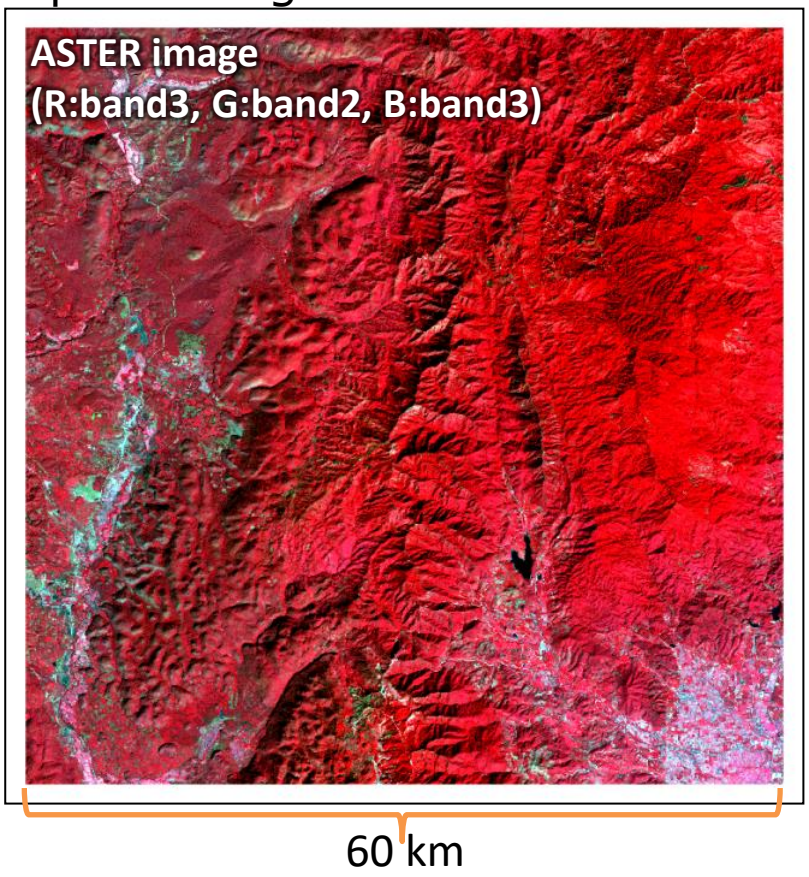
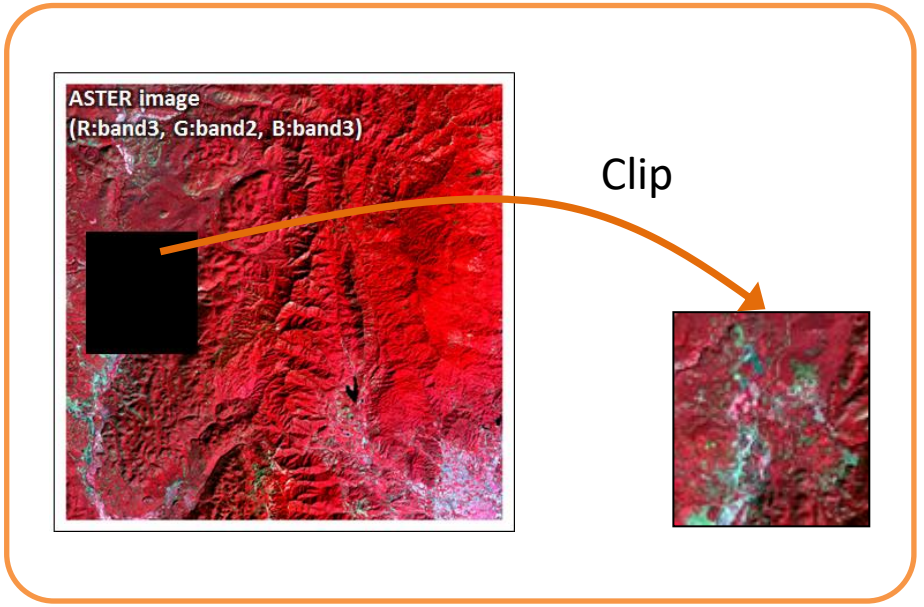
False color composite

Japan Space Systems

Clip the region of interest

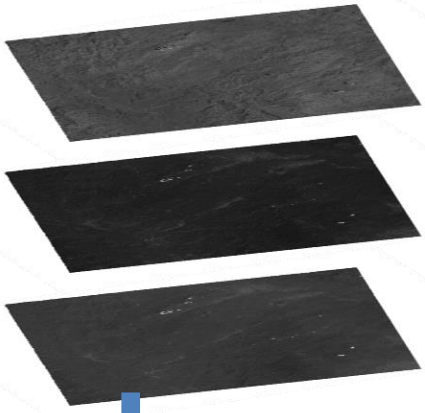
- ASTER image cover 60km x 60km.
- When your region of interest is locally, you should extract this region before processing.



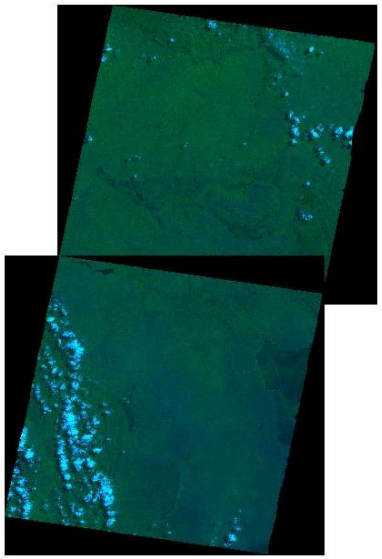


- **File size becomes small.**
- **Processing of data becomes fast**

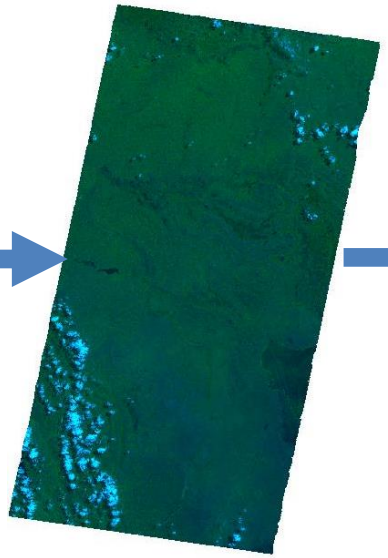
Goal of this practise



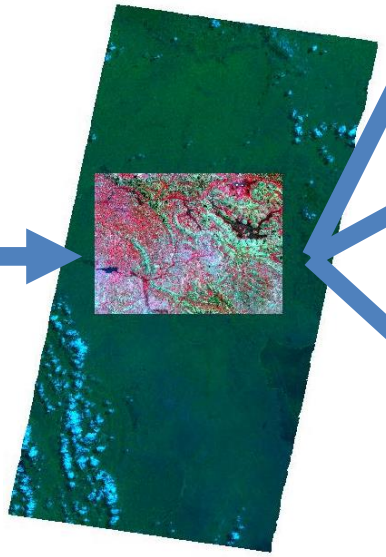
Layer stack



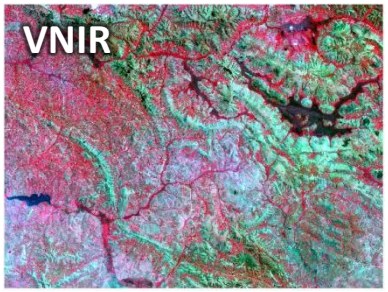
Two ASTER images

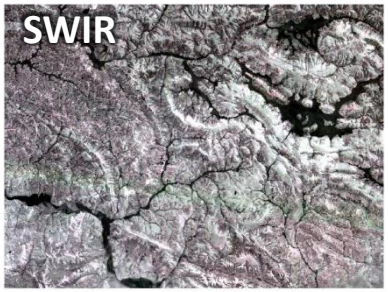


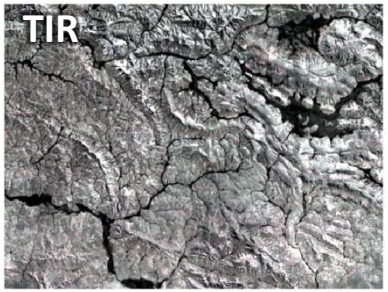
Merge



Clip



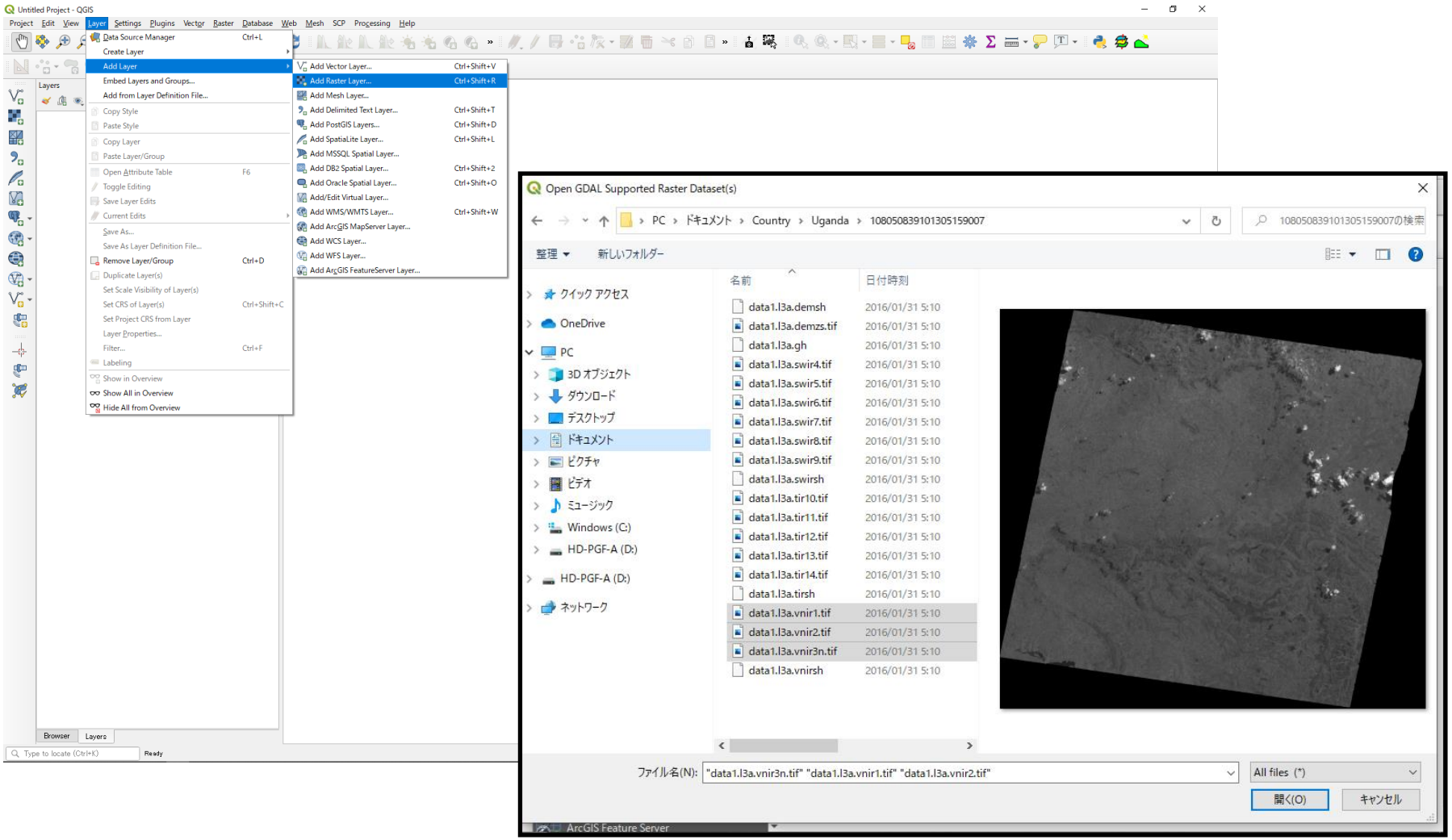




We will use these clipped data in following lesson.

