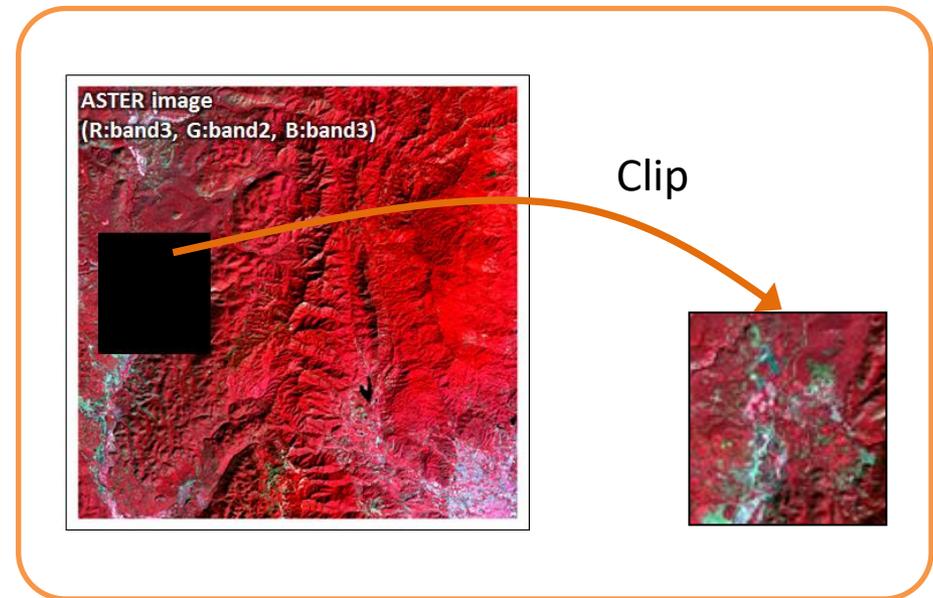
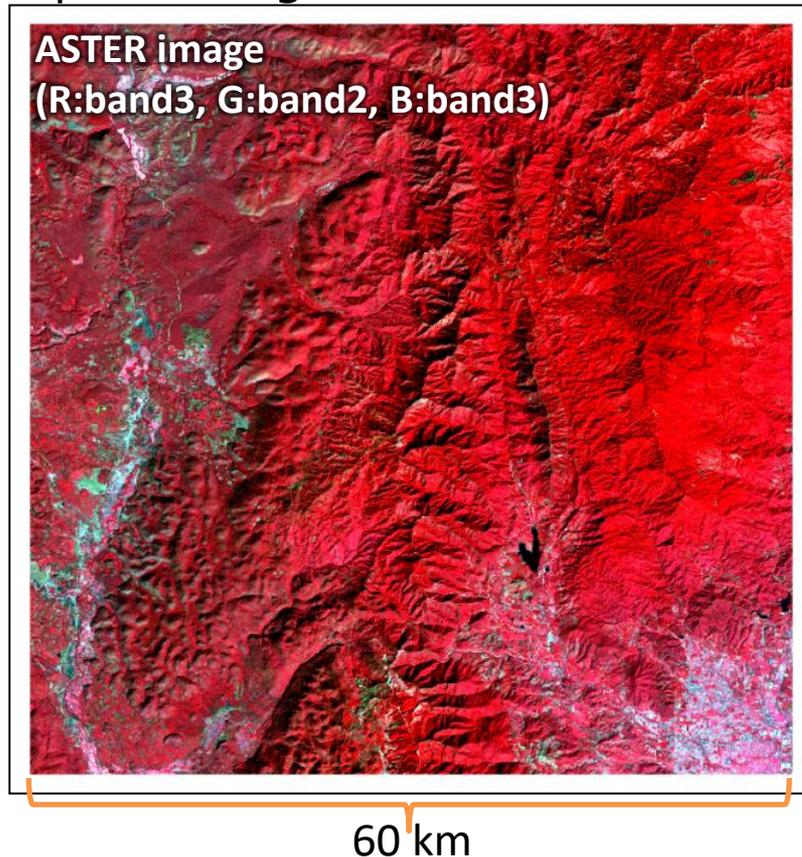


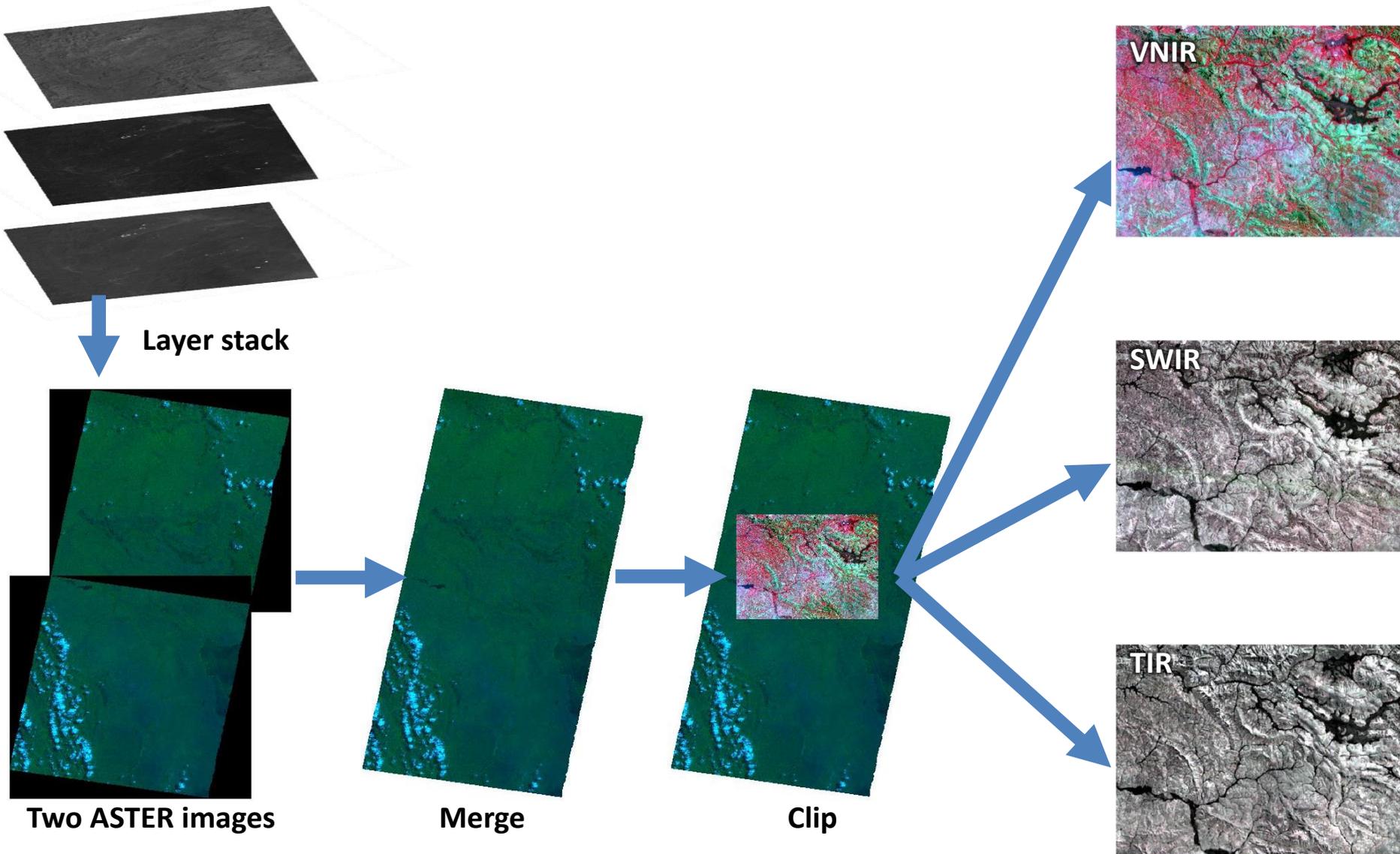
False color composite

Japan Space Systems

- ASTER image cover 60km x 60km.
- When your region of interest is locally, you should extract this region before processing.

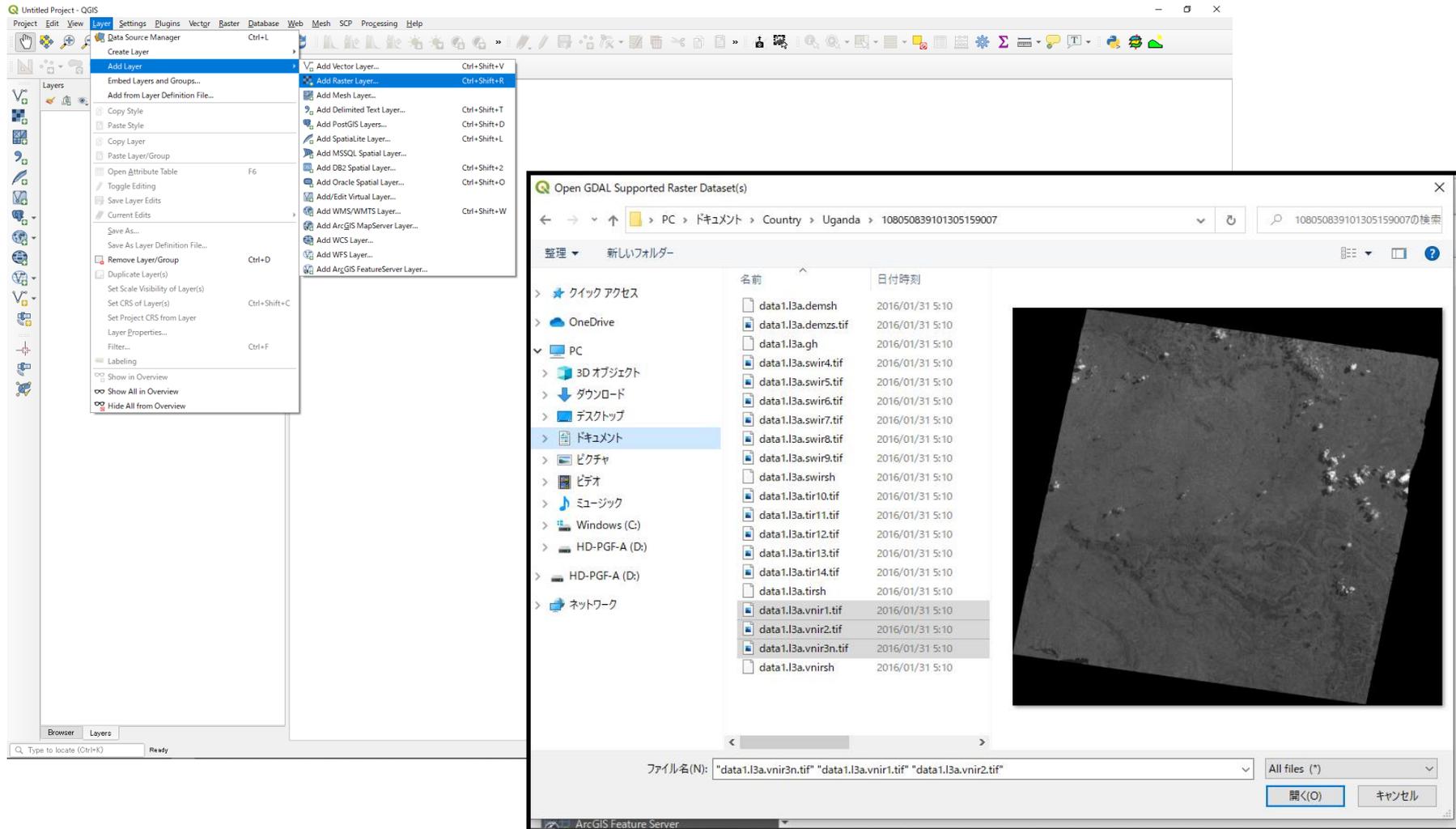


- **File size becomes small.**
- **Processing of data becomes fast**

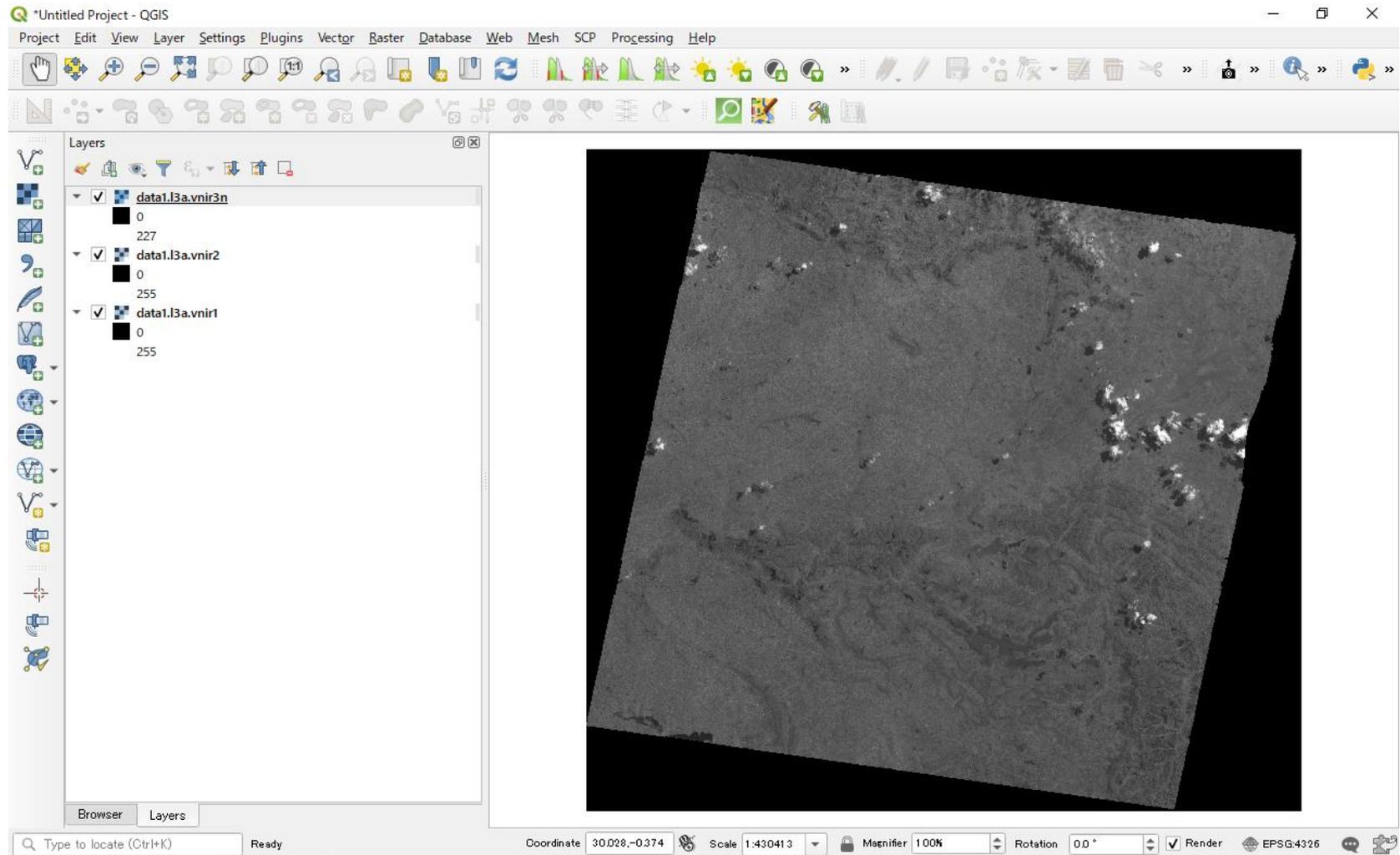


We will use these clipped data in following lesson.

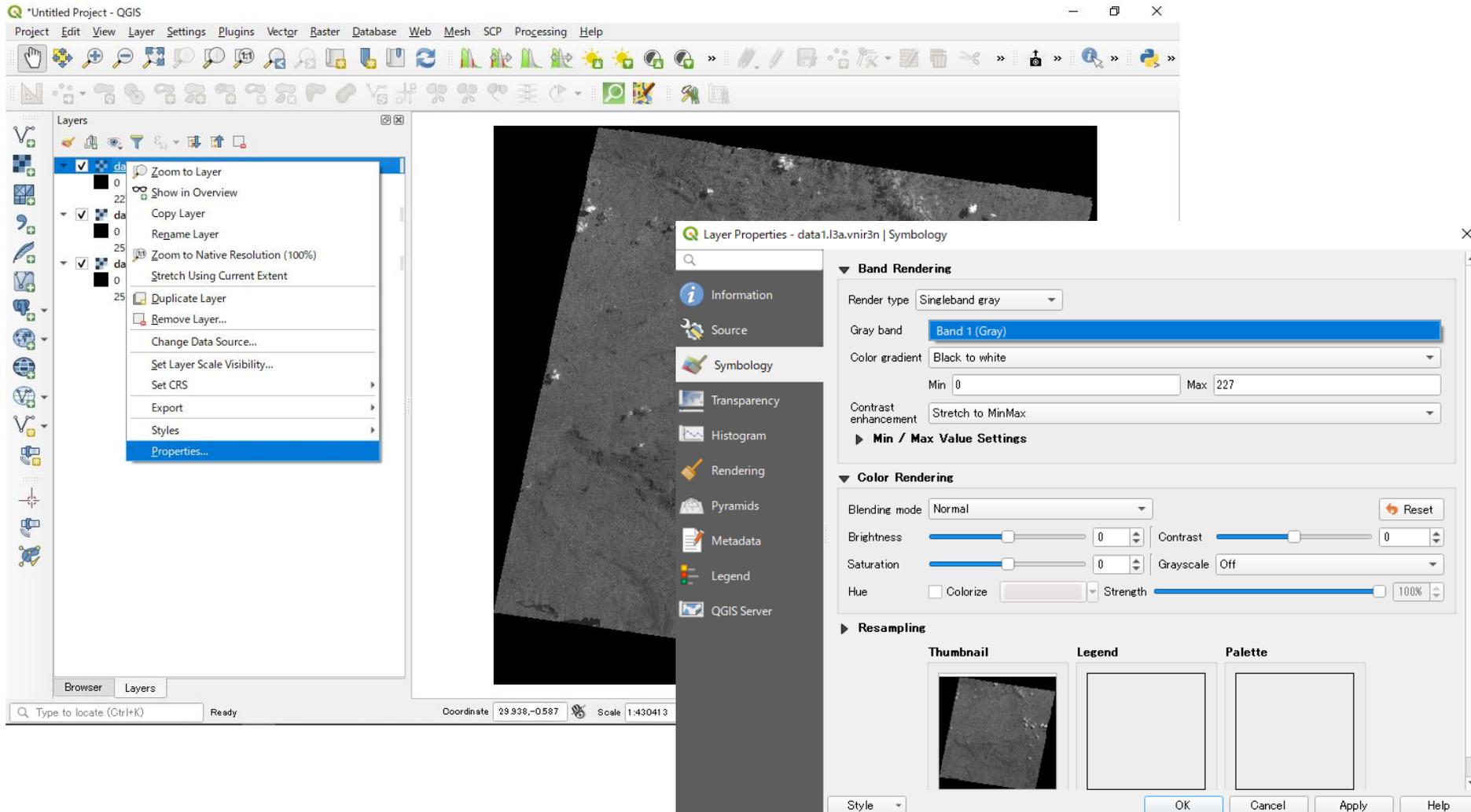
- From “Layer” menu, select “Add Layer” and “Add Raster Layer”.
- Select files with the vnir1, vnir2, vnir3n.



- Selected images are opened separately.

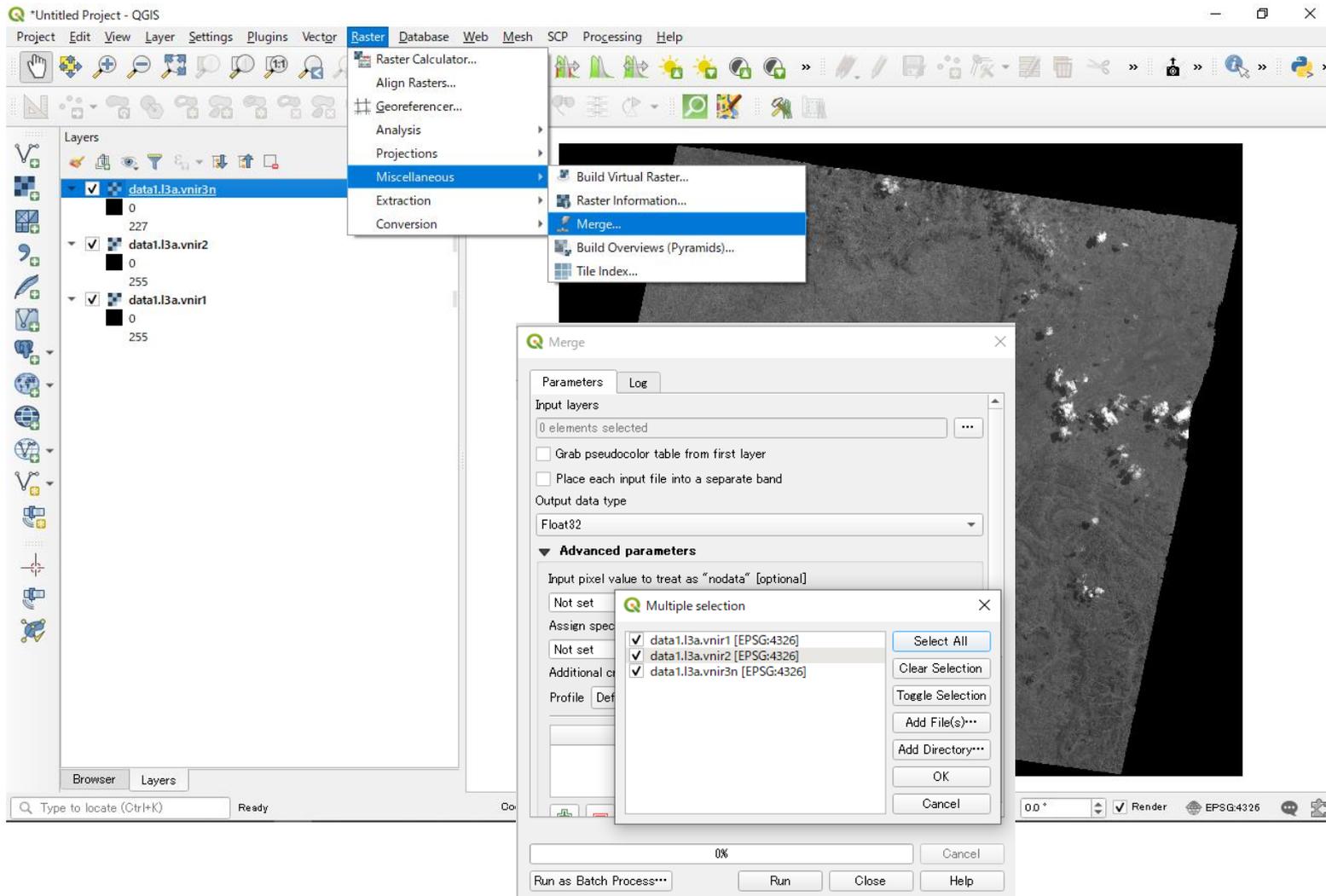


- Select layer, click right mouse button and select “Properties”.
- Select “Symbology” and click “Band1 (Gray)”.
- Confirm that there is only one band.

