# Imaging procedure for GCOM-C(SHIKISAI) product by using QGIS

This document shows how to read the GCOM-C (SHIKISAI) level-2 land surface temperature product by using QGIS and visualize it as an image. For detail of QGIS, please refer to the link below.

https://gportal.jaxa.jp/gpr/information/tool?lang=en

Please refer to the "G-Portal User's Manual" below for how to search for and download products from G-Portal.
https://gportal.jaxa.jp/gpr/assets/mng_upload/COMMON/upload/GPortalUserManual_en.pdf

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# [STEP1] Prepare Land Surface Temperature product

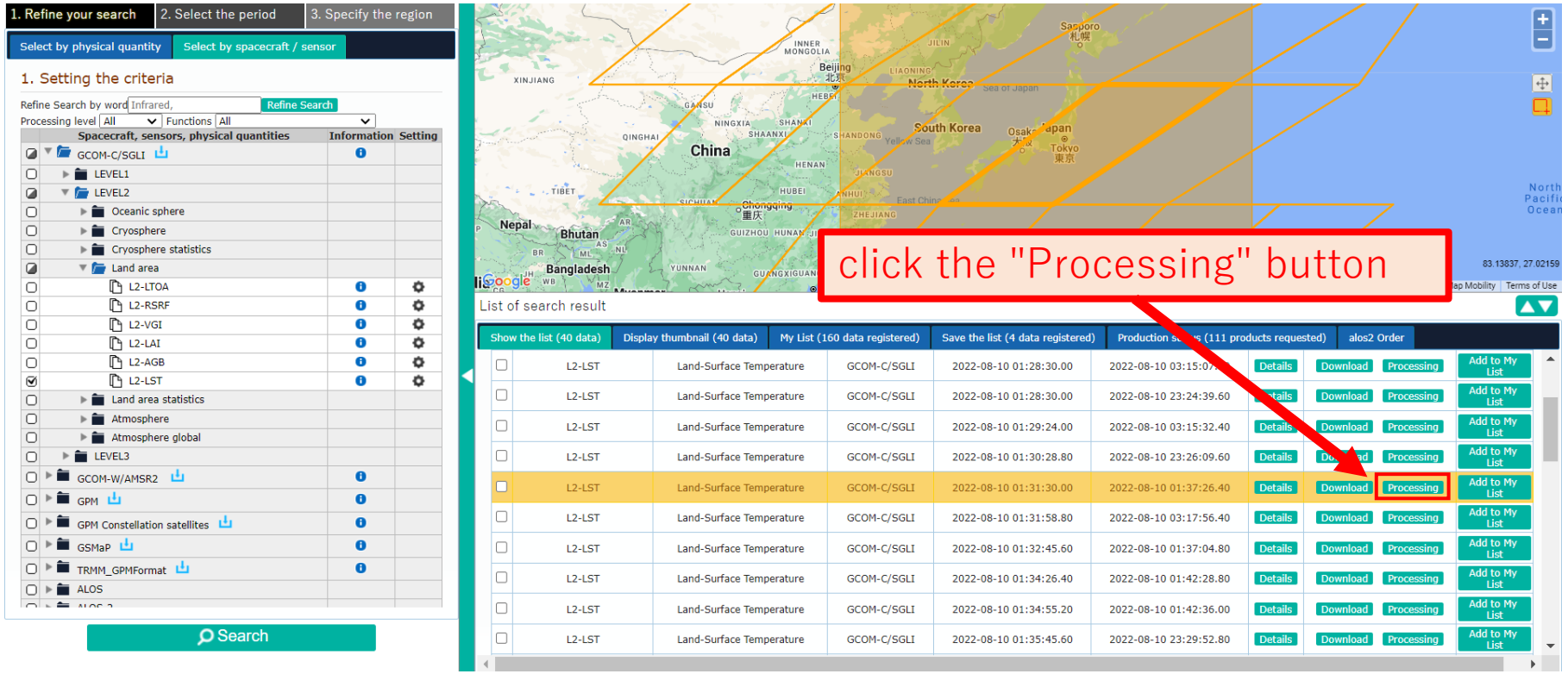
First, prepare land surface temperature product in "GeoTIFF" format to load into QGIS.
There are two ways to get it:

A. Using the processing request function of G-Portal, convert land surface temperature product to GeoTIFF format and download it.

B. Download land surface temperature product from G-Portal, convert the HDF5 format to GeoTIFF format using “SGLI Map projection & GeoTIFF conversion Tool”.

# [STEP1-A](1/2) Get data in GeoTIFF format using G-Portal's processing request function

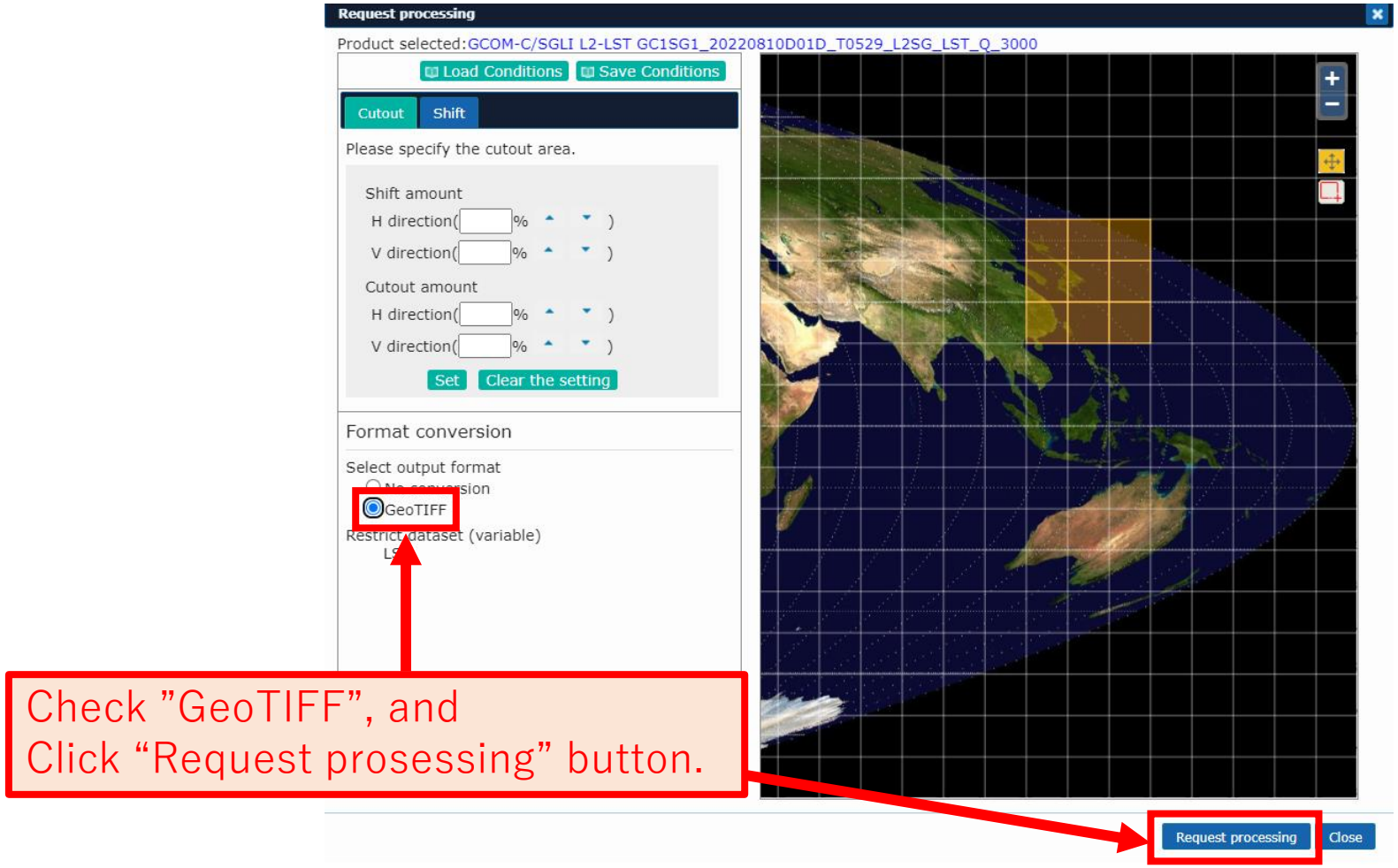
(1) Search land surface temperature data of GCOM-C (Shikisai)  from G-Portal that you want to display as an image in QGIS.
(2) When the search results are displayed, click the "Processing" button in the row of the desired data.




※ If you click the "Download" button, the data will be downloaded in HDF5 format.

# [STEP1-A](2/2) Get data in GeoTIFF format using G-Portal's processing request function

(3) Execute the processing request as follows, and download the GeoTIFF file after receiving email of “[G-Portal] Notice of completion of product production”.



# [STEP1-B](1/2) Convert HDF5 format to GeoTIFF format

Open command prompt and convert HDF5 product to GeoTIFF using SGLI Map projection & GeoTIFF conversion Tool.
Please refer to the following instruction manual for SGLI Map projection & GeoTIFF conversion Tool.
https://gportal.jaxa.jp/gpr/information/tool?lang=en#GCOM-C

```
C:¥xxxxx¥Desktop¥GCOM-C_L2-LST>SGLI_geo_map_win.exe GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000.h5 -d Image_data/LST
========================== Input parameters ==============================
Input file            = GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000.h5
Projection coordinates  = Geodetic Latitude/Longitude
Pixel spacing         = Default (7.5sec/15sec/30sec)
Resampling method     = BL
Data selection        = Image_data/LST
Output directory      = .
==========================================================================
product_type = L2/tile
tile = 0529
pid = GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000
hemi = 0
p=0, Image_data/LST
data rank = 2
data size = 4800/4800
data type = unsigned short
INFO: type of attr is int -> cast to unsigned short! function (H5_common_read2.c) line = 272
max_valid_DN = 65534
x range =  129.4125000000,  141.6000000000
y range =   30.0000000000,   38.8083333333
outsize = 5850, 4228
output = [.¥GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST.tif]
output = [.¥GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST.xml]
done...
```

[Example]
we will use the tile data for Japan on August 10, 2022.

# [STEP1-B](2/2) Convert HDF5 format to GeoTIFF format

Command options for SGLI Map projection & GeoTIFF conversion Tool

Set band offset/scaling(slope) values from HDF attributes to GDAL_METADATA Tag (42112) with an option specified at METADATA.
If you specify the option, you can omit the calculation of the slope/offset value in the formula described on page 18 of this document. However, please note that the temperature is in absolute temperature (K).

[Example]
>SGLI_geo_map_win.exe GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000.h5 -d Image_data/LST –a default

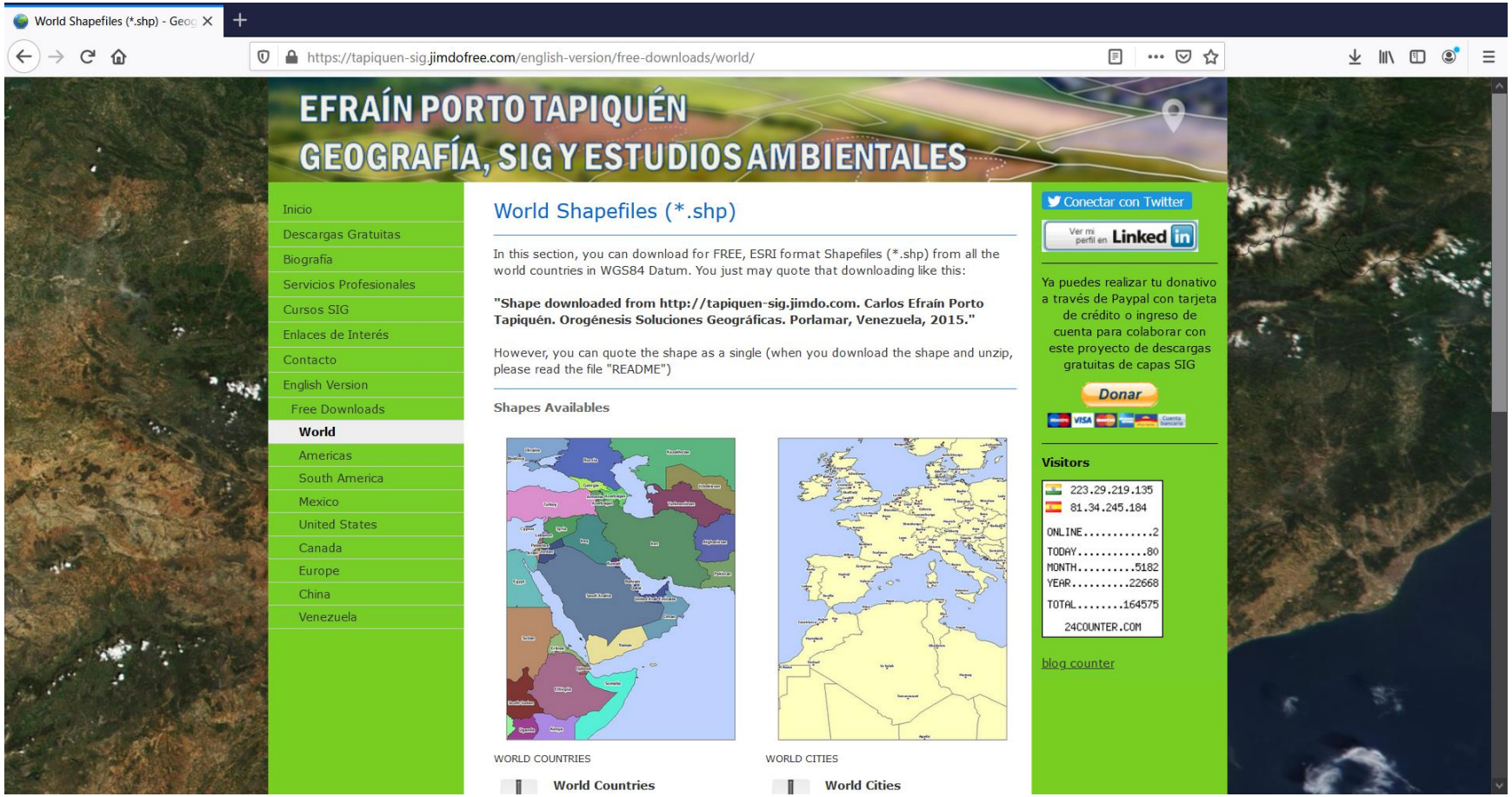
For details of options, refer to page 4 of the instruction manual mentioned in the previous section.
https://gportal.jaxa.jp/gpr/information/tool#GCOM-C

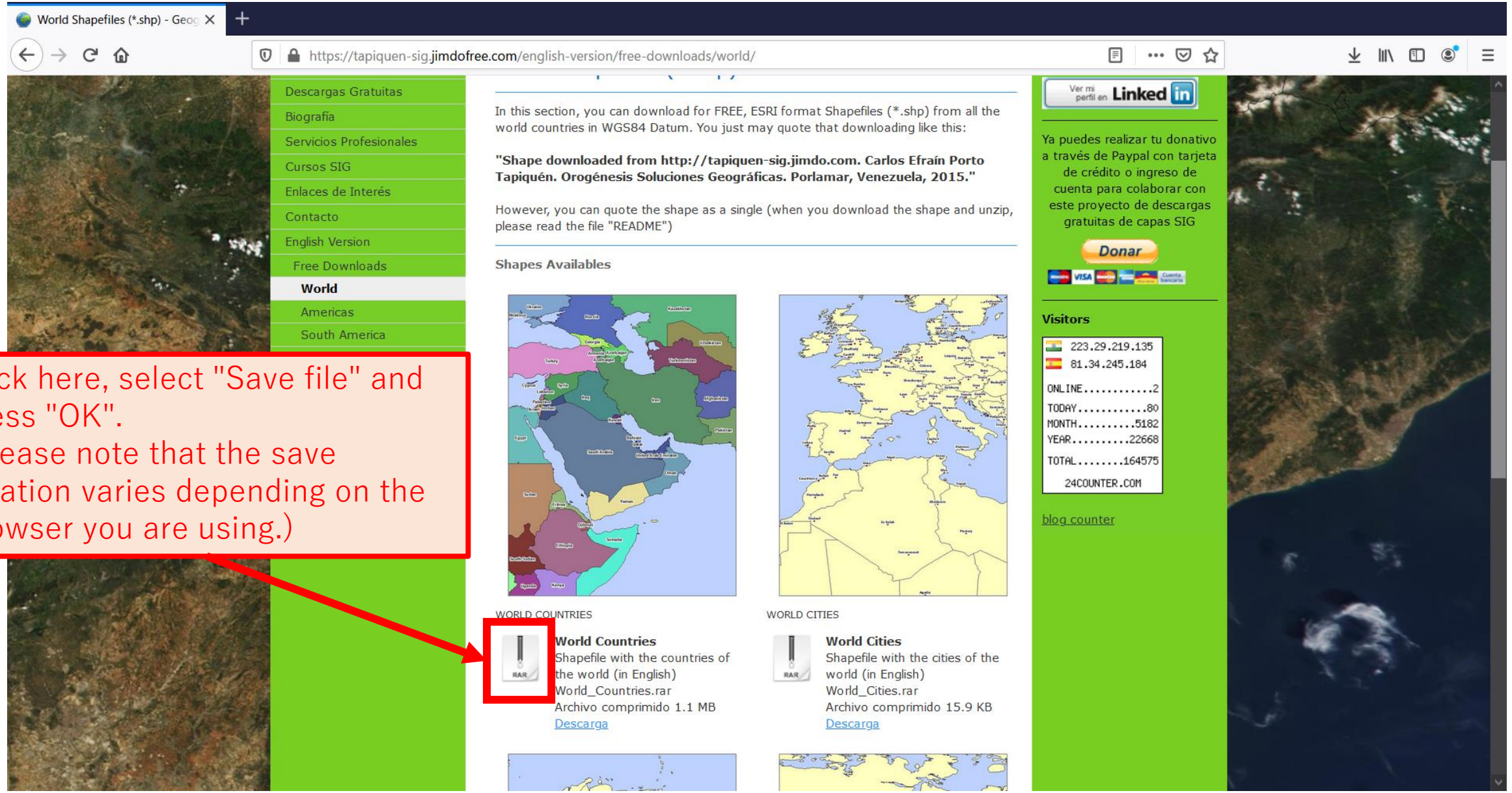
# [STEP2] Read GeoTIFF with the free tool QGIS (https://qgis.org/en/site/) and image it