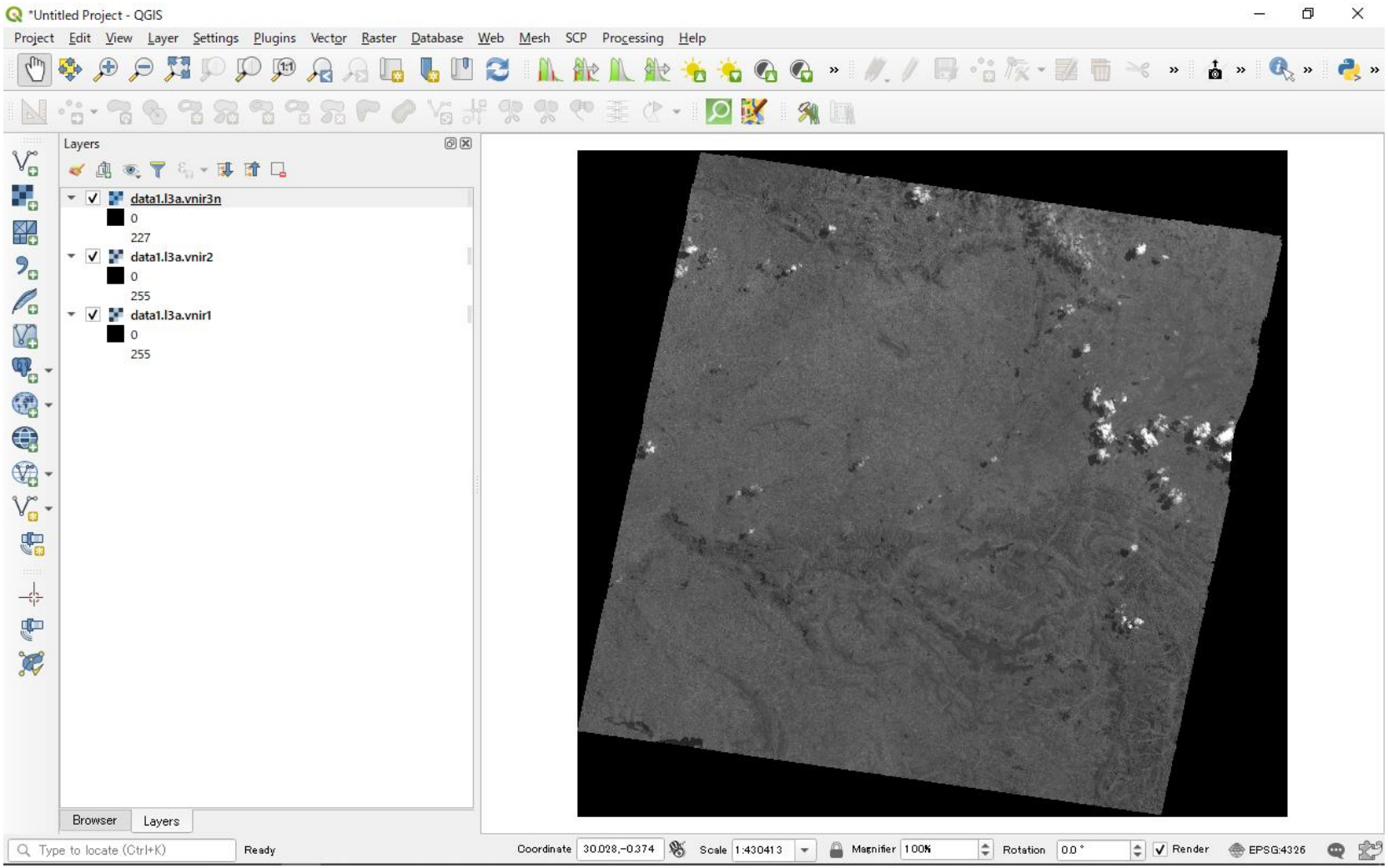
Open ASTER image

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



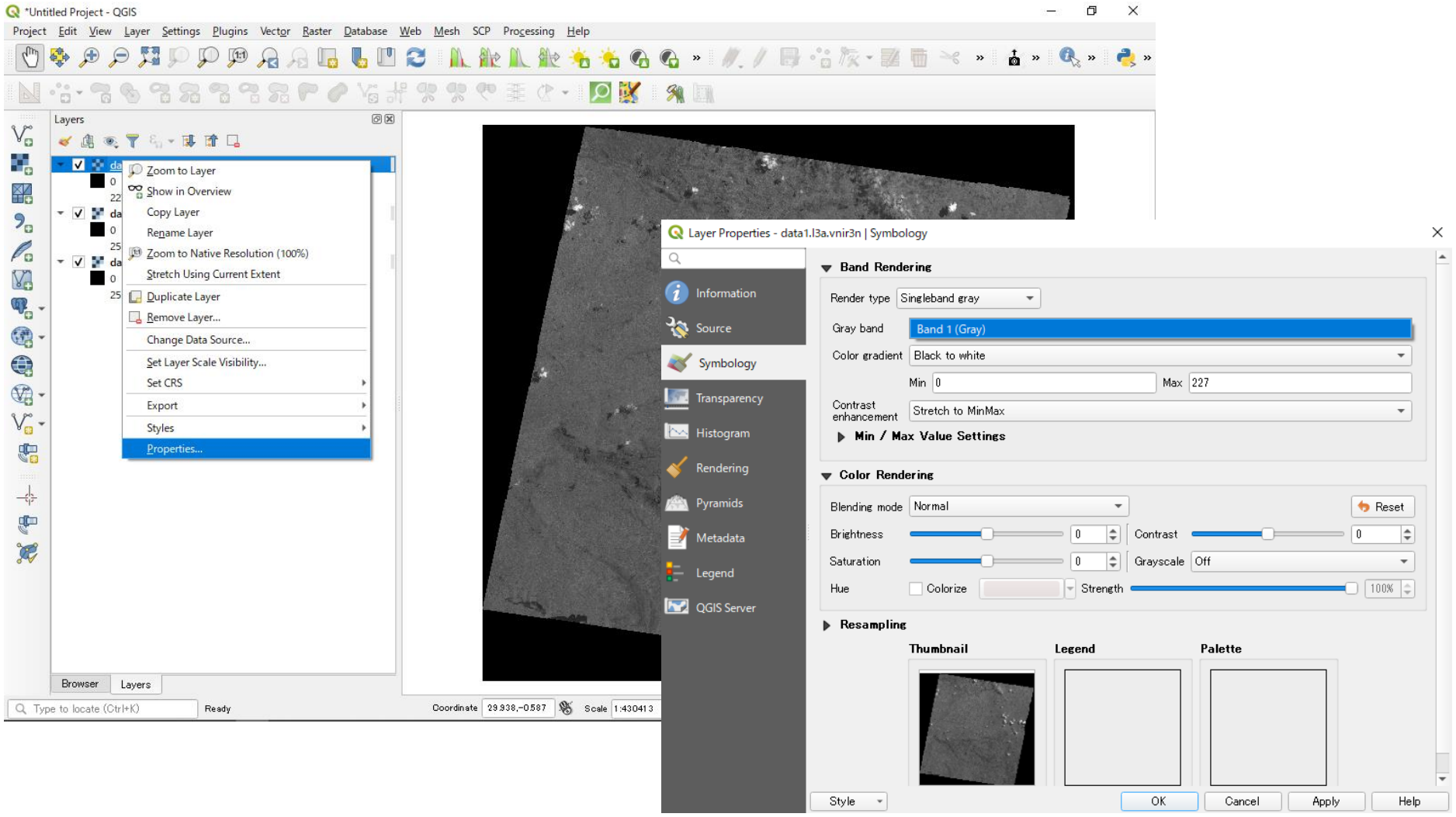
Open ASTER image

- Selected images are opened separately.