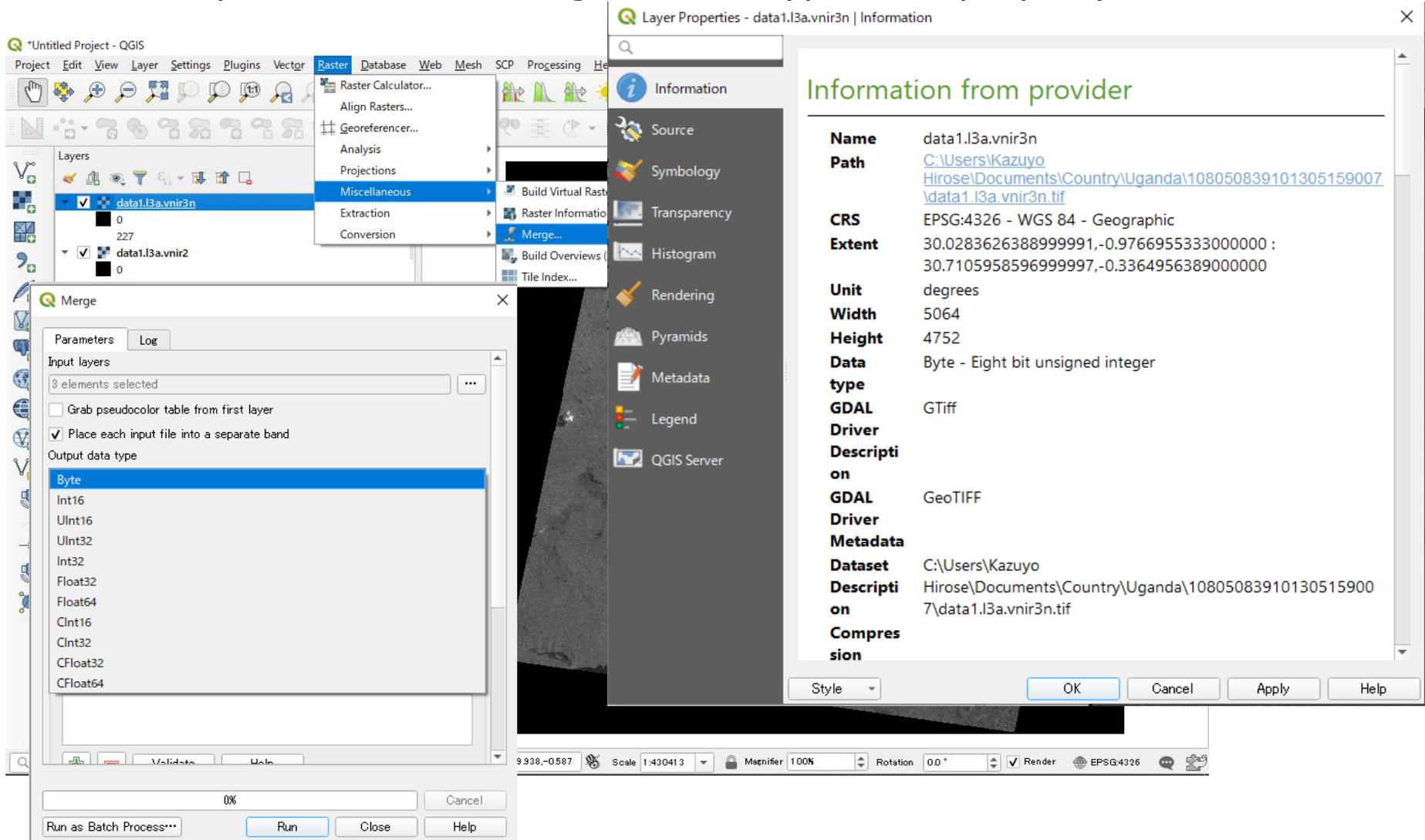


Merge single-band layer in multi-band layer

- From “Raster” menu, select “Miscellaneous” and “Merge”.
- Open “Merge” window and check three boxes of layers.



- Check the box of “Place each input file into a separate band”.
- Select “Byte” after confirming the data type from property-Information tab.



The screenshot shows the QGIS interface with the Merge dialog box open. The 'Parameters' tab is active, and the 'Place each input file into a separate band' checkbox is checked. The 'Output data type' list has 'Byte' selected. The Layer Properties dialog box is also open, showing the 'Information' tab with the following details:

Information from provider	
Name	data1.l3a.vnir3n
Path	C:\Users\Kazuyo\Hirose\Documents\Country\Uganda\108050839101305159007\data1.l3a.vnir3n.tif
CRS	EPSG:4326 - WGS 84 - Geographic
Extent	30.0283626388999991,-0.9766955333000000 : 30.7105958596999997,-0.3364956389000000
Unit	degrees
Width	5064
Height	4752
Data type	Byte - Eight bit unsigned integer
GDAL Driver	GTiff
GDAL Driver Metadata	GeoTIFF
Dataset	C:\Users\Kazuyo
Description	Hirose\Documents\Country\Uganda\108050839101305159007\data1.l3a.vnir3n.tif

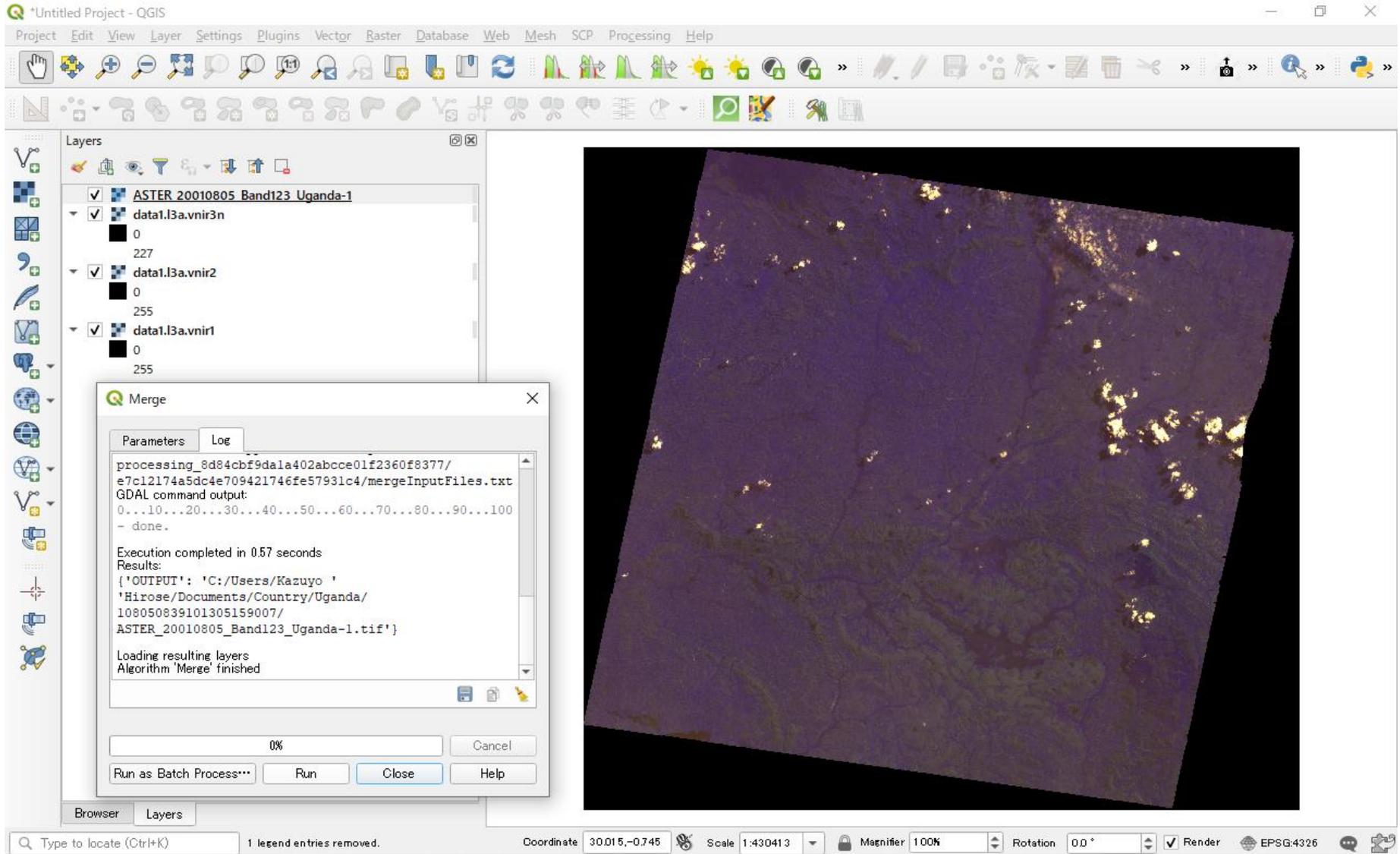
Merge single-band layer in multi-band layer

- Click Button and save to file as “ASTER_20010805_Band123_Uganda-1”
- Click Run

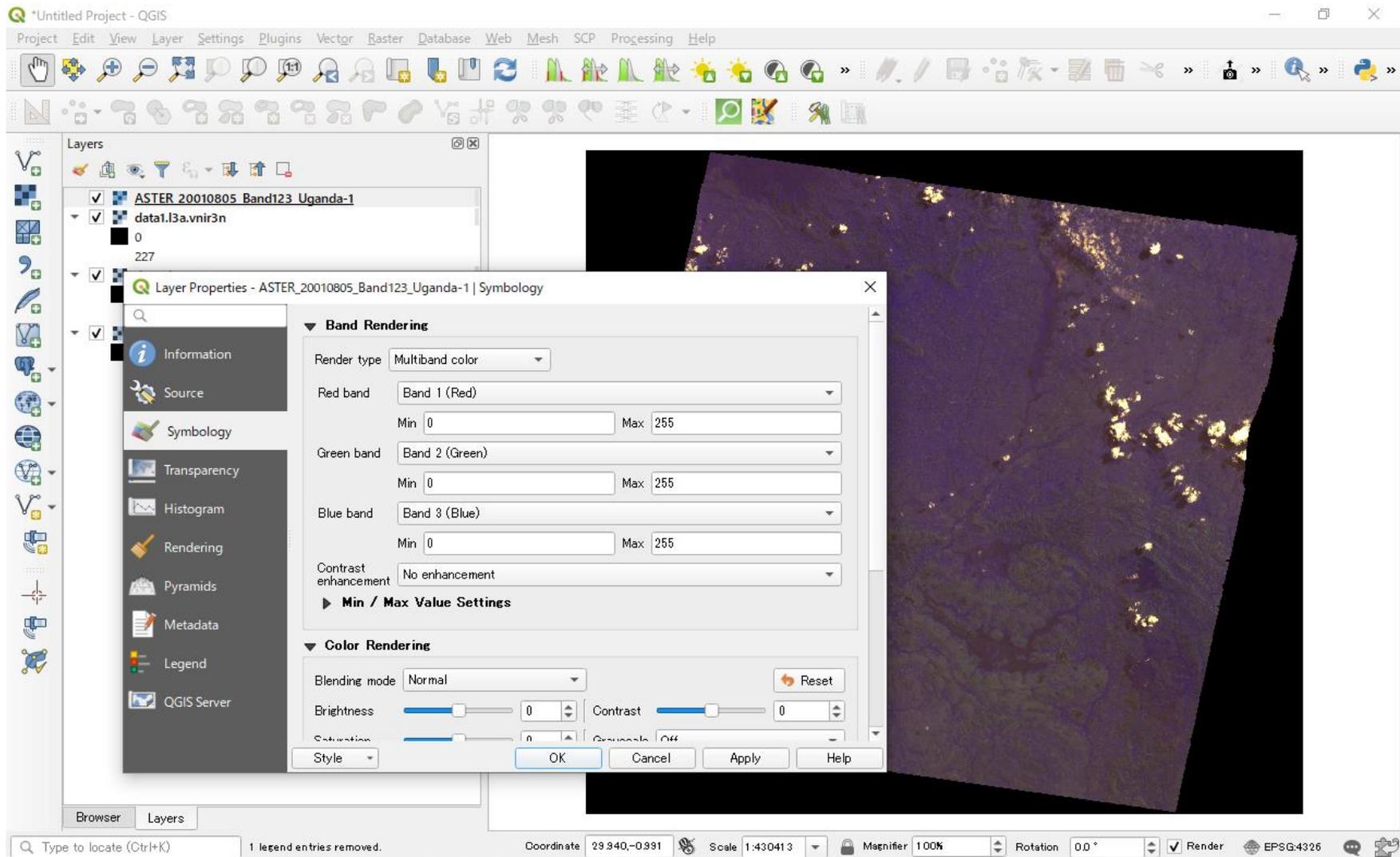
The screenshot shows the QGIS interface with the following elements:

- Layers Panel:** Contains three layers: data1.l3a.vnir3n (0 bands), data1.l3a.vnir2 (227 bands), and data1.l3a.vnir1 (255 bands).
- Merge Dialog:** Opened with the 'Parameters' tab selected. The 'Merged' section shows 'Open output file after running algorithm' checked. The 'GDAL/OGR console call' field contains a complex command line for merging the layers.
- File Explorer:** Opened to the directory 'C:\Documents\Country\Uganda\108050839101305159007'. It lists several TIF files. The filename 'ASTER_20010805_Band123_Uganda-1' is highlighted in yellow.
- Context Menu:** A right-click context menu is open over the file explorer, with 'Save to File...' selected. A red arrow points to this option.

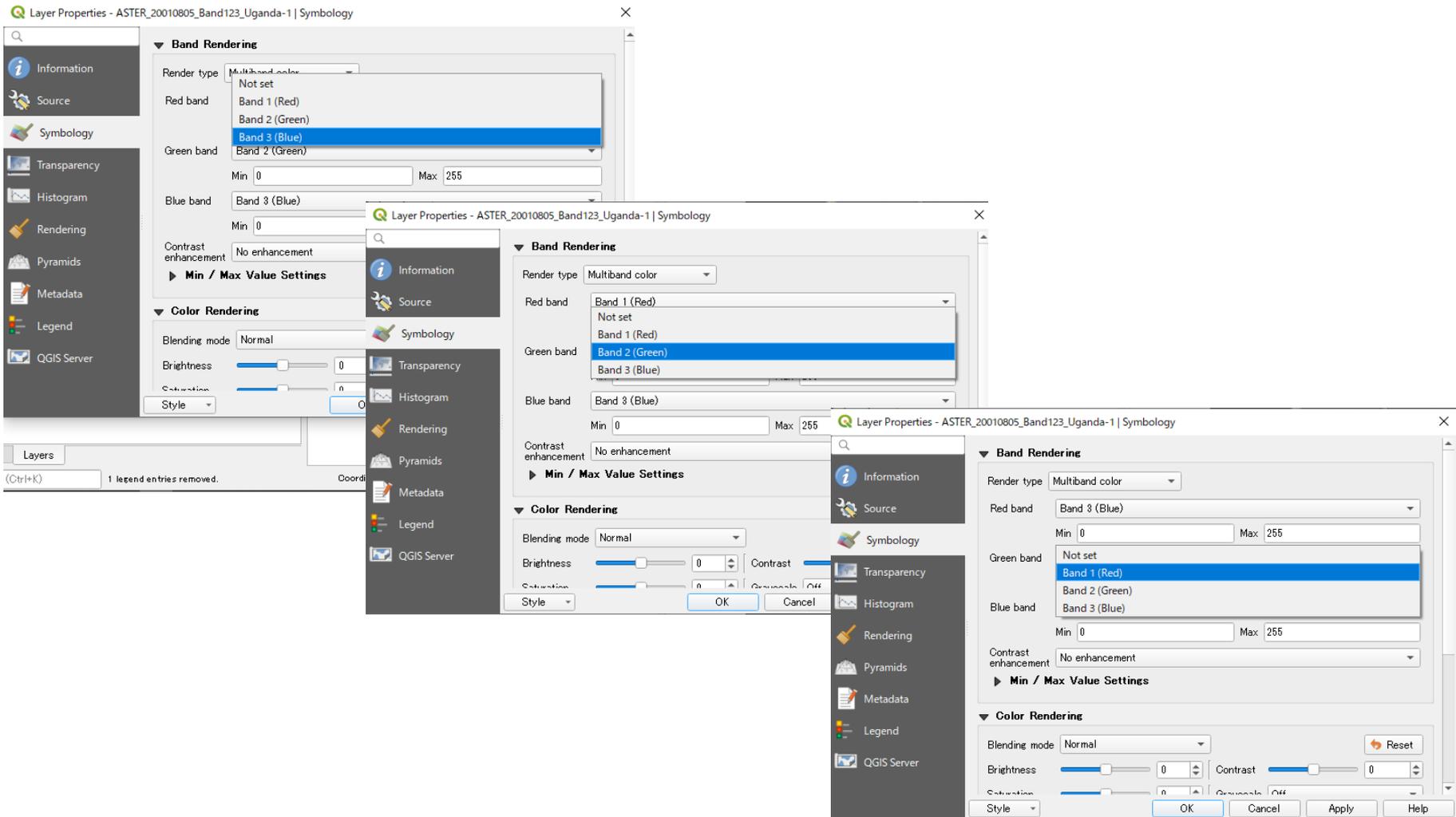
- New layer is created and added to the layer window.



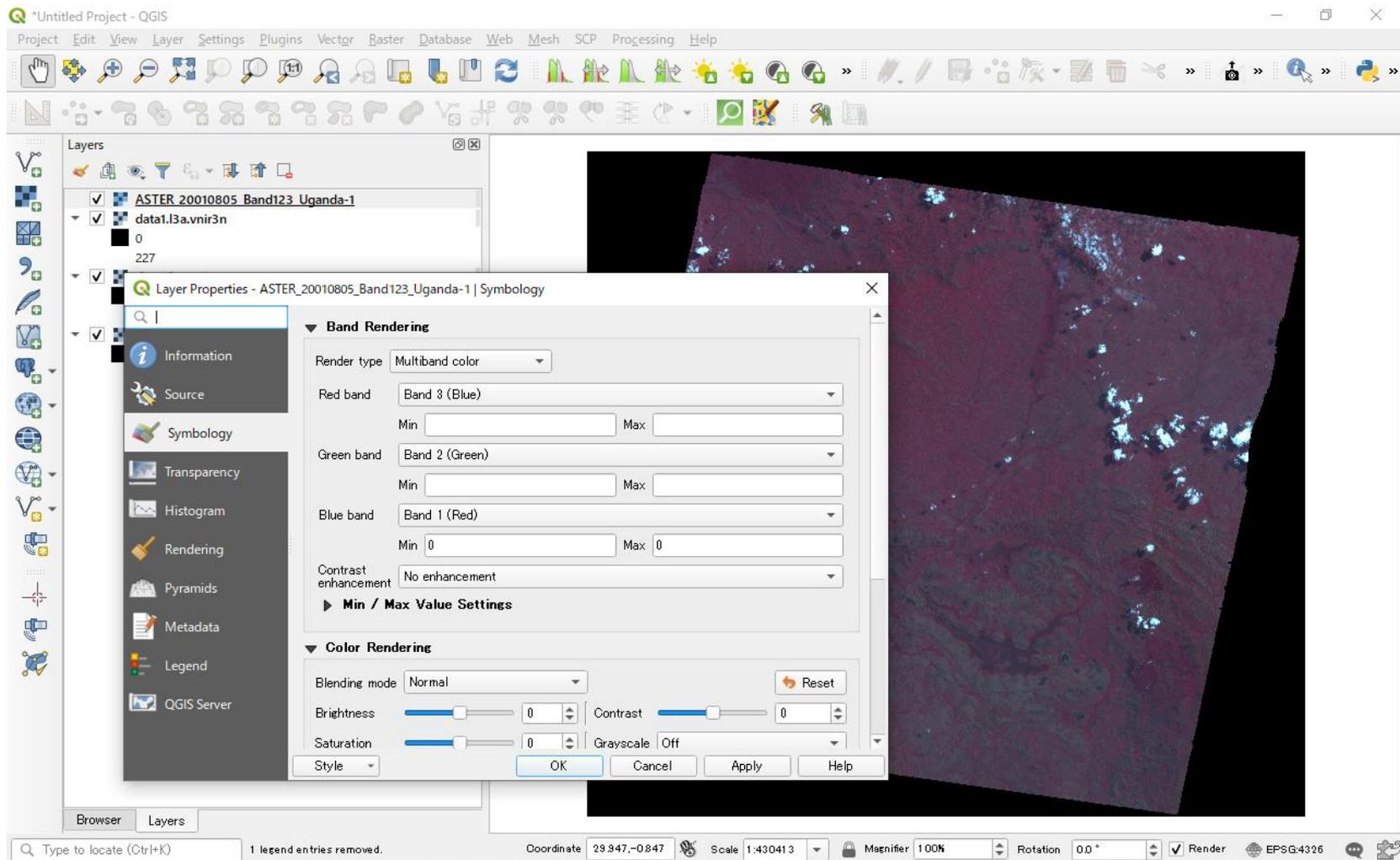
- Select merged layer, click right mouse button and select “Properties”.
- Select “Symbology” tab and confirm that there are three bands.



- Select merged layer, click right mouse button and select “Properties”.
- Select “Symbology” tab and confirm that there are three bands.

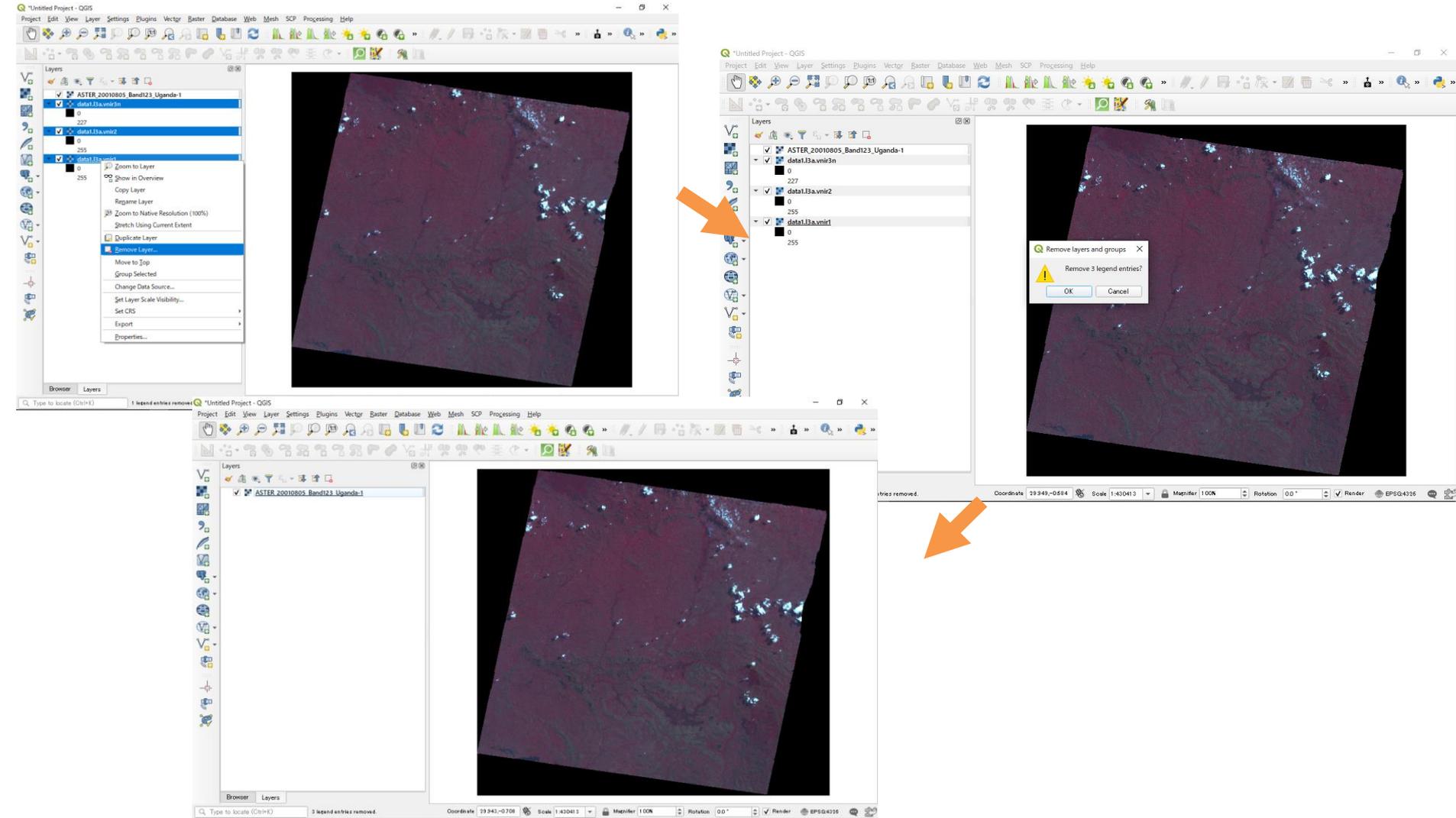


- In “Band rendering” group, change band color and push “OK”.
- Confirm that the color of merged layer is changed.