**<Prepare - Download the land data input to QGIS ->**

Download the land data (used to color land when imaging data with QGIS) from the following sites.

https://tapiquen-sig.jimdofree.com/english-version/free-downloads/world/





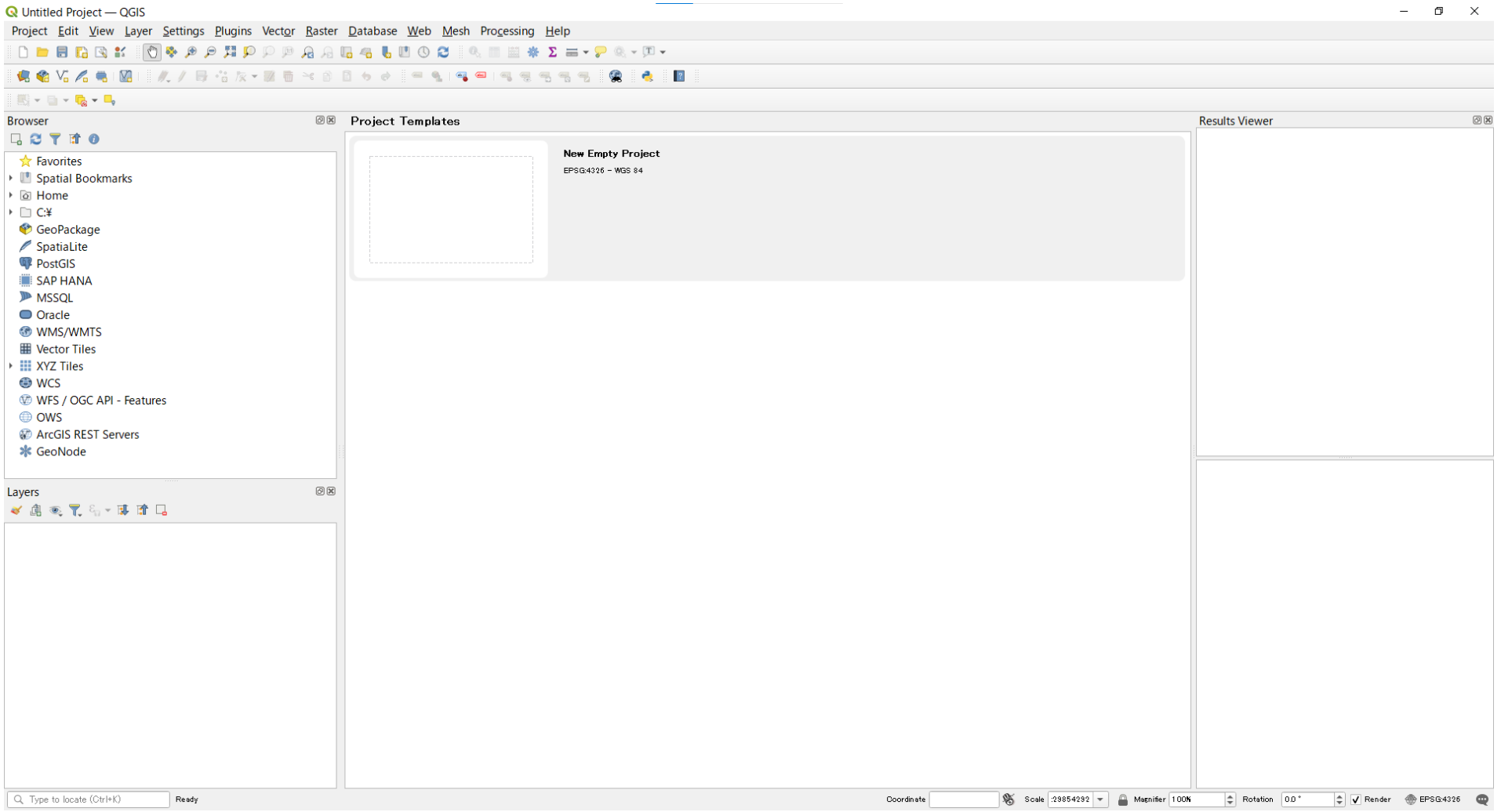

Click here, select "Save file" and press "OK".
(Please note that the save location varies depending on the browser you are using.)

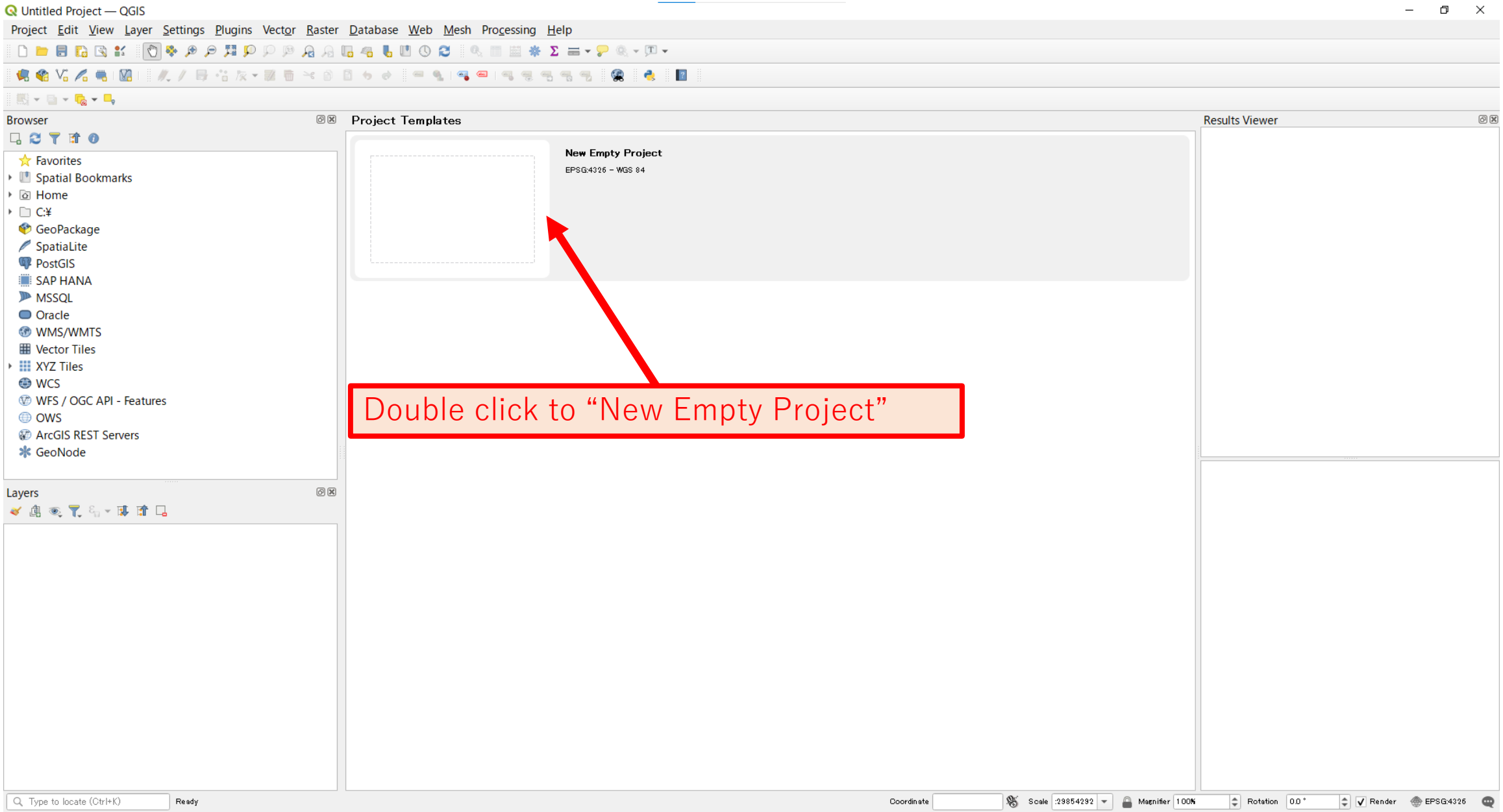
Open the folder where you saved the file and double-click the file named "World_Countries.rar" to unzip it, and you will see the file "World_Countries.shp".
(The "World_Countries.shp" will be used later.)

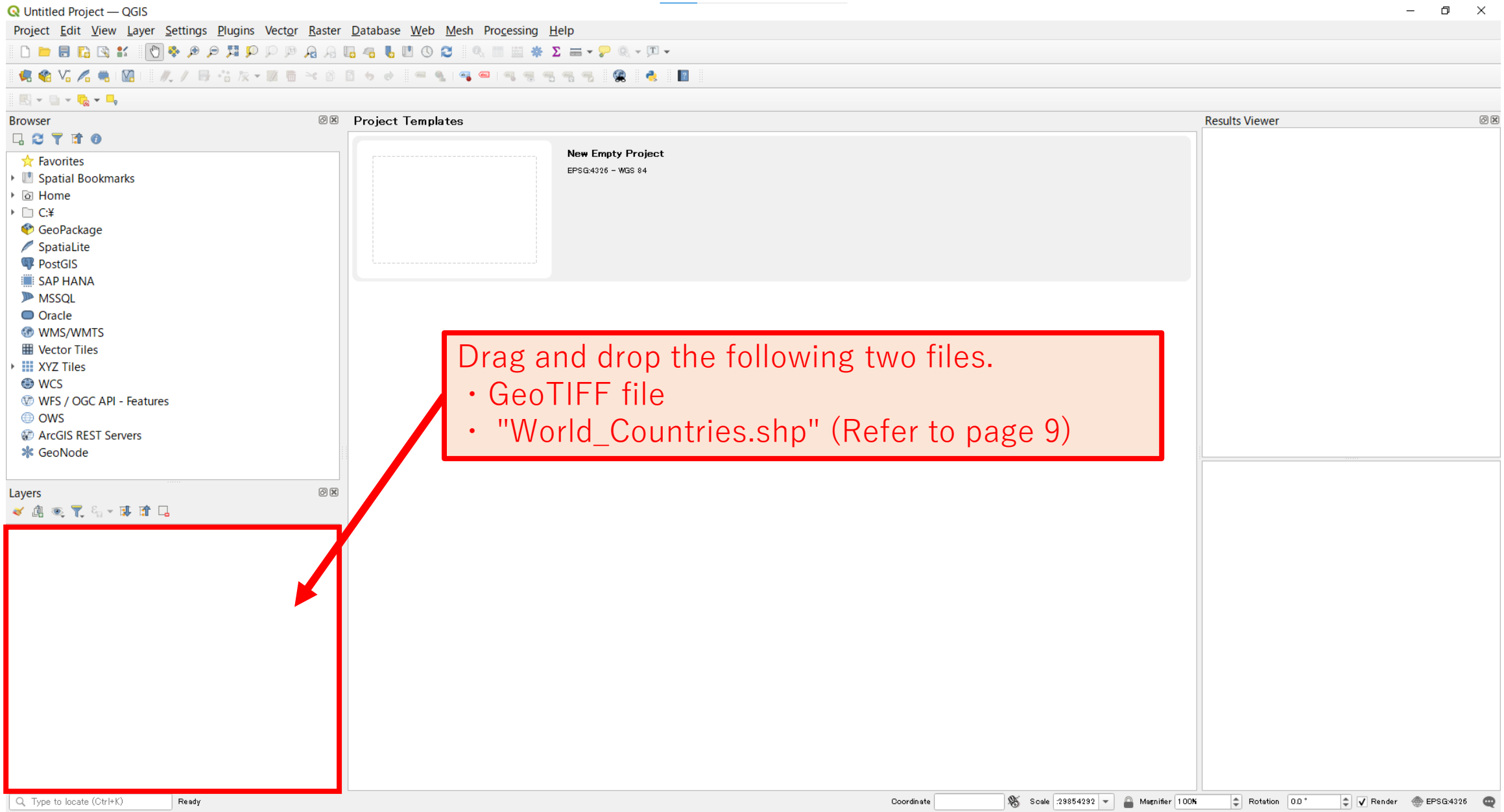
- World_Countries.dbf
- World_Countries.prj
- World_Countries.sbn
- World_Countries.sbx
- **World_Countries.shp**
- World_Countries.shp.xml
- World_Countries.shx
- World_Countries_README.txt