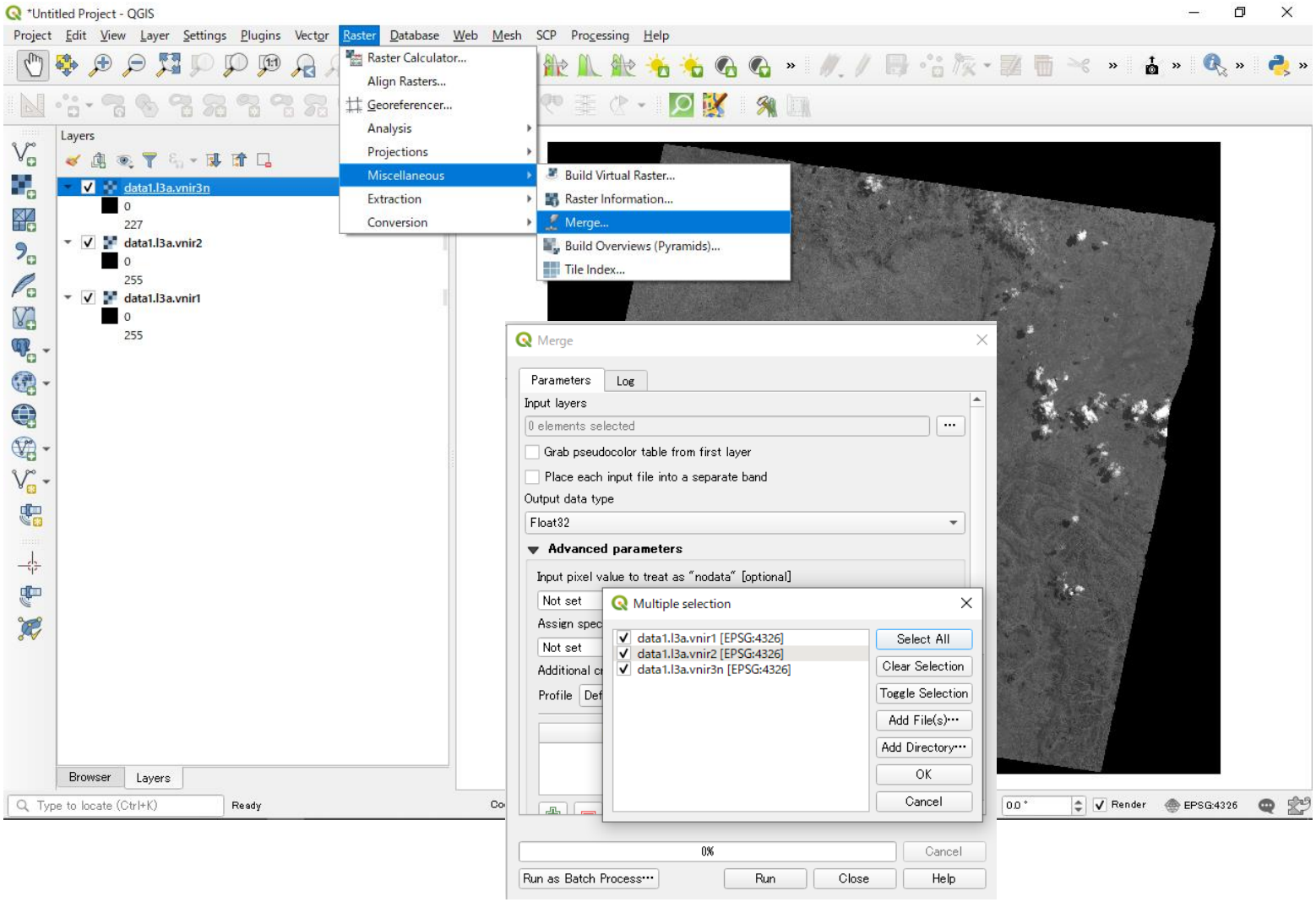
Check property

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



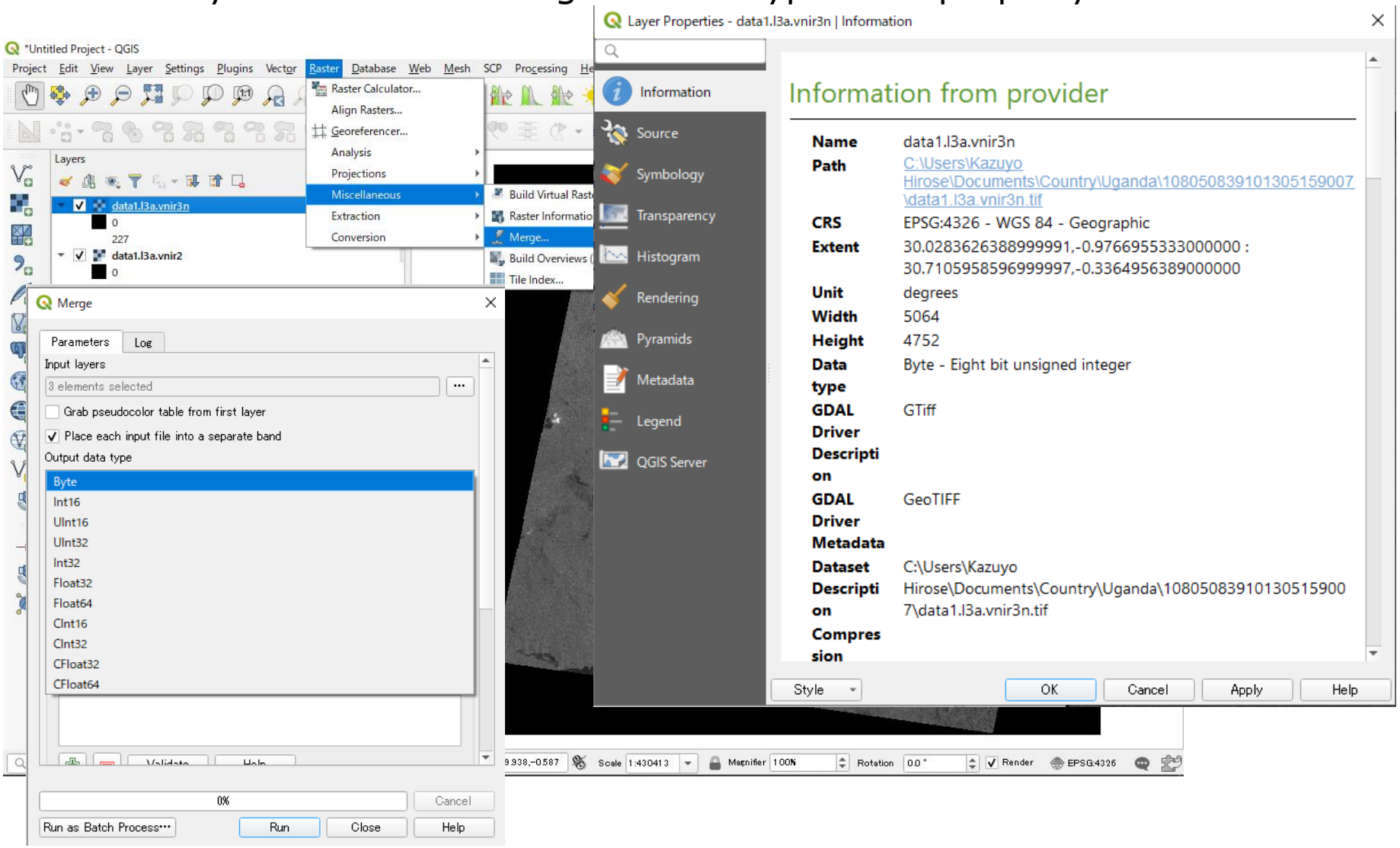
Merge single-band layer in multi-band layer

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



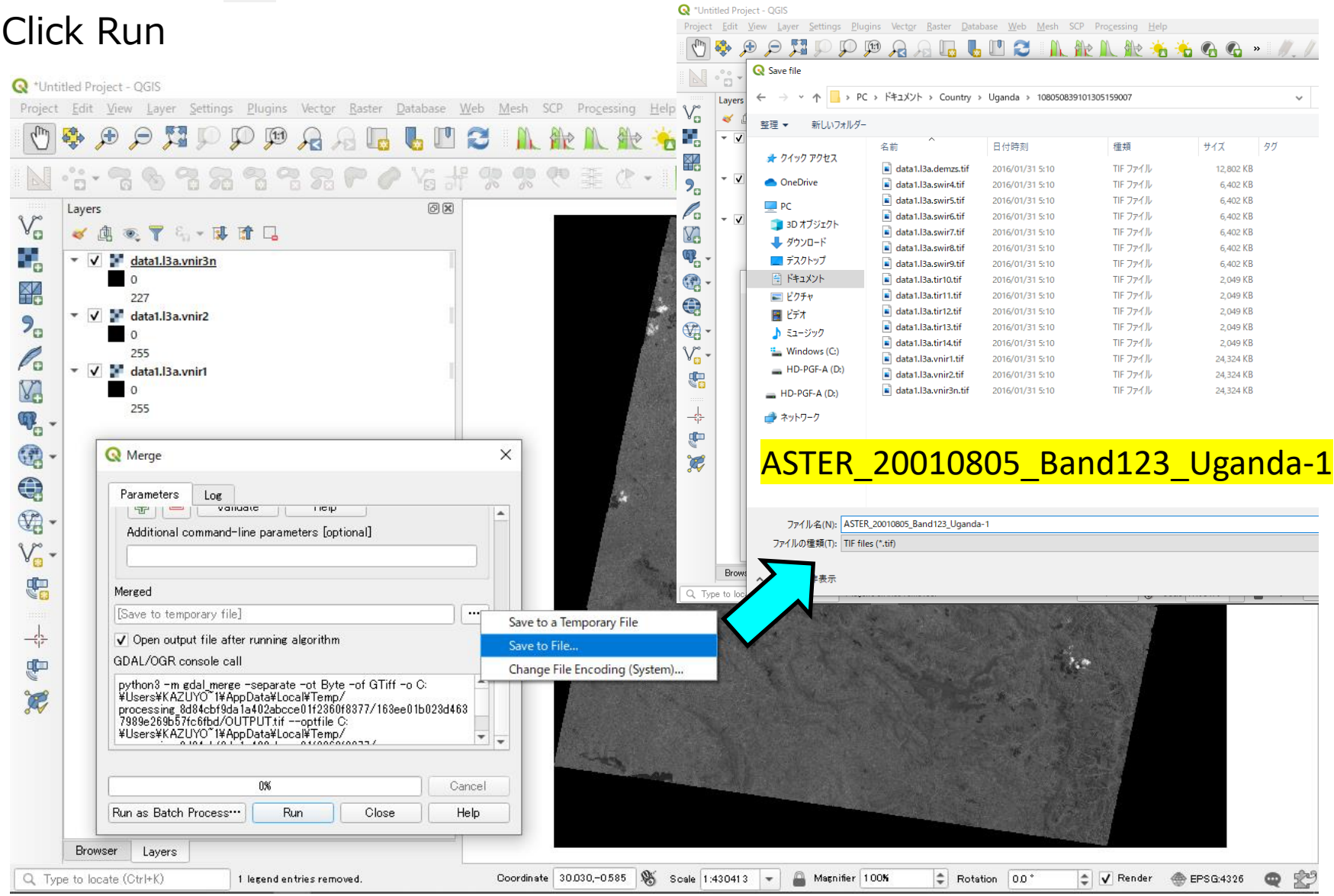
Merge single-band layer in multi-band layer

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



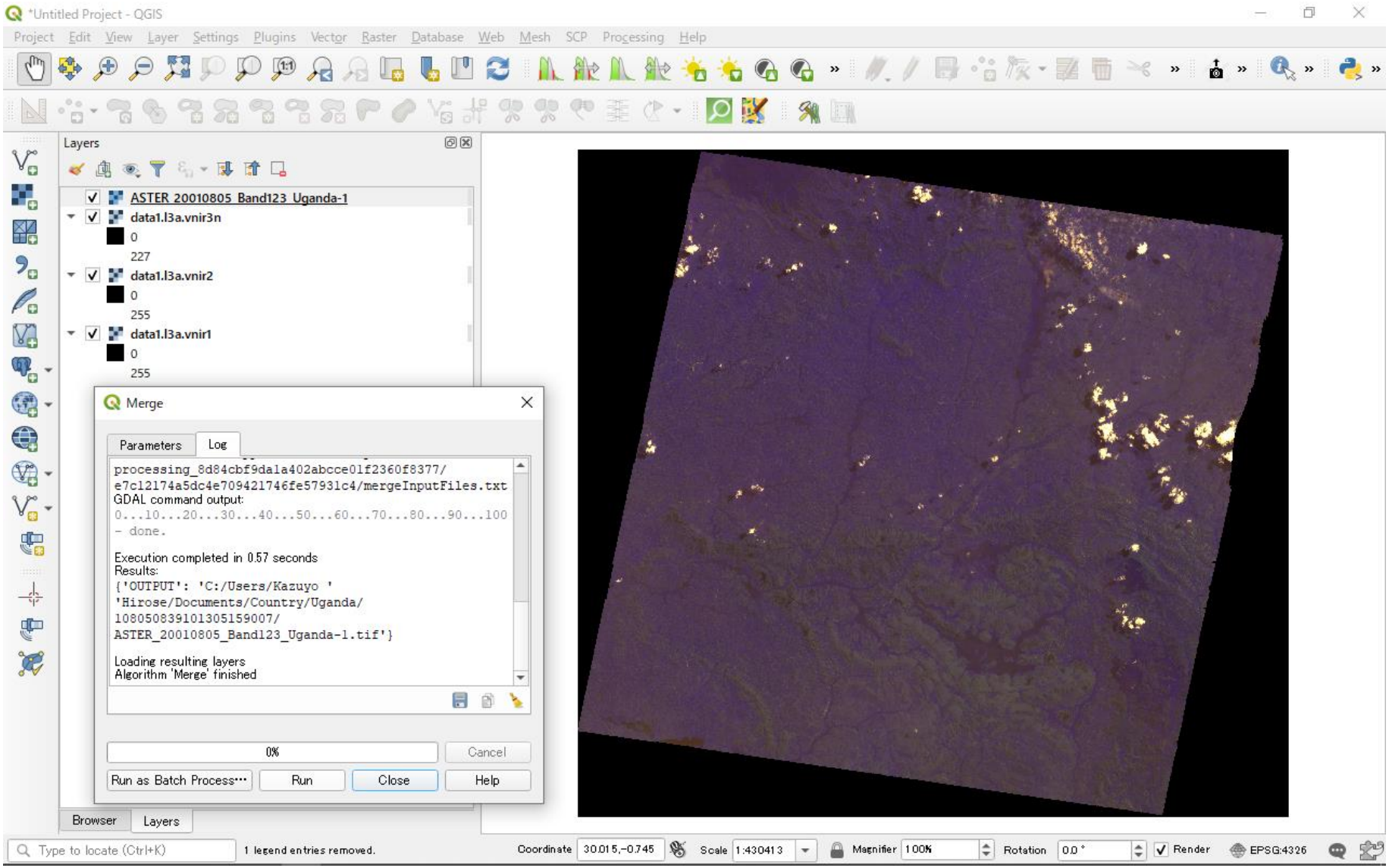
Merge single-band layer in multi-band layer

- Click Button [...] and save to file as “ASTER_20010805_Band123_Uganda-1
- Click Run