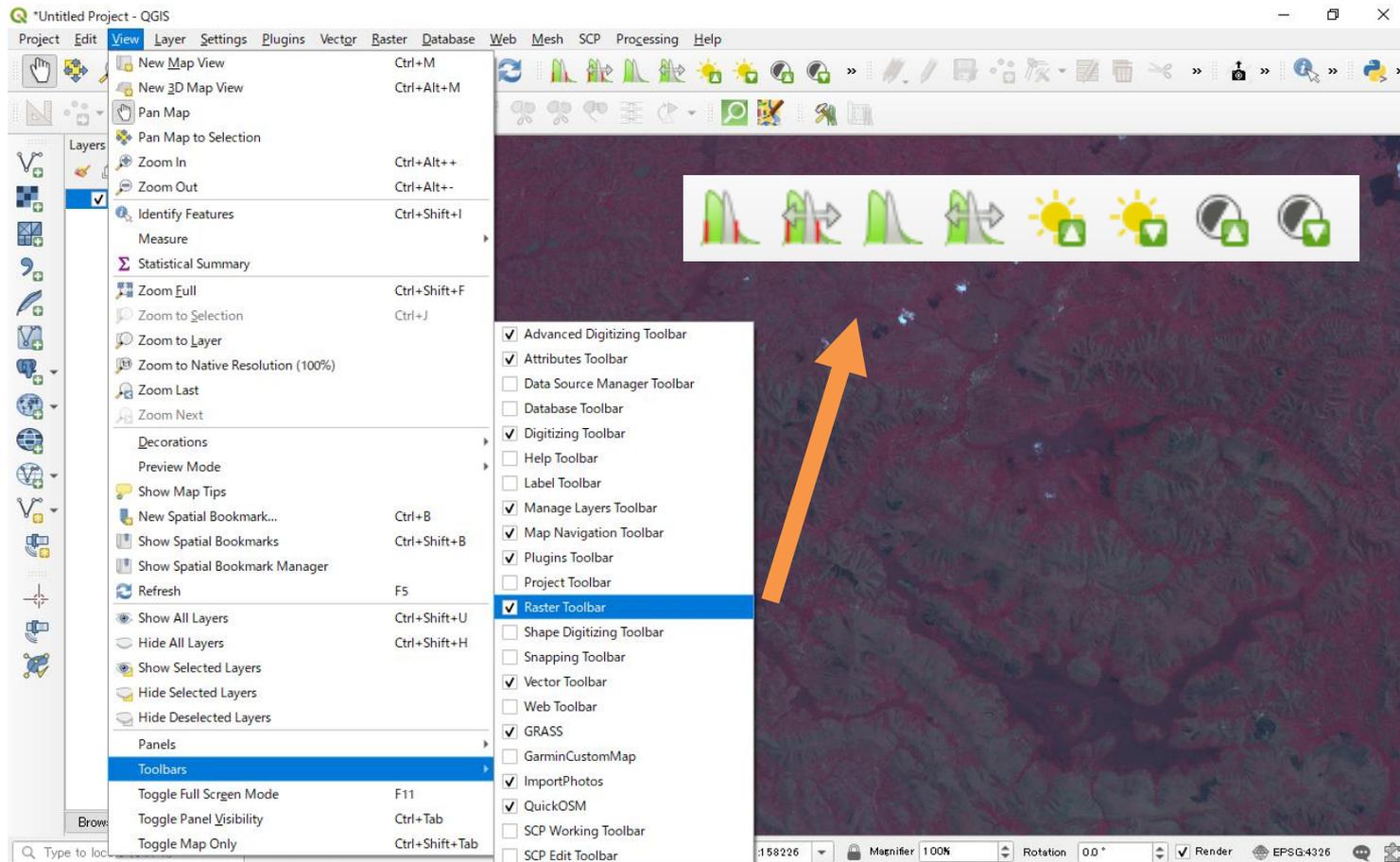


Remove single-band layer

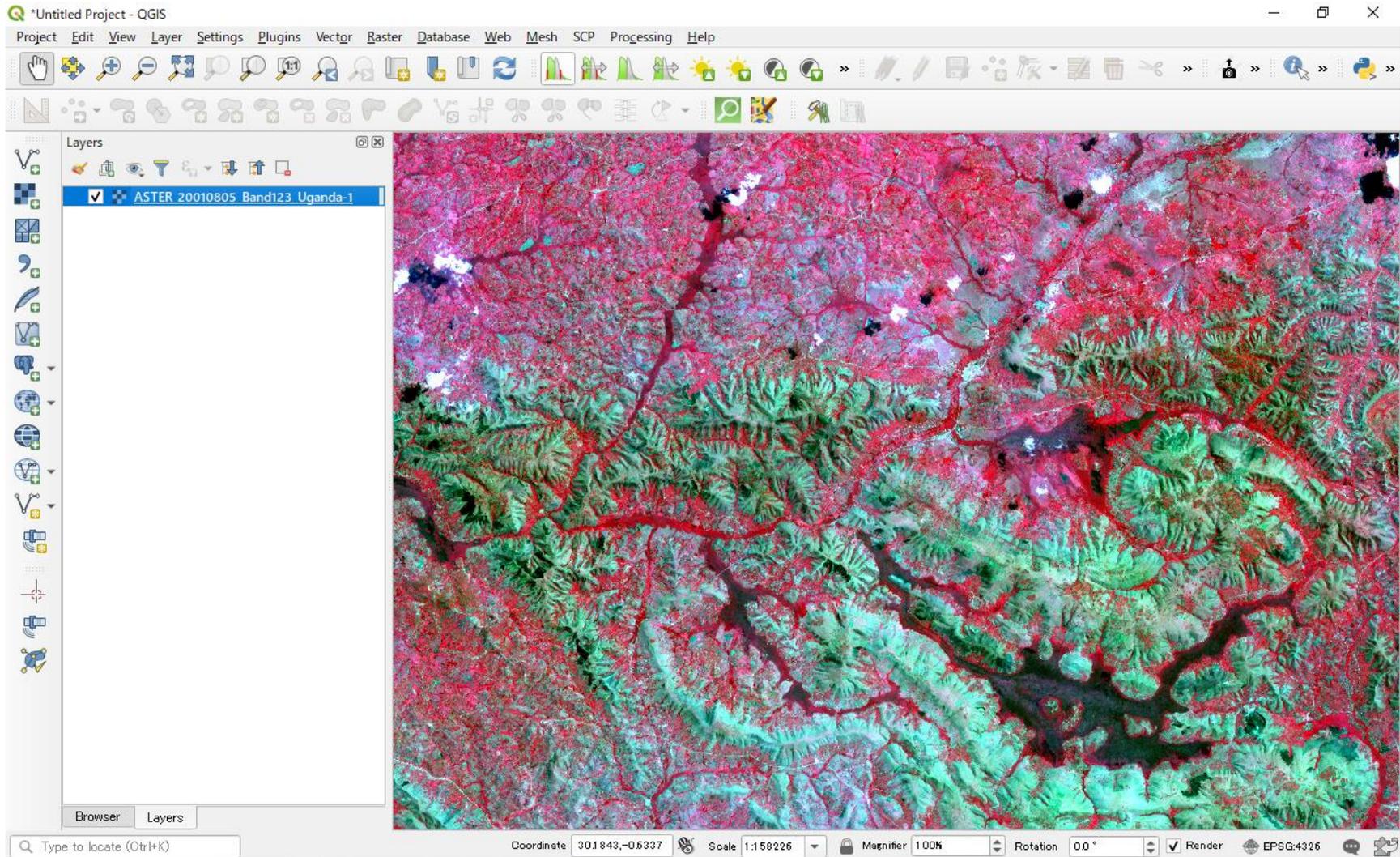
- Select single band layers, click right mouse button and select "Remove".
- Remove these layers.



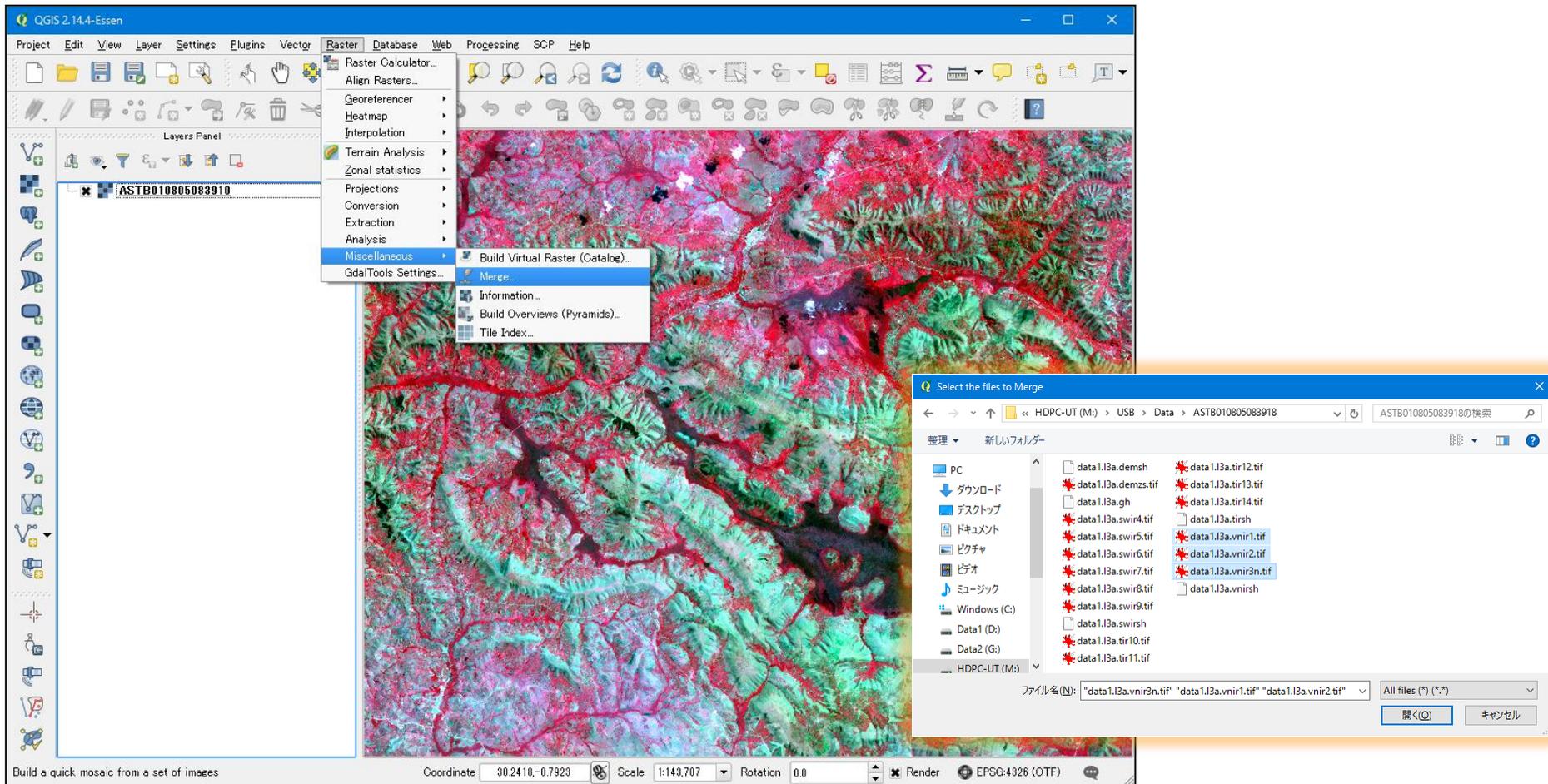
- Zoom in to the region of interest on merged layer.
- Check Menu button View-Toolbars-Raster Toolbar.
- Click button  to enhance contrast of the image.



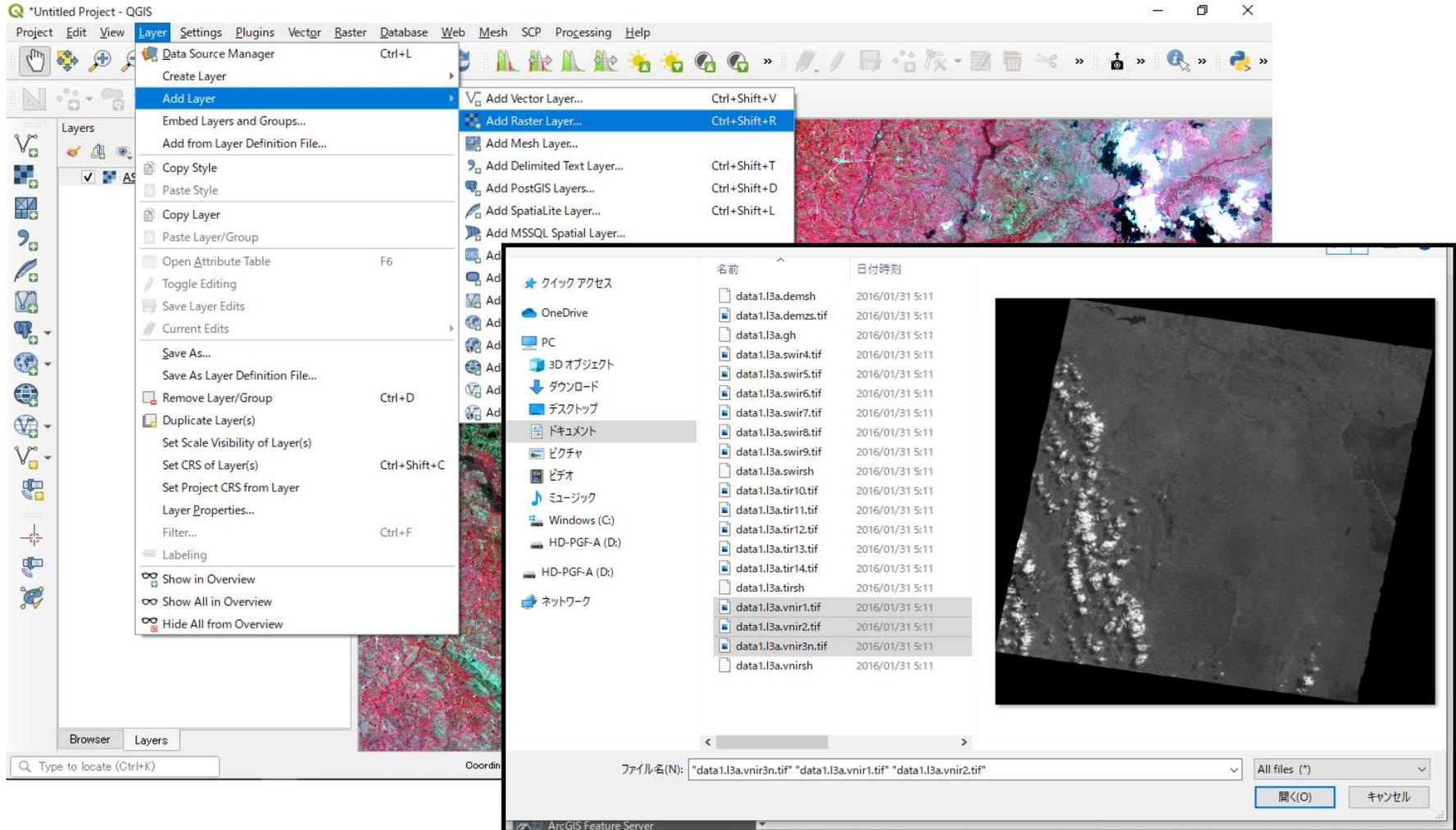
- Confirm that contrast enhancement is changed.



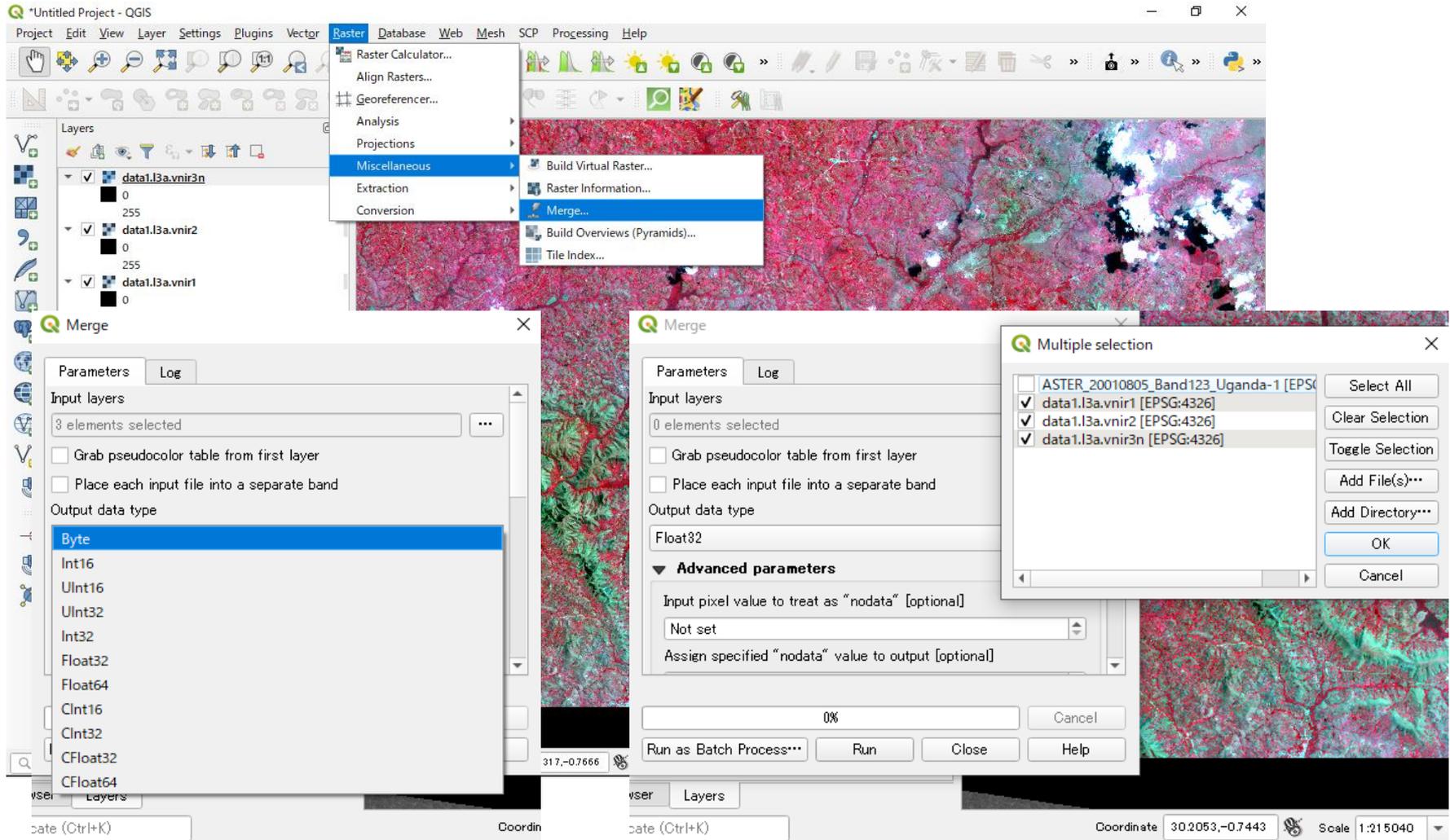
- Create one more image to merge horizontally.
- From “Raster” menu, select “Miscellaneous” and “Merge”.
- Open “Merge” window.
- Select files with the vnir to the end in another folder.



- From “Raster” menu, select “Miscellaneous” and “Merge”.
- Open “Merge” window.
- Select files with the vnir1, vnir2 and vnir3n.