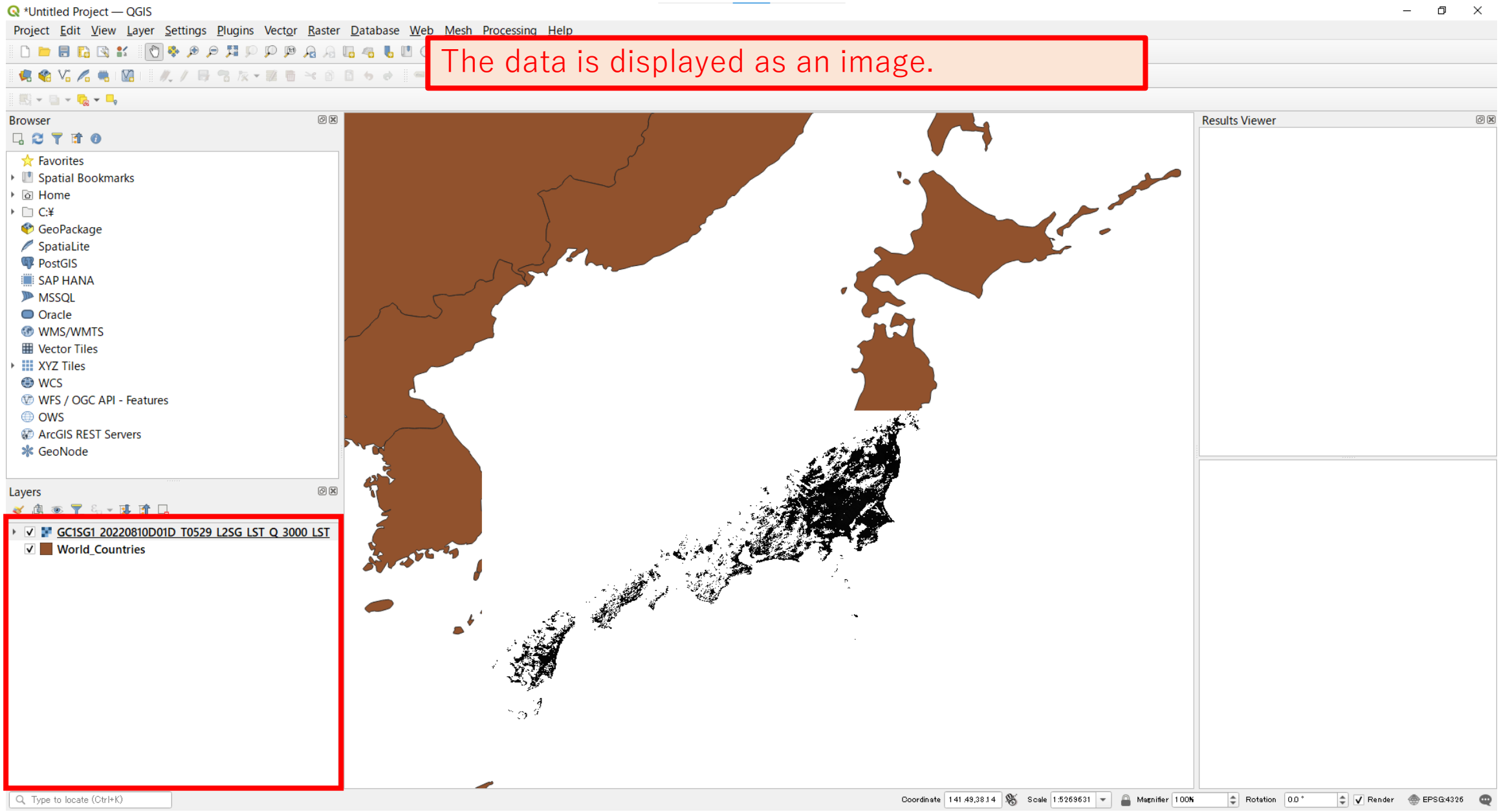
# [STEP3] Load GeoTIFF data into QGIS

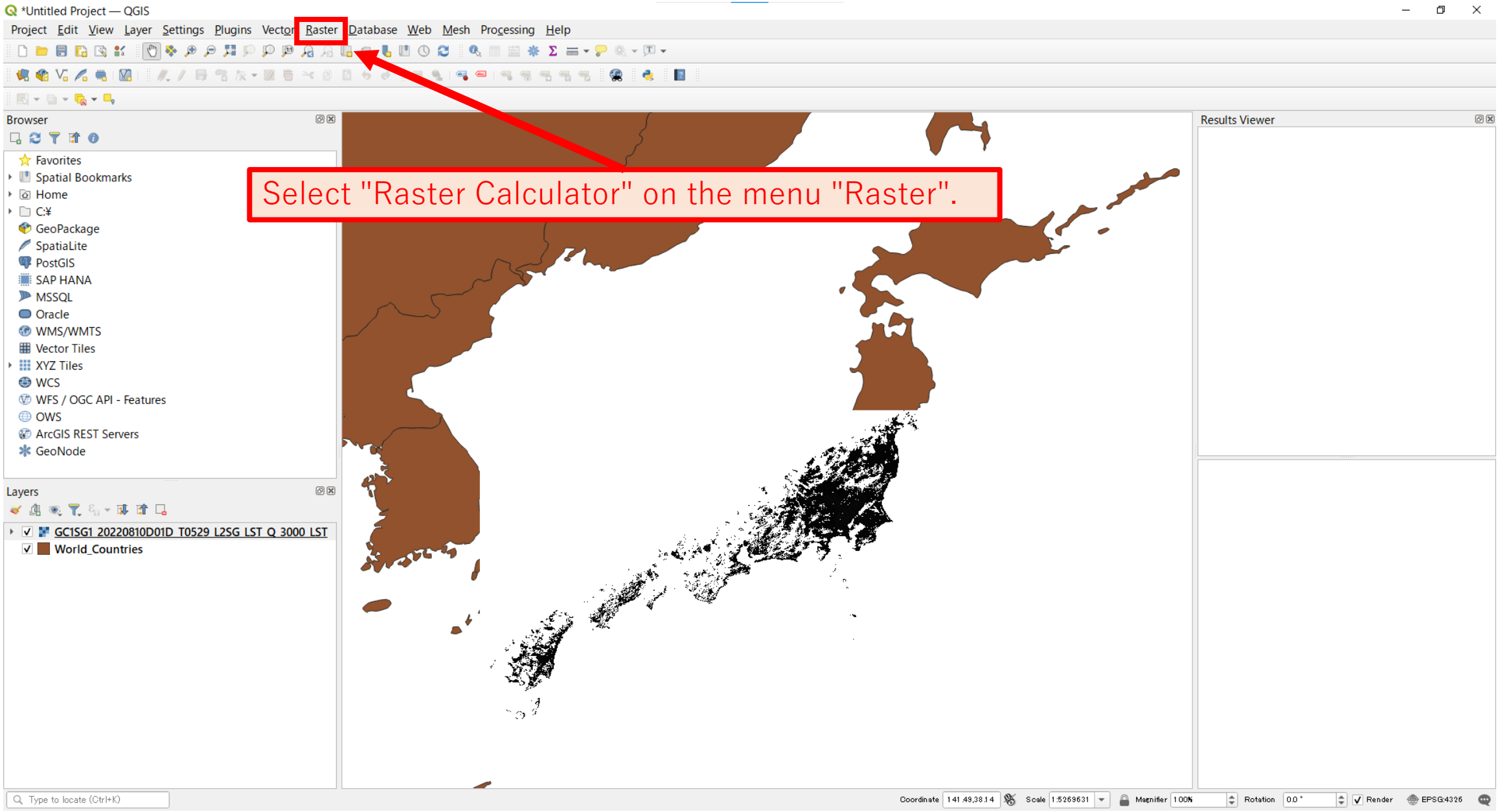
1 . Start QGIS.

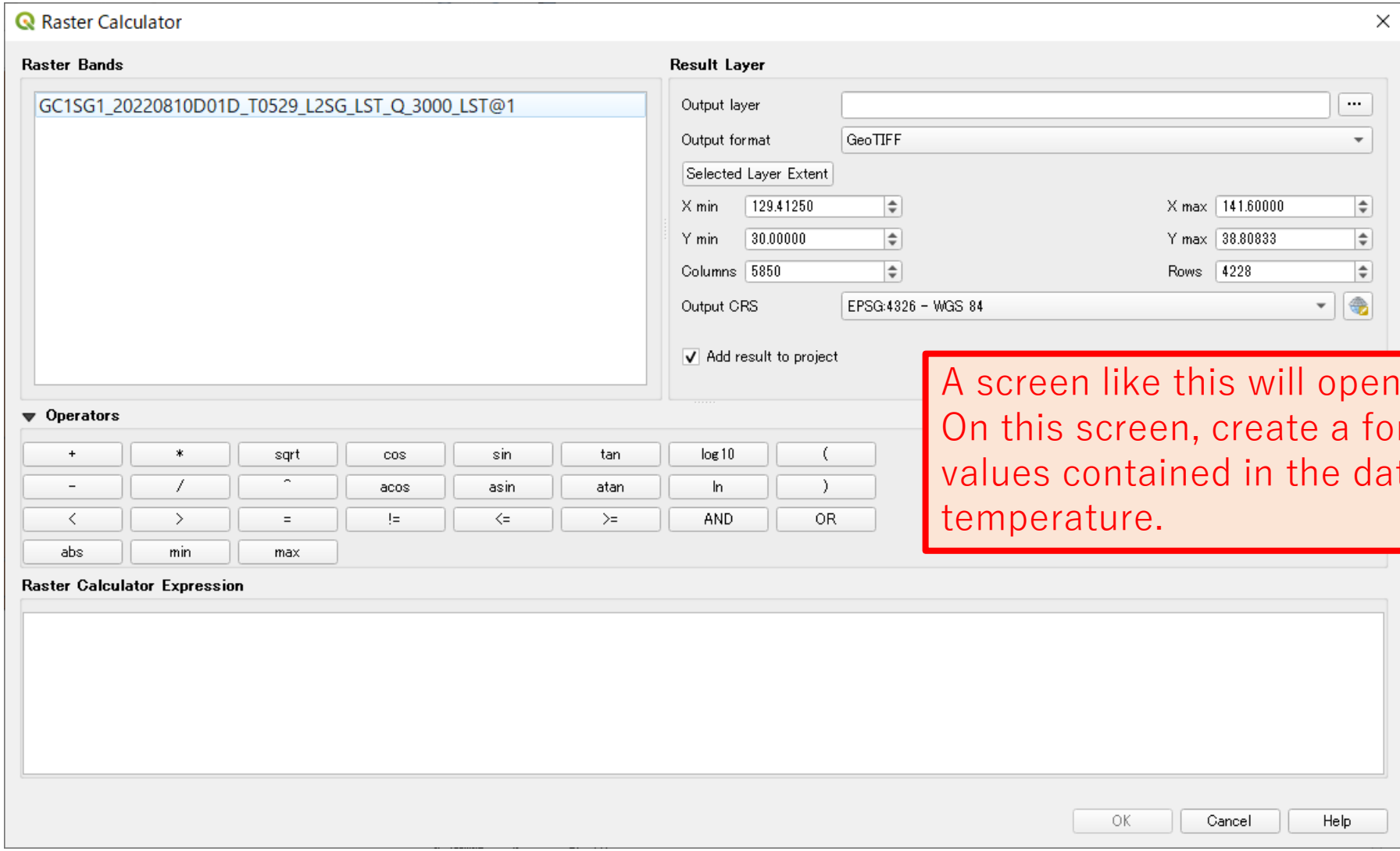



Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Bookmarks
Home
C:¥
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS
WFS / OGC API - Features
OWS
ArcGIS REST Servers
GeoNode
Layers
Project Templates
New Empty Project
EPSG:4326 – WGS 84
Results Viewer
Double click to “New Empty Project”
Type to locate (Ctrl+K)
Ready
Coordinate
Scale
Magnifier
100%
Rotation
0.0 °
Render
EPSG:4326

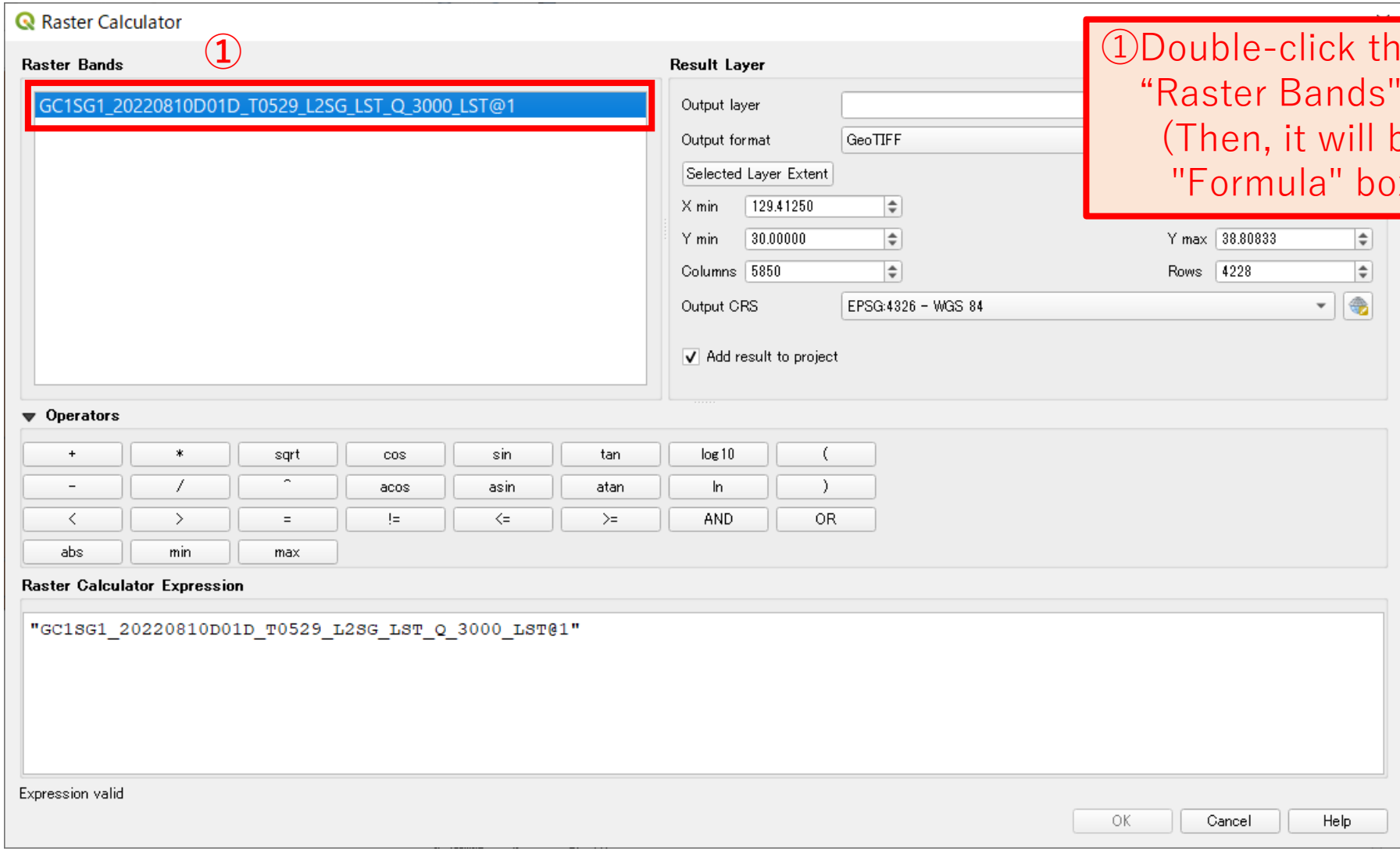

Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Bookmarks
Home
C:¥
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS
WFS / OGC API - Features
OWS
ArcGIS REST Servers
GeoNode
Project Templates
New Empty Project
EPSG:4326 – WGS 84
Results Viewer
Layers
Drag and drop the following two files.
・GeoTIFF file
・ "World_Countries.shp" (Refer to page 9)
Type to locate (Ctrl+K)
Ready
Coordinate
Scale
Magnifier
100%
Rotation
0.0 °
Render
EPSG:4326


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
The data is displayed as an image.
Browser
Favorites
Spatial Bookmarks
Home
C:¥
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS
WFS / OGC API - Features
OWS
ArcGIS REST Servers
GeoNode
Layers
GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST
World_Countries
Results Viewer
Type to locate (Ctrl+K)
Coordinate 141.49,38.14
Scale 1:5269631
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326

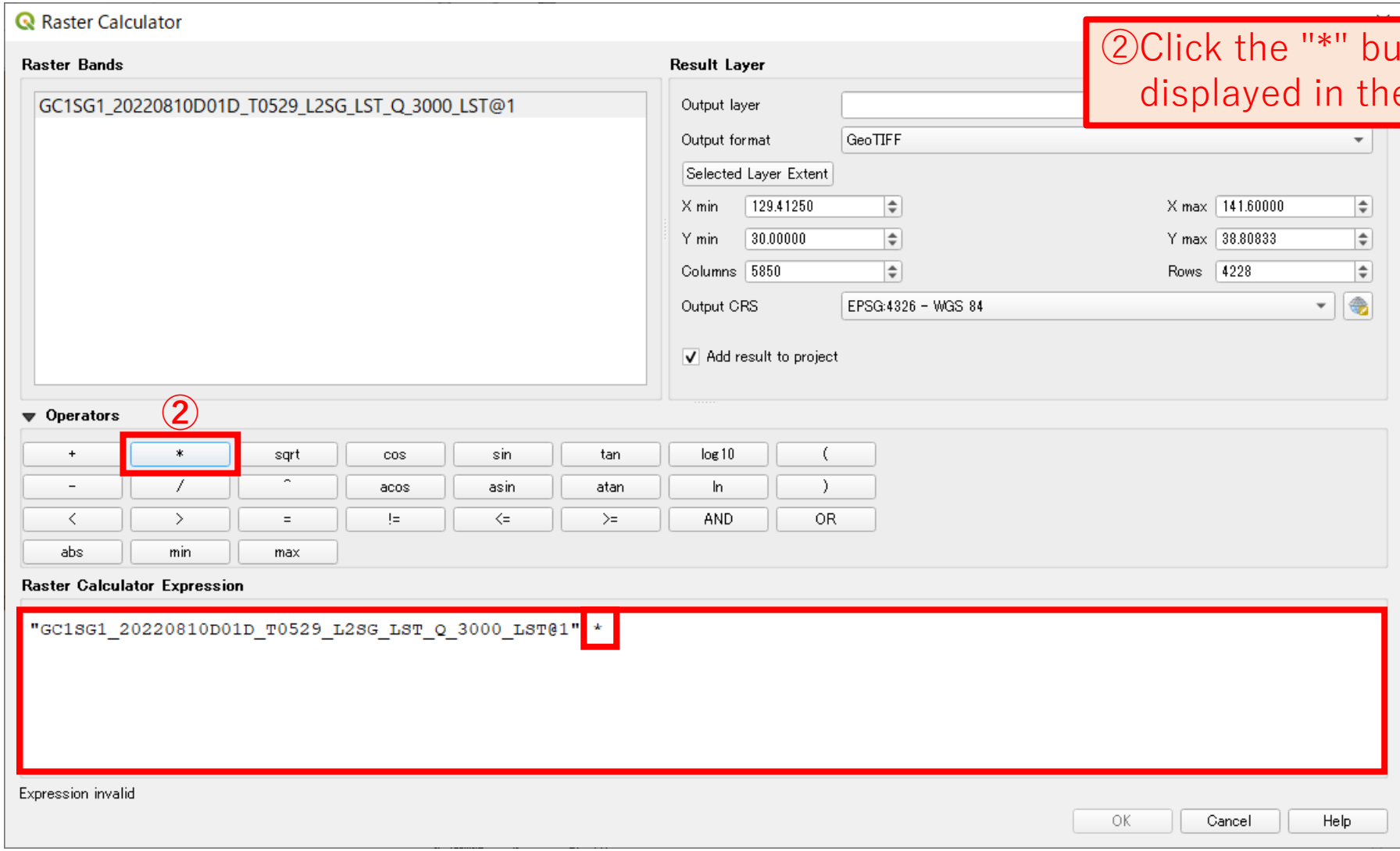

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Select "Raster Calculator" on the menu "Raster".
Browser
Favorites
Spatial Bookmarks
Home
C:¥
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS
WFS / OGC API - Features
OWS
ArcGIS REST Servers
GeoNode
Layers
GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST
World_Countries
Results Viewer
Type to locate (Ctrl+K)
Coordinate 141.49,38.14
Scale 1:5269631
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326



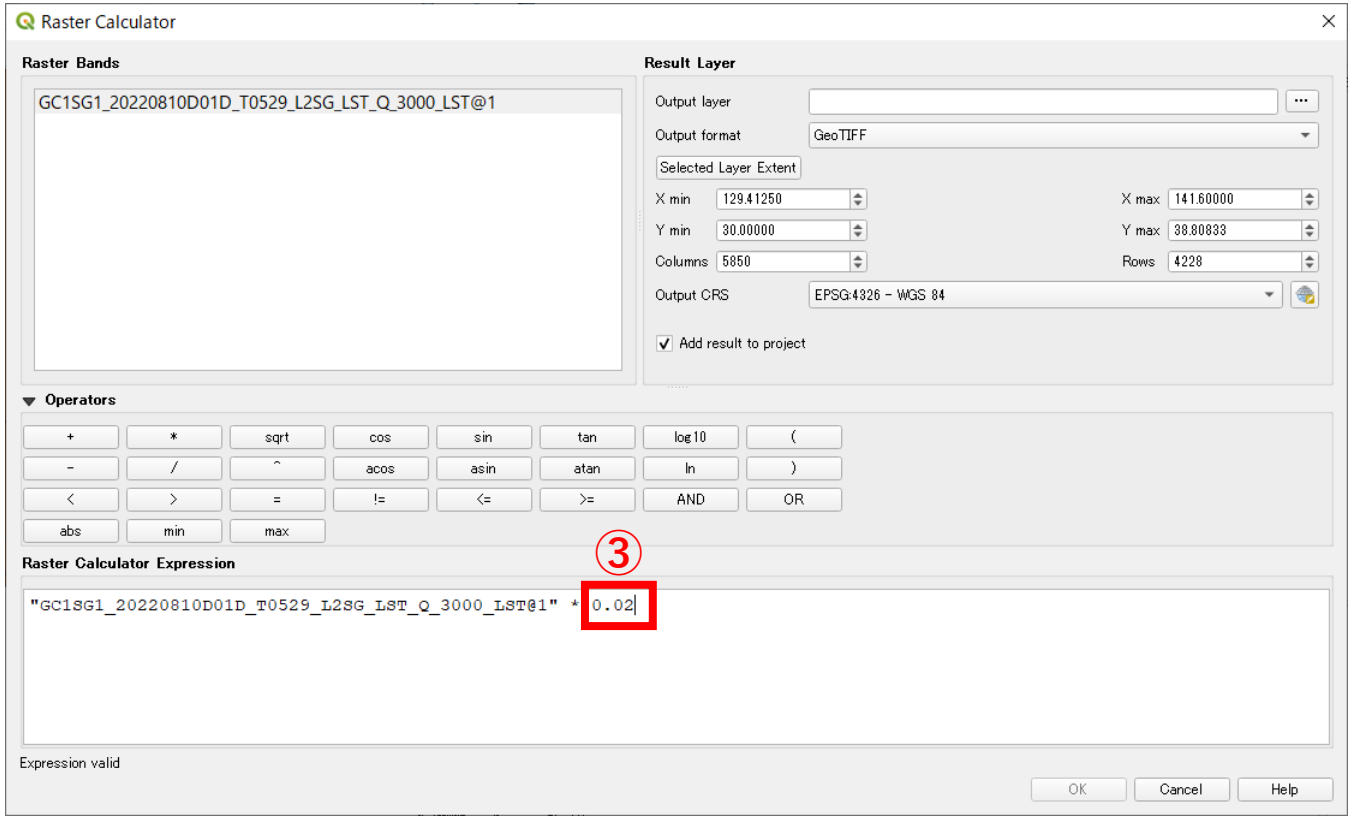

A screen like this will open.
On this screen, create a formula to convert the values contained in the data into the land surface temperature.