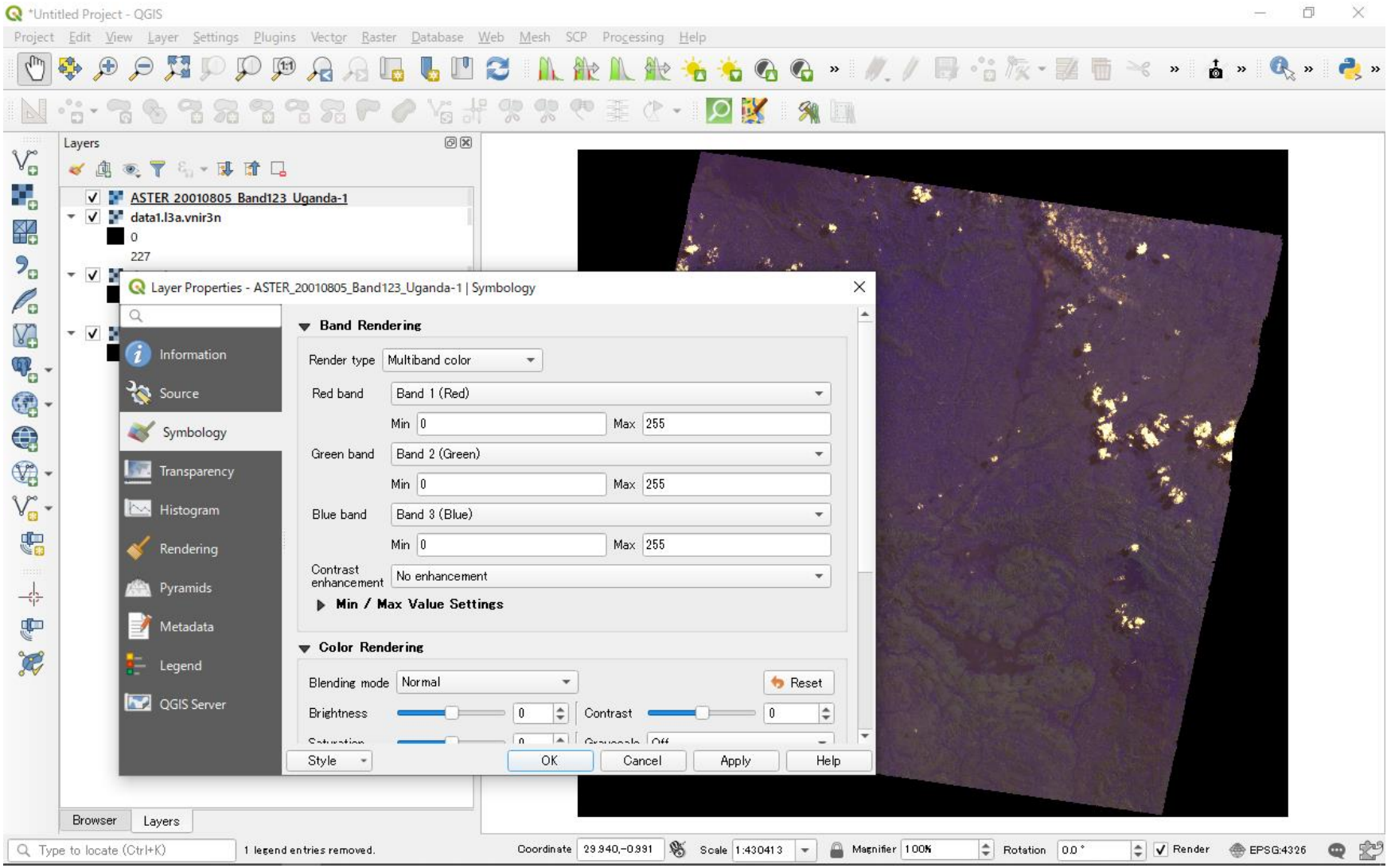
Merge single-band layer in multi-band layer

