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How to merge GeoTIFFs and extract the specified area from them

This part explains how to convert multiple HDF5 products to GeoTIFFs, merge them, and then extract them by specifying arbitrary latitude and longitude.

[Preparation]

Windows machine（Recommended OS : Windows 10 (64 bit)）

Installing QGIS on Windows machine（https://www.qgis.org/en/site/index.html）

Installing SGLI Map projection & GeoTIFF conversion Tool on Windows machine（https://gportal.jaxa.jp/gpr/information/tool#GCOM-C）

In this example, the GCOM-C/L2-SST products of the two consecutive scenes shown below are each converted to GeoTIFF in steps 1 to 4, they are merged in step 5, and an arbitrary range is cut out in step 6.

Although steps 1 to 4 are for one scene in the explanation, they are actually performed for two scenes.

・GC1SG1_202209090139J05310_L2SG_SSTDK_3001.h5

・GC1SG1_202209090143N05311_L2SG_SSTDK_3001.h5

[Reference]

For details on GDAL and GDAL command options such as gdal_calc and gdalwarp used in this explanation, please see below.

GDAL ： https://gdal.org/index.html

GDAL command ： https://gdal.org/programs/index.html

Please refer to ”SHIKISAI GeoTIFF-Ocean” for reference in the steps below.

[Step.1]

Referring to ”SHIKISAI GeoTIFF-Ocean” ”1) Command for Level-2 product (single SD array) conversion”, use the SGLI Map projection & GeoTIFF conversion Tool to extract observation data (DN value) and QA_flag from the HDF5 file and output them as GeoTIFF.

You should use the command prompt to run the following command for each file you want to convert.

```
>SGLI_geo_map_win.exe GC1SG1_202209090139J05310_L2SG_SSTDK_3001.h5 -d Image_data/SST -a default -n 65535 -z -o .
```

```
>SGLI_geo_map_win.exe GC1SG1_202209090139J05310_L2SG_SSTDK_3001.h5 -d Image_data/QA_flag -a default -n 65535 -z -o .
```

[Step.2]

Referring to ”SHIKISAI GeoTIFF-Ocean” ”4) The gdal command for applying QA_flag to Level-2/Level-3 products”, create a GeoTIFF which indicates whether or not each pixel is covered with clouds as values of 0 or 1 specifying the GeoTIFF of QA_flag created in step. 1 as input file.

At this time, set the invalid value to pixels that store error DN which is ”65535” for L2-SST. For details on command options, please refer to ”SHIKISAI GeoTIFF-Ocean” ”4) The gdal command for applying QA_flag to Level-2/Level-3 products”.

First, launch the command line application ”OSGeo4W Shell” that is installed with QGIS. In general, it is on the Windows Start menu.

Next, run the command below for each file you want to convert.

```
>gdal_calc -A GC1SG1_202209090139J05310_L2SG_SSTDK_3001_QA_flag.tif --outfile=GC1SG1_202209090139J05310_L2SG_SSTDK_3001_QA_flag2.tif --calc=”(bitwise_and(right_shift(A, 13), 3) > 0) * 1” --NoDataValue=65535
```

[Step.3]

Input the two GeoTIFFs created in steps 1 and 2 and create a GeoTIFF that stores the observed values (DN values) with the influence of clouds removed. For detailed explanations of command options, please refer to ”SHIKISAI GeoTIFF-Ocean” ”4) The gdal command for applying QA_flag to Level-2/Level-3 products”.

Use the OSGeo4W Shell to run the following command for each file you want to convert.

```
>gdal_calc -A GC1SG1_202209090139J05310_L2SG_SSTDK_3001_SST.tif -B GC1SG1_202209090139J05310_L2SG_SSTDK_3001_QA_flag2.tif --outfile=GC1SG1_202209090139J05310_L2SG_SSTDK_3001_SST_QA.tif --calc=”(A > 65531) * 65535 + (A <= 65531) * (B == 0) * 65535 + (A <= 65531) * (B == 1) * A” --NoDataValue=65535
```

[Step.4]

By multiplying each pixel of the GeoTIFF created in step 3 by the slope value and adding the offset value, create a GeoTIFF that stores the values converted from the DN values to physical quantities (in this example, sea surface temperature).

*The slope value (”0.0012” for sea surface temperature) and offset value (”-10” for sea surface temperature) differ depending on each product. For more details, please refer to the link below.

https://suzaku.eorc.jaxa.jp/GCOM_C/data/product_std.html

Use the OSGeo4W Shell to run the following command for each file you want to convert.

```
>gdal_calc -A GC1SG1_202209090139J05310_L2SG_SSTDK_3001_SST_QA.tif --outfile=GC1SG1_202209090139J05310_L2SG_SSTDK_3001_SST_QA2.tif --type=Float32 --calc=”A * 0.0012 - 10” --NoDataValue=65535
```

[Step.5]

Merge the L2-SST GeoTIFFs of the two scenes created in step 4.

Use the OSGeo4W Shell to run the following command.