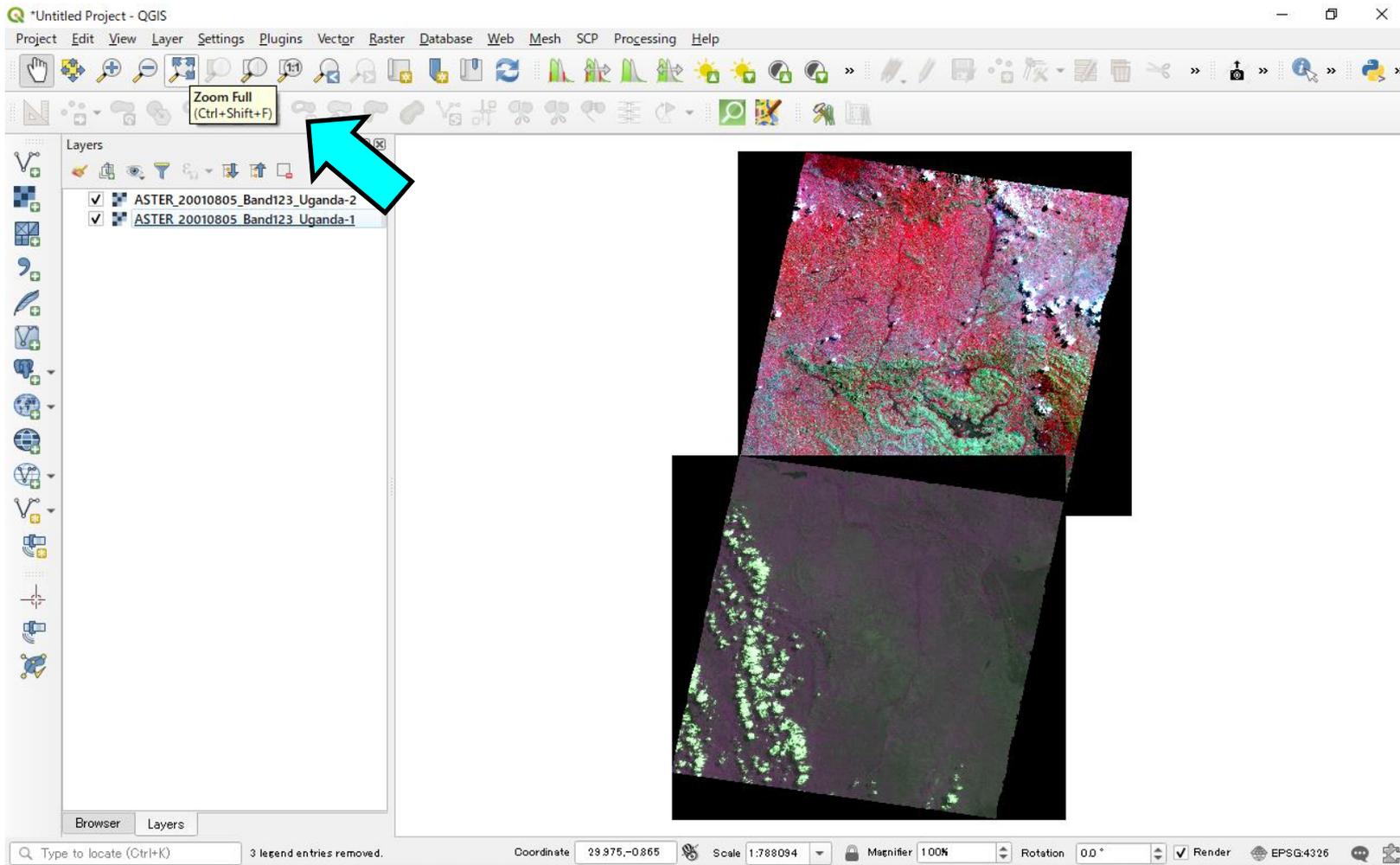


- Confirm that new merged layer is created and added in layer window.
- Merge three layers and change data type as “Byte” and save

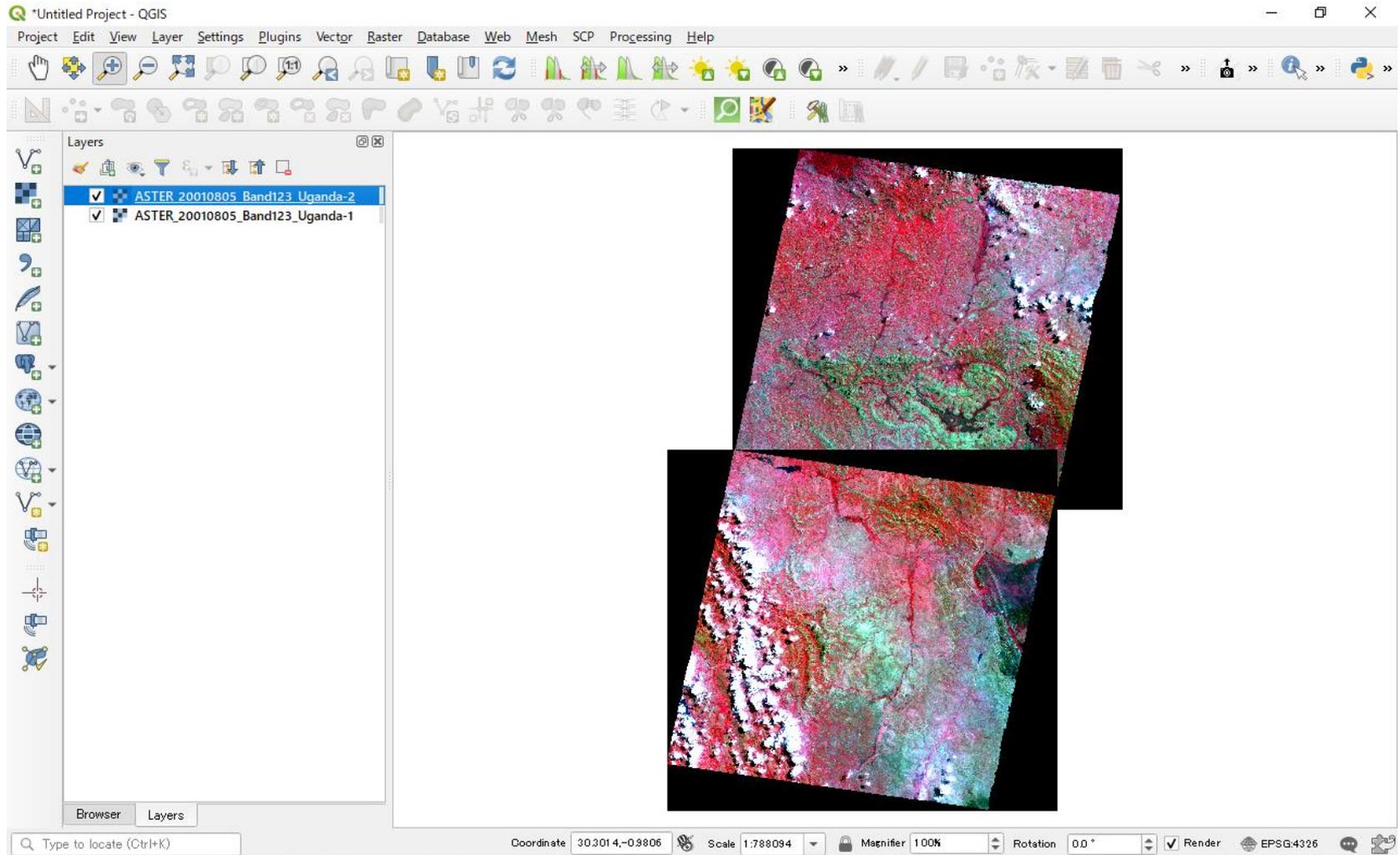


Merge single-band layer in multi-band layer

- Created image is opened and click button “Zoom Full” 
- Confirm that new merged layer is created and added in layer window.

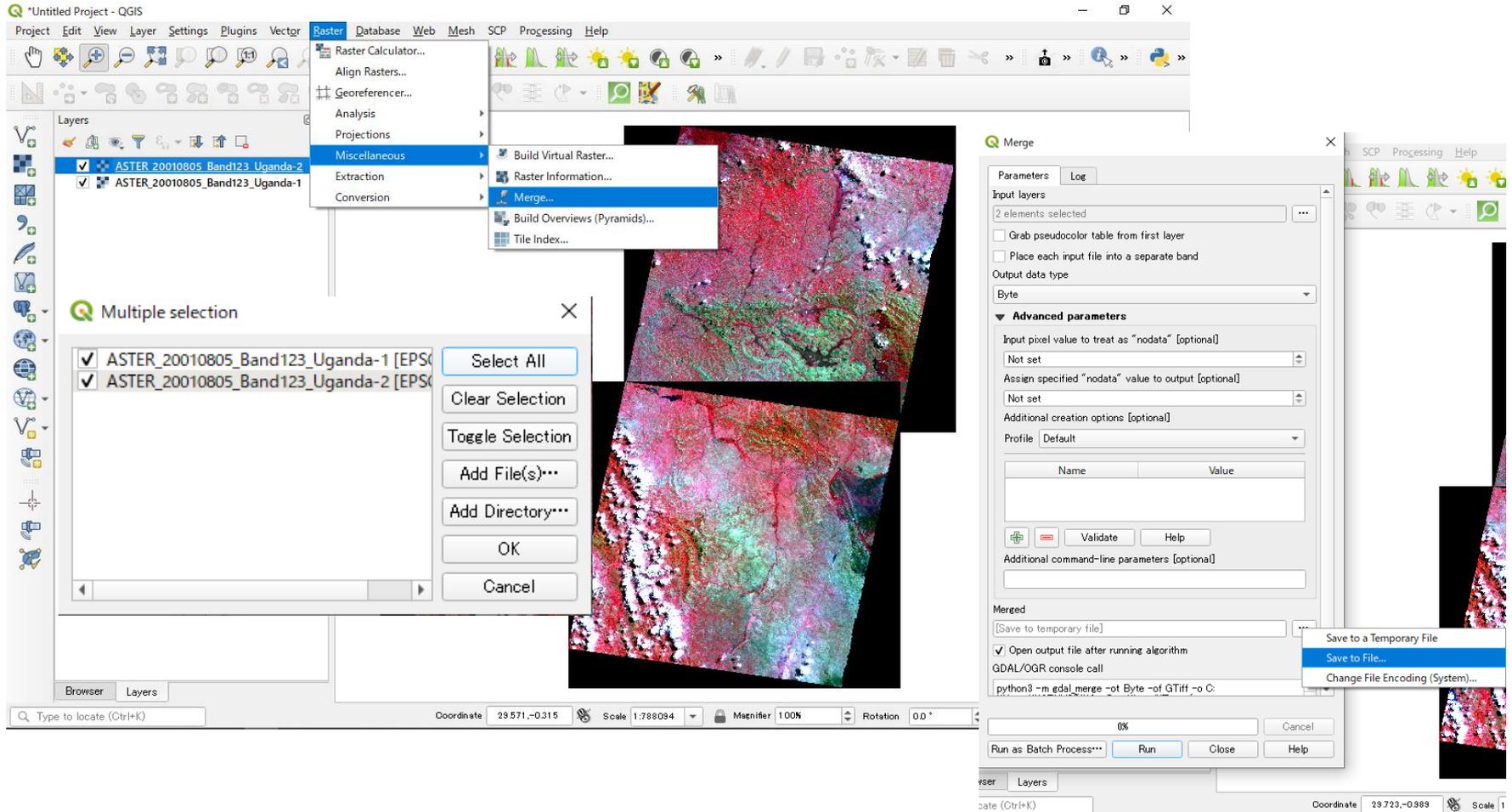


- Open property window and change color.



Merge multi-band layer

- From “Raster” menu, select “Miscellaneous” and “Merge”.
- Open “Merge” window.
- Select “Input files” and “Output file” .



The screenshot shows the QGIS interface with the following elements:

- Top Menu:** Project, Edit, View, Layer, Settings, Plugins, Vector, **Raster**, Database, Web, Mesh, SCP, Processing, Help.
- Layers Panel:**
 - ASTER_20010805_Band123_Uganda-2
 - ASTER_20010805_Band123_Uganda-1
- Raster Menu:**
 - Raster Calculator...
 - Align Rasters...
 - Georeferencer...
 - Analysis
 - Projections
 - Miscellaneous
 - Build Virtual Raster...
 - Raster Information...
 - Merge...**
 - Build Overviews (Pyramids)...
 - Tile Index...
 - Extraction
 - Conversion
- Multiple selection Dialog:**
 - ASTER_20010805_Band123_Uganda-1 [EPSG:31466]
 - ASTER_20010805_Band123_Uganda-2 [EPSG:31466]
 - Buttons: Select All, Clear Selection, Toggle Selection, Add File(s)..., Add Directory..., OK, Cancel.
- Merge Dialog:**
 - Parameters | Log
 - Input layers: 2 elements selected
 - Advanced parameters:
 - Input pixel value to treat as "nodata" [optional]: Not set
 - Assign specified "nodata" value to output [optional]: Not set
 - Additional creation options [optional]:
 - Profile: Default
 - Buttons: Validate, Help
 - Additional command-line parameters [optional]:
 - Merged:
 - [Save to temporary file] (dropdown menu open):
 - Save to a Temporary File
 - Save to File...**
 - Change File Encoding (System)...
 - GDAL/OGR console call: python3 -m gdal_merge -ot Byte -of GTiff -o C:\...
 - Progress: 0%
 - Buttons: Run as Batch Process..., Run, Close, Help

- Don't check the box of "Place each input file into a separate band" because of merging horizontal images in this case.

The screenshot shows the QGIS Merge dialog box with the following settings:

- Input layers: 2 elements selected
- Grab pseudocolor table from first layer
- Place each input file into a separate band
- Output data type: Float32
- Advanced parameters:
 - Input pixel value to treat as "nodata" [optional]: 0
 - Assign specified "nodata" value to output [optional]: Not set
 - Additional creation options [optional]:
 - Profile: Default
- Merged: `/Country/Uganda/ASTER_20010805_Band123_Uganda-merge.tif`
- Open output file after running algorithm
- GDAL/OGR console call:
`python3 -m gdal_merge -n 0 -ot Float32 -of GTiff -o "C:/Users/`

The file explorer shows the following files:

- 108050839101305
- 108050839181305
- ASTER_20010805_Band123_Uganda-1.tif
- ASTER_20010805_Band123_Uganda-2.tif

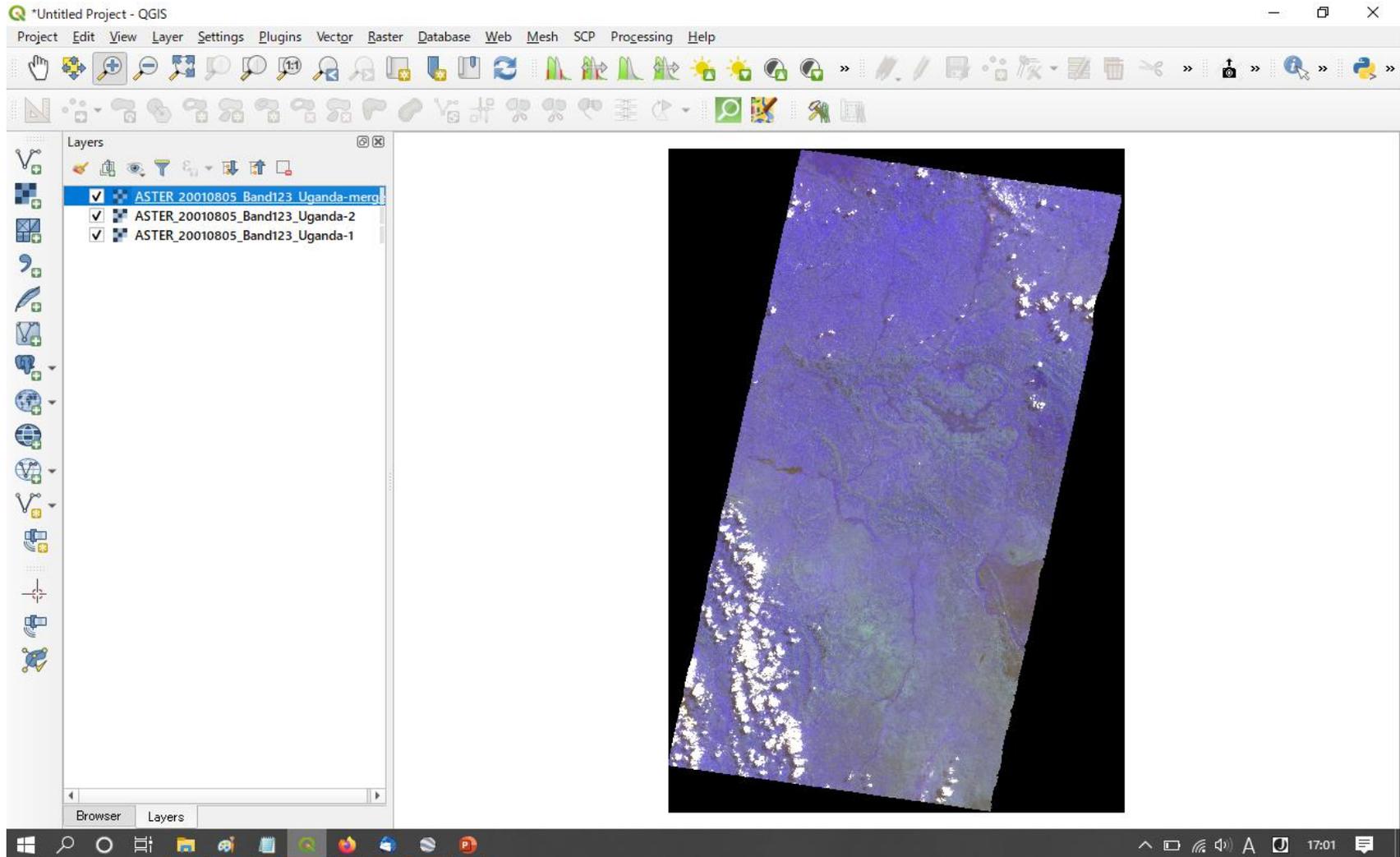
The file name dialog box shows:

- ファイル名(N): ASTER_20010805_Band123_Uganda-merge.tif
- ファイルの種類(T): TIF files (*.tif)

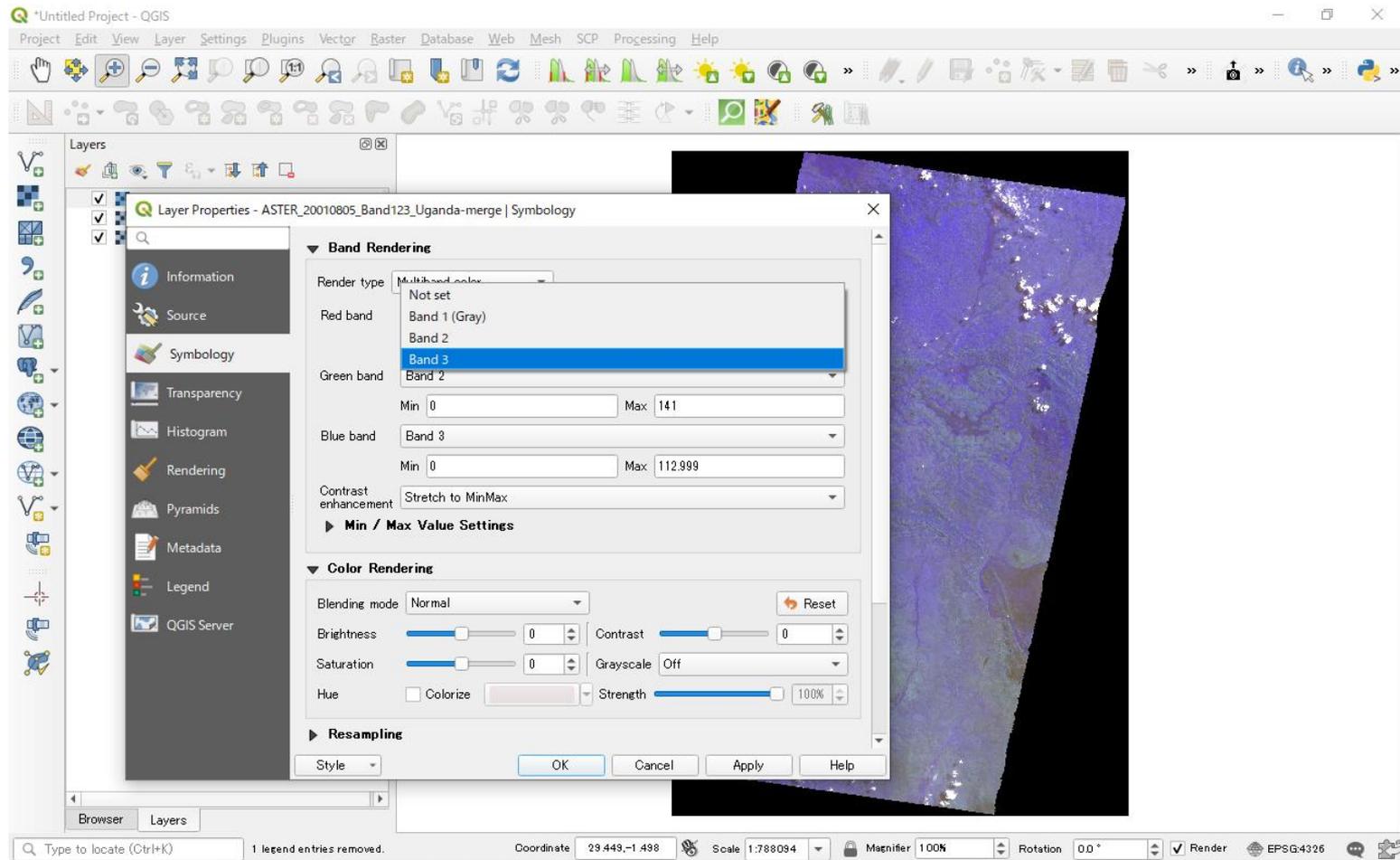
The console call is partially visible at the bottom of the dialog box:

```
python3 -m gdal_merge -n 0 -ot Float32 -of GTiff -o "C:/Users/
```

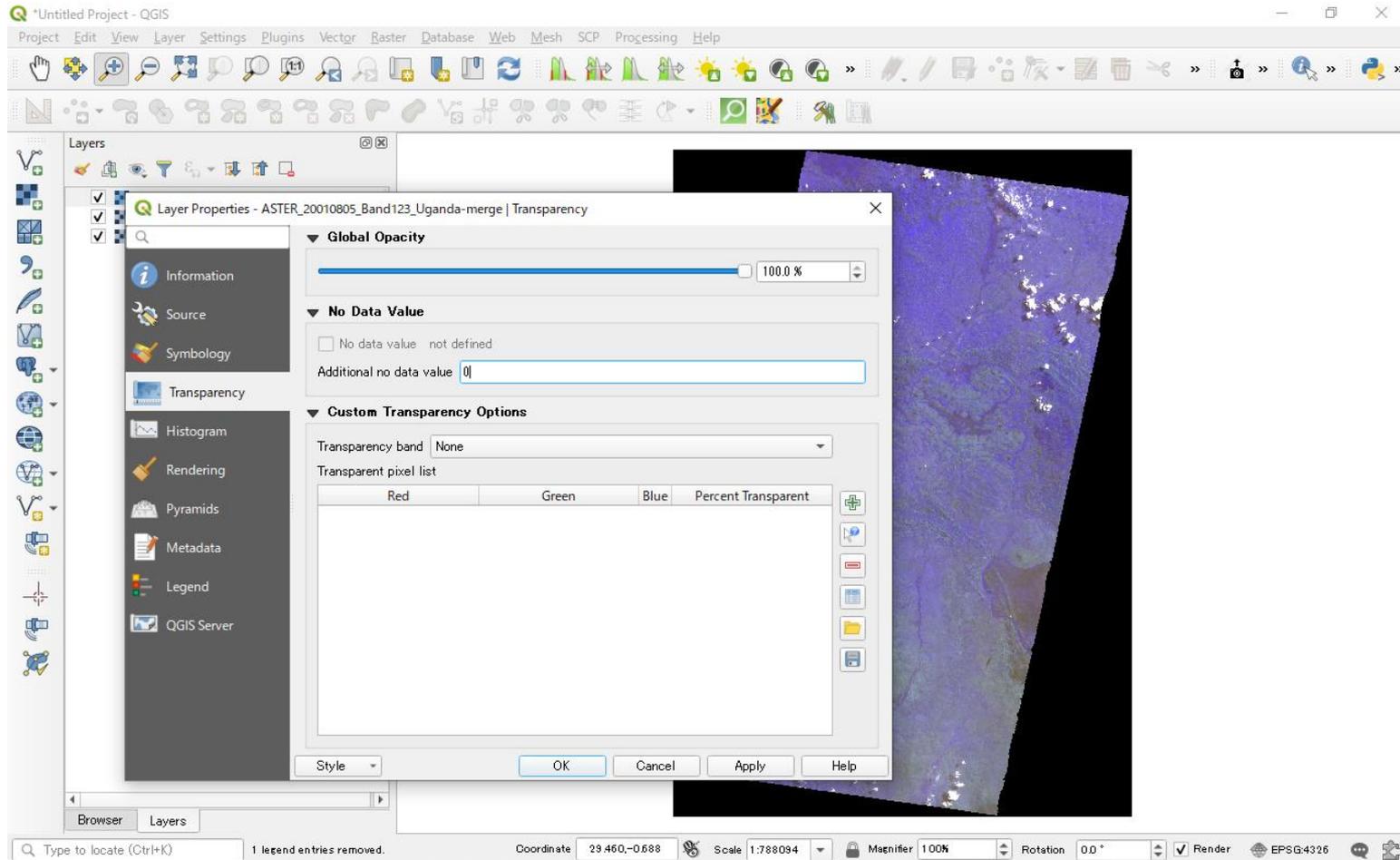
- Two multi band layer is merged.