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



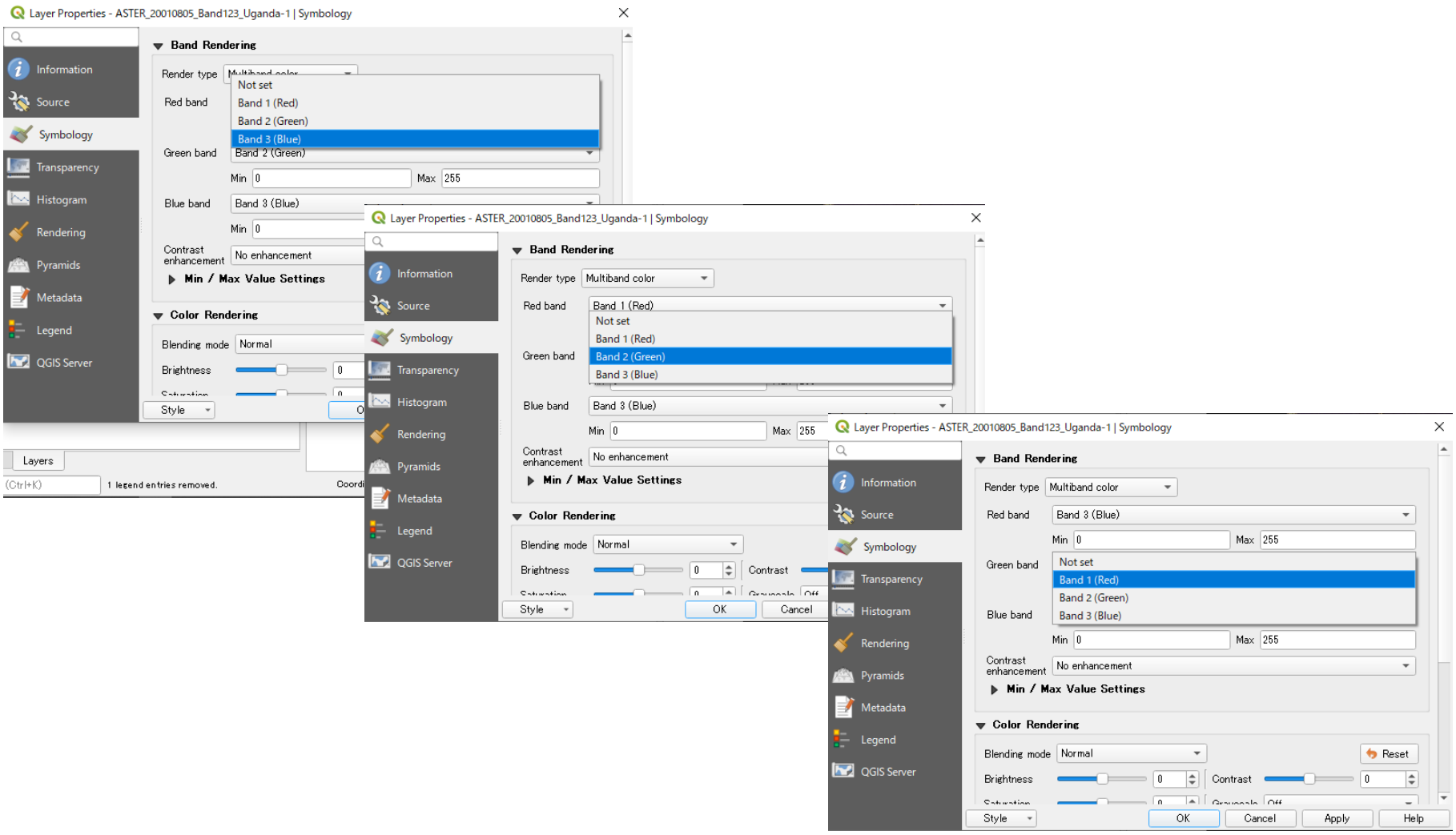
Change property

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



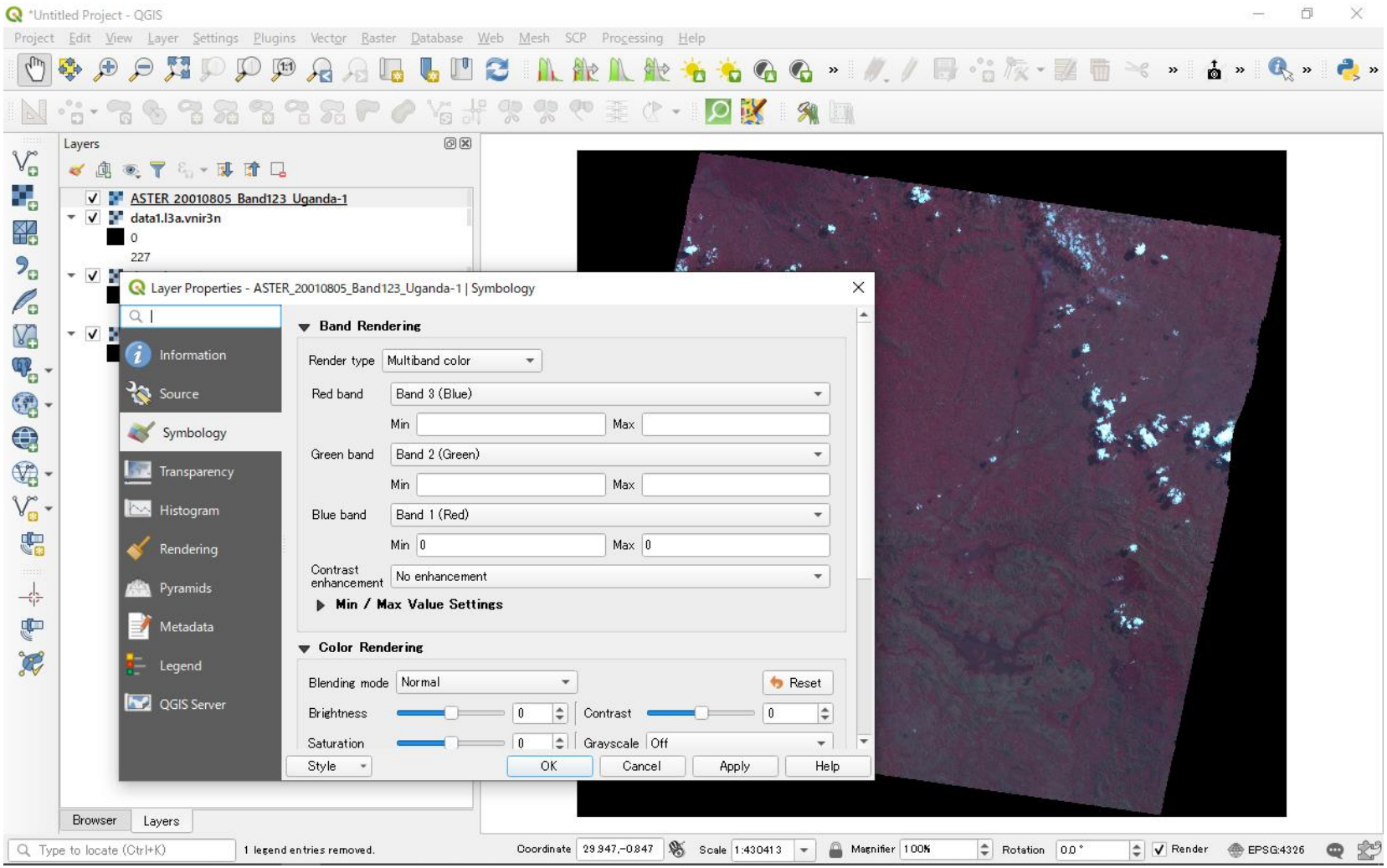
Change property

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



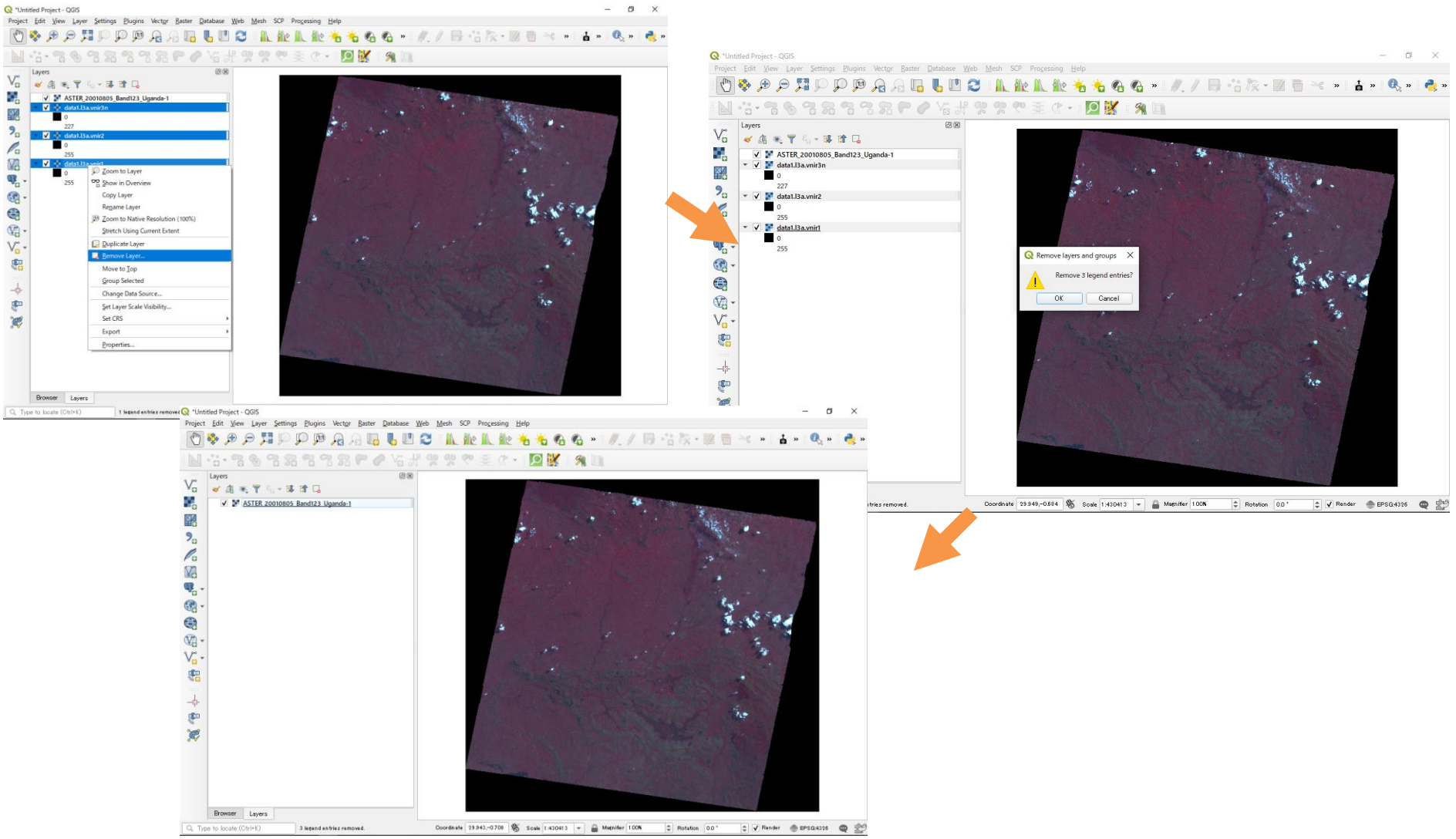
Change property

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



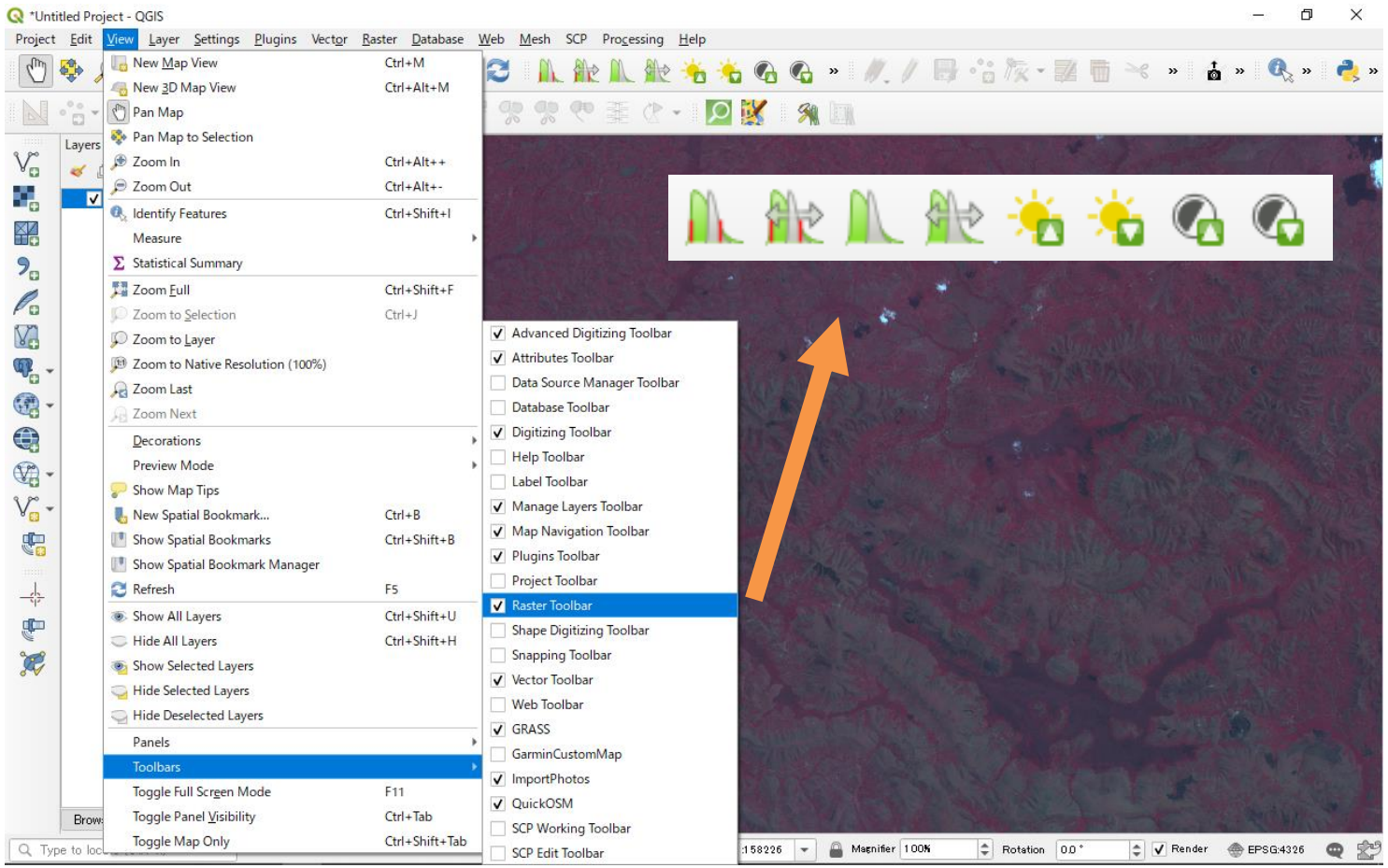
Remove single-band layer

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



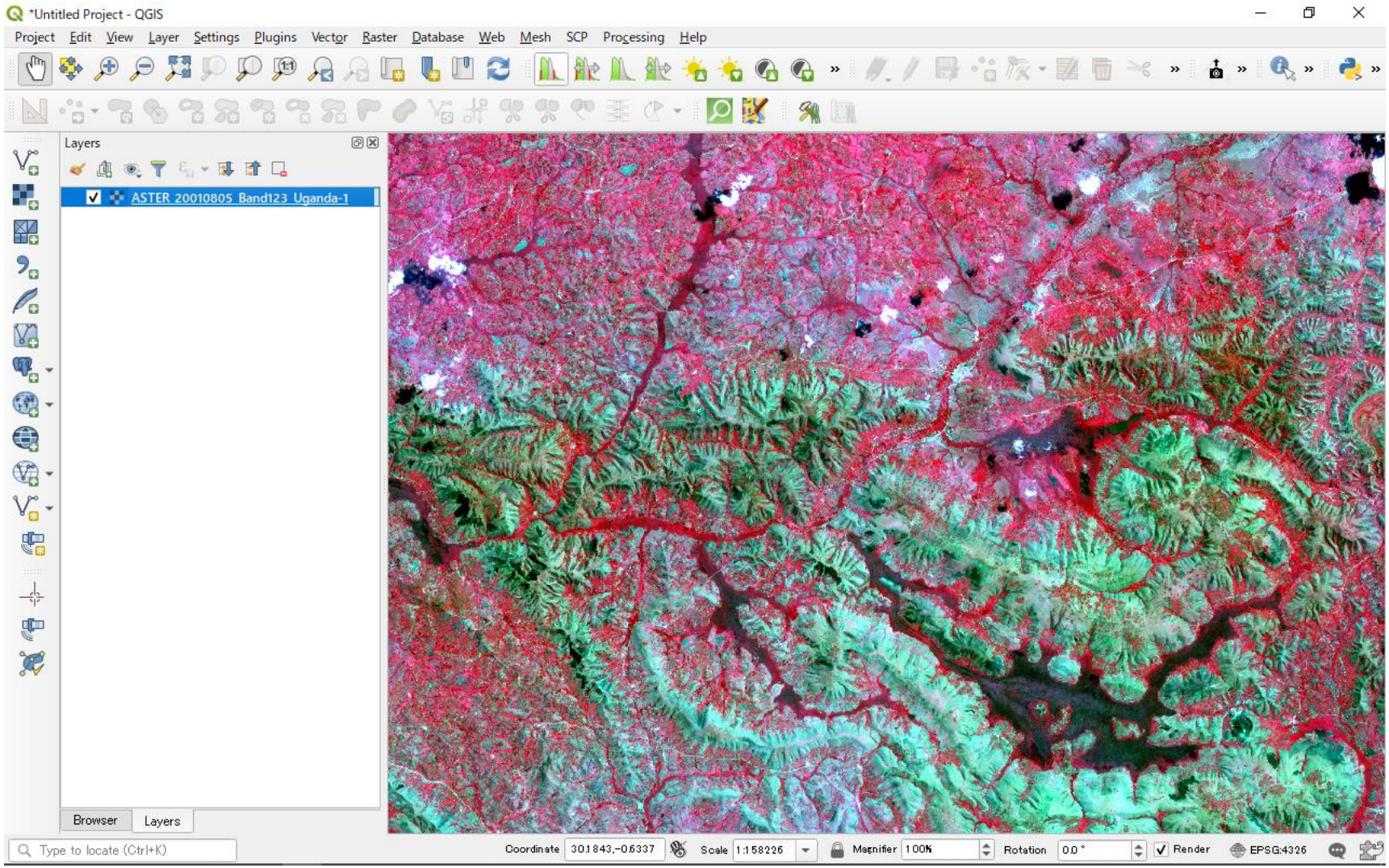
Change contrast enhancement

- 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.



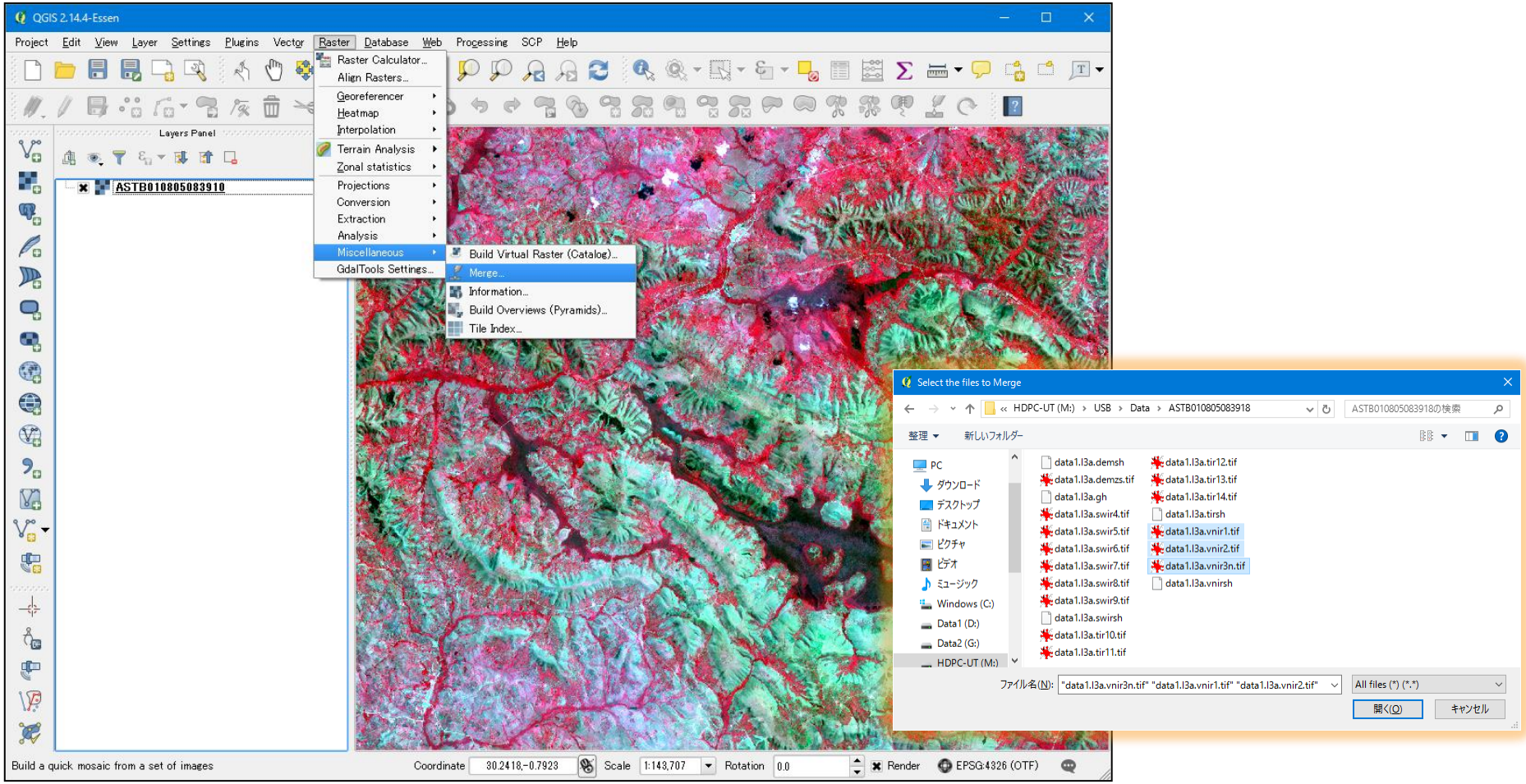
Change contrast enhancement

- Confirm that contrast enhancement is changed.