①Double-click the file name in the “Raster Bands" frame.
(Then, it will be displayed in the "Formula" box below.)




②Click the "*" button. (Then, it will be displayed in the "Formula" box below.)




③Place the cursor on the right side of "*", click once, and input "0.02".

※The value stored in the data can be converted to temperature (°C) by the following formula.
Temperature (°C) = [value stored in data] * [0.02 (slope value for LST)] + [0 (offset value for LST)] - 273 (K)

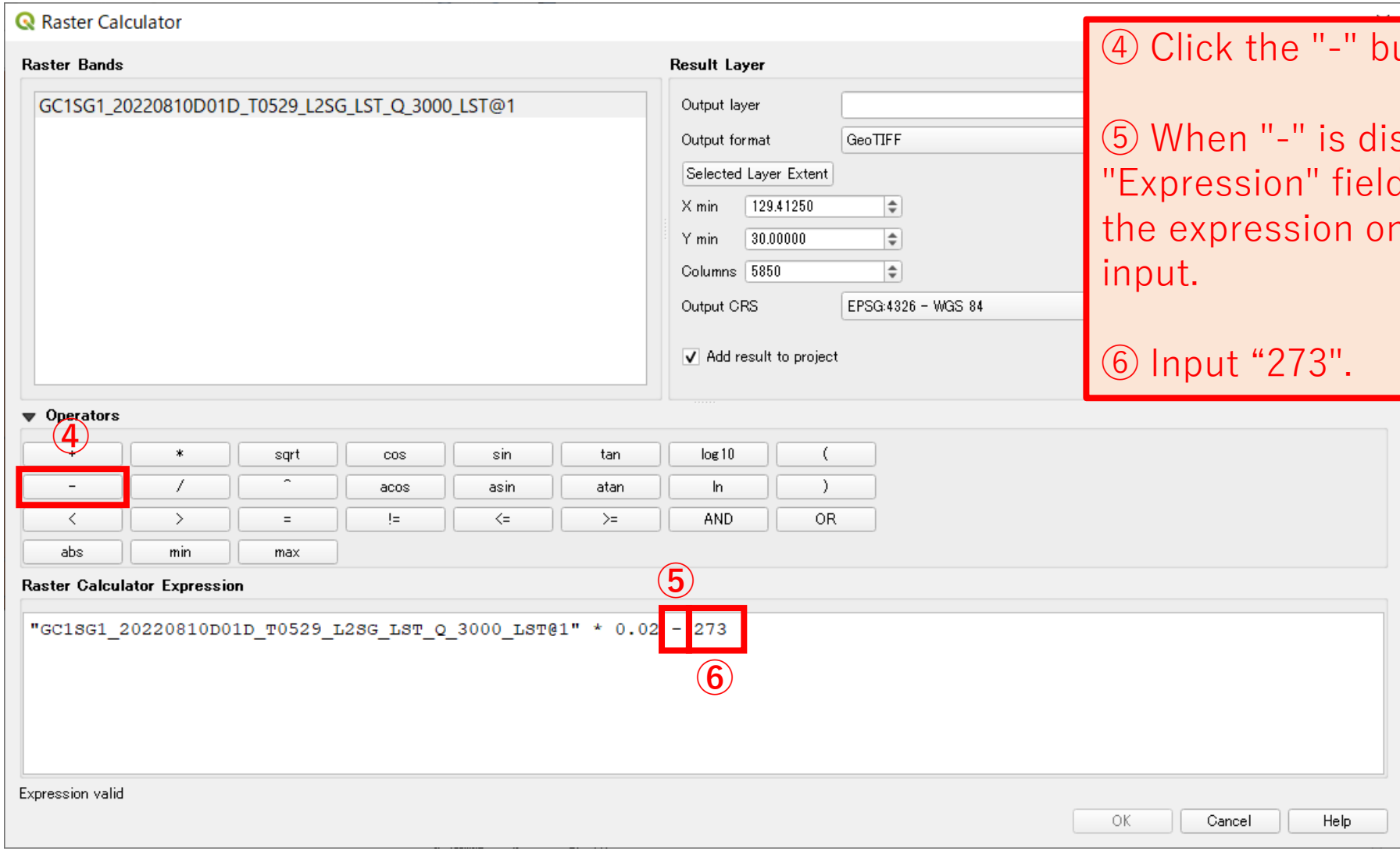
## Attribute information

| Ver.1,2,3 | Attribute | | Remarks |
|---|---|---|---|
| Attribute of Image_data ⊕ | | | |
| E01 ⊕ | | | |
| E02 ⊕ | | | |
| LST ⊖<br>16-bit unsigned integer | Data_description | Land Surface Temperature (LST) | |
| | Error_DN | 65535 | |
| | Mask_for_statistics | 63507 | Detail: QA_flag_information(～L3_mask) |
| | Maximum_valid_DN | 65534 | |
| | Minimum_valid_DN | 0 | |
| | Offset | 0 | |
| | Slope | 0.02 | |
| | Unit | Kelvin | |

## How to use

・Physical quantity＝DN*slope + offset
・Valid values are during Minimum_valid_DN～Maximum_valid_DN

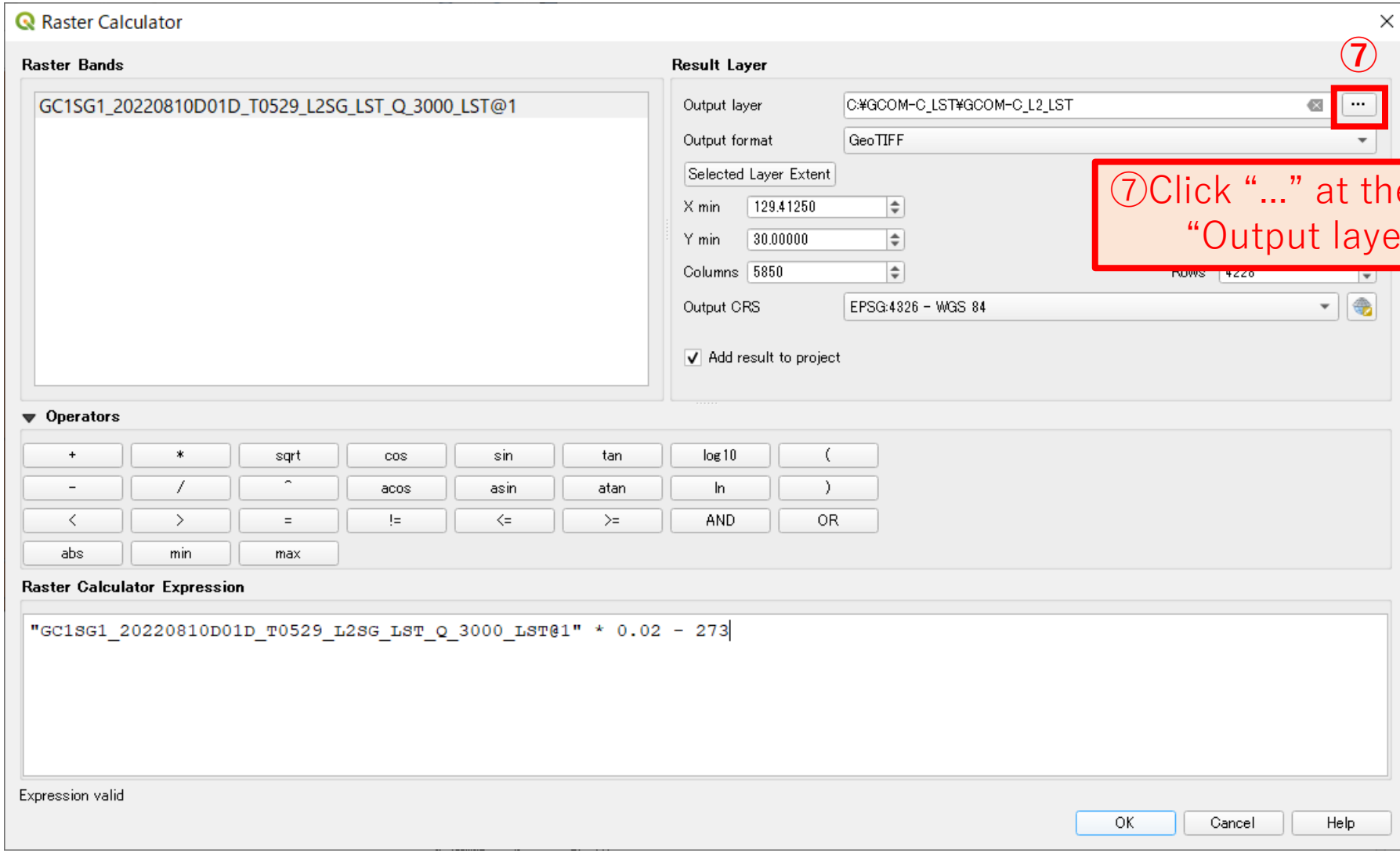
https://suzaku.eorc.jaxa.jp/GCOM_C/data/update/Algorithm_LST_en.html

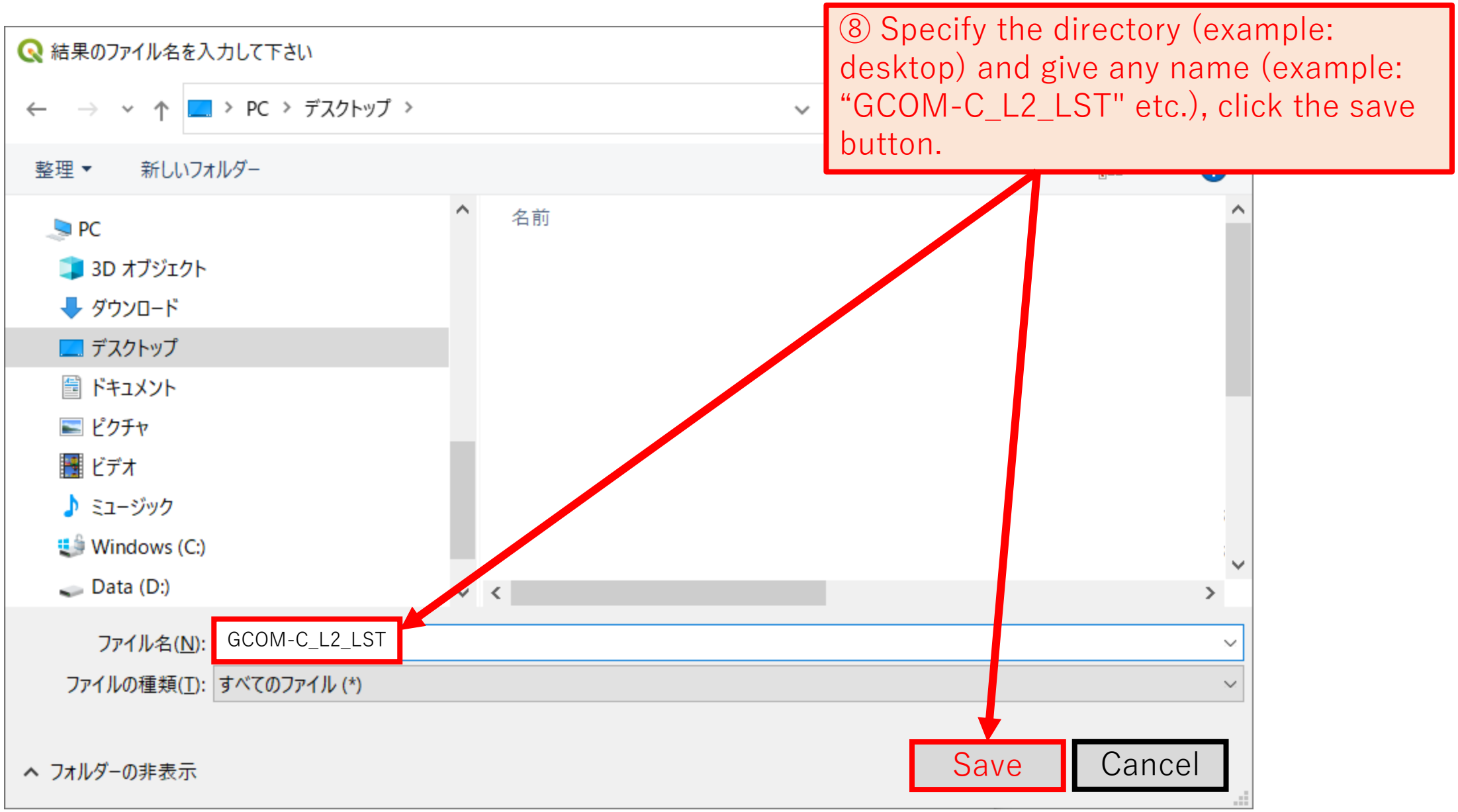


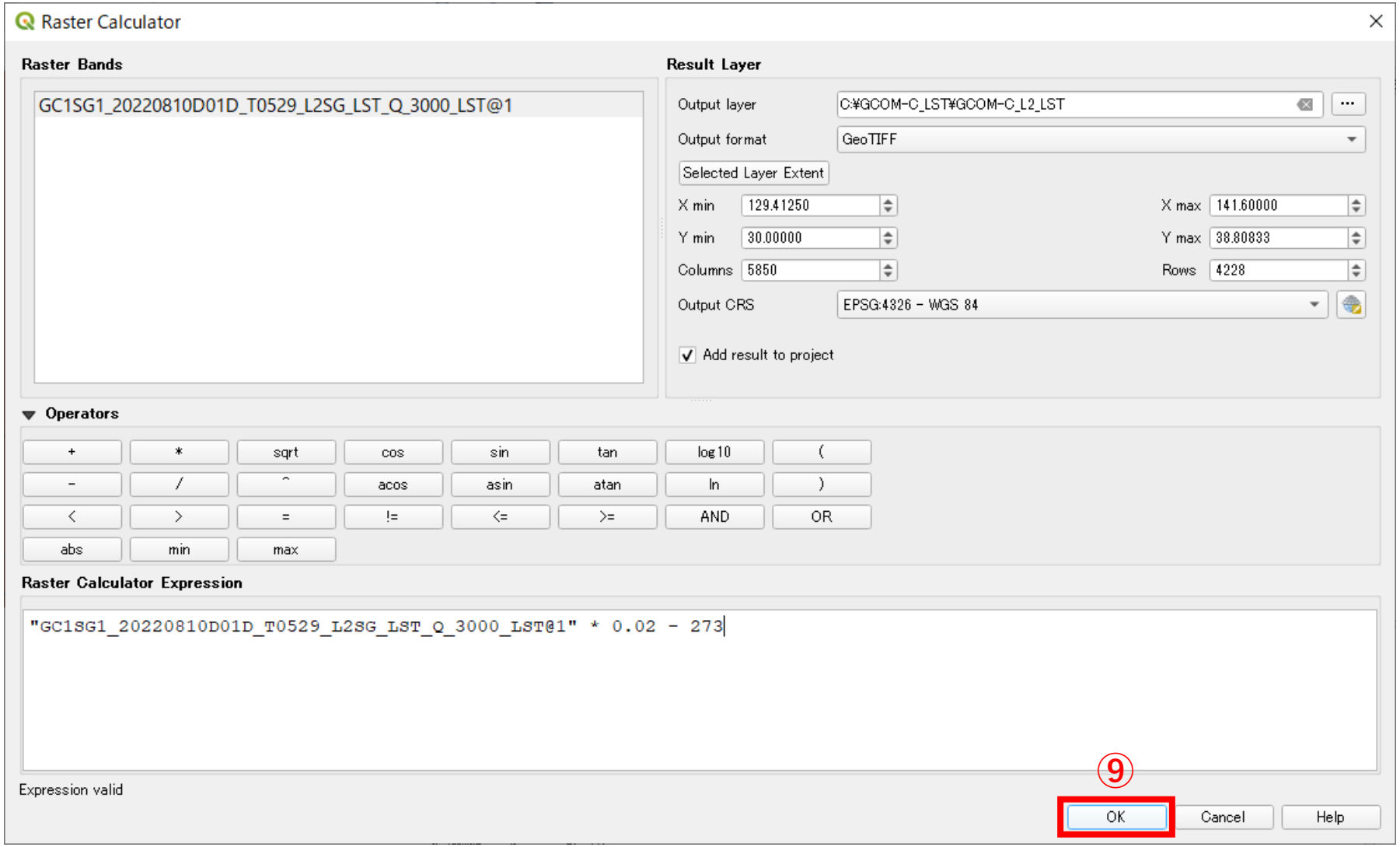

④ Click the "-" button.