You can also specify multiple files in the same folder using wildcard character.

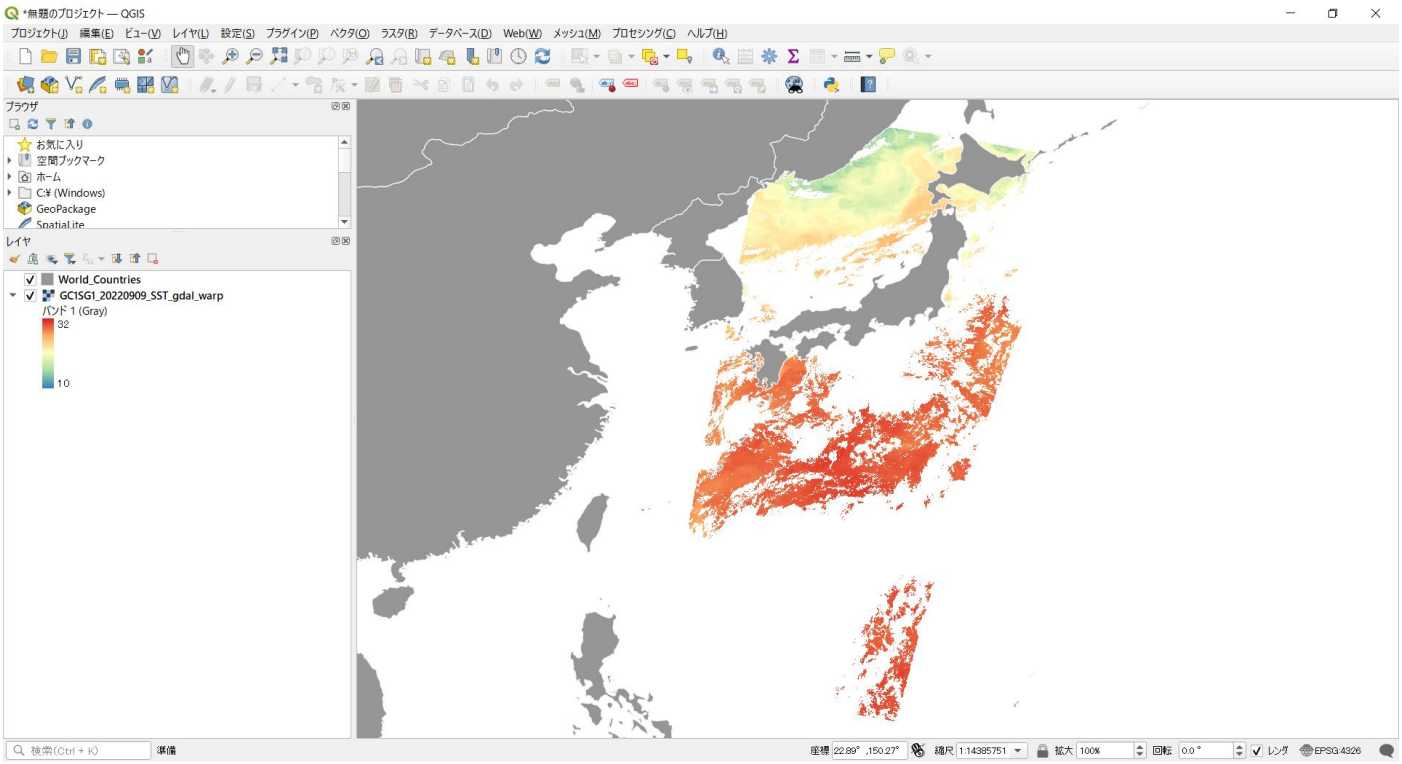
How to execute by passing each file name as an arguments

```
>gdalwarp -srcnodata 65535 -dstnodata nan -co ”COMPRESS=LZW” -r average GC1SG1_202209090139J05310_L2SG_SSTDK_3001_SST_QA2.tif GC1SG1_202209090143N05311_L2SG_SSTDK_3001_SST_QA2.tif ./GC1SG1_20220909_SST_gdal_warp.tif
```

How to execute using wildcard

```
>gdalwarp -srcnodata 65535 -dstnodata nan -co ”COMPRESS=LZW” -r average *_SST_QA2.tif ./GC1SG1_20220909_SST_gdal_warp2.tif
```

When you open the resulting GeoTIFF using QGIS, you will see that the two scene files have been merged as shown below.



[Step.6]

Input the GeoTIFF created in step 5 and specify longitude and latitude of lower left and upper right to extract.

In this example, specify the longitude of the lower left as 124.0°, the latitude as 22.0°, the longitude of the upper right as 150.0°, and the latitude as 36.5°.

Use the OSGeo4W Shell to run the following command.

```
>gdalwarp -te 124.0 22.0 150.0 36.5 GC1SG1_20220909_SST_gdal_warp.tif GC1SG1_20220909_SST_gdal_warp_cut.tif
```

When you open the resulting GeoTIFF using QGIS, you will see that it has been extracted as follows.