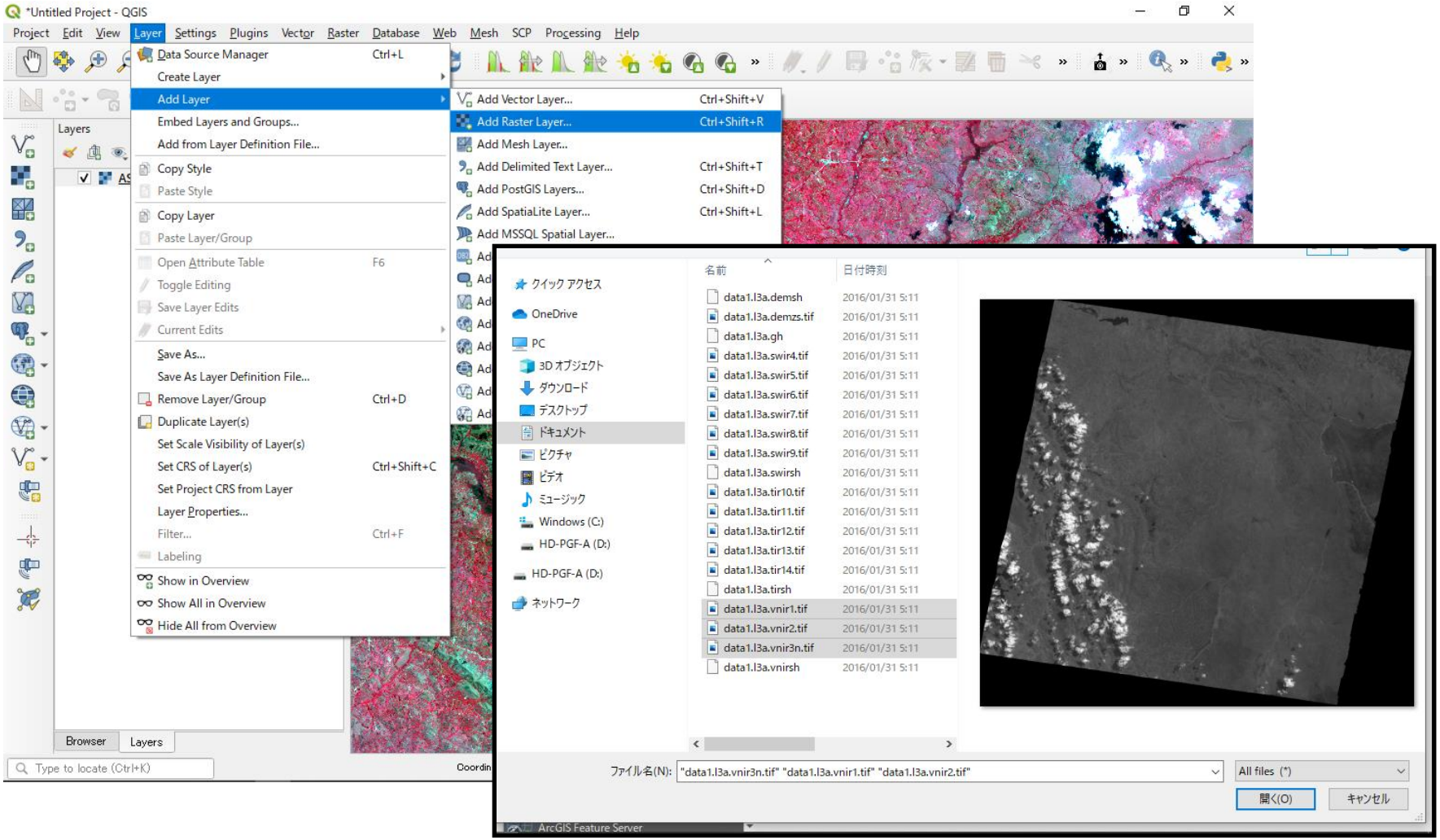
Merge single-band layer in multi-band layer

- 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.



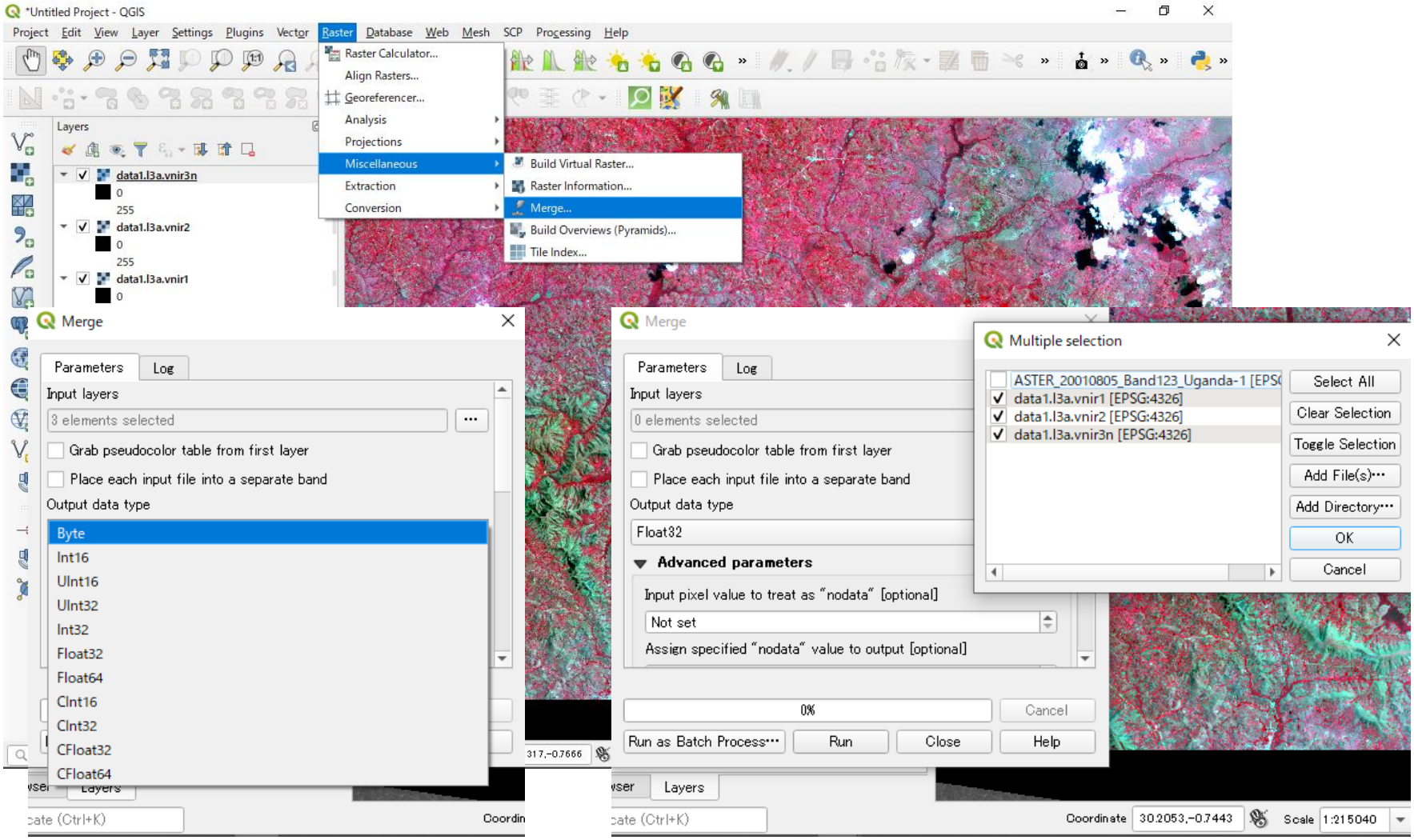
Merge single-band layer in multi-band layer

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



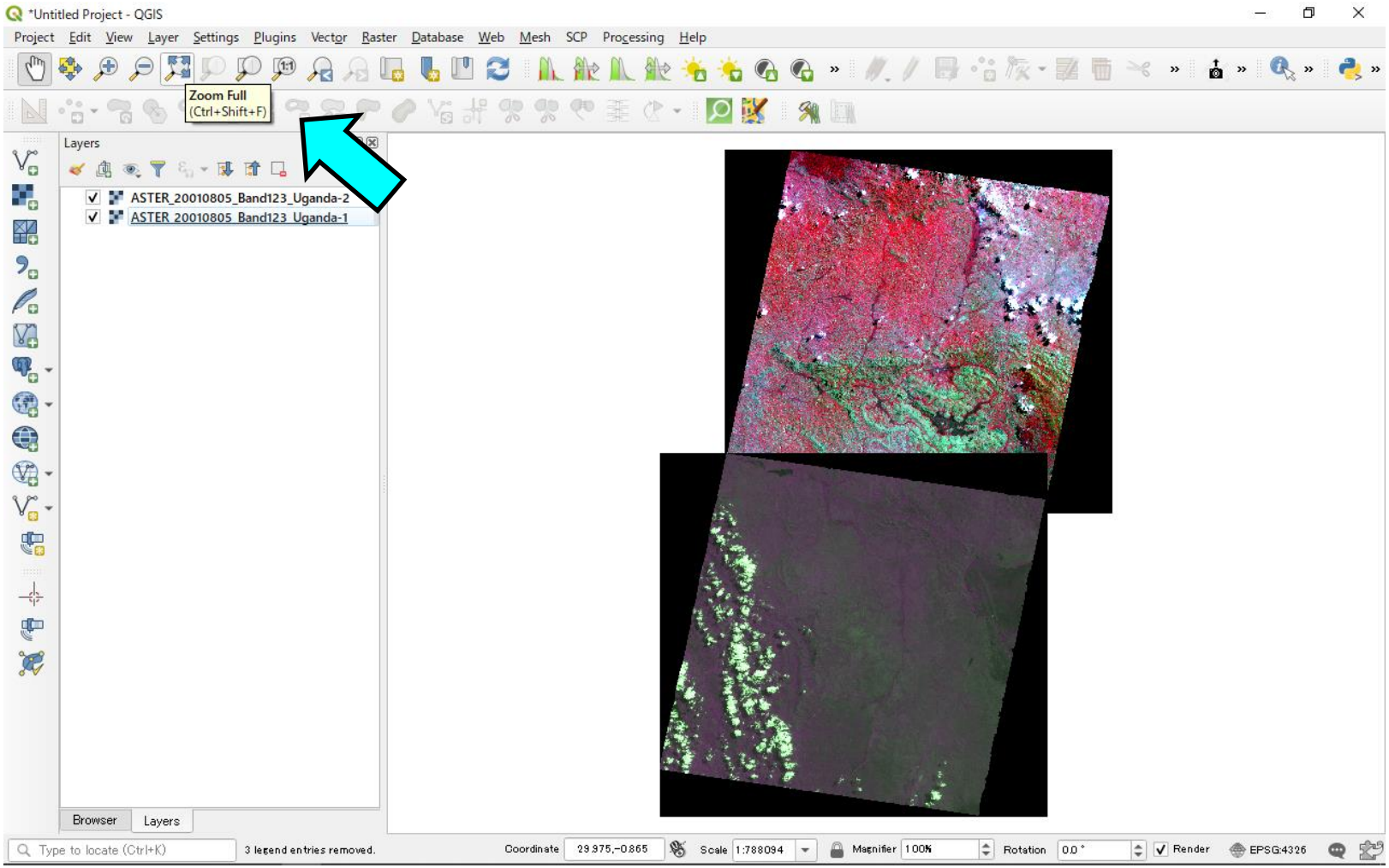
Merge single-band layer in multi-band layer