⑤ When "-" is displayed in the "Expression" field, click the right side of the expression once to make it ready for input.

⑥ Input “273".

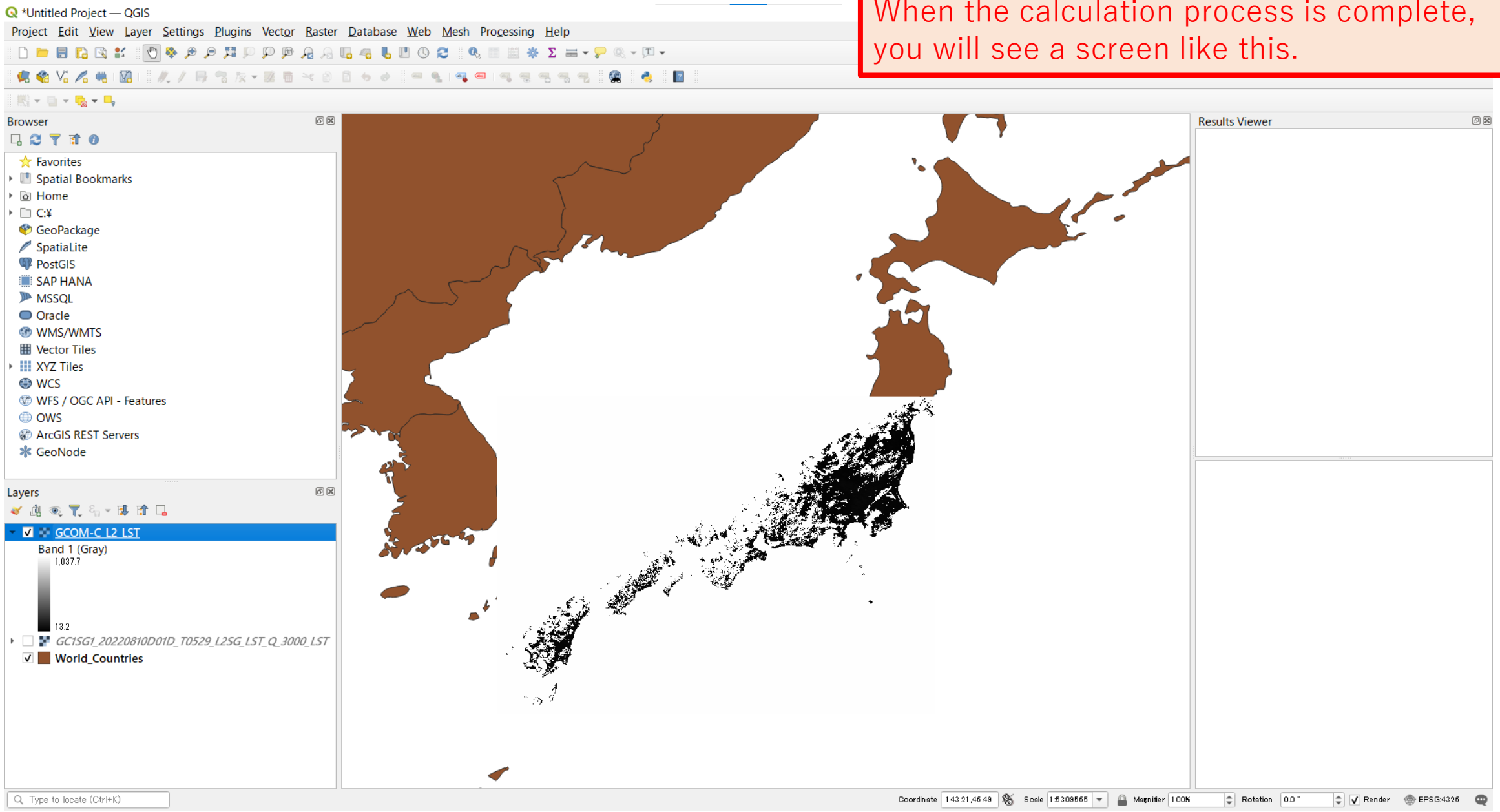

Raster Calculator
⑦
Raster Bands
GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST@1
Result Layer
Output layer
C:¥GCOM-C_LST¥GCOM-C_L2_LST
Output format
GeoTIFF
Selected Layer Extent
X min
129.41250
Y min
30.00000
Columns
5850
Rows
4226
Output CRS
EPSG:4326 - WGS 84
Add result to project
⑦Click “…” at the right end of
“Output layer” in the “Result layer”.
Operators
+ * sqrt cos sin tan log10 (
- / ^ acos asin atan ln )
< > = != <= >= AND OR
abs min max
Raster Calculator Expression
"GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST@1" * 0.02 - 273
Expression valid
OK
Cancel
Help


⑧ Specify the directory (example: desktop) and give any name (example: “GCOM-C_L2_LST" etc.), click the save button.
結果のファイル名を入力して下さい
PC › デスクトップ ›
整理
新しいフォルダー
名前
PC
3D オブジェクト
ダウンロード
デスクトップ
ドキュメント
ピクチャ
ビデオ
ミュージック
Windows (C:)
Data (D:)
ファイル名(N):
GCOM-C_L2_LST
ファイルの種類(T):
すべてのファイル (*)
フォルダーの非表示
Save
Cancel

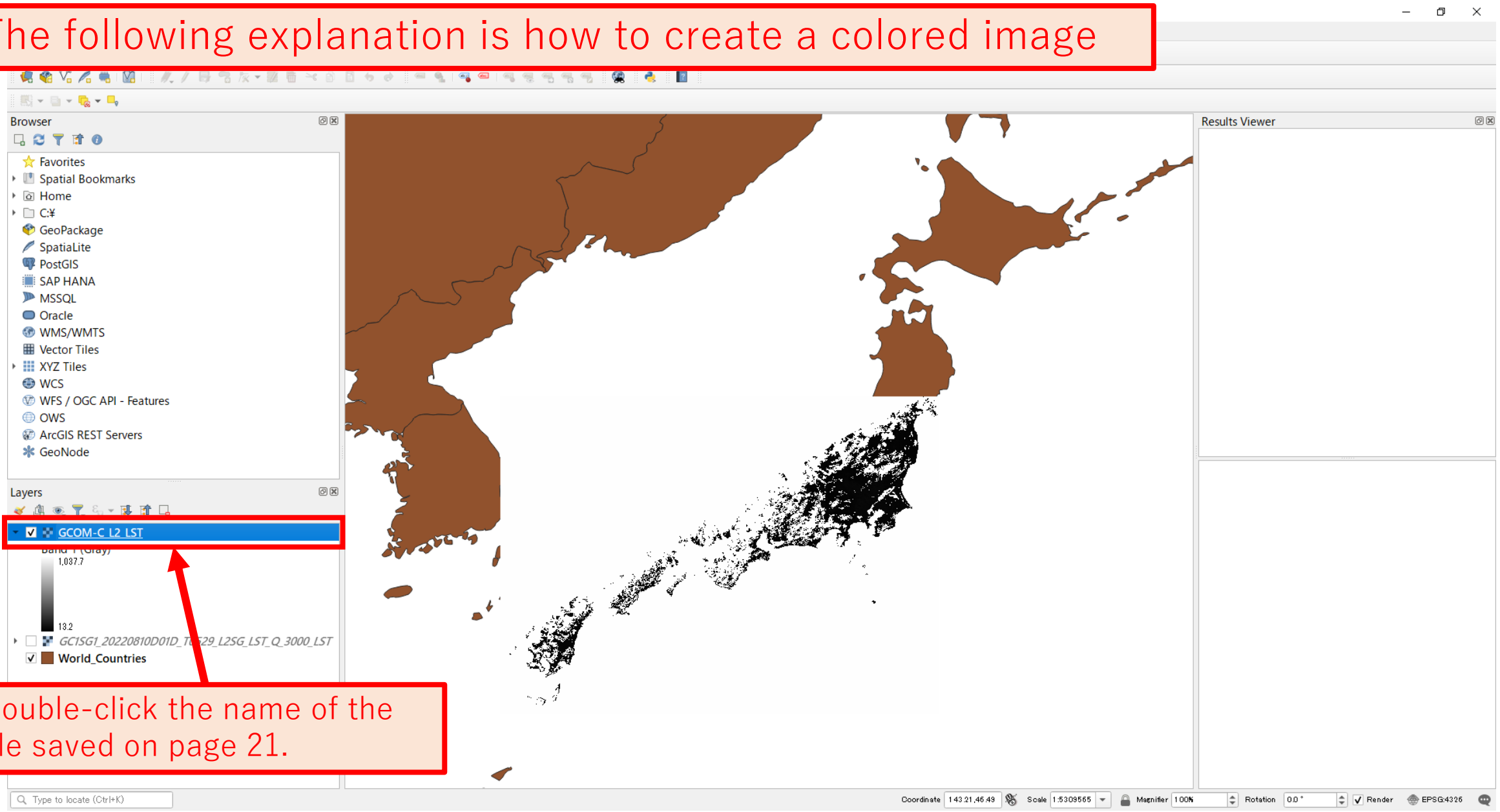

Raster Calculator
Raster Bands
GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST@1
Result Layer
Output layer
C:¥GCOM-C_LST¥GCOM-C_L2_LST
Output format
GeoTIFF
Selected Layer Extent
X min
129.41250
X max
141.60000
Y min
30.00000
Y max
38.80833
Columns
5850
Rows
4228
Output CRS
EPSG:4326 - WGS 84
Add result to project
Operators
+
*
sqrt
cos
sin
tan
log10
(
-
/
^
acos
asin
atan
ln
)
<
>
=
!=
<=
>=
AND
OR
abs
min
max
Raster Calculator Expression
"GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST@1" * 0.02 - 273
Expression valid
⑨
OK
Cancel
Help

⑨ Click to ”OK”.

When the calculation process is complete, you will see a screen like this.

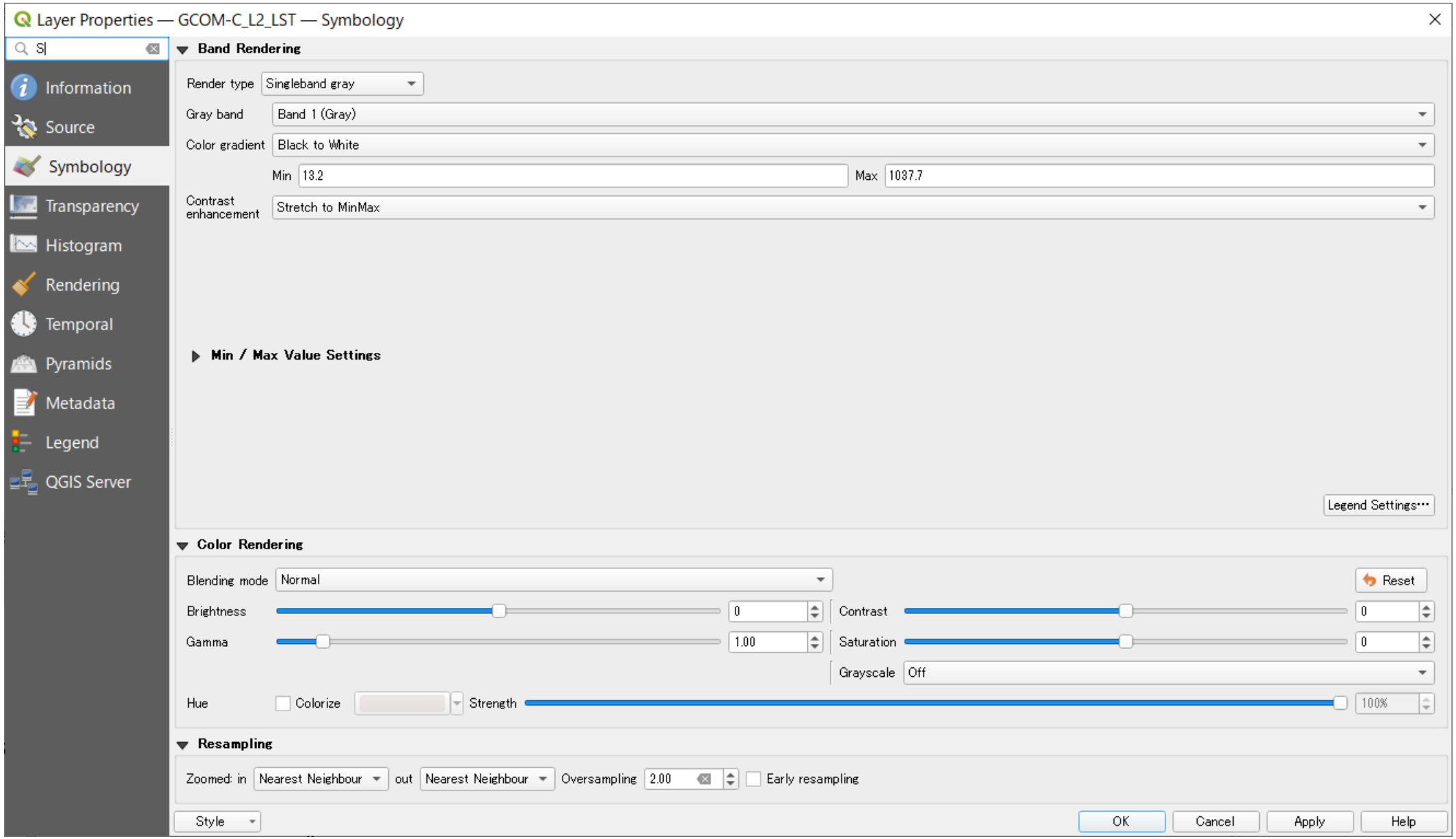


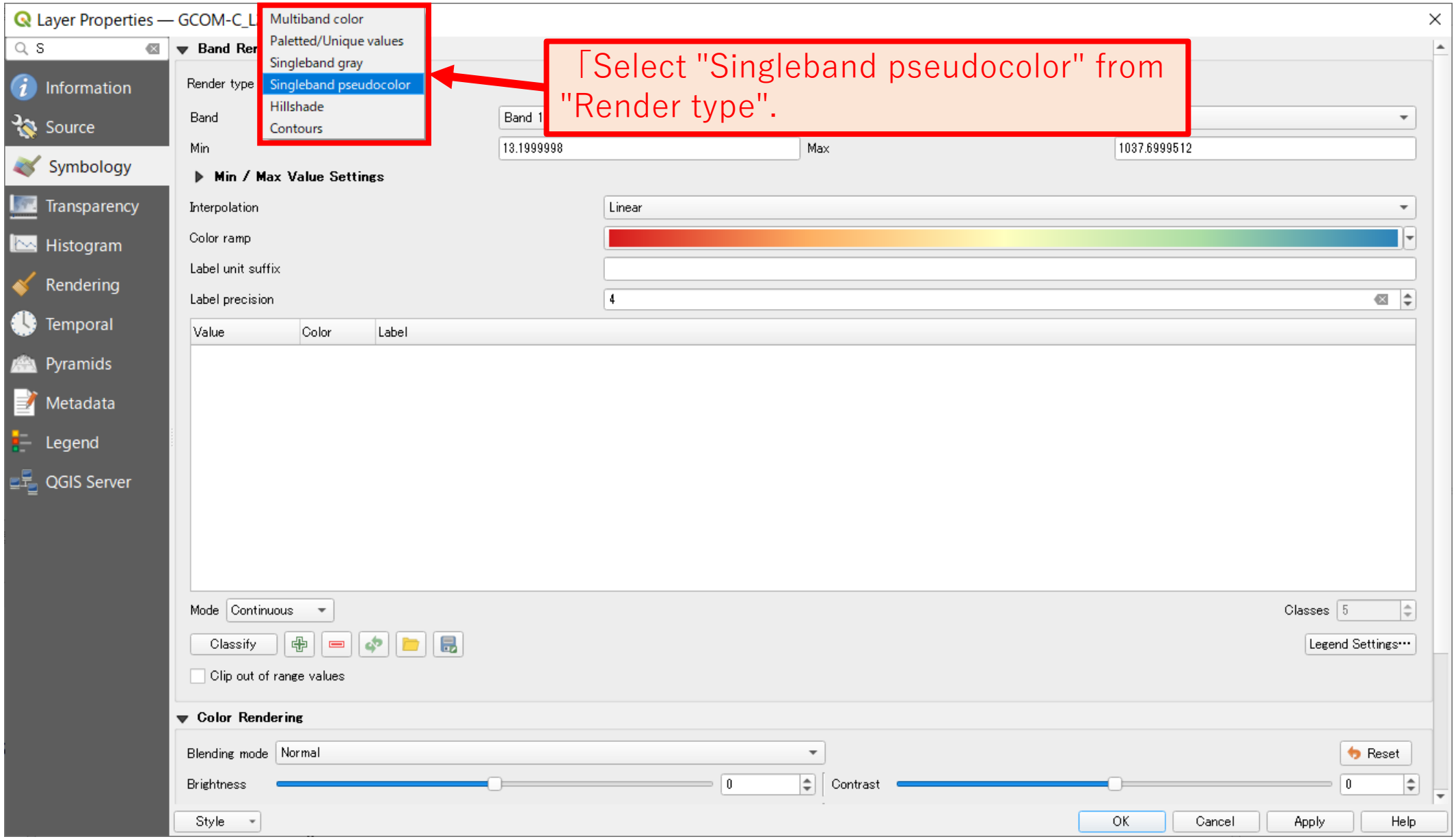
# The following explanation is how to create a colored image