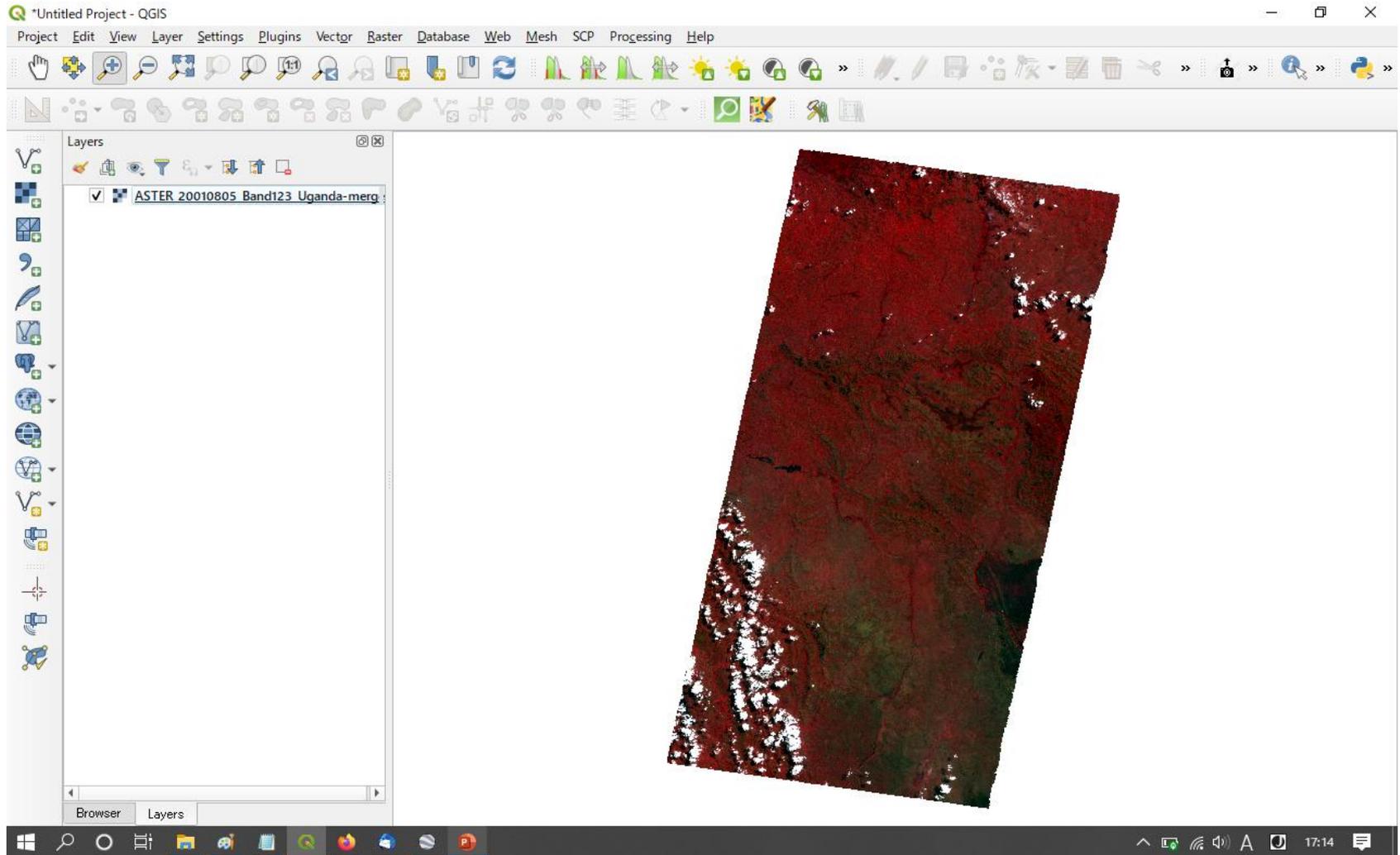
- Select merged layer, click right mouse button and select “Properties”.
- Change color and contrast enhancement in “Symbology” tab.



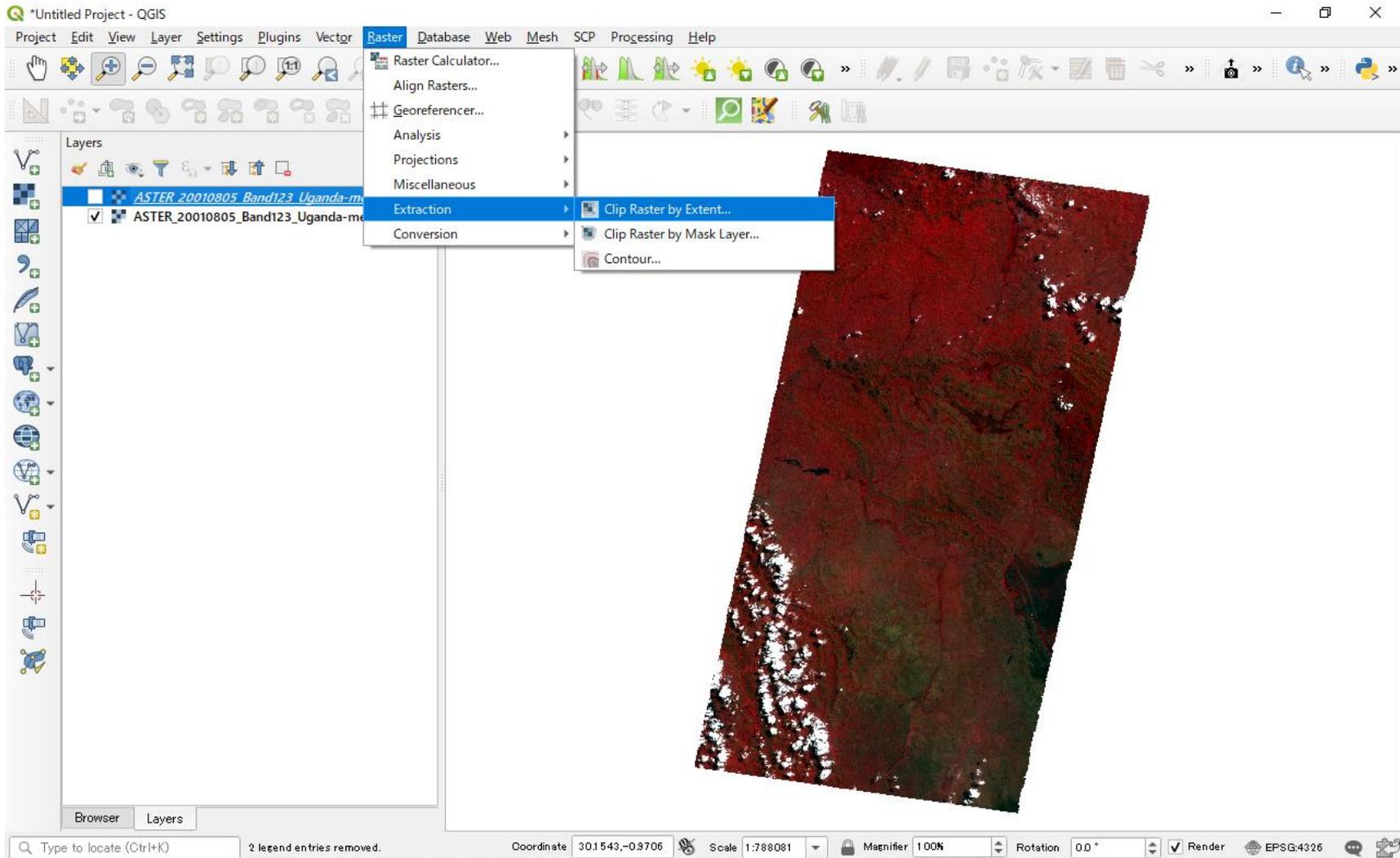
- Select “Transparency” tab and check “No data value” option as “0”.



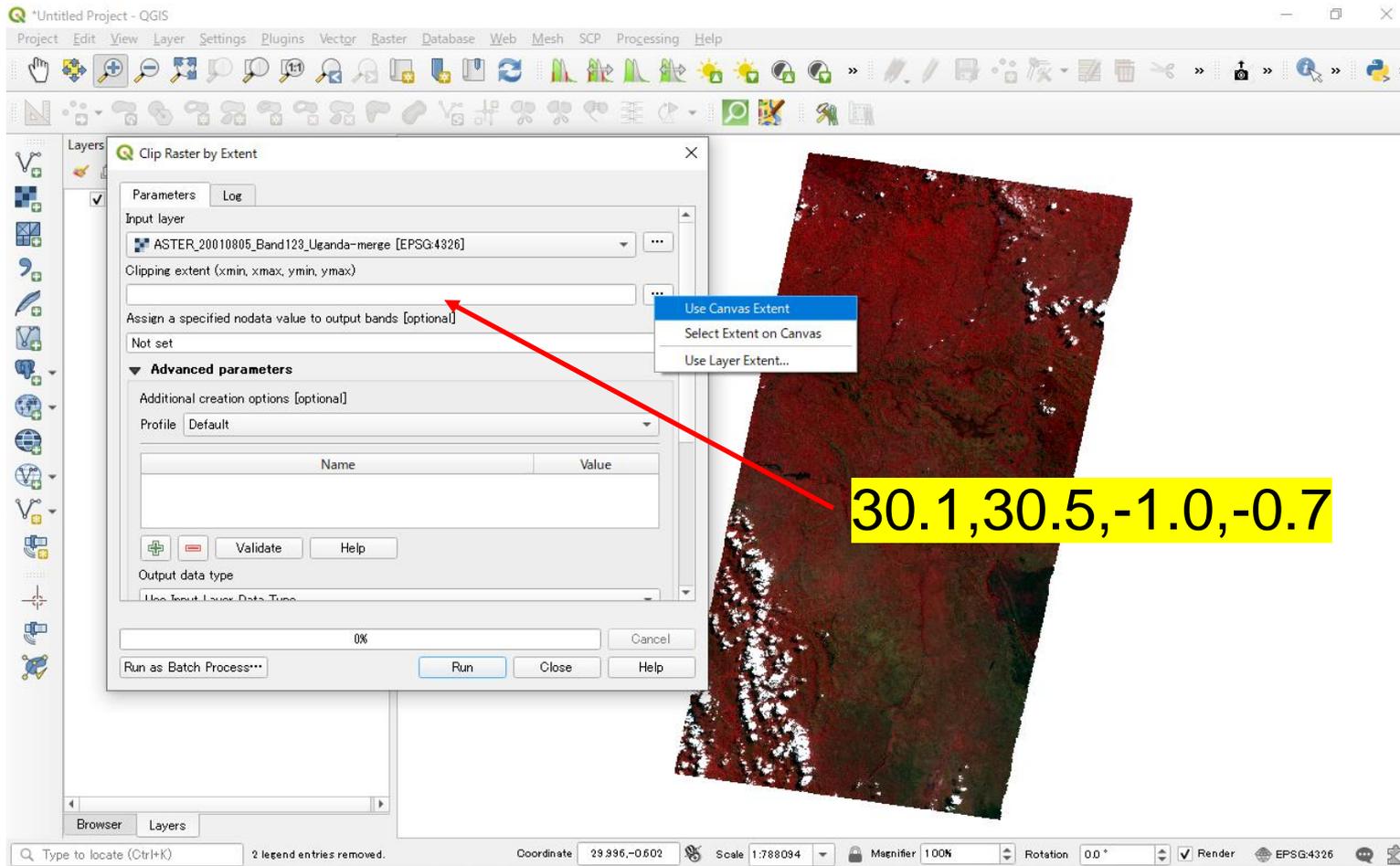
- Merged image is created.



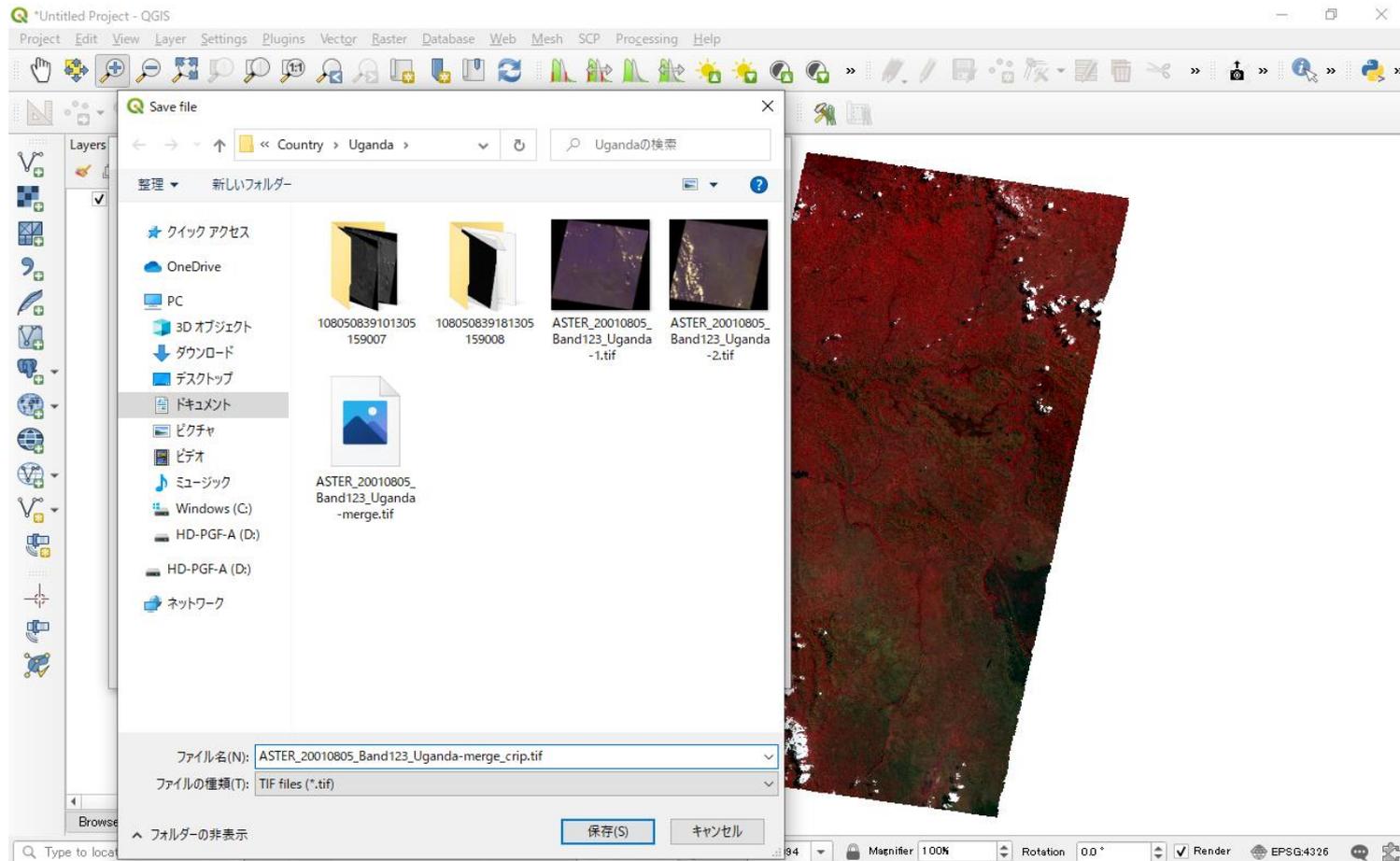
- From “Raster” menu, select “Extraction” and “Clip Raster by Extent”.



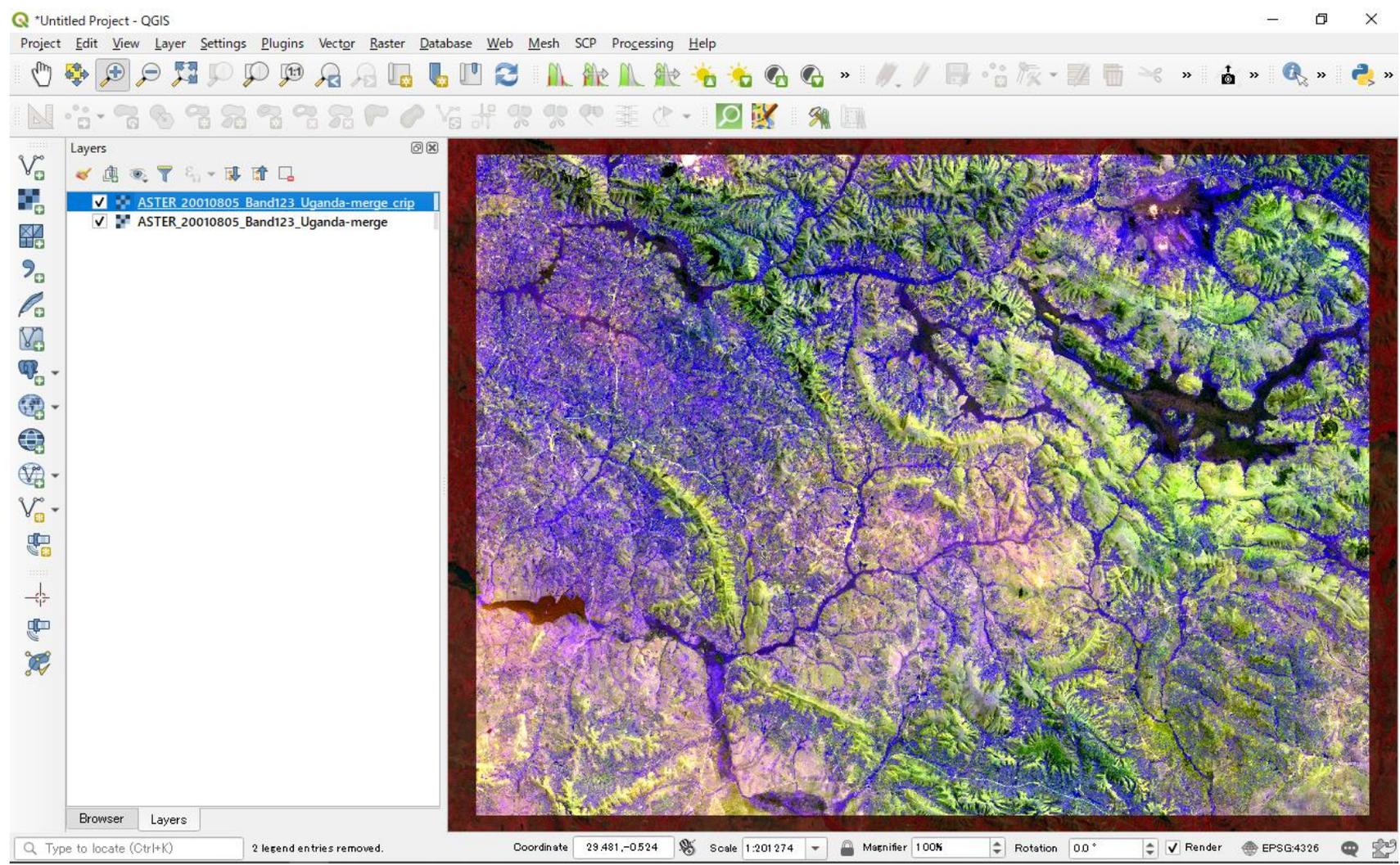
- Enter coordinate in Clip Raster by Extent window as below.
- Push "OK".



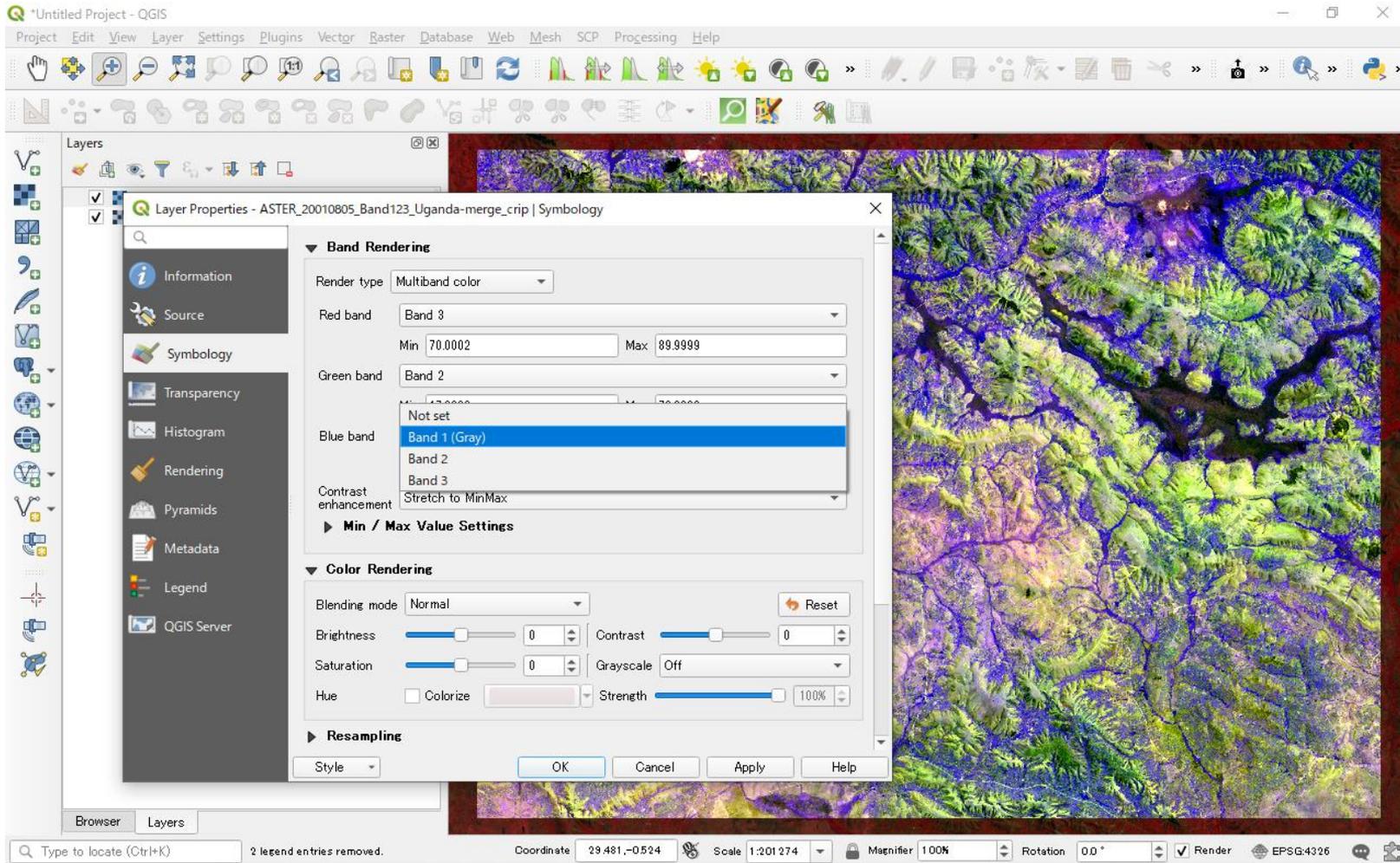
- Enter coordinate in Clip Raster by Extent window as below.
- Enter the file name and push “OK”.