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



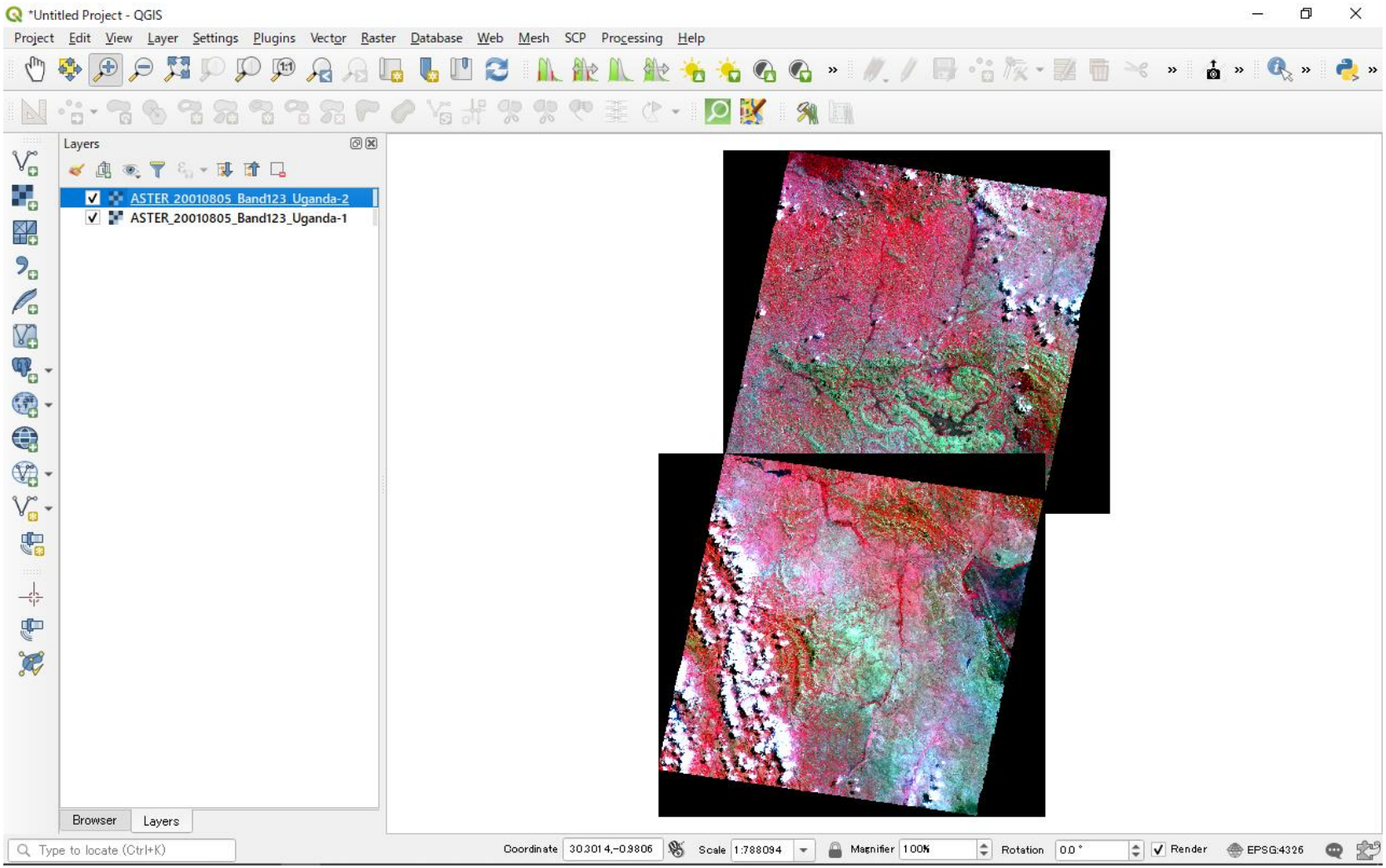
Merge single-band layer in multi-band layer

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



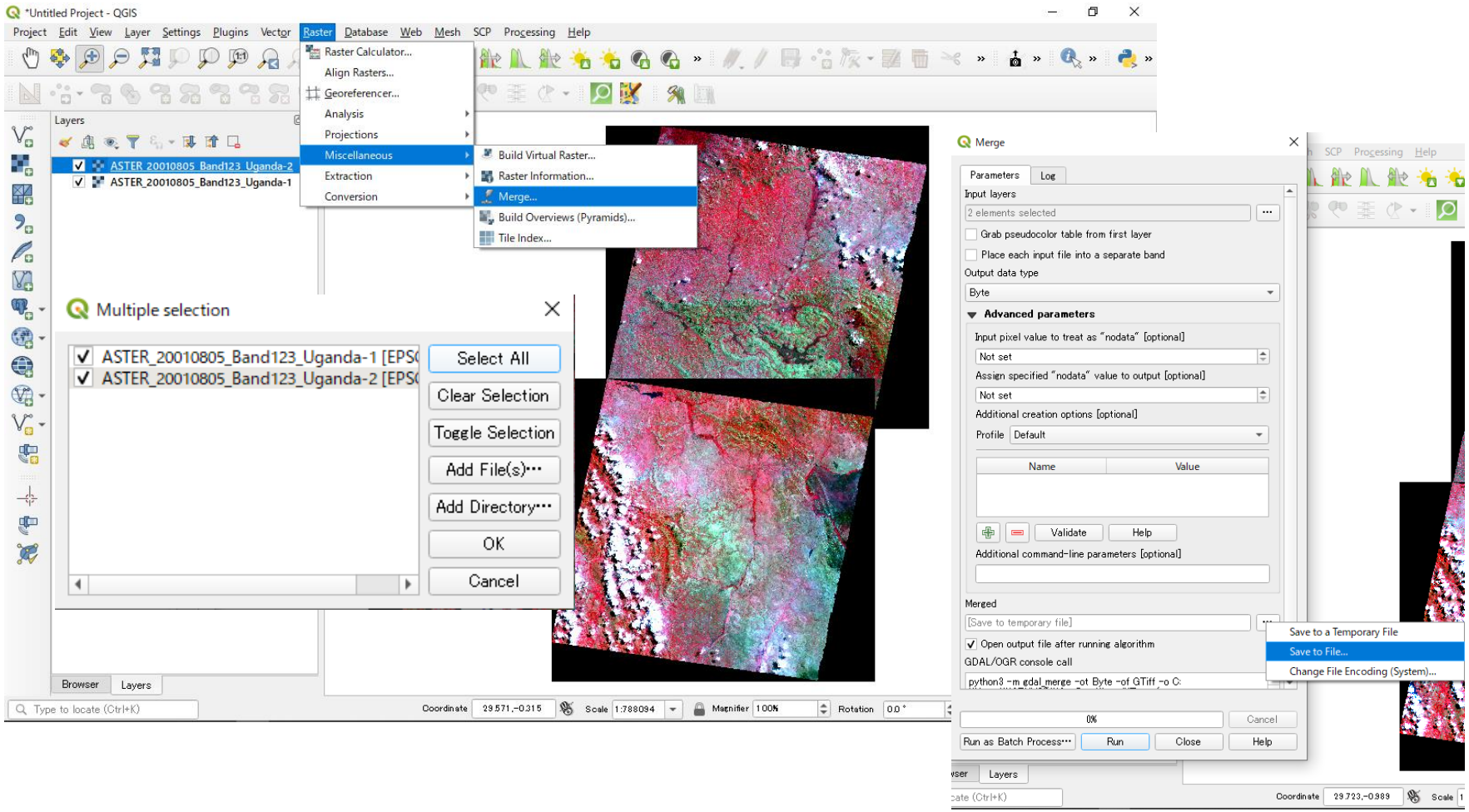
Change property

- Open property window and change color.