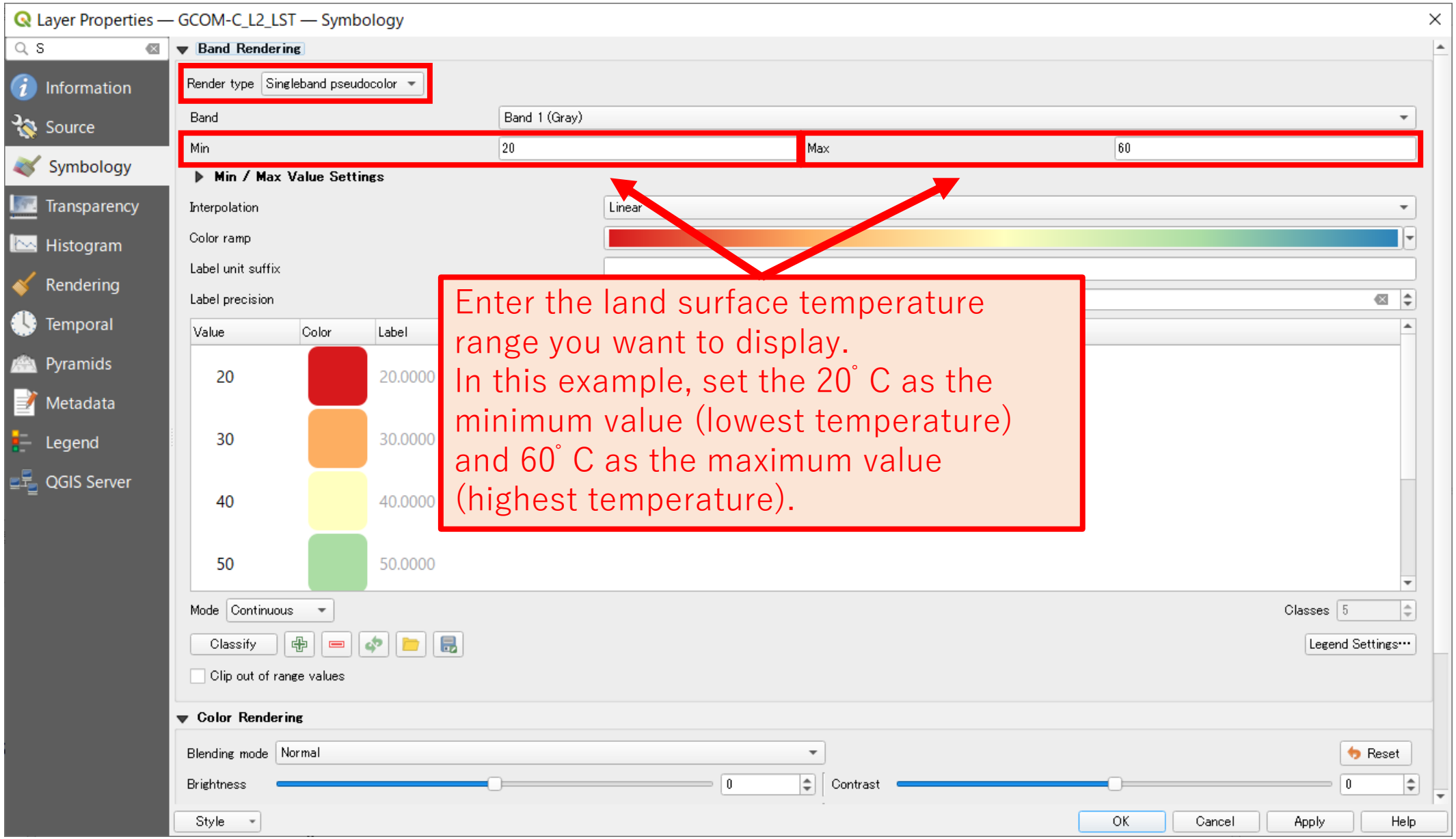


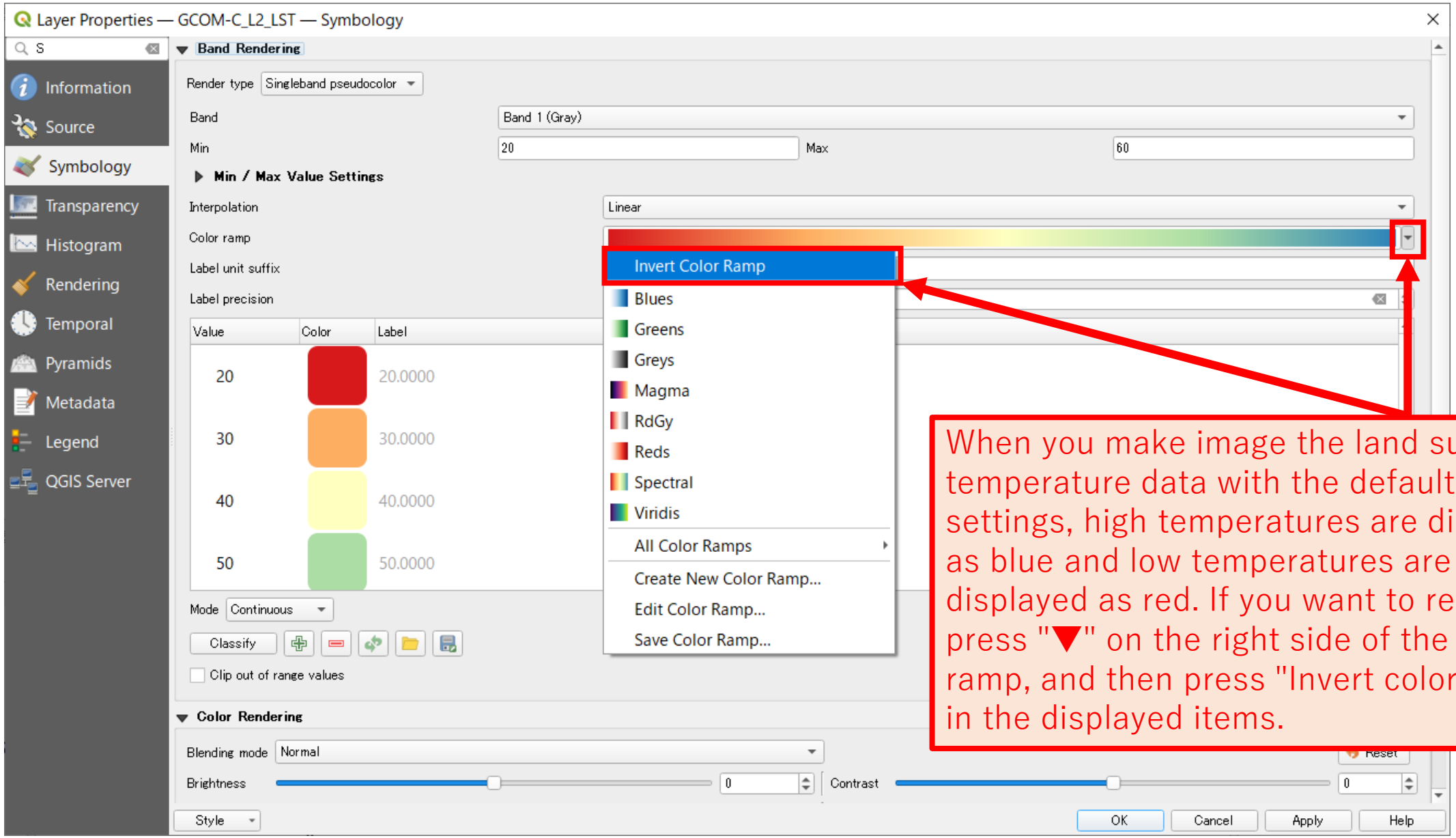

Double-click the name of the file saved on page 21.

A window like this will open.

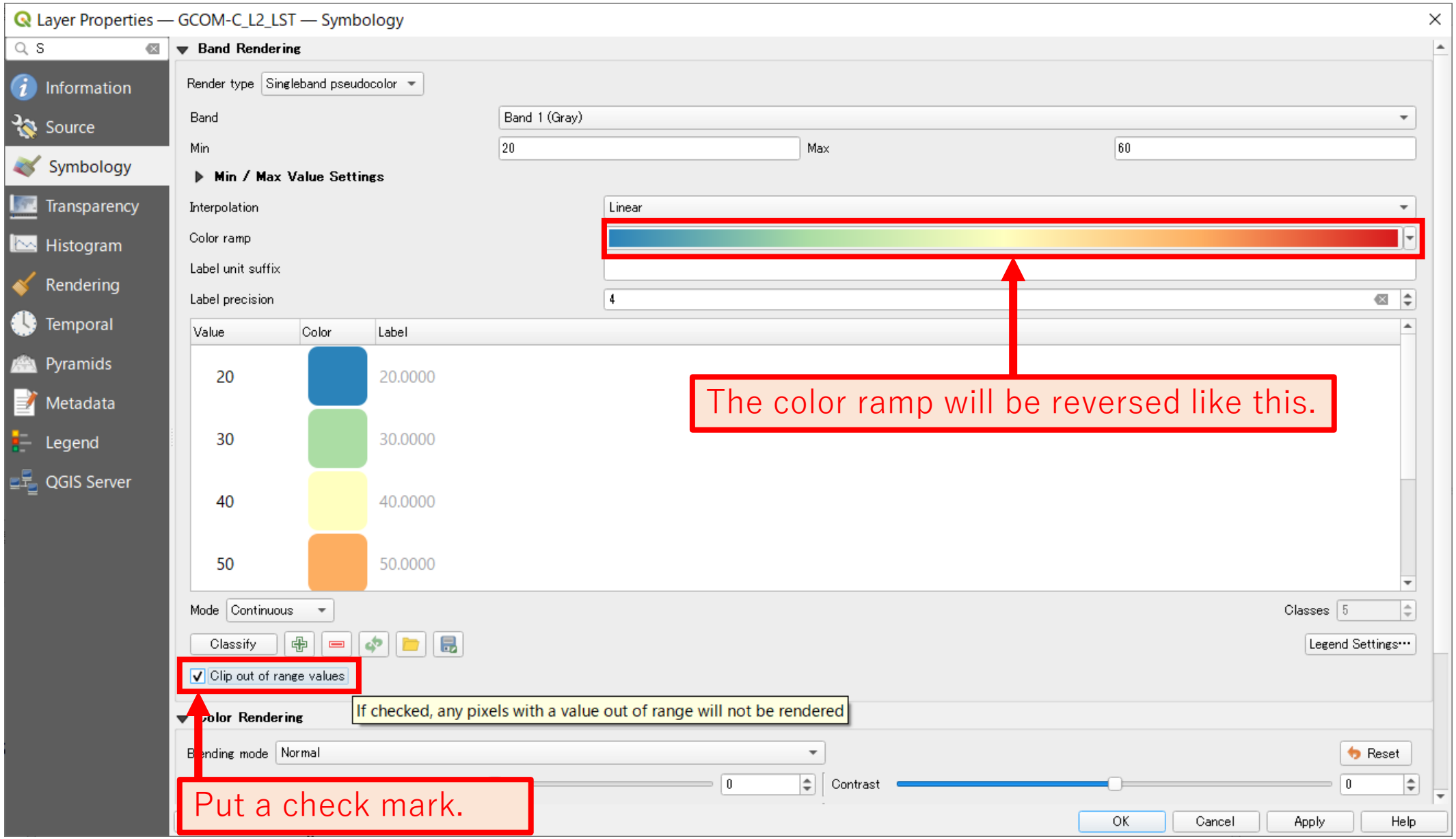


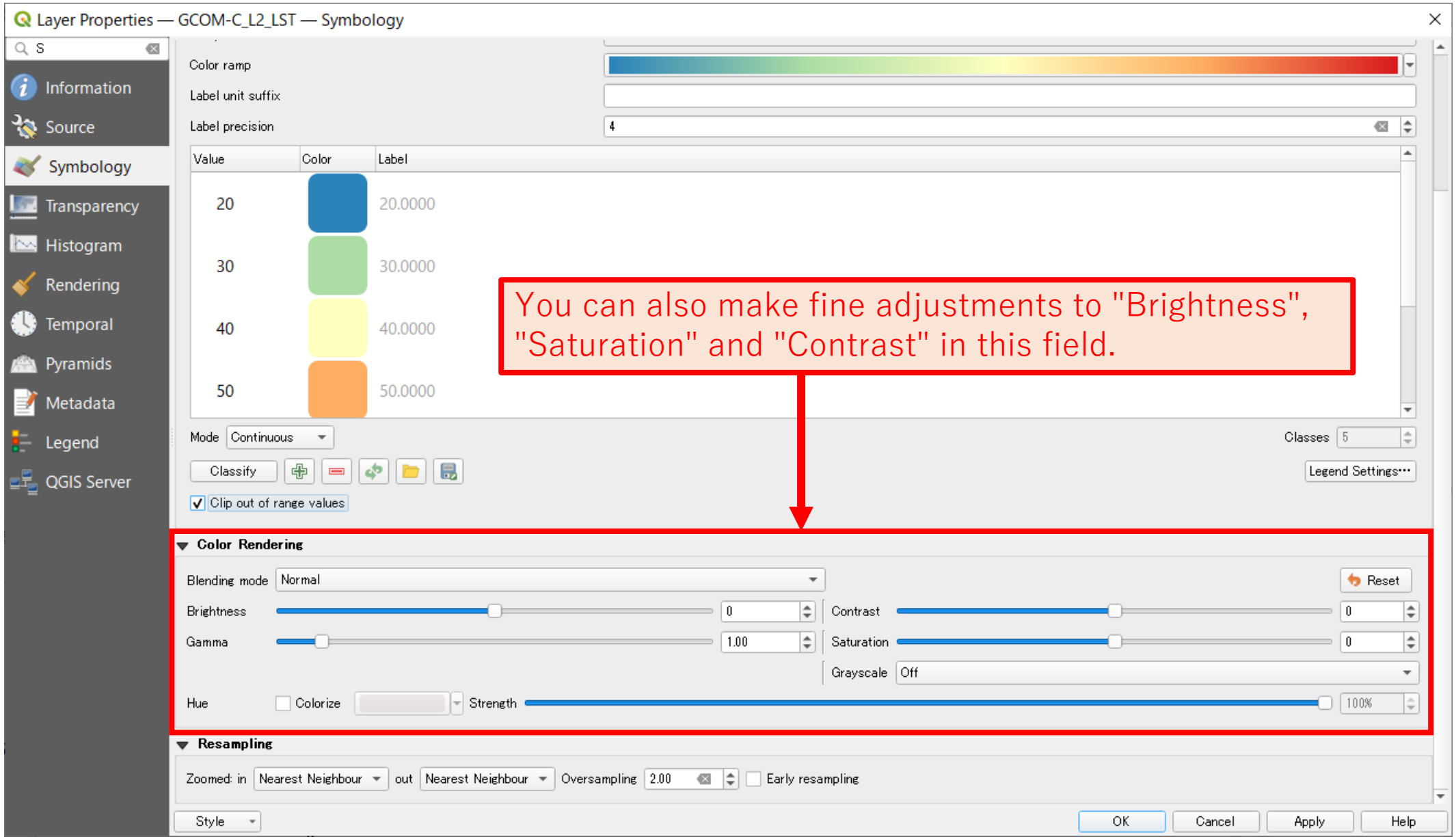

Layer Properties — GCOM-C_L
Multiband color
Paletted/Unique values
Singleband gray
Singleband pseudocolor
Hillshade
Contours
「Select "Singleband pseudocolor" from "Render type".
Information
Source
Symbology
Transparency
Histogram
Rendering
Temporal
Pyramids
Metadata
Legend
QGIS Server
Render type
Band
Band 1
Min
13.1999998
Max
1037.6999512
Min / Max Value Settings
Interpolation
Linear
Color ramp
Label unit suffix
Label precision
4
Value
Color
Label
Mode
Continuous
Classes
5
Classify
Legend Settings...
Clip out of range values
Color Rendering
Blending mode
Normal
Reset
Brightness
0
Contrast
0
Style
OK
Cancel
Apply
Help

