-SDR_All/BrightnessTemperature (in SVIXX product; XX=04-05)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data in the following ranges (equivalent to 180K-320K) for each VIIRS emissive band:
I4: -11539 to 46157; I5: 8547 to 48433; M12: -9134 to 46465; M13: 180 to 320; M14:

16047 to 53491; M15: 16746 to 50733; M16: 18084 to 50965; are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535 for I4, I5, M12, M14, M15 and M16 and -999 for M13) are set to 0.

```
if hdf_value == Fill_Value
    geotiff_value=0
else
   geotiff_value=1+round((254/(upper_bound_sds-lower_bound_sds)*(hdf_value-
lower_bound_sds)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: K; range: 180K to 320K):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*(upper_bound_sds-lower_bound_sds)/254]+lower_bound_sds
//scale 1-255 to lower_bound_sds to upper_bound_sds
 parameter_value=hdf_value*scale+offset    //apply scaling and offset factors as specified in the
HDF SDS
else //geotiff_value=0
   hdf_value=FILL_VALUE
  parameter_value=NO_RETRIEVAL
end
```

O1. OMPS Ultraviolet Aerosol Index

HDF SDS: /ScienceData/UVAerosolIndex (in OMPS Total Column Total Ozone product generated by OMPSnadir_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 1.0 to 3.0 (equivalent to aerosol index of 1.0 to 3.0) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-9999 to -3000) are set to 0.

```
if hdf_value >= -9999 and hdf_value<=-3000
    geotiff_value=0
else
   geotiff_value=1+round((254/2.0)*(hdf_value-1.0)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
```

```
        geotiff_value=255
    endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless; range: 1.0 to 3.0):

```
if geotiff_value>0
    hdf_value=[(geotiff_value-1)*2.0/254]+1.0   //scale 1-255 to 1.0 to 3.0
    parameter_value=hdf_value
else //geotiff_value=0
    hdf_value=FILL_VALUE
   parameter_value=NO_RETRIEVAL
end
```

O2. OMPS Total Column Ozone

HDF SDS: /ScienceData/ColumnAmountO3 (in OMPS Total Column Total Ozone product generated by OMPSnadir_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 200.0 to 500.0 (equivalent to Total Ozone of 200 D.U. to 500.0 D.U.) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-9999 to 50) are set to 0.

```
if hdf_value >= -9999 and hdf_value<=50
     geotiff_value=0
else
    geotiff_value=1+round((254/300)*(hdf_value-200)) //scale from 1 to 255
    if(geotiff_value<1)
         geotiff_value=1
    endif
    if(geotiff_value>255)
        geotiff_value=255
    endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: D.U. ; range: 200.0 to 500.0):

```
if geotiff_value>0
    hdf_value=[(geotiff_value-1)*300.0/254] +200.0   //scale 1-255 to 200-500
    parameter_value=hdf_value
else //geotiff_value=0
    hdf_value=FILL_VALUE
   parameter_value=NO_RETRIEVAL
end
```

O3. OMPS Reflectivity at 331nm

HDF SDS: /ScienceData/Reflectivity331 (Total Column Total Ozone product generated by OMPSnadir_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0.0 to 1.0 (equivalent to Reflectivity of 0.0 to 1.0) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-9999 to -1) are set to 0.

```
if hdf_value >= -9999 and hdf_value<=-1.0
    geotiff_value=0
else
   geotiff_value=1+round((254/1.0)*(hdf_value)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: dimensionless ; range: 0.0 to 1.0):

```
if geotiff_value>0
   hdf_value=[(geotiff_value-1)*1.0/254] //scale 1-255 to 0.0-1.0
   parameter_value=hdf_value
else //geotiff_value=0
   hdf_value=FILL_VALUE
  parameter_value=NO_RETRIEVAL
end
```

O4. OMPS Total Column SO_2

HDF SDS: /HDFEOS/SWATHS/OMPS Column Amount SO2/Data Fields/ColumnAmountSO2_TRM (in OMPS SO_2 product generated by OMPSnadir_SPA)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data from 0.0 to 2.0 (equivalent to Total Ozone of 0.0 D.U. to 2.0 D.U.) are scaled linearly to 1-255 in GeoTIFF output. Fill values (-9999 to -10) are set to 0.