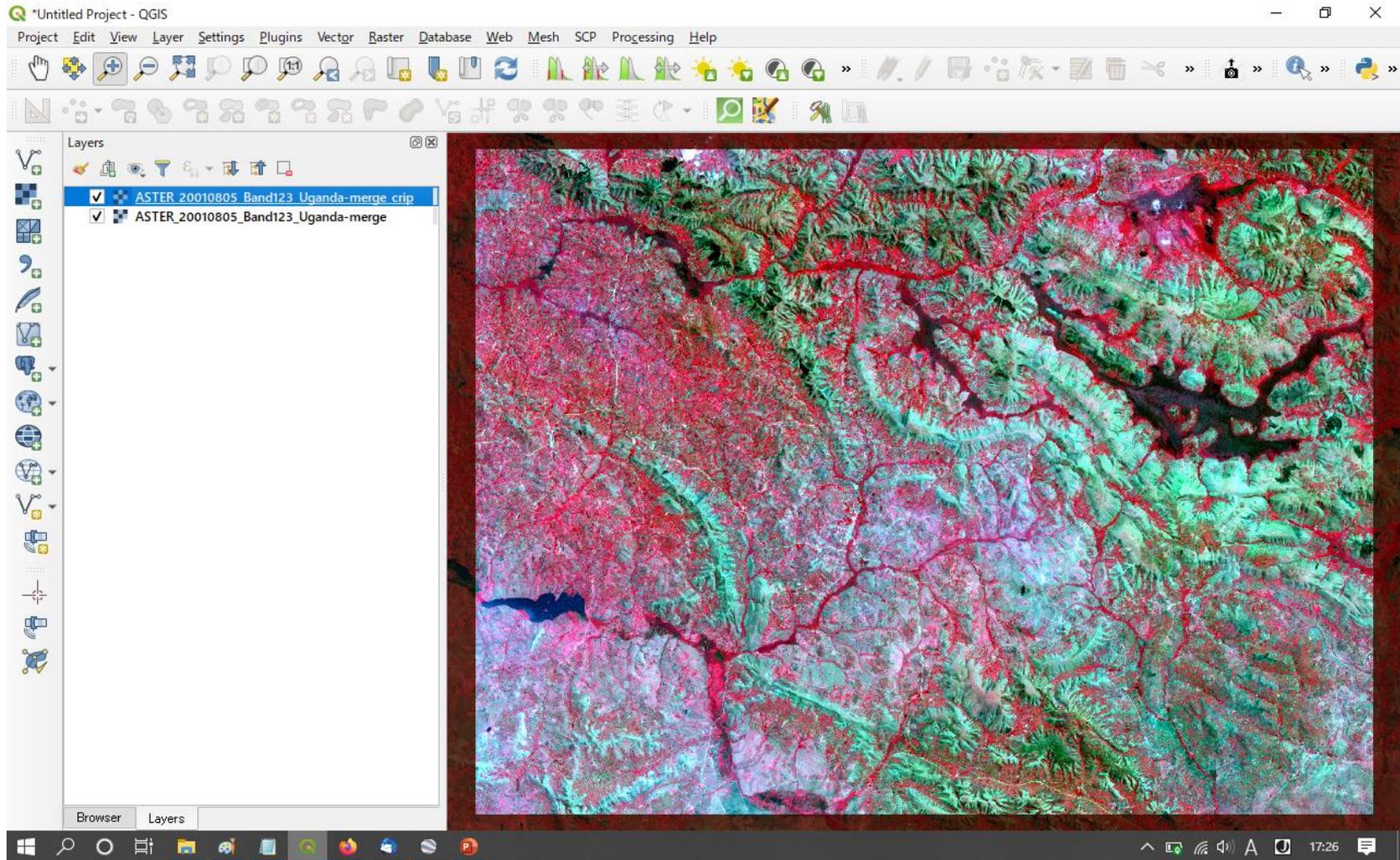
- Zoom in and confirm clipped region.



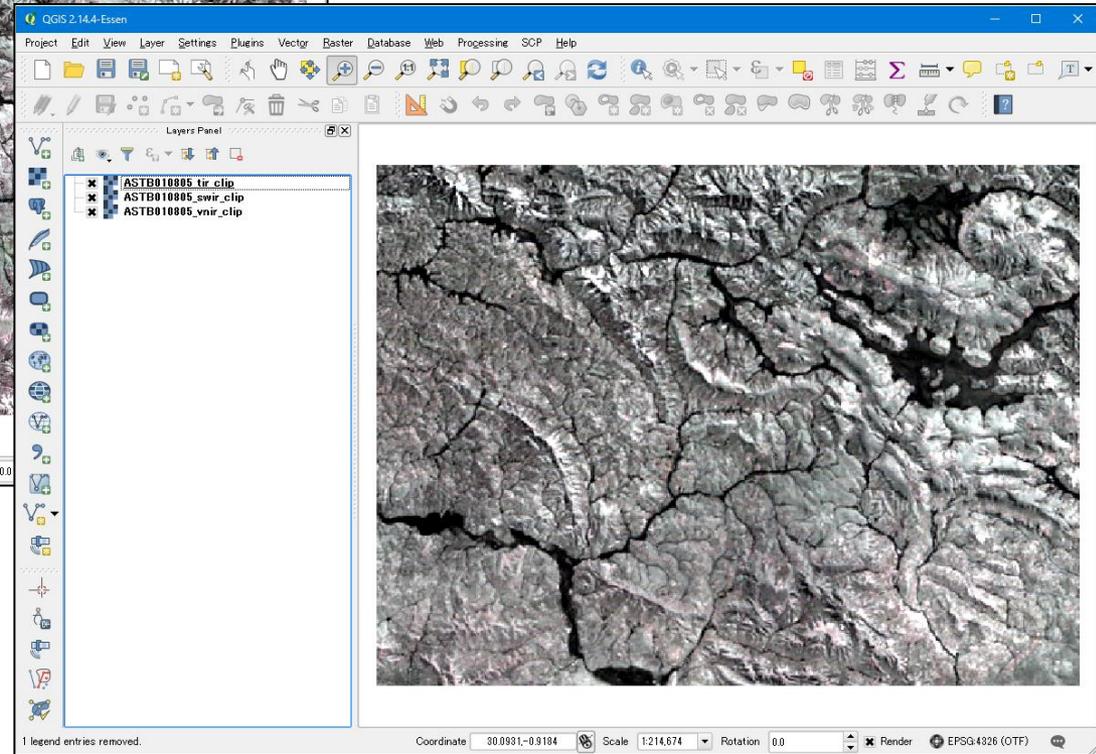
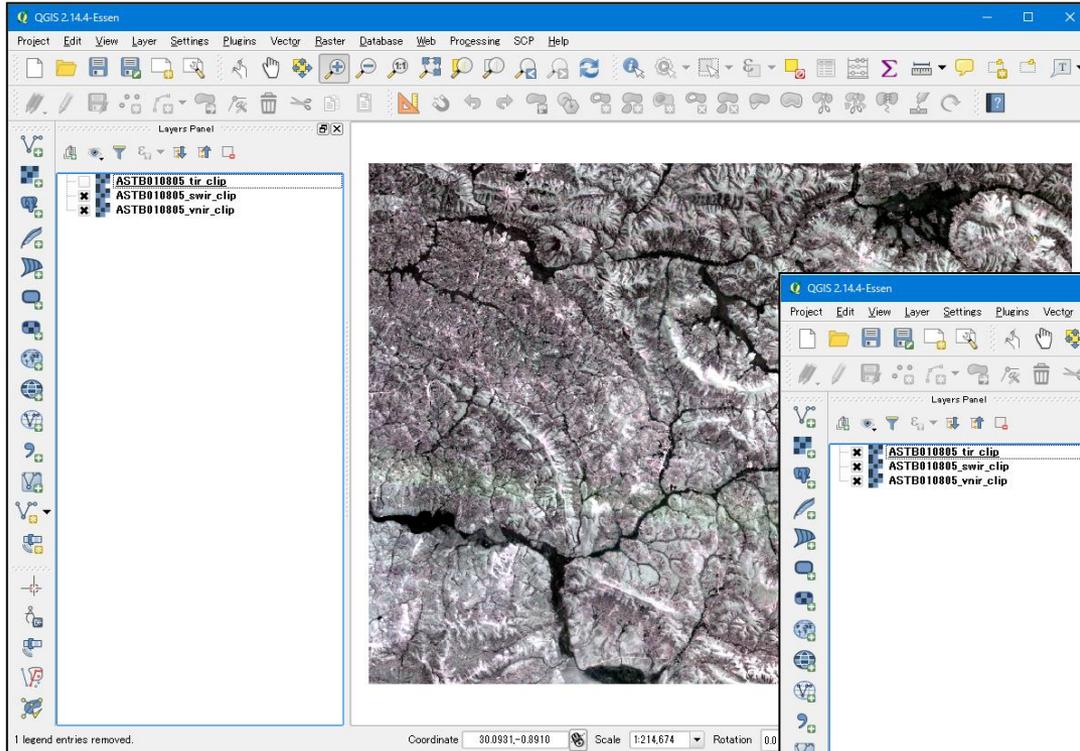
- Open property window and change color.



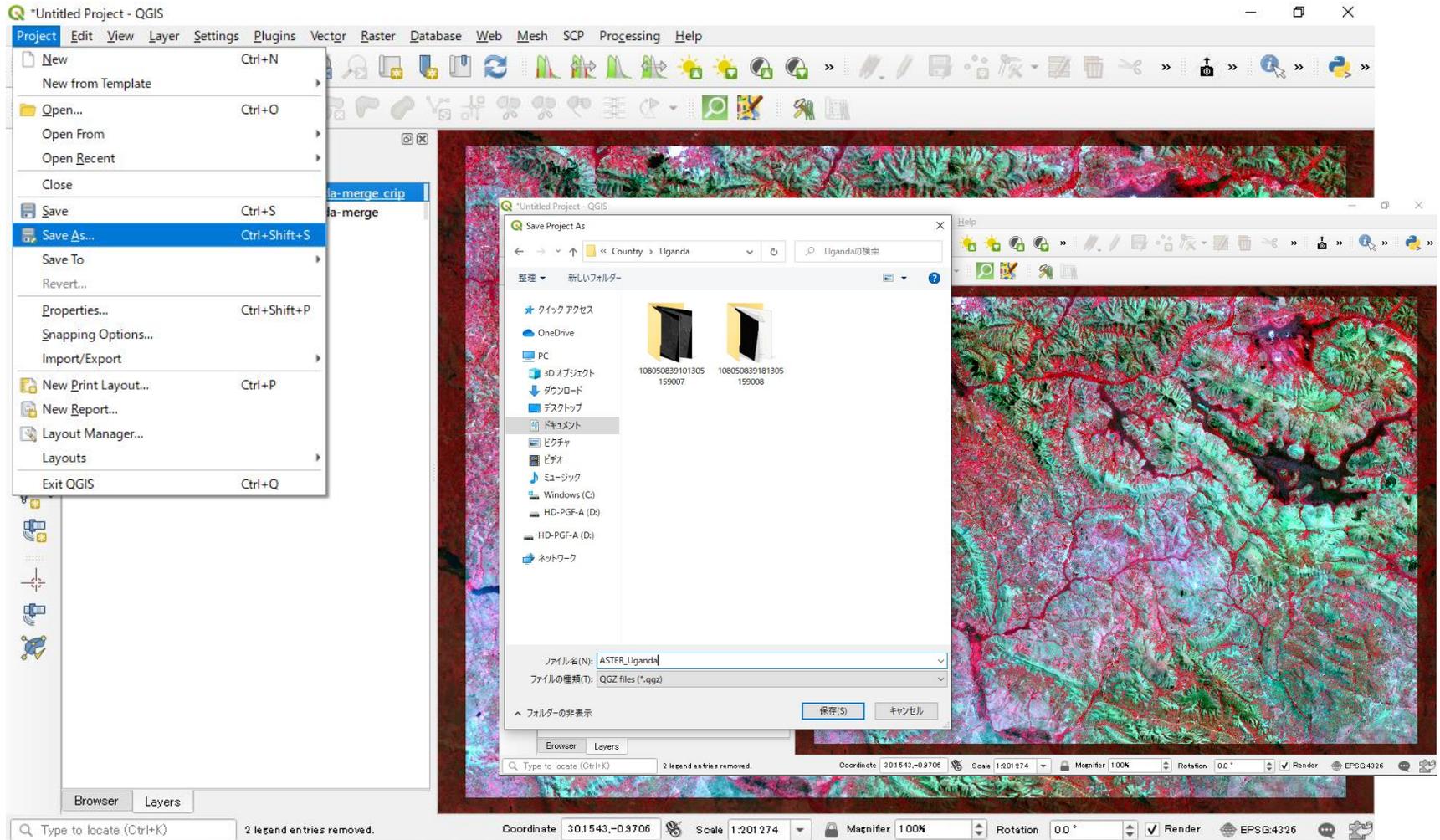
- Open property window and change color.



- Make clipped images of SWIR and TIR.



- From “Project” menu, select “Save As”.
- Save this project.



Artisanal, Small-scale / Illegal mining monitoring in Kenya

IN PICTURES: Kenya's gold rush

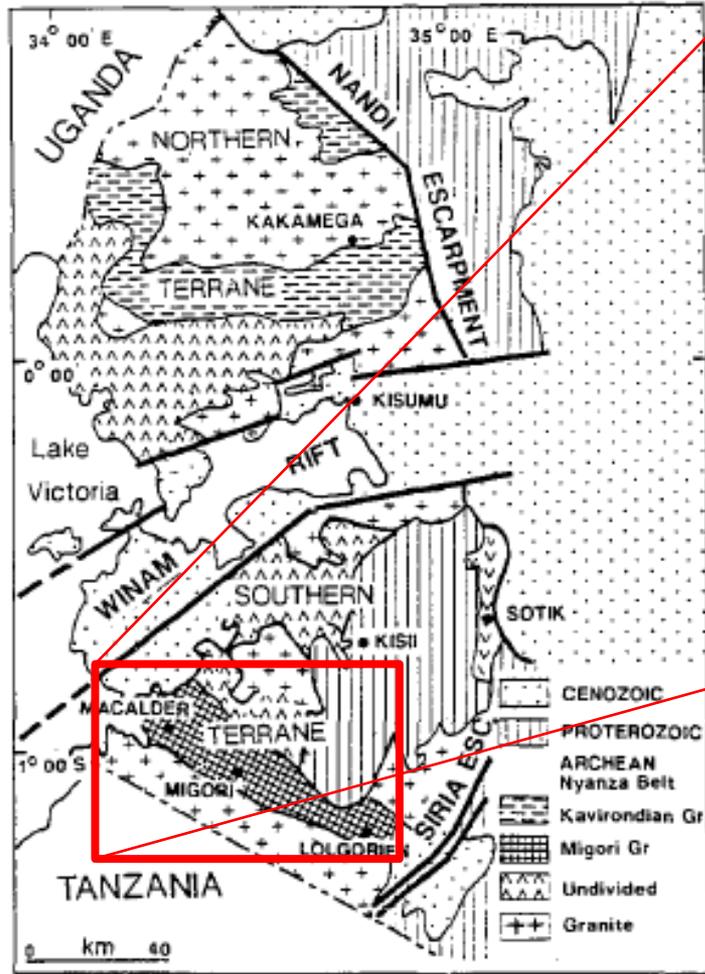
AFRICA Friday 11 March 2016 - 12:25pm



Thousands of artisanal and small-scale miners find themselves working in perilous conditions in western Kenya, where large-scale gold deposits have reportedly been located. Photo: DAI KUROKAWA

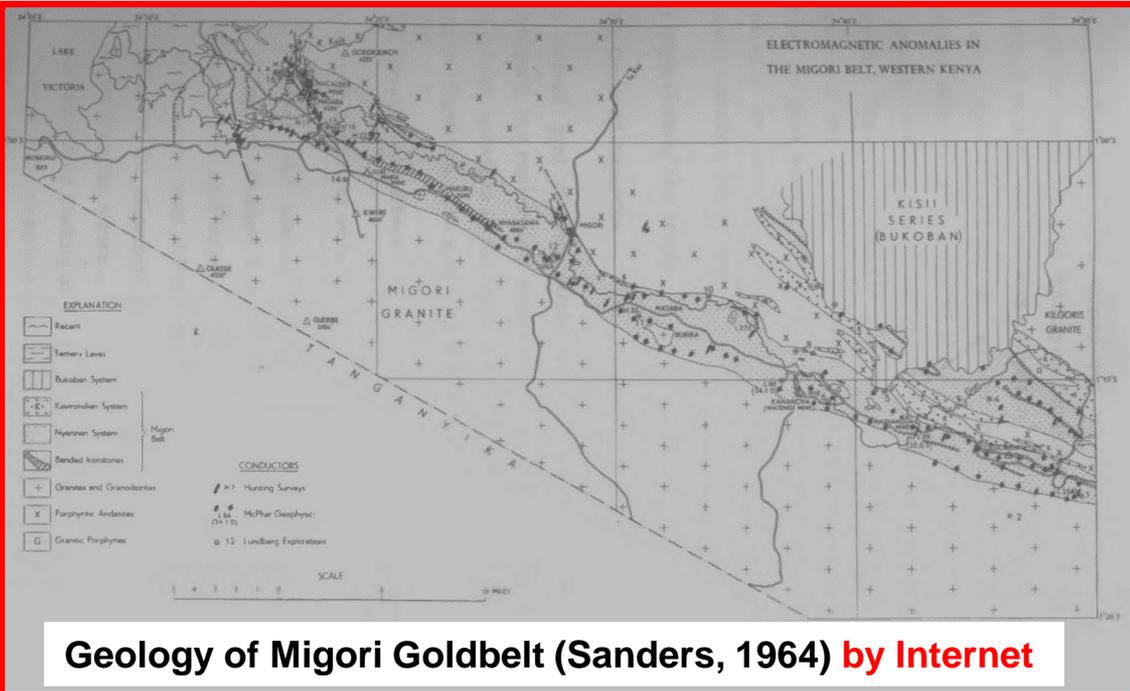
According to the Mines and Geology Department at the Ministry of Environment and Natural Resources of Kenya, the gold capacity of Migori alone stands at 34 tonnes per year. That could earn the country some \$670 million (67 billion Kenya shillings) annually, according to a local report.

(<http://www.epa.eu/feature-packages/archive/2016/gold-mining-in-Kenya>)

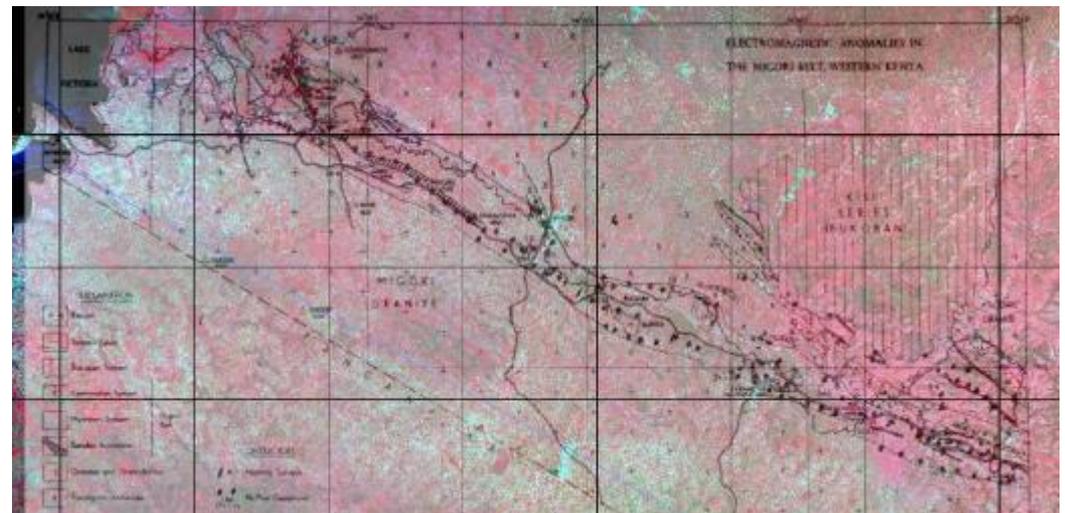


Ichang'I (1990)

Migori Geology on Sentinel-2

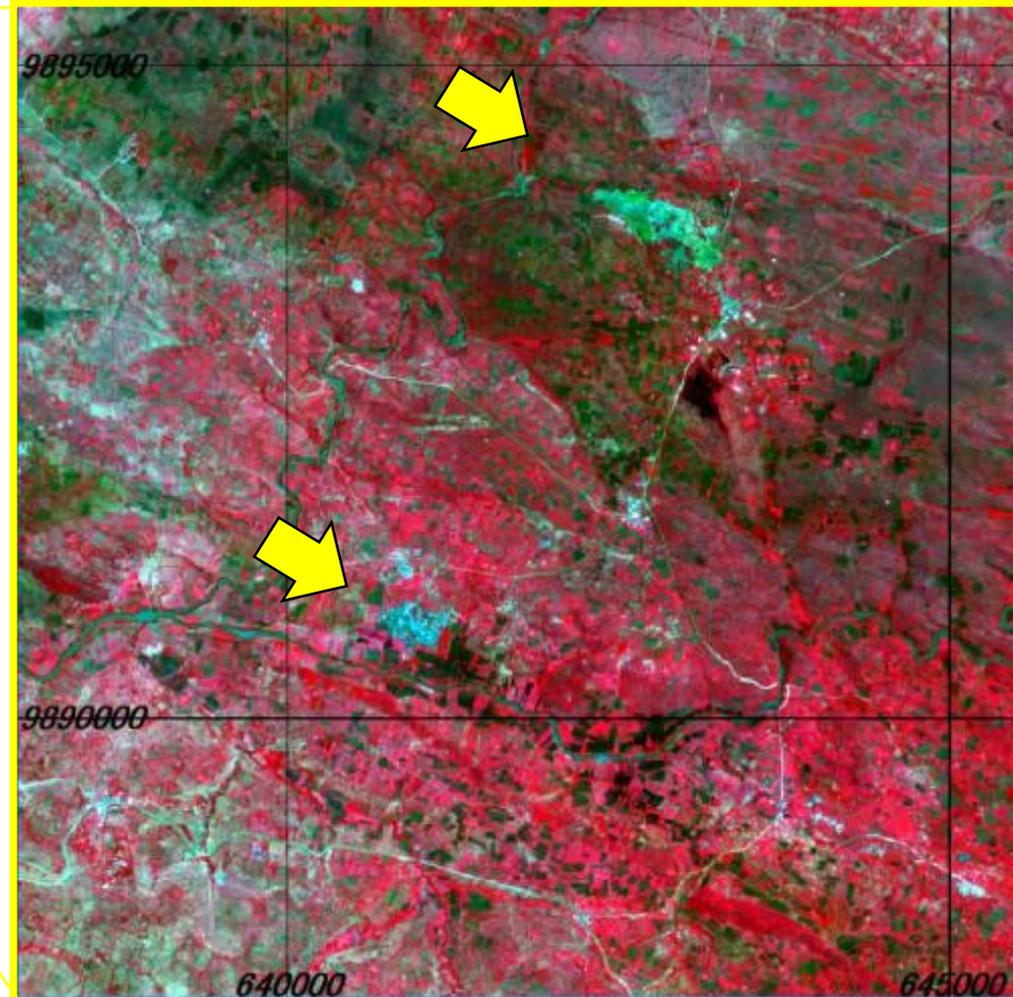
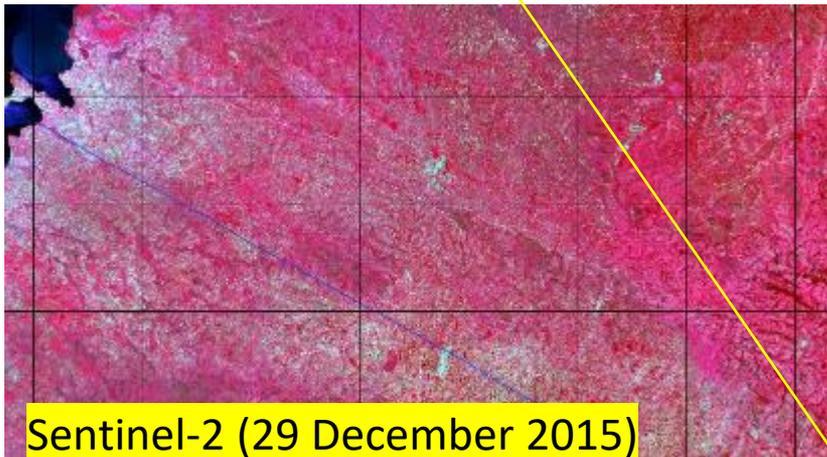
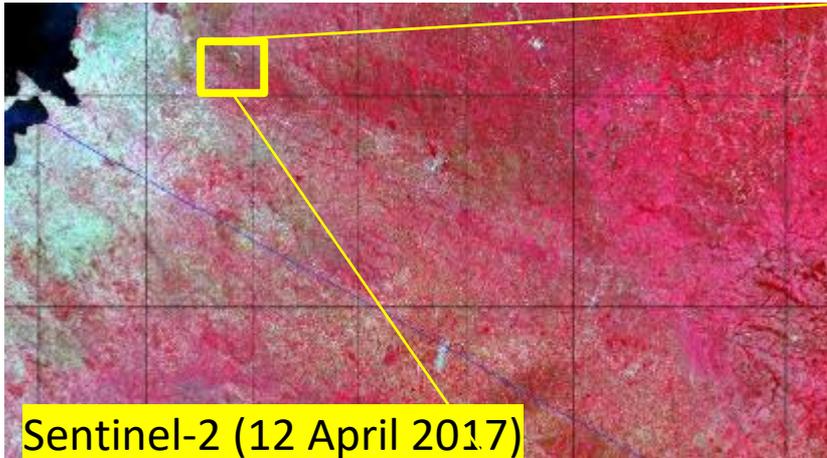


Geology of Migori Goldbelt (Sanders, 1964) by Internet



◆ Hypothesis

Bare land for long time and rapid land expansion may suggest mining activities.