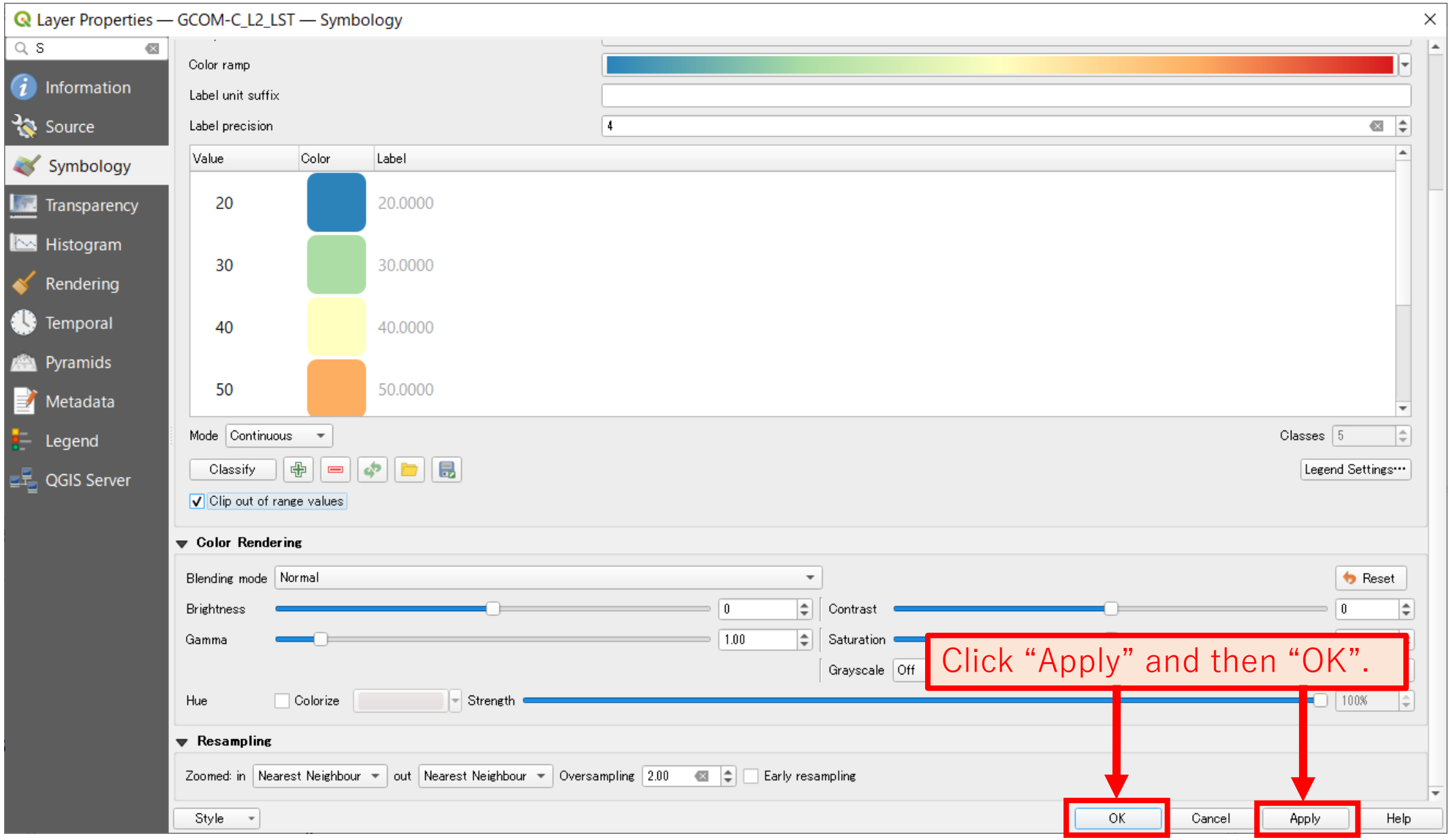

Layer Properties — GCOM-C_L2_LST — Symbology
Information
Source
Symbology
Transparency
Histogram
Rendering
Temporal
Pyramids
Metadata
Legend
QGIS Server
Band Rendering
Render type
Singleband pseudocolor
Band
Band 1 (Gray)
Min
20
Max
60
Min / Max Value Settings
Interpolation
Linear
Color ramp
Label unit suffix
Label precision
Value
Color
Label
20
20.0000
30
30.0000
40
40.0000
50
50.0000
Mode
Continuous
Classes
5
Classify
Legend Settings...
Clip out of range values
Color Rendering
Blending mode
Normal
Reset
Brightness
0
Contrast
0
Style
OK
Cancel
Apply
Help
Enter the land surface temperature range you want to display.
In this example, set the 20˚ C as the minimum value (lowest temperature) and 60˚ C as the maximum value (highest temperature).



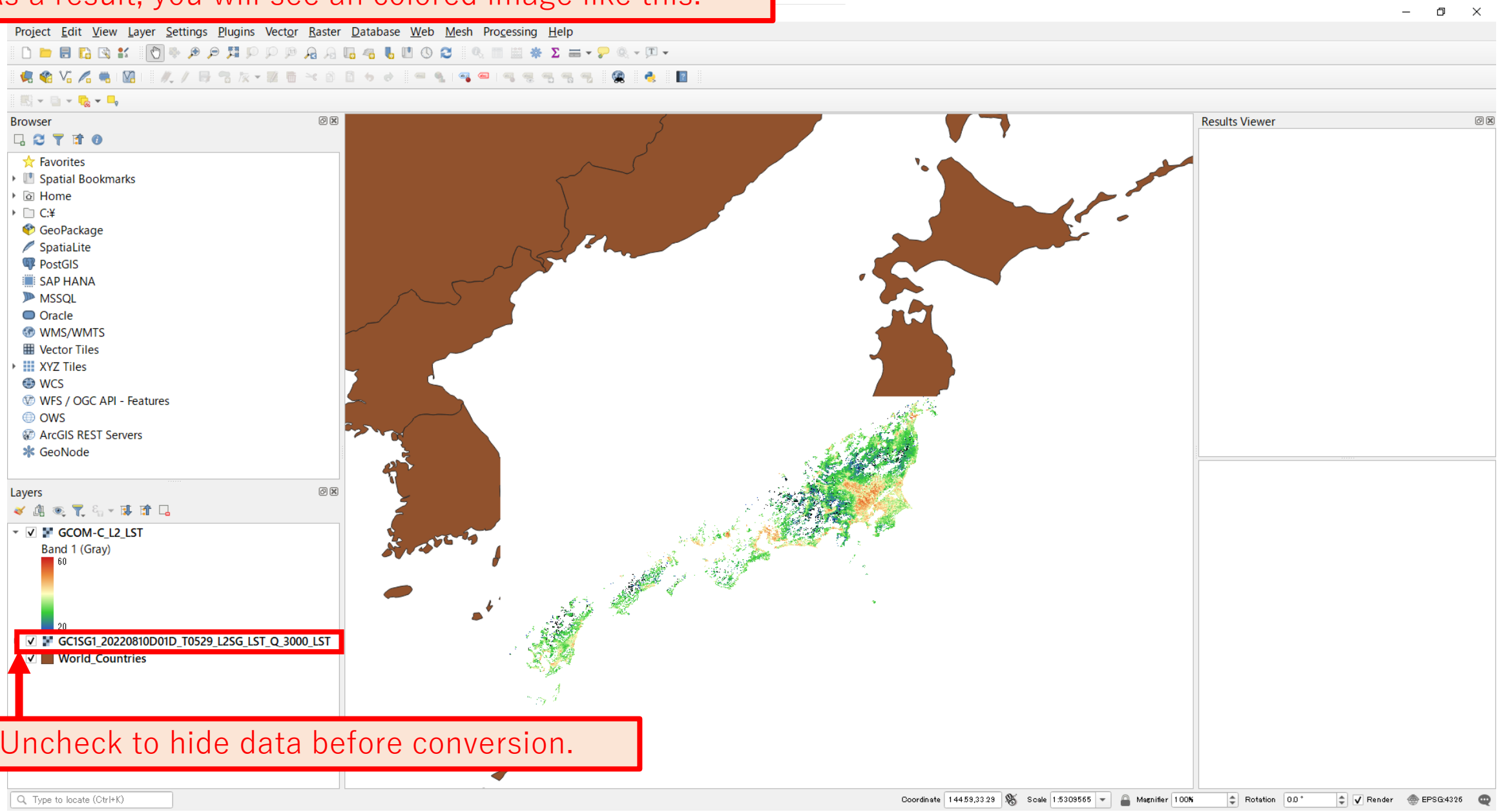

When you make image the land surface temperature data with the default settings, high temperatures are displayed as blue and low temperatures are displayed as red. If you want to reverse it, press "▼" on the right side of the color ramp, and then press "Invert color ramp" in the displayed items.


Layer Properties — GCOM-C_L2_LST — Symbology
Information
Source
Symbology
Transparency
Histogram
Rendering
Temporal
Pyramids
Metadata
Legend
QGIS Server
Band Rendering
Render type
Singleband pseudocolor
Band
Band 1 (Gray)
Min
20
Max
60
Min / Max Value Settings
Interpolation
Linear
Color ramp
Label unit suffix
Label precision
4
Value
Color
Label
20
20.0000
30
30.0000
40
40.0000
50
50.0000
The color ramp will be reversed like this.
Mode
Continuous
Classes
5
Classify
Legend Settings...
Clip out of range values
If checked, any pixels with a value out of range will not be rendered
Color Rendering
Blending mode
Normal
Reset
0
Contrast
0
Put a check mark.
OK
Cancel
Apply
Help

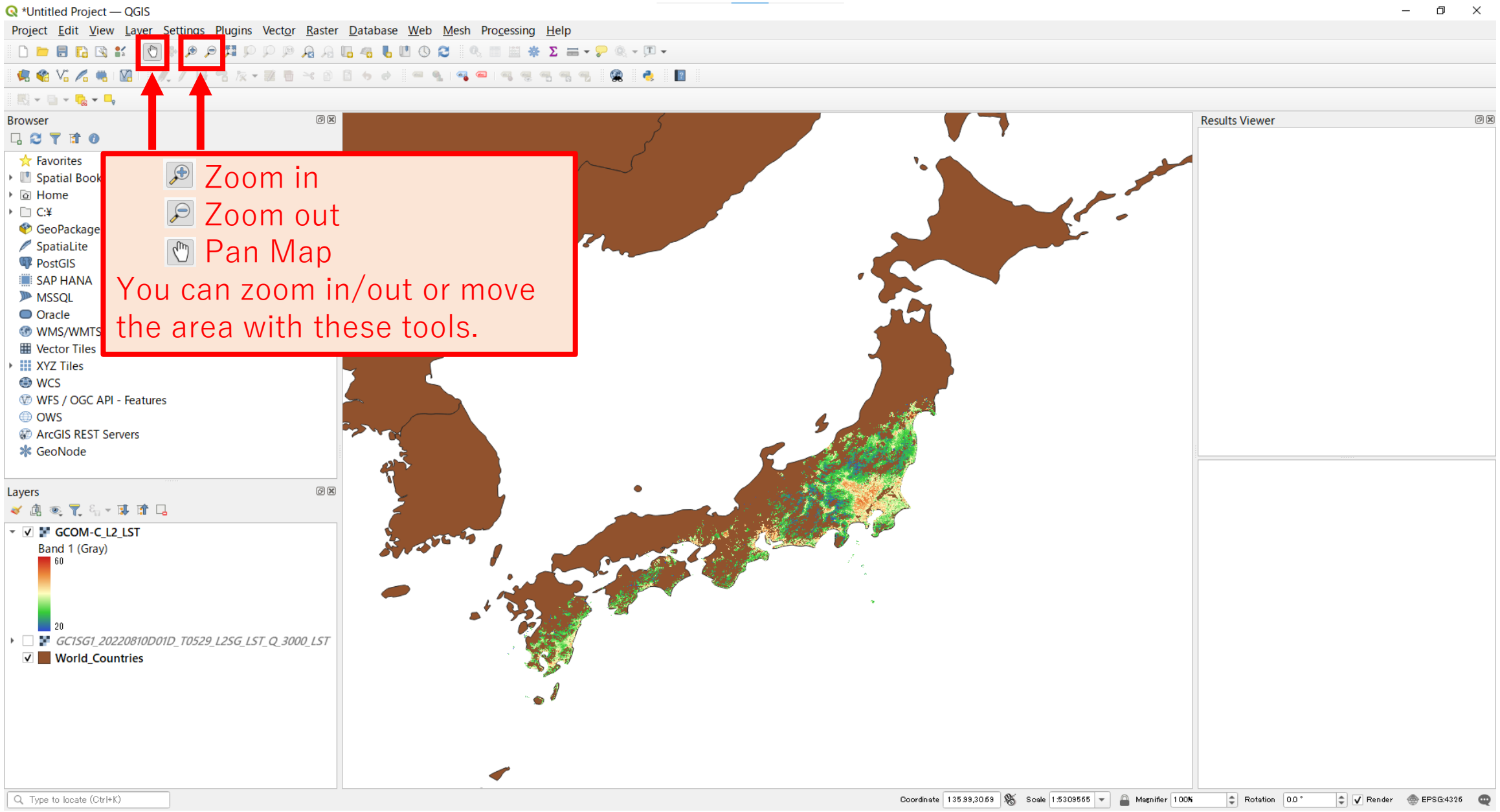

Layer Properties — GCOM-C_L2_LST — Symbology
Information
Source
Symbology
Transparency
Histogram
Rendering
Temporal
Pyramids
Metadata
Legend
QGIS Server
Color ramp
Label unit suffix
Label precision
4
Value
Color
Label
20
20.0000
30
30.0000
40
40.0000
50
50.0000
You can also make fine adjustments to "Brightness", "Saturation" and "Contrast" in this field.
Mode
Continuous
Classes
5
Classify
Legend Settings...
Clip out of range values
Color Rendering
Blending mode
Normal
Reset
Brightness
0
Contrast
0
Gamma
1.00
Saturation
0
Grayscale
Off
Hue
Colorize
Strength
100%
Resampling
Zoomed in
Nearest Neighbour
out
Nearest Neighbour
Oversampling
2.00
Early resampling
Style
OK
Cancel
Apply
Help

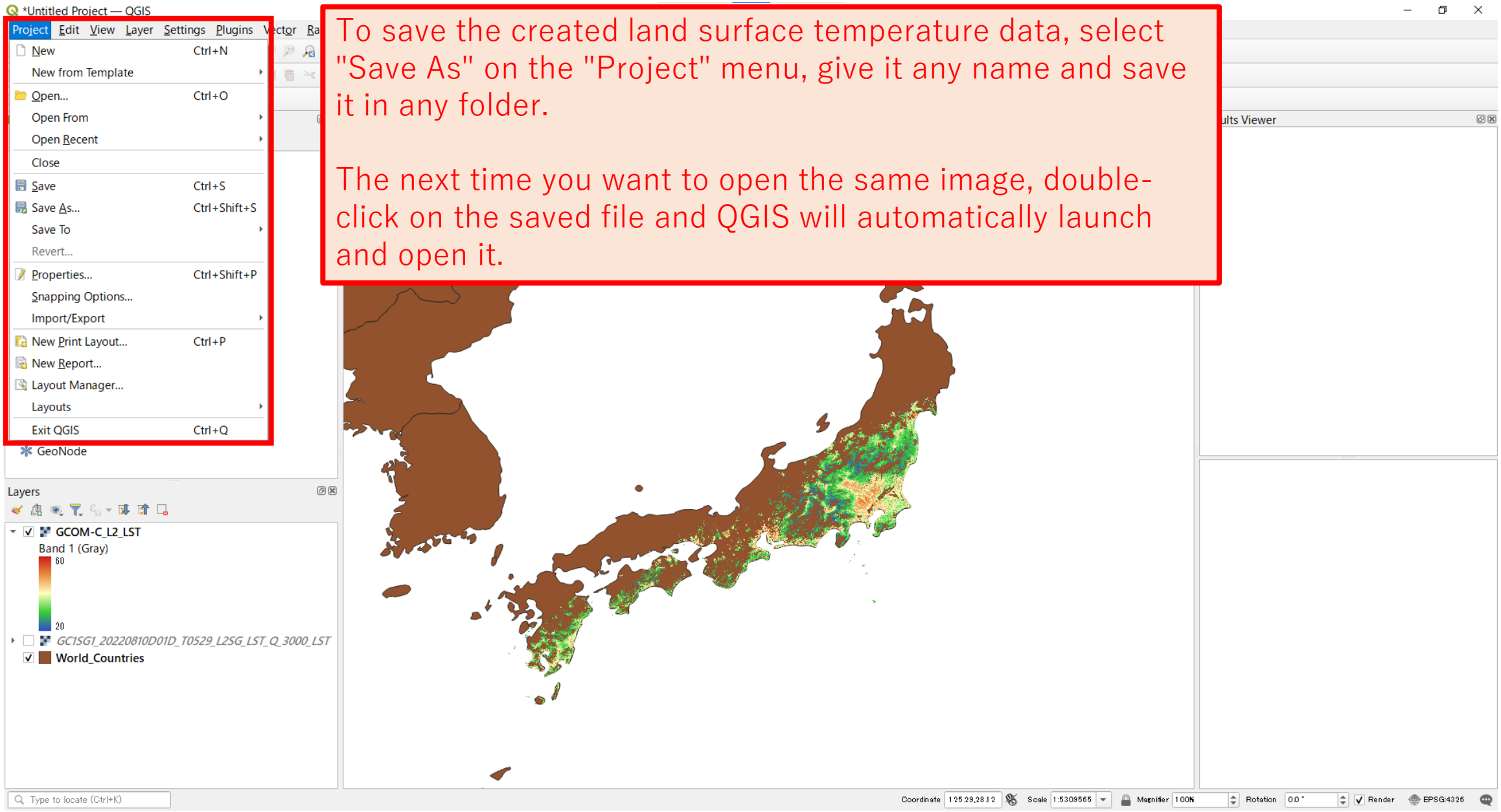

Layer Properties — GCOM-C_L2_LST — Symbology
Information
Source
Symbology
Transparency
Histogram
Rendering
Temporal
Pyramids
Metadata
Legend
QGIS Server
Color ramp
Label unit suffix
Label precision
4
Value
Color
Label
20
20.0000
30
30.0000
40
40.0000
50
50.0000
Mode
Continuous
Classes
5
Classify
Legend Settings...
Clip out of range values
Color Rendering
Blending mode
Normal
Reset
Brightness
0
Contrast
0
Gamma
1.00
Saturation
Grayscale
Off
Hue
Colorize
Strength
100%
Resampling
Zoomed in
Nearest Neighbour
out
Nearest Neighbour
Oversampling
2.00
Early resampling
Style
OK
Cancel
Apply
Help
Click “Apply” and then “OK”.

As a result, you will see an colored image like this.