```
if hdf_value >= -9999 and hdf_value<=-10
   geotiff_value=0
```

```
else
   geotiff_value=1+round((254/2.0)*(hdf_value)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: D.U. ; range: 0.0 to 2.0):

```
    if geotiff_value>0
       hdf_value=[(geotiff_value-1)*2.0/254]//scale 1-255 to 0.0-2.0
       parameter_value=hdf_value
    else //geotiff_value=0
       hdf_value=FILL_VALUE
      parameter_value=NO_RETRIEVAL
    end
```

C1/C2/C3. CrIS SDR Brightness Temperature

HDF SDS: /All_Data/CrIS-SDR_All/ES_RealXX (XX=SW, MW, LW in SCRIS SDR product)

Scaling used to convert HDF SDS values to GeoTIFF values: CrIS SDR data in the latter datasets are first preprocessed into Brightness Temperature intermediate products containing average brightness temperature for the following spectral ranges: 900-905 cm^{-1} (Longwave); 1598-1602 cm^{-1} (Mediumwave); 2425-2430 cm^{-1} (Shortwave). These Brightness temperatures in the following ranges for each spectral range: Longwave: 205K to 305K; Mediumwave: 205K-265K; Shortwave: 225K-305K are scaled linearly to 1-255 in GeoTIFF output. Fill values (-999) are set to 0.

```
    if hdf_value== Fill_Value
        geotiff_value=0
    else
       geotiff_value=1+round((254/(upper_bound_brightTemp-
    lower_bound_brightTemp)*(brightTemp-lower_bound_brightTemp)) //scale from 1 to 255
       if(geotiff_value<1)
            geotiff_value=1
       endif
       if(geotiff_value>255)
           geotiff_value=255
       endif
    endif
```

Pseudo-code to convert GeoTIFF values to Brightness Temperature values (units: K; range: as described above for each channel):

```
if geotiff_value>0
//scale 1-255 to parameter values
brightTemp=[(geotiff_value-1)*(upper_bound_brightTemp-
lower_bound_brightTemp)/254]+lower_bound_brightTemp
else //geotiff_value=0
brightTemp=NO_RETRIEVAL
end
```

A1-A22. ATMS SDR Brightness Temperature

HDF SDS: /All_Data/ATMS-SDR_All/BrightnessTemperature (in SATMS SDR product)

Scaling used to convert HDF SDS values to GeoTIFF values: HDF SDS data in the following ranges for each ATMS channel: Channel 1, 2, 3, 4, 16, 17, 18: 39713 to 59570 (equivalent to 200K-300K); Channel 5, 19, 20, 21, 22: 39713 to 55599 (equivalent to 200K-280K); Channel 6: 43685 to 51627 (equivalent to 220K to 260K); Channel 7: 41699 to 47656 (equivalent to 210K to 240K); Channel 8, 9, 10, 11: 41699 to 45670 (equivalent to 210K to 230K); Channel 12, 13: 41699 to 49642 (equivalent to 210K to 250K): Channel 14, 15: 41699 to 55599 (equivalent to 210K to 280K); are scaled linearly to 1-255 in GeoTIFF output. Fill values (65528 to 65535) are set to 0.

```
if hdf_value == Fill_Value
    geotiff_value=0
else
   geotiff_value=1+round((254/(upper_bound_sds-lower_bound_sds)*(hdf_value-
lower_bound_sds)) //scale from 1 to 255
   if(geotiff_value<1)
        geotiff_value=1
   endif
   if(geotiff_value>255)
       geotiff_value=255
   endif
endif
```

Pseudo-code to convert GeoTIFF values to HDF SDS values/actual parameter values (units: K; range: as described above for each channel):

```
if geotiff_value>0
//scale 1-255 to lower_bound_sds to upper_bound_sds
   hdf_value=[(geotiff_value-1)*(upper_bound_sds-lower_bound_sds)/254]+lower_bound_sds
```

```
//apply scaling and offset factors as specified in the HDF SDS
    parameter_value=hdf_value*0.005036092
else //geotiff_value=0
    hdf_value=FILL_VALUE
   parameter_value=NO_RETRIEVAL
end
```