Migori district, Western Kenya

Macalder Tailings Resource

The Macalder VMS deposit was discovered in the mid-1930s and mined for copper and gold till mid-1970s. The tailings produced during that period have been demonstrated by Red Rock to contain potentially economic levels of residual gold mineralization amenable to cyanide leach extraction. A JORC Measured Mineral Resource Estimate has since been completed.

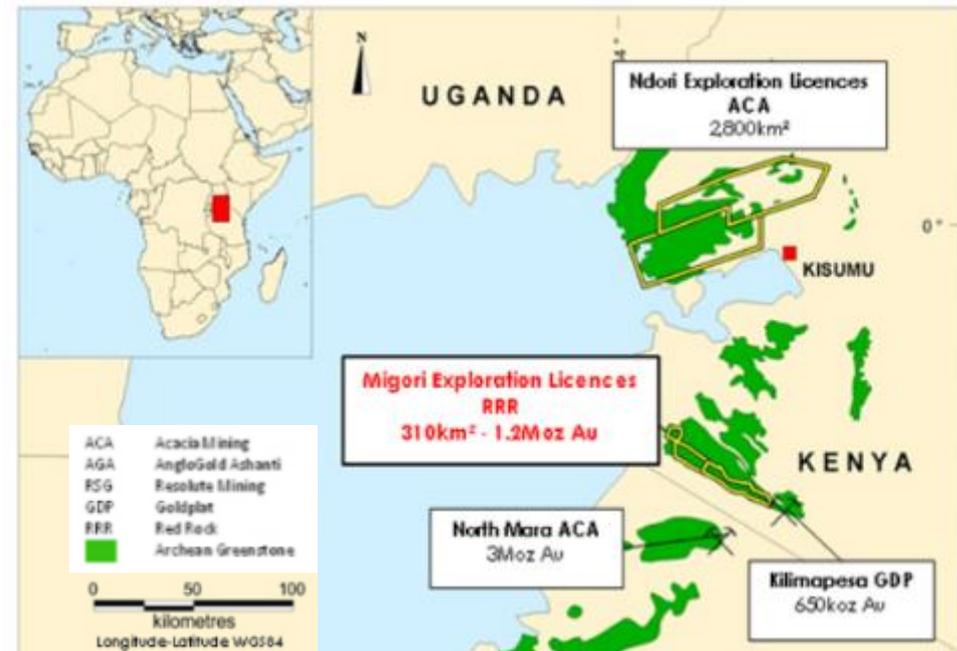
Measured ore: 1.3 Mt (1.65g/tAu)

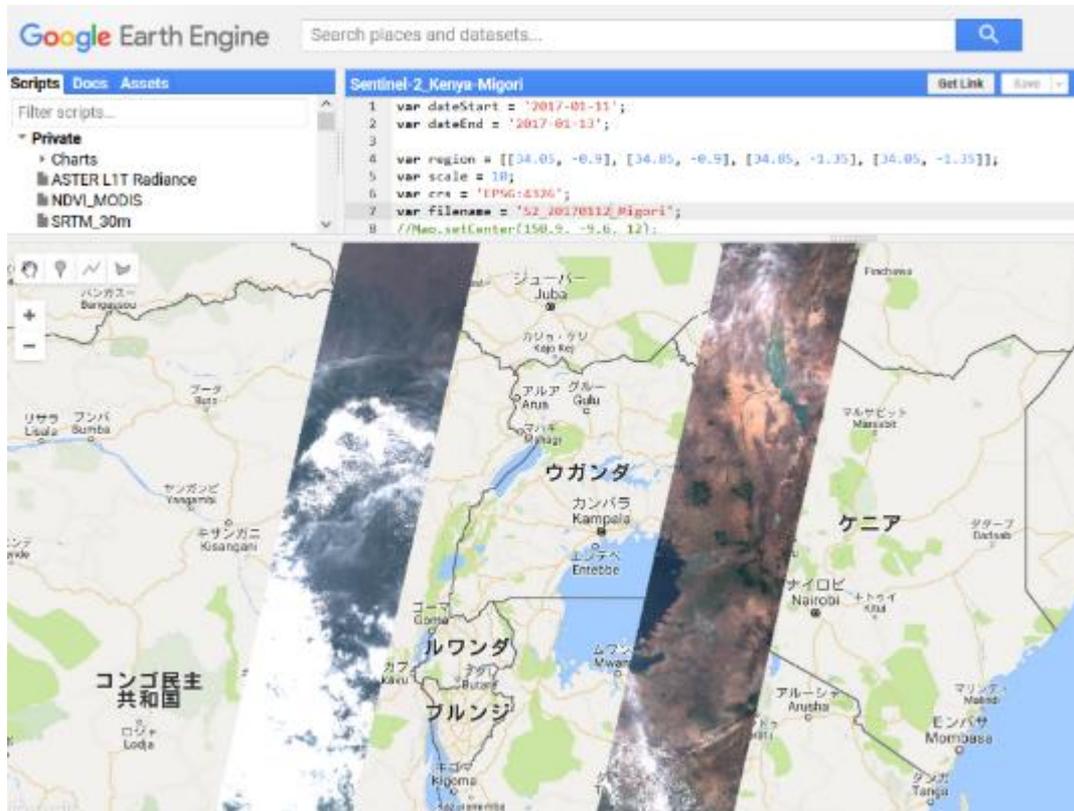


Geology

Gold enrichment within the MGB is predominantly found in and around shear zones associated with quartz-carbonate veining and significant alteration, as well as banded iron formations (BIFs) and poly-metallic Volcanogenic Massive Sulphides (VMS).

<https://www.rrrplc.com/projects-and-investments/gold/migori-gold-project/>





Sentinel-2 Launch dates:

2A: 2015/06/23
2B: 2017/03/07
2C: 2019

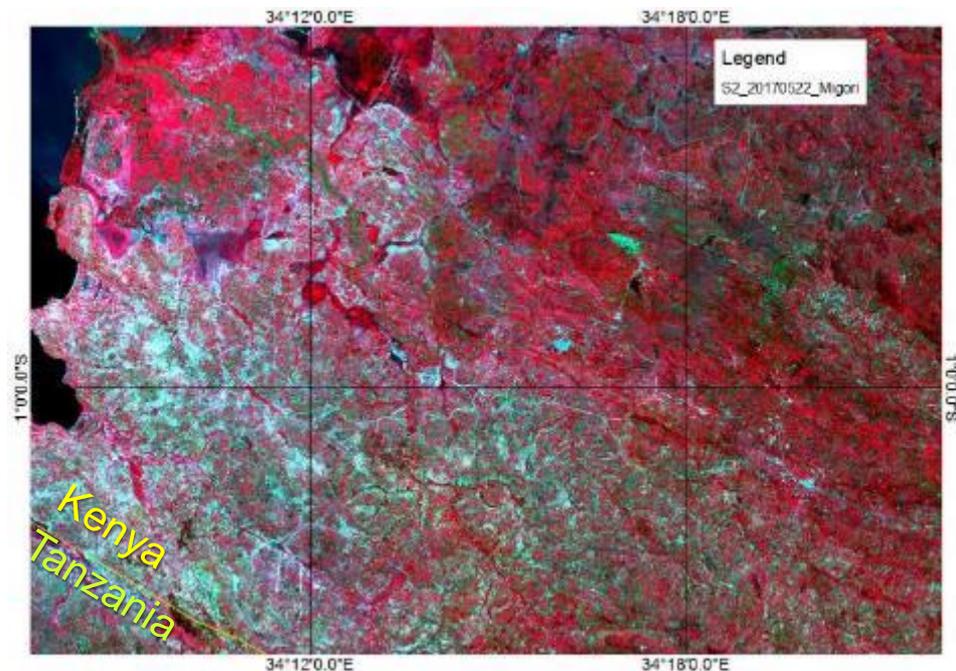
2015/12/29
~2017/05/22

21 scenes

S2_20170522_Migori
S2_20170412_Migori
S2_20170402_Migori
S2_20160328_Migori
S2_20170313_Migori
S2_20170221_Migori
S2_20170211_Migori
S2_20170112_Migori
S2_20161223_Migori
S2_20161123_Migori
S2_20161113_Migori
S2_20161014_Migori
S2_20160914_Migori
S2_20160904_Migori
S2_20160726_Migori
S2_20160716_Migori
S2_20160606_Migori
S2_20160328_Migori
S2_20160217_Migori
S2_20160108_Migori
S2_20151229_Migori

■ Importance for estimating illegal mining activity

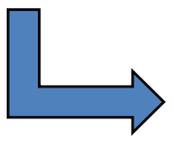
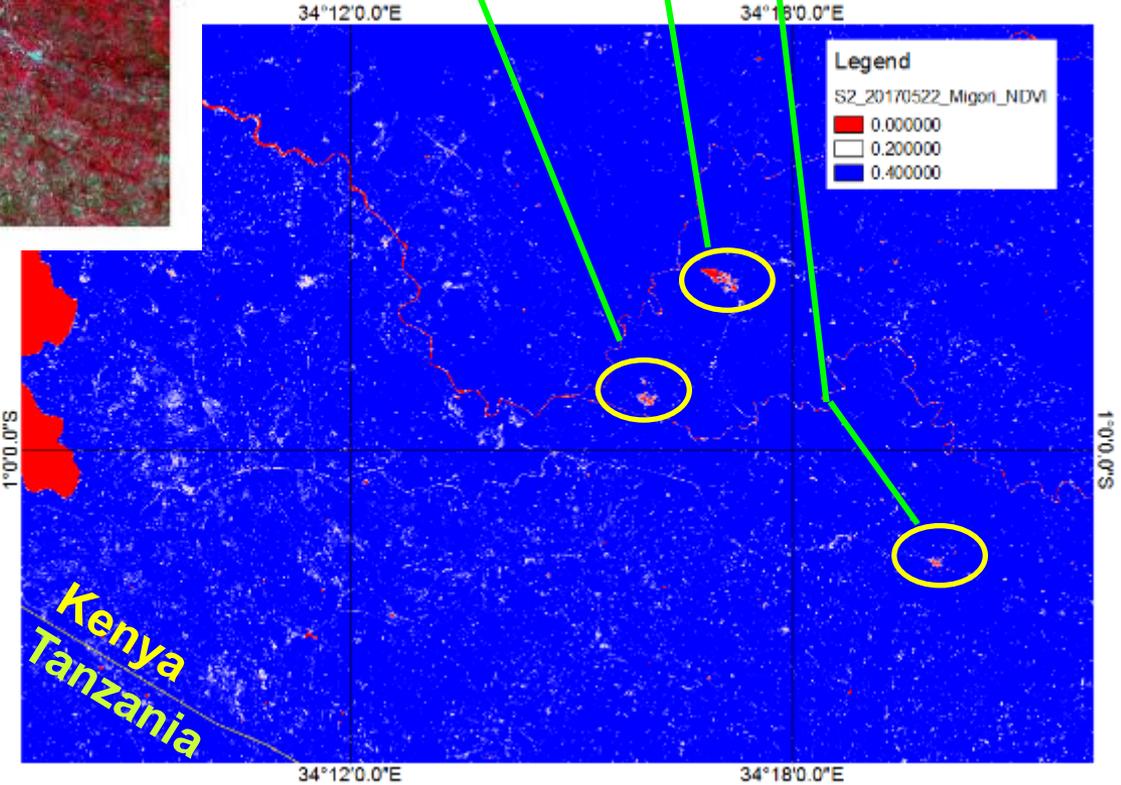
1. **Frequent observation:**
to identify the long-term bare land to discriminate agricultural land
1. **Object shapes (area, road-network, settlement and etc.):**
 - ➡ Irregular shape => informal activity
 - ➡ Angular shape, systematic pattern => legal activity



Sentinel-2 (2017/05/22)
RGB:843

**Unknown area:
Illegal mining?**

**Macalder
Tailing**



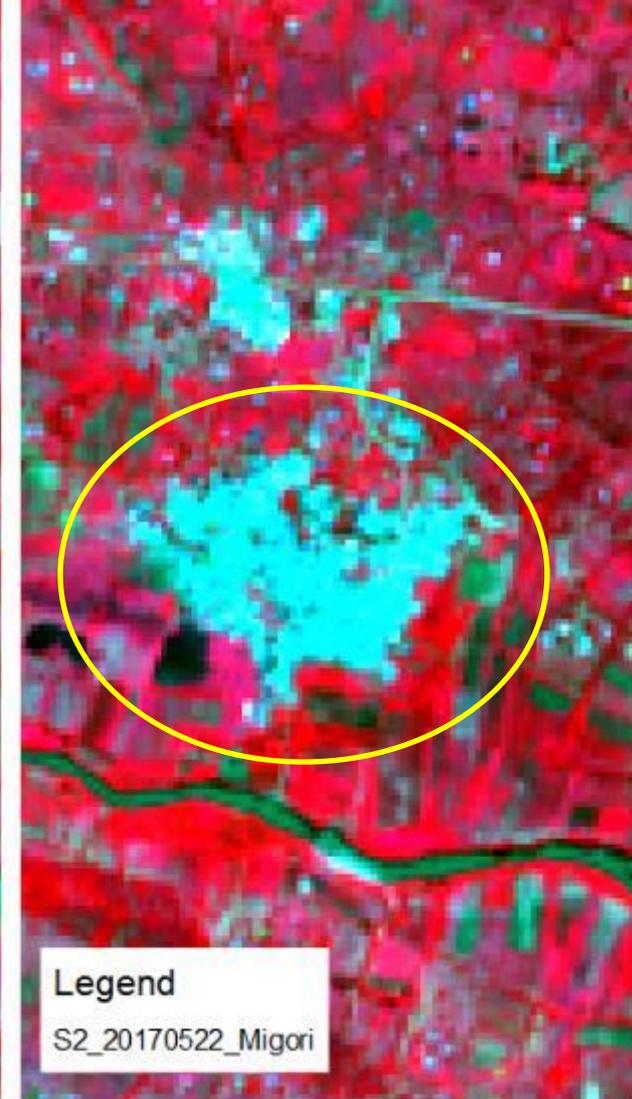
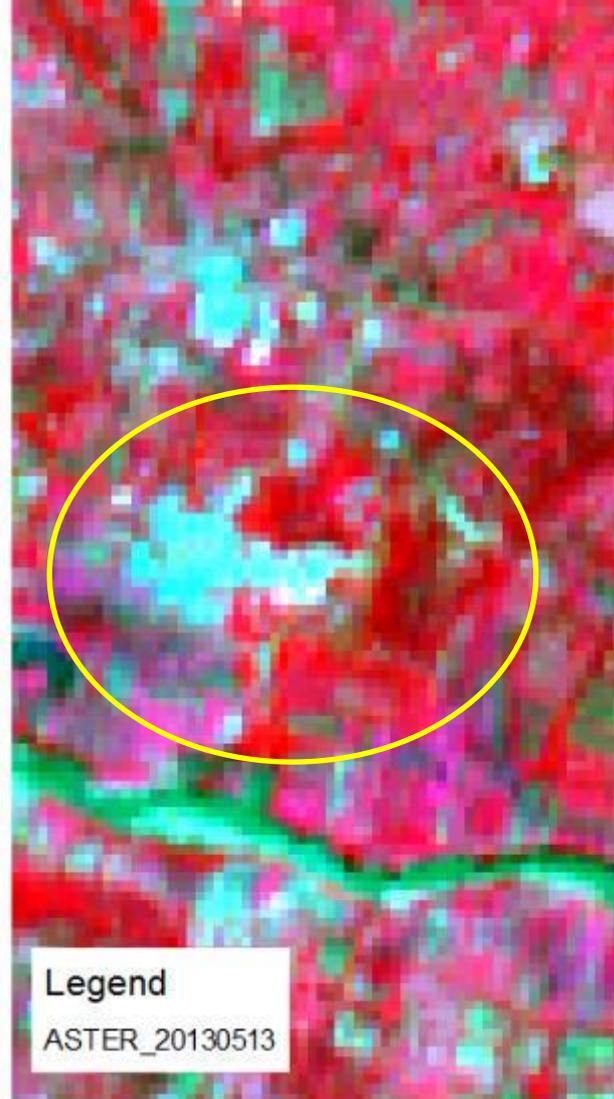
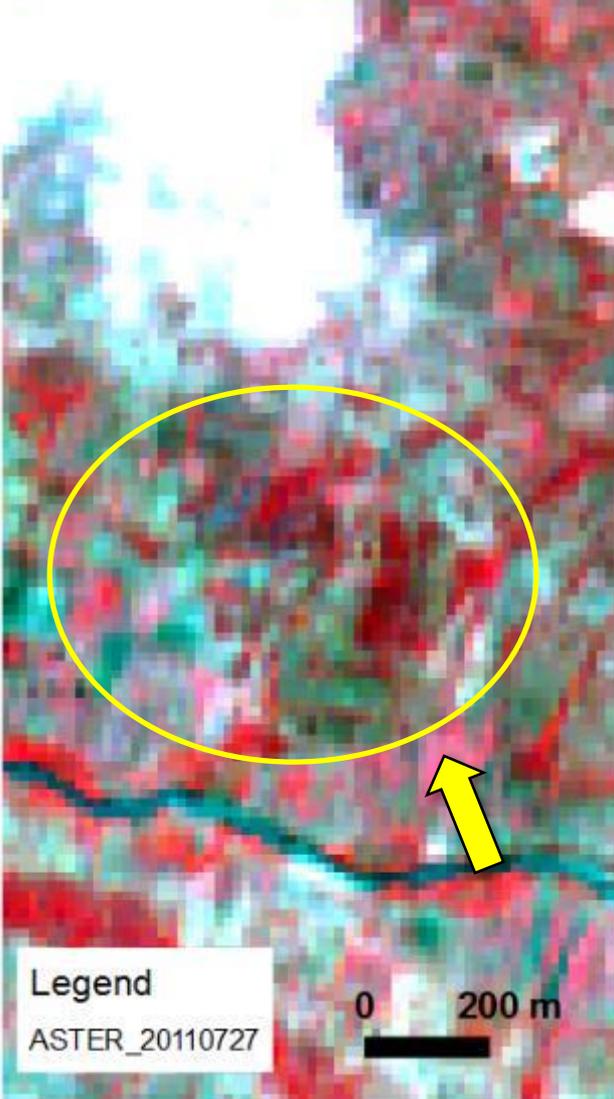
**Bare land:
NDVI < 0**

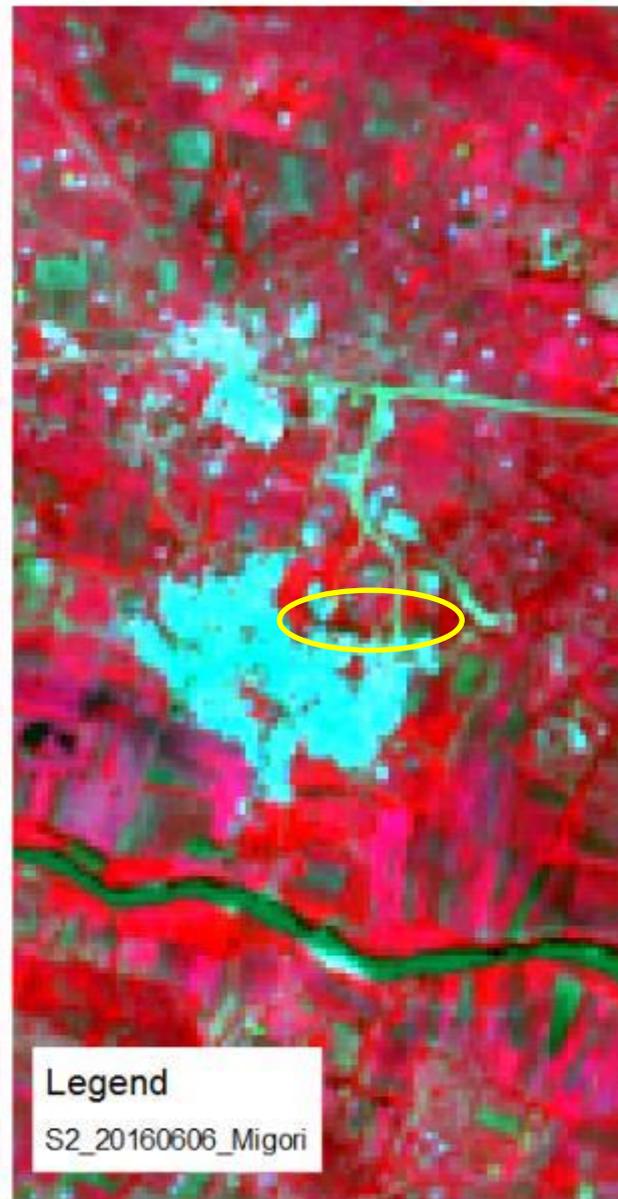
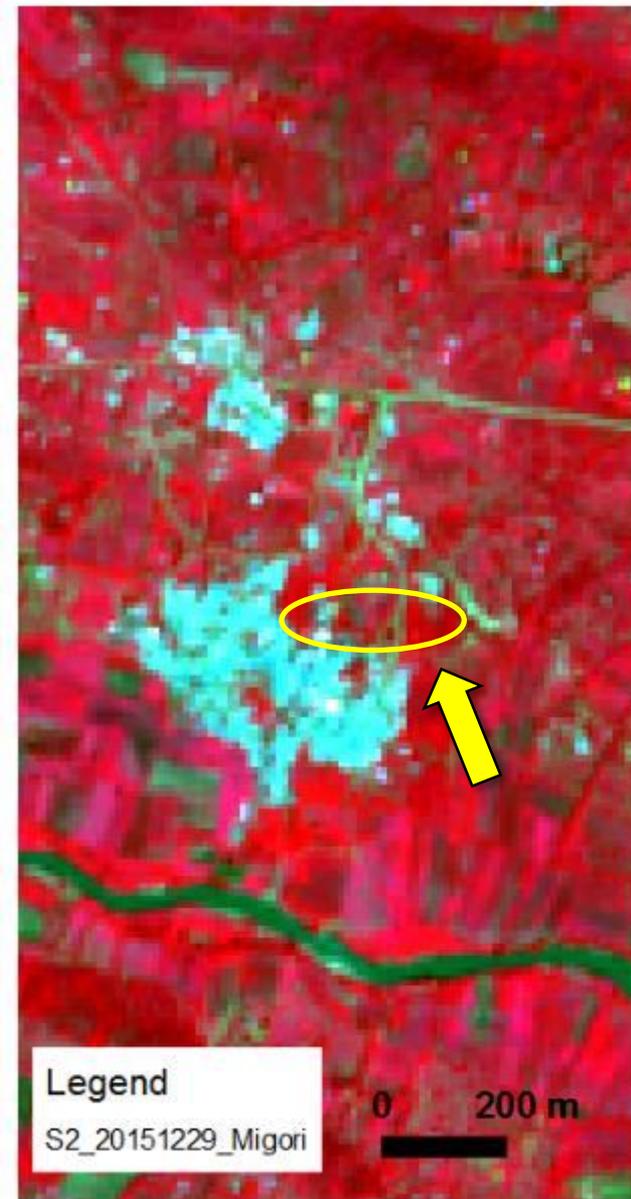