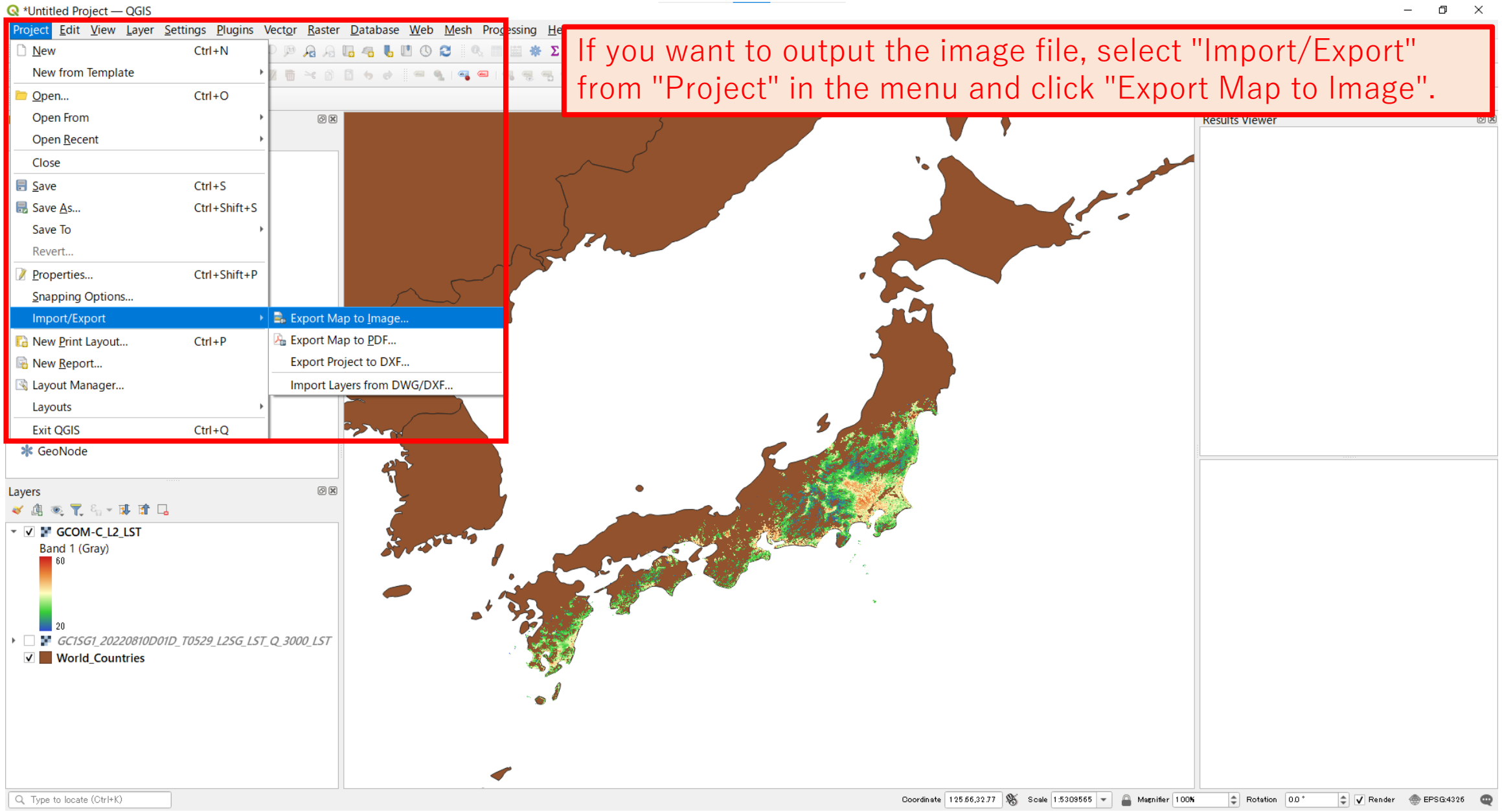

Uncheck to hide data before conversion.

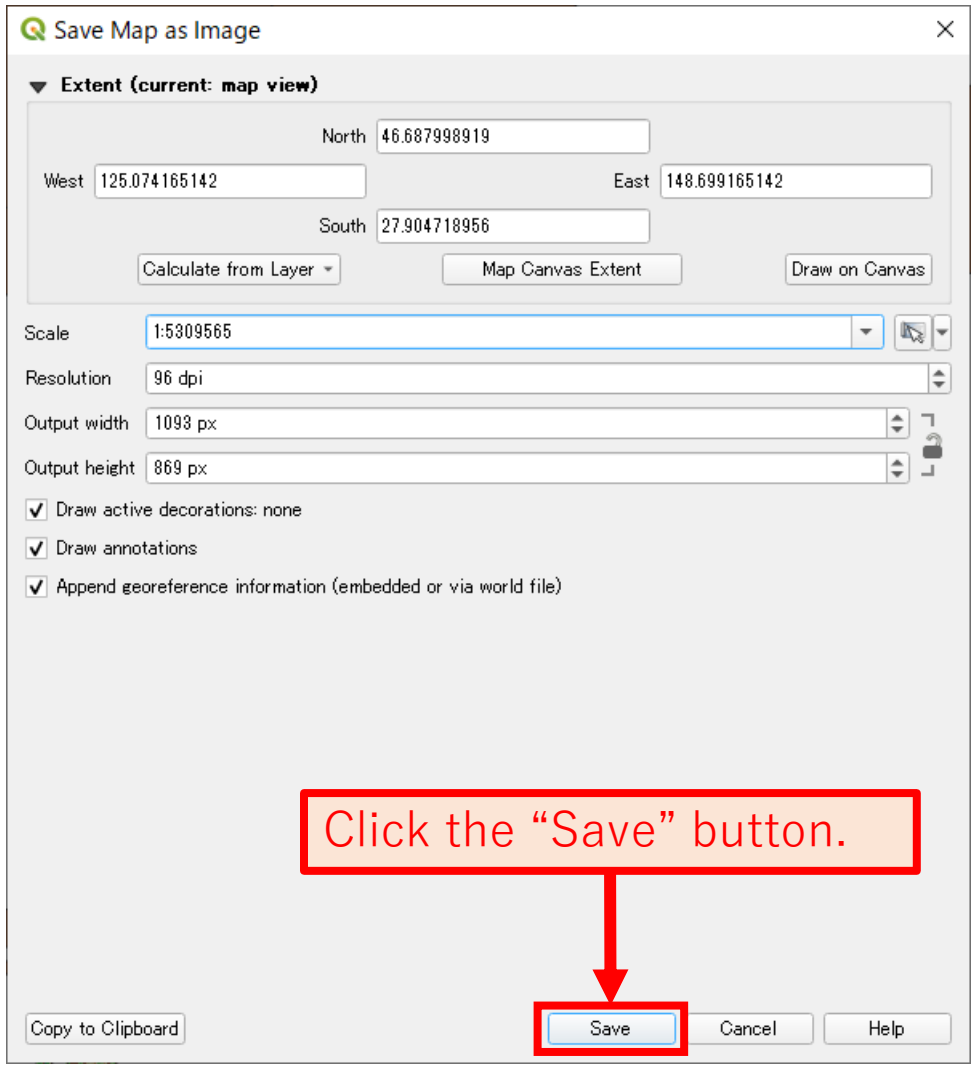

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Book
Home
C:¥
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS
WFS / OGC API - Features
OWS
ArcGIS REST Servers
GeoNode
Zoom in
Zoom out
Pan Map
You can zoom in/out or move the area with these tools.
Results Viewer
Layers
GCOM-C_L2_LST
Band 1 (Gray)
60
20
GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST
World_Countries
Type to locate (Ctrl+K)
Coordinate
Scale
Magnifier
Rotation
Render
EPSG:4326

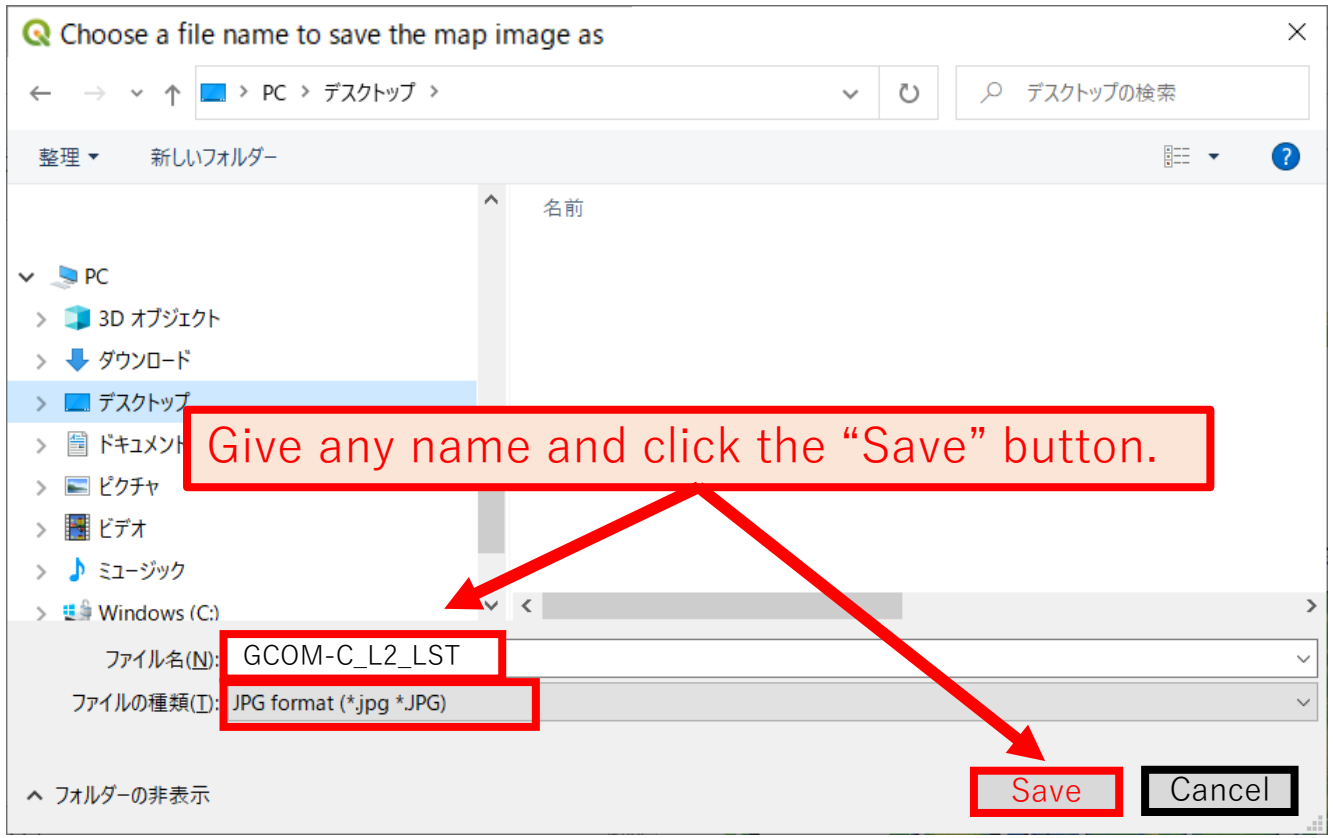


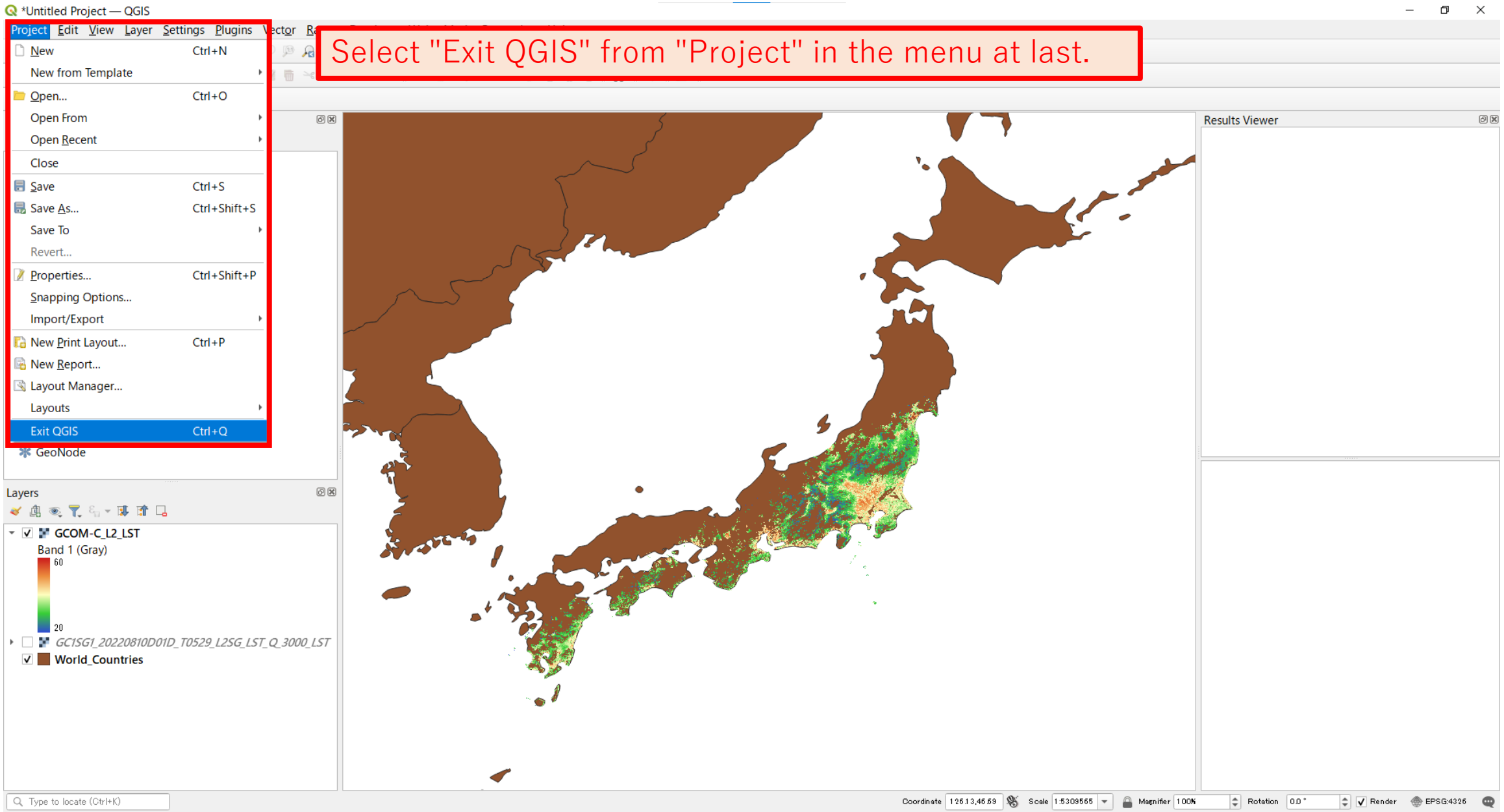

To save the created land surface temperature data, select "Save As" on the "Project" menu, give it any name and save it in any folder.

The next time you want to open the same image, double-click on the saved file and QGIS will automatically launch and open it.


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing He
New Ctrl+N
New from Template
Open... Ctrl+O
Open From
Open Recent
Close
Save Ctrl+S
Save As... Ctrl+Shift+S
Save To
Revert...
Properties... Ctrl+Shift+P
Snapping Options...
Import/Export
New Print Layout... Ctrl+P
New Report...
Layout Manager...
Layouts
Exit QGIS Ctrl+Q
Export Map to Image...
Export Map to PDF...
Export Project to DXF...
Import Layers from DWG/DXF...
If you want to output the image file, select "Import/Export" from "Project" in the menu and click "Export Map to Image".
Results Viewer
GeoNode
Layers
GCOM-C_L2_LST
Band 1 (Gray)
60
20
GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST
World_Countries
Type to locate (Ctrl+K)
Coordinate
Scale
Magnifier
Rotation
Render
EPSG:4326


Save Map as Image
Extent (current: map view)
North 46.687998919
West 125.074165142
East 148.699165142
South 27.904718956
Calculate from Layer
Map Canvas Extent
Draw on Canvas
Scale 1:5309565
Resolution 96 dpi
Output width 1093 px
Output height 869 px
Draw active decorations: none
Draw annotations
Append georeference information (embedded or via world file)
Click the “Save” button.
Copy to Clipboard
Save
Cancel
Help


Choose a file name to save the map image as
PC › デスクトップ ›
デスクトップの検索
整理
新しいフォルダー
名前
PC
3D オブジェクト
ダウンロード
デスクトップ
ドキュメント
ピクチャ
ビデオ
ミュージック
Windows (C:)
Give any name and click the “Save” button.
ファイル名(N): GCOM-C_L2_LST
ファイルの種類(T): JPG format (*.jpg *.JPG)
フォルダーの非表示
Save
Cancel


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins
New Ctrl+N
New from Template
Open... Ctrl+O
Open From
Open Recent
Close
Save Ctrl+S
Save As... Ctrl+Shift+S
Save To
Revert...
Properties... Ctrl+Shift+P
Snapping Options...
Import/Export
New Print Layout... Ctrl+P
New Report...
Layout Manager...
Layouts
Exit QGIS Ctrl+Q
GeoNode
Select "Exit QGIS" from "Project" in the menu at last.
Results Viewer
Layers
GCOM-C_L2_LST
Band 1 (Gray)
60
20
GC1SG1_20220810D01D_T0529_L2SG_LST_Q_3000_LST
World_Countries
Type to locate (Ctrl+K)
Coordinate
Scale
Magnifier
Rotation
Render
EPSG:4326