ASTER(2011/07/27)

ASTER(2013/05/13)

Sentinel-2(2017/05/22)







Ministry of Mining

Mining Cadastre Portal



Mining Cadastre

Home

Mining Cadastre Map

Sign In

Help and FAQ

Registration

Licence Applications

Conversion to WGS84

Managing my Licence

Payments

Mineral Dealers

Explosives

External Links

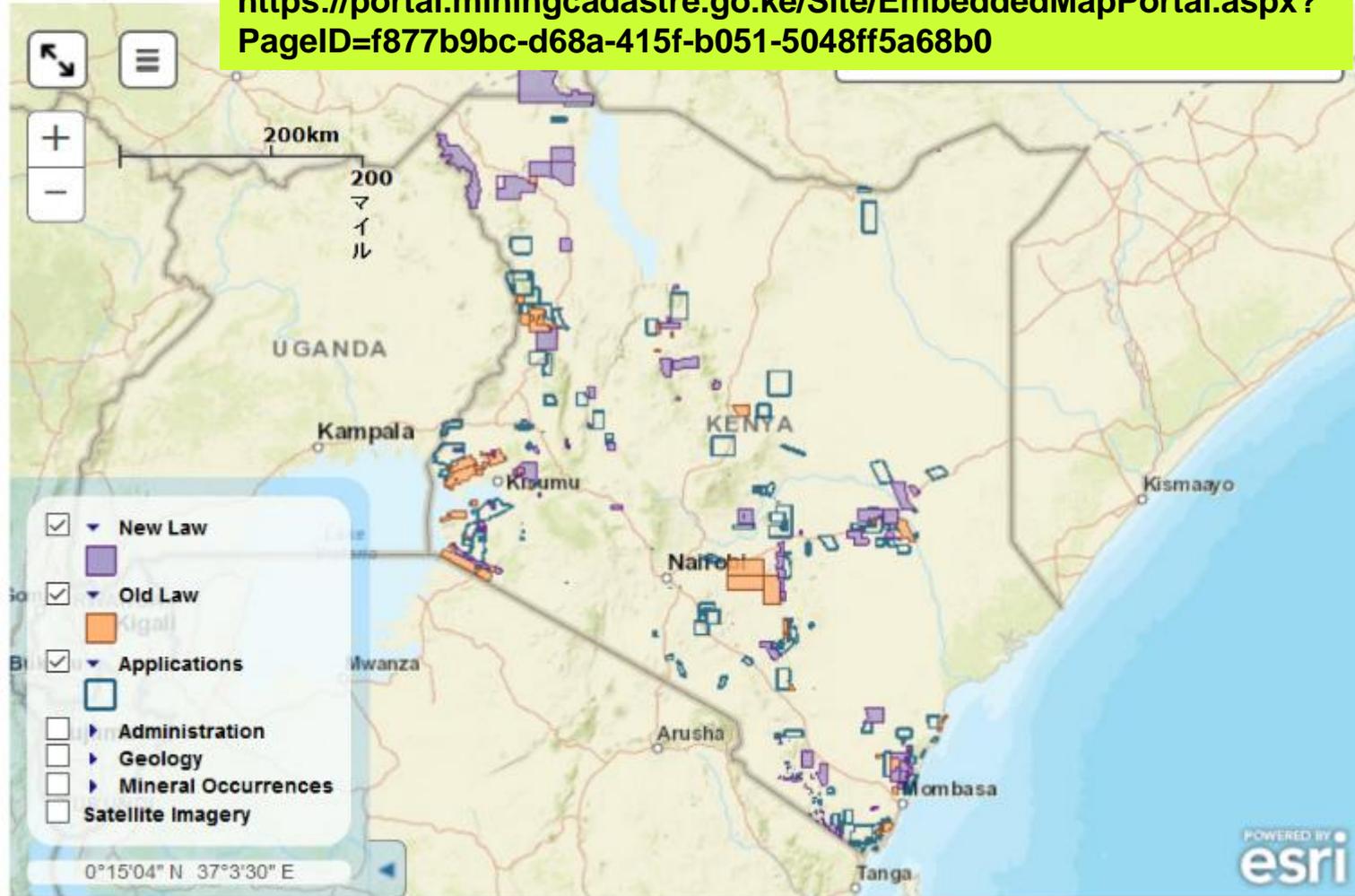
Madini Facebook

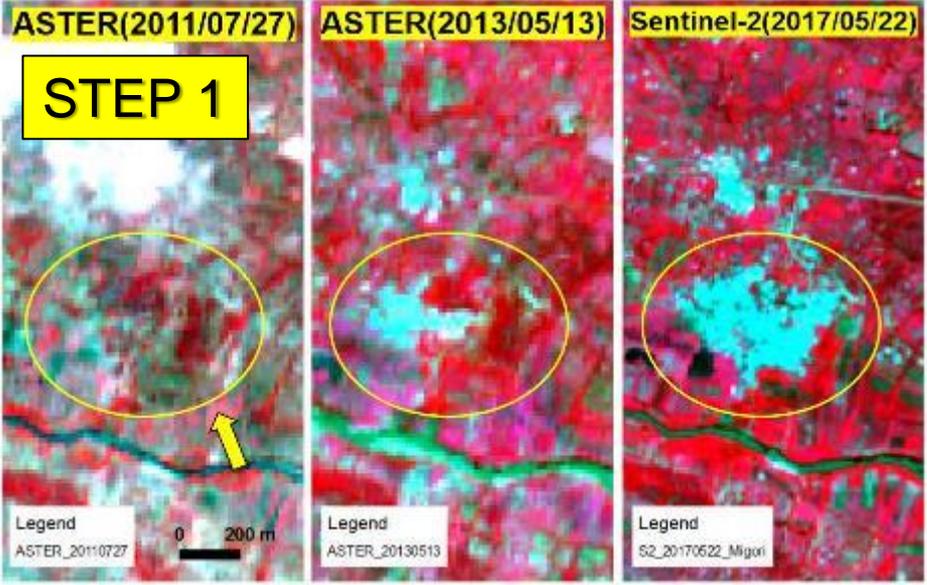
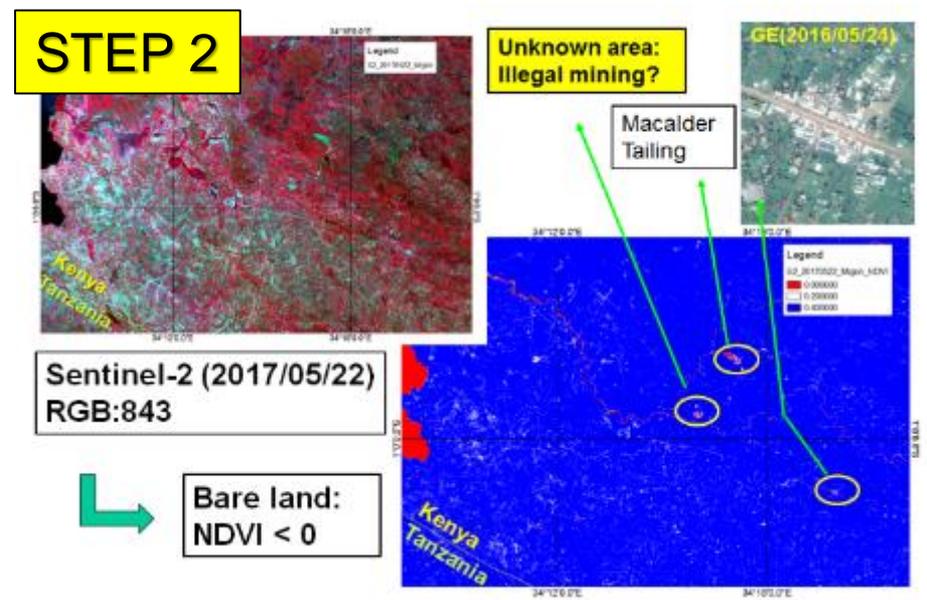
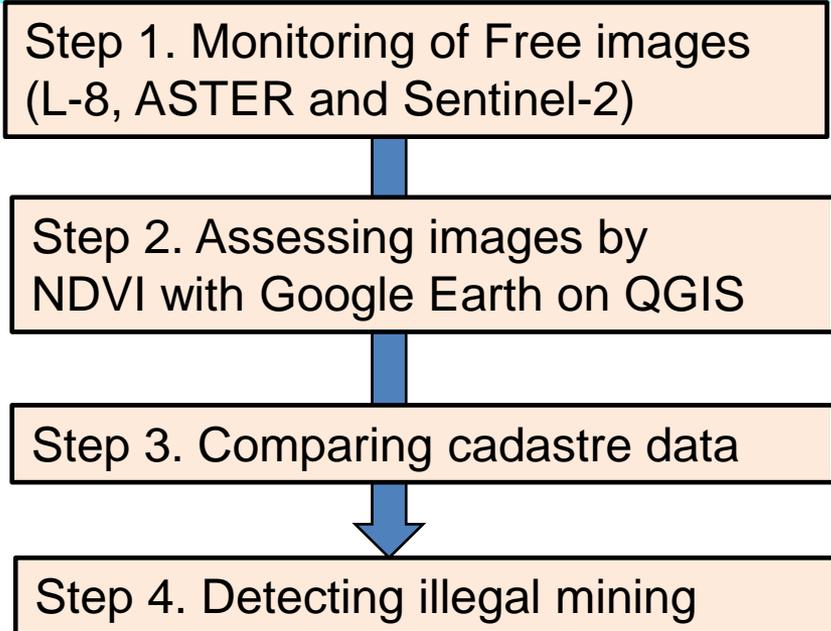
Madini Twitter

Share on Social Media

Map Portal

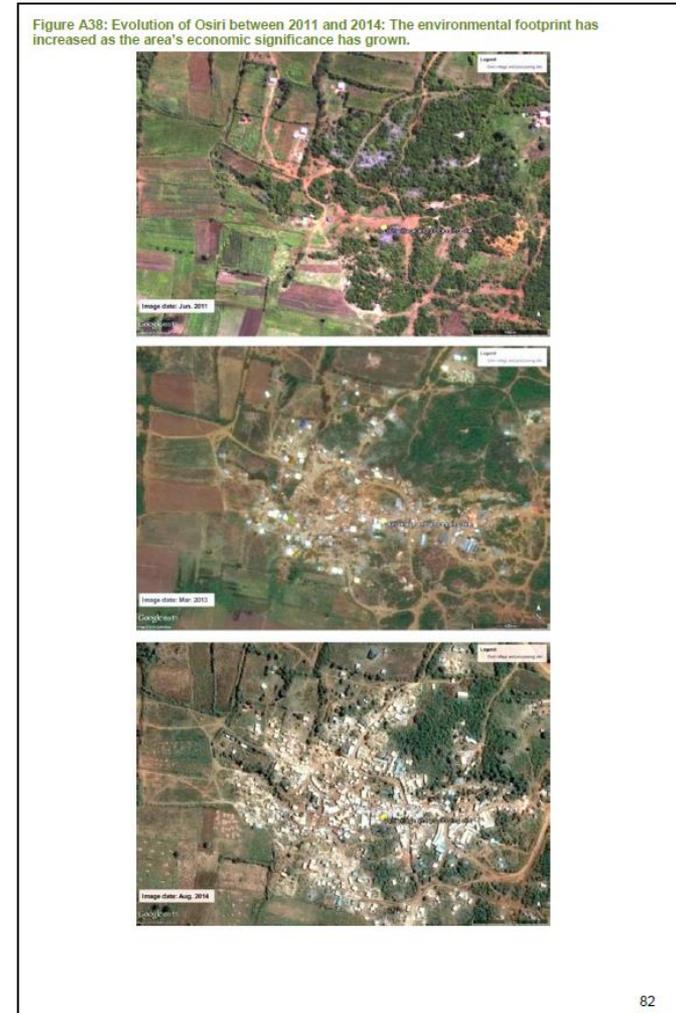
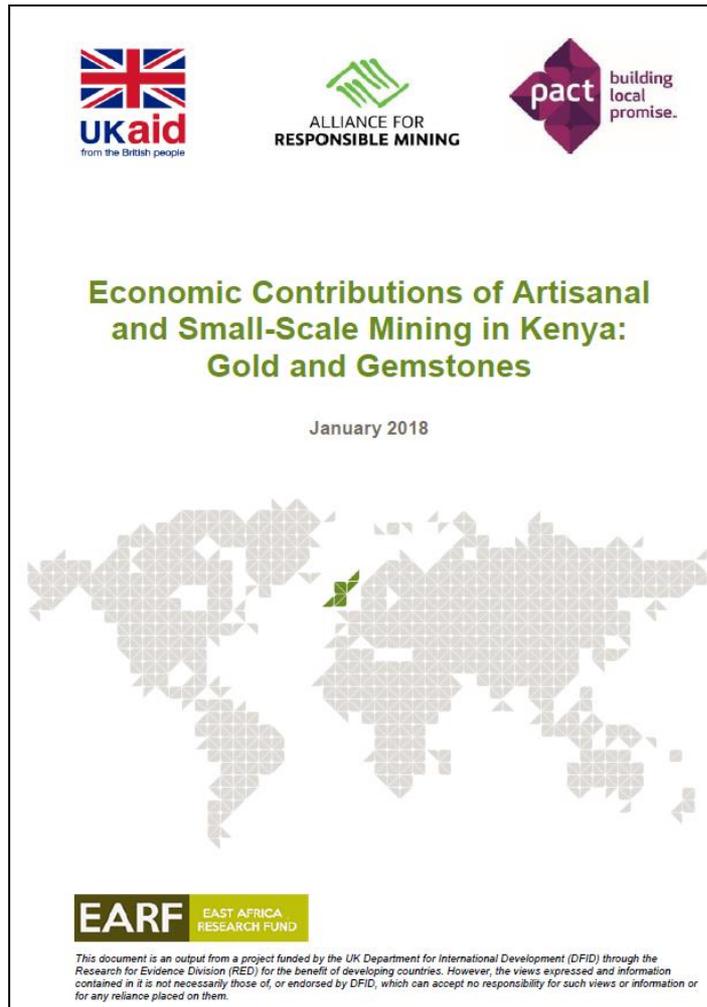
<https://portal.miningcadastre.go.ke/Site/EmbeddedMapPortal.aspx?PageID=f877b9bc-d68a-415f-b051-5048ff5a68b0>





The extent of land disturbance to land is significant in a relatively short time

(Figure A38, next page). The changing footprint illustrates both rapid changes in the magnitude of environmental impacts and economic significance common in many ASM areas.

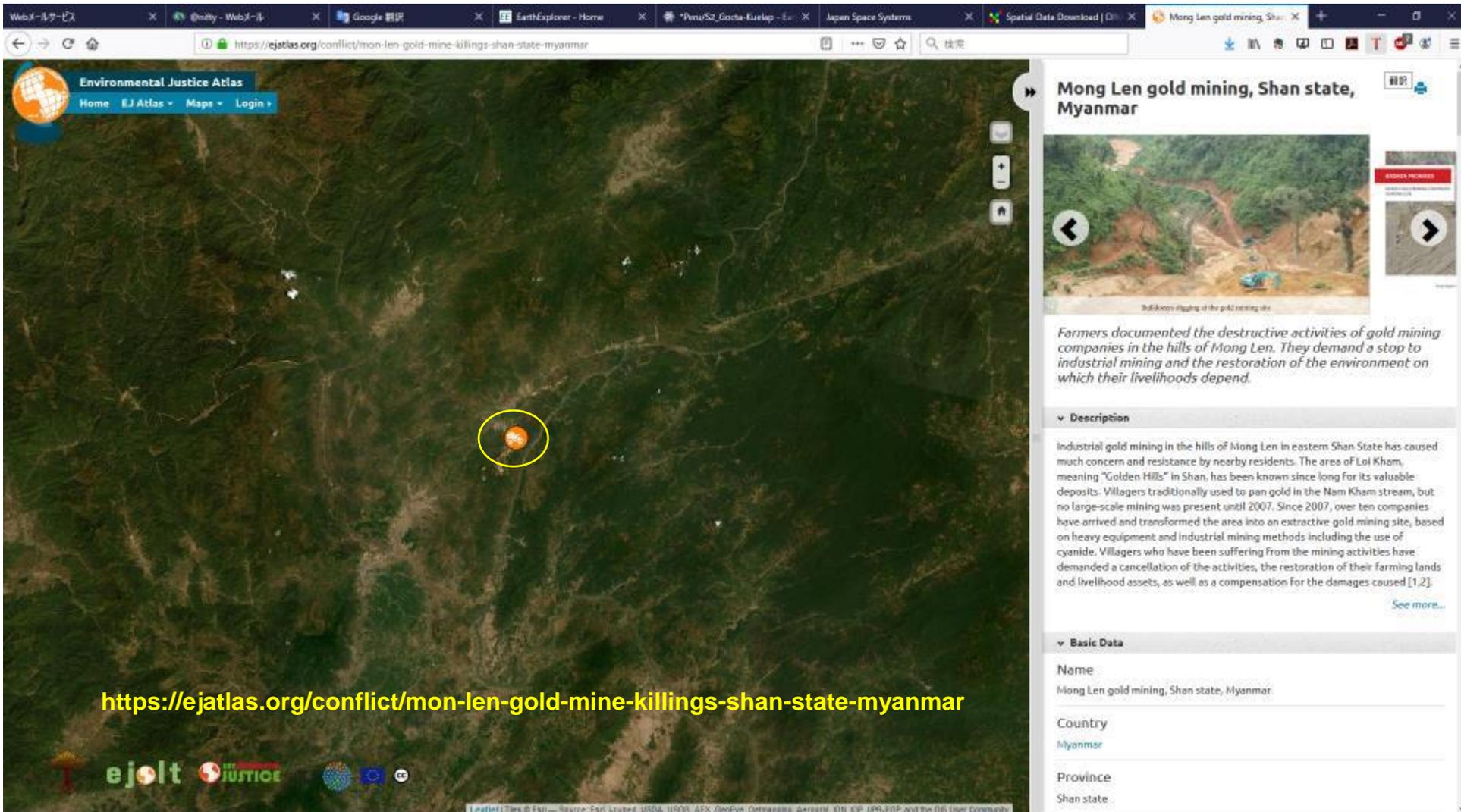


Artisanal, Small-scale / Illegal mining monitoring in Myanmar

3) Project experience with Myanmar (2016)



■ Environmental Justice Atlas (Mong Len Gold Mining)



Environmental Justice Atlas
Home EJ Atlas Maps Login

Mong Len gold mining, Shan state, Myanmar

30.6km² Mapping of the gold mining site

Farmers documented the destructive activities of gold mining companies in the hills of Mong Len. They demand a stop to industrial mining and the restoration of the environment on which their livelihoods depend.

Description

Industrial gold mining in the hills of Mong Len in eastern Shan State has caused much concern and resistance by nearby residents. The area of Loi Kham, meaning "Golden Hills" in Shan, has been known since long for its valuable deposits. Villagers traditionally used to pan gold in the Nam Kham stream, but no large-scale mining was present until 2007. Since 2007, over ten companies have arrived and transformed the area into an extractive gold mining site, based on heavy equipment and industrial mining methods including the use of cyanide. Villagers who have been suffering from the mining activities have demanded a cancellation of the activities, the restoration of their farming lands and livelihood assets, as well as a compensation for the damages caused [1,2].

[See more...](#)

Basic Data

Name	Mong Len gold mining, Shan state, Myanmar
Country	Myanmar
Province	Shan state

<https://ejatlas.org/conflict/mon-len-gold-mine-killings-shan-state-myanmar>

ejolt JUSTICE

Leaflet | Data © Esri — Source: Esri, DeLorme, USDA, USGS, AEX, GeoEye, IGN, CNR, IPP, FFP, and the OpenStreetMap contributors

3) Project experience with Myanmar (2016)

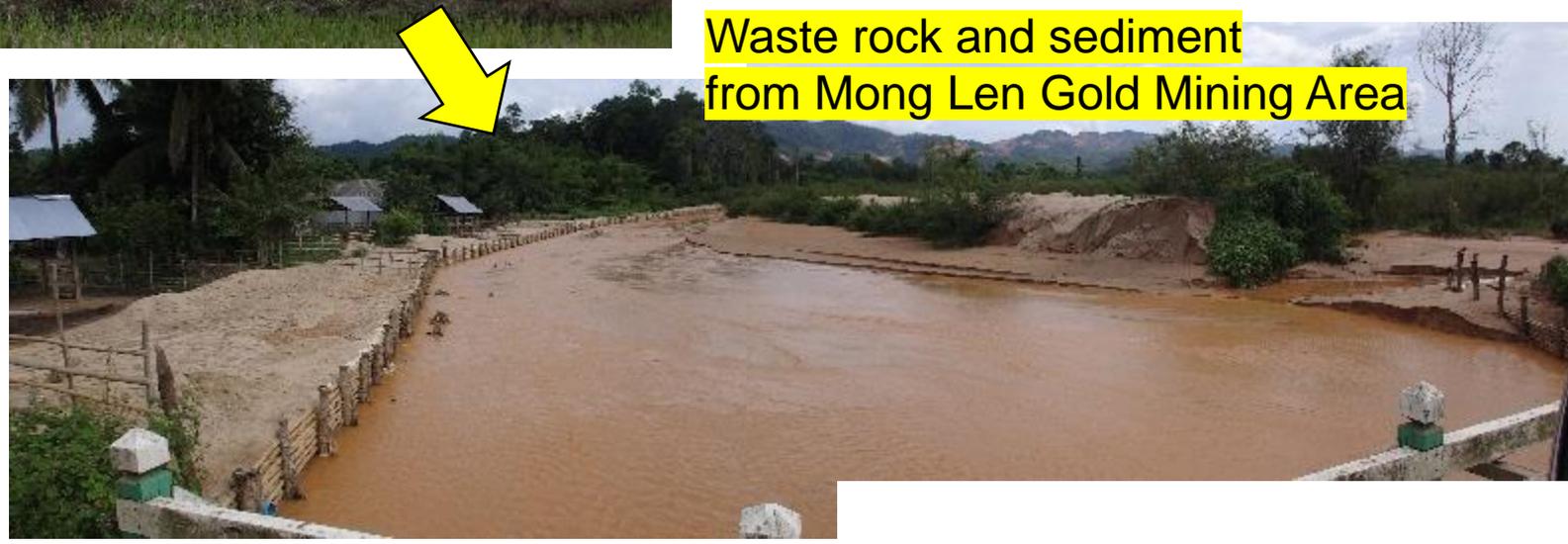
Mong Len Gold Mining Area



Waste rock and sediment from Mong Len Gold Mining Area



Waste rock and sediment from Mong Len Gold Mining Area



- The dominant method used by large scale gold mines is chemical leaching using cyanide, while small-scale miners use mercury.
- While cyanide and mercury are both hazardous substances.
- Cyanide can obtain very high recovery rates - often 90% of the gold in the ore - and it is cheap.
- Innovations in cyanide leaching allowed large deposits of low gold grade to be processed, allowing formerly uneconomical ore deposits to be exploited.
- For the same set of reasons, the use of cyanide has become increasingly adopted by small-scale miners.
- Unfortunately, misuse and poor management of cyanide in small-scale mining is common and has led to disastrous local pollution and safety hazards.

UNEP(2012), A practical guide 'reducing mercury use in artisanal and small-scale gold mining'