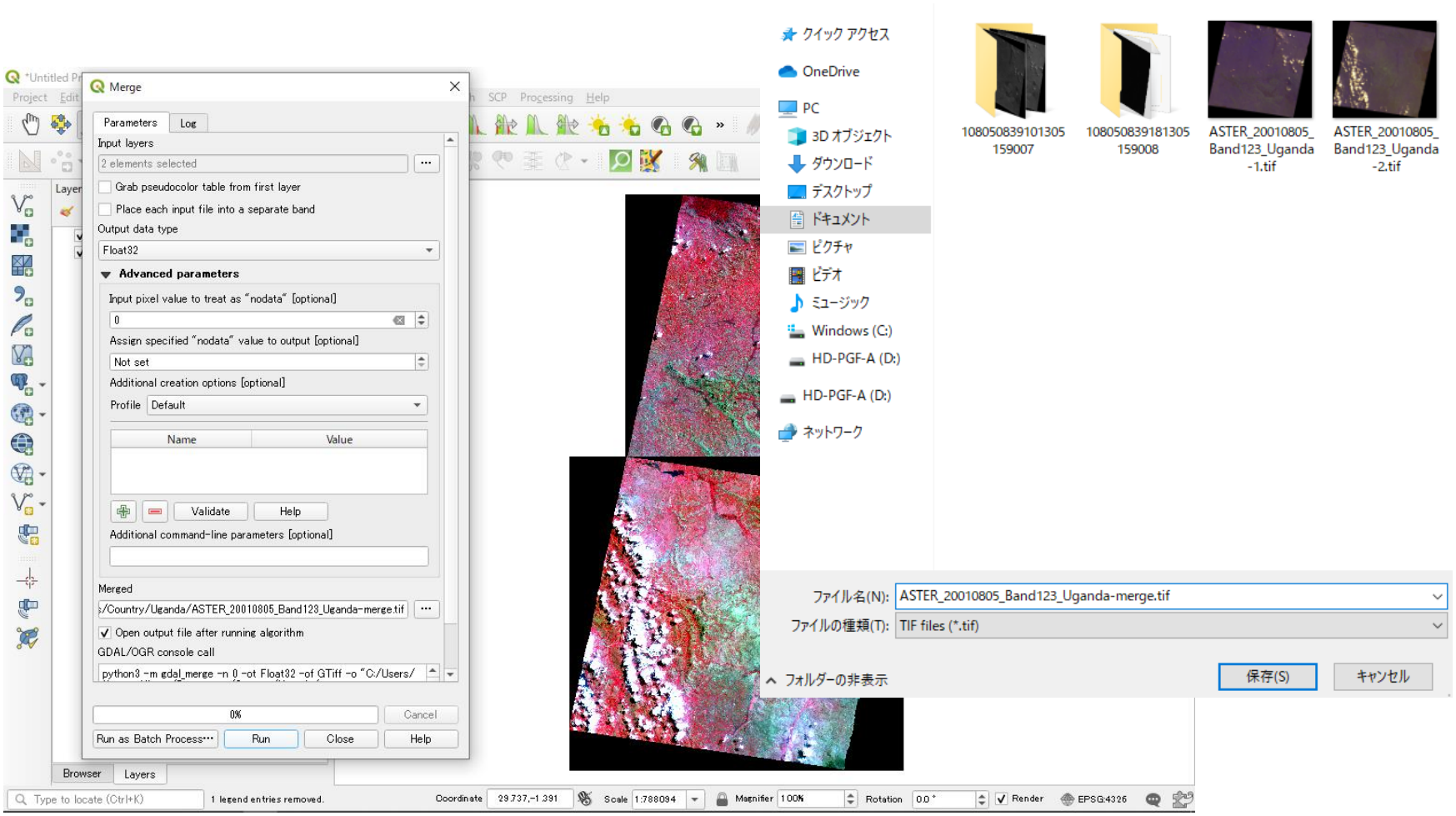
Merge multi-band layer

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



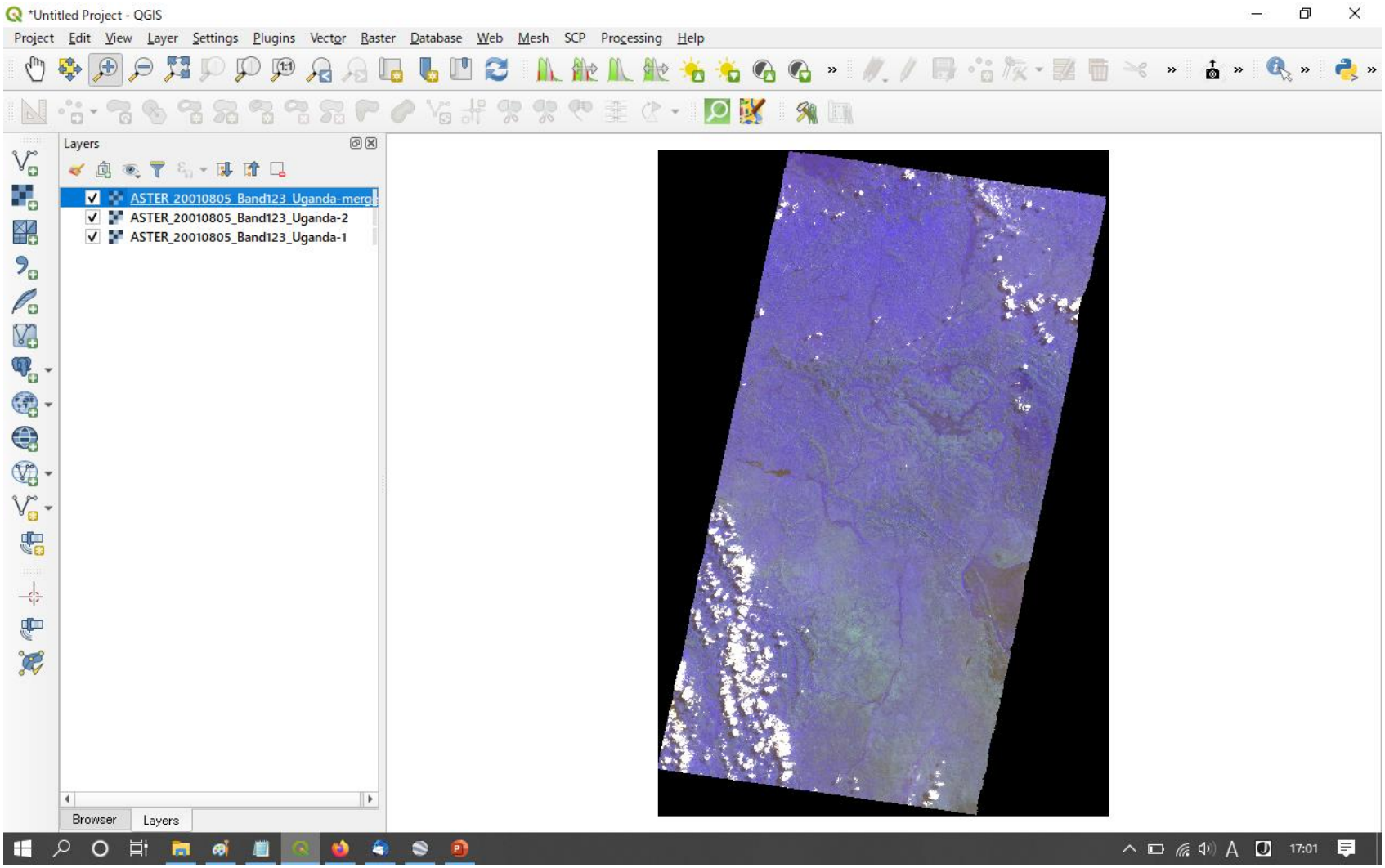
Merge multi-band layer

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



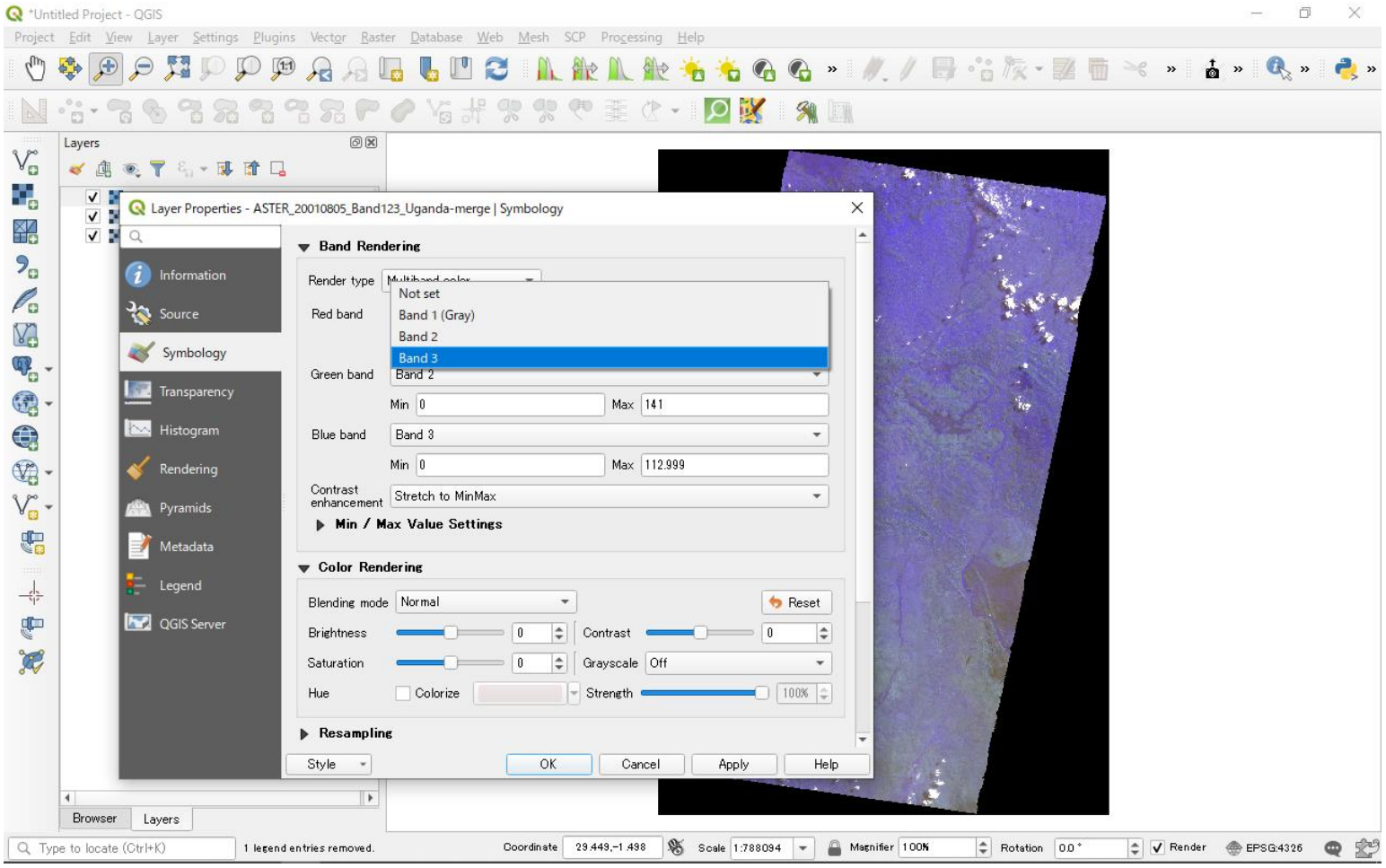
Merge multi-band layer

- Two multi band layer is merged.



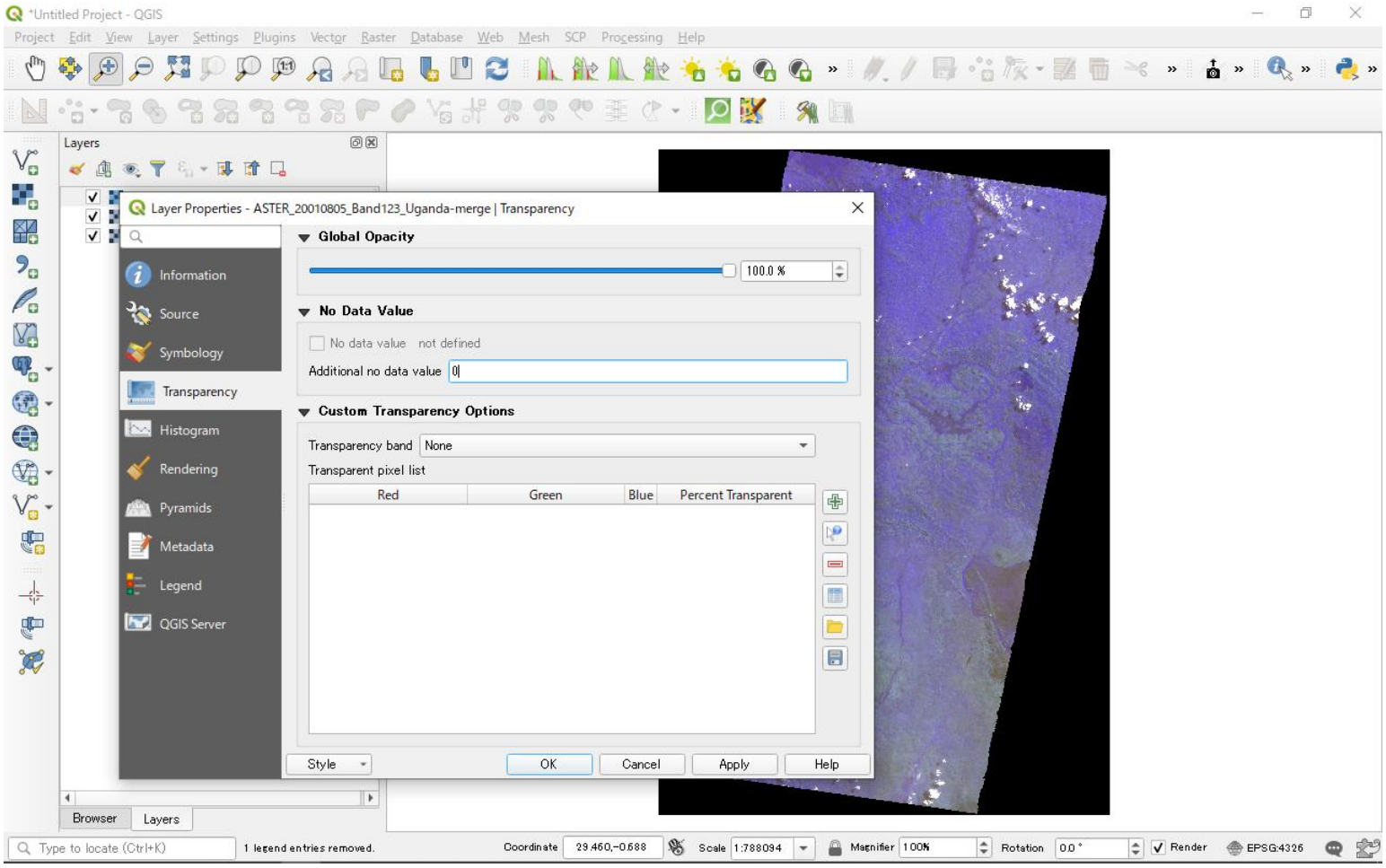
Change property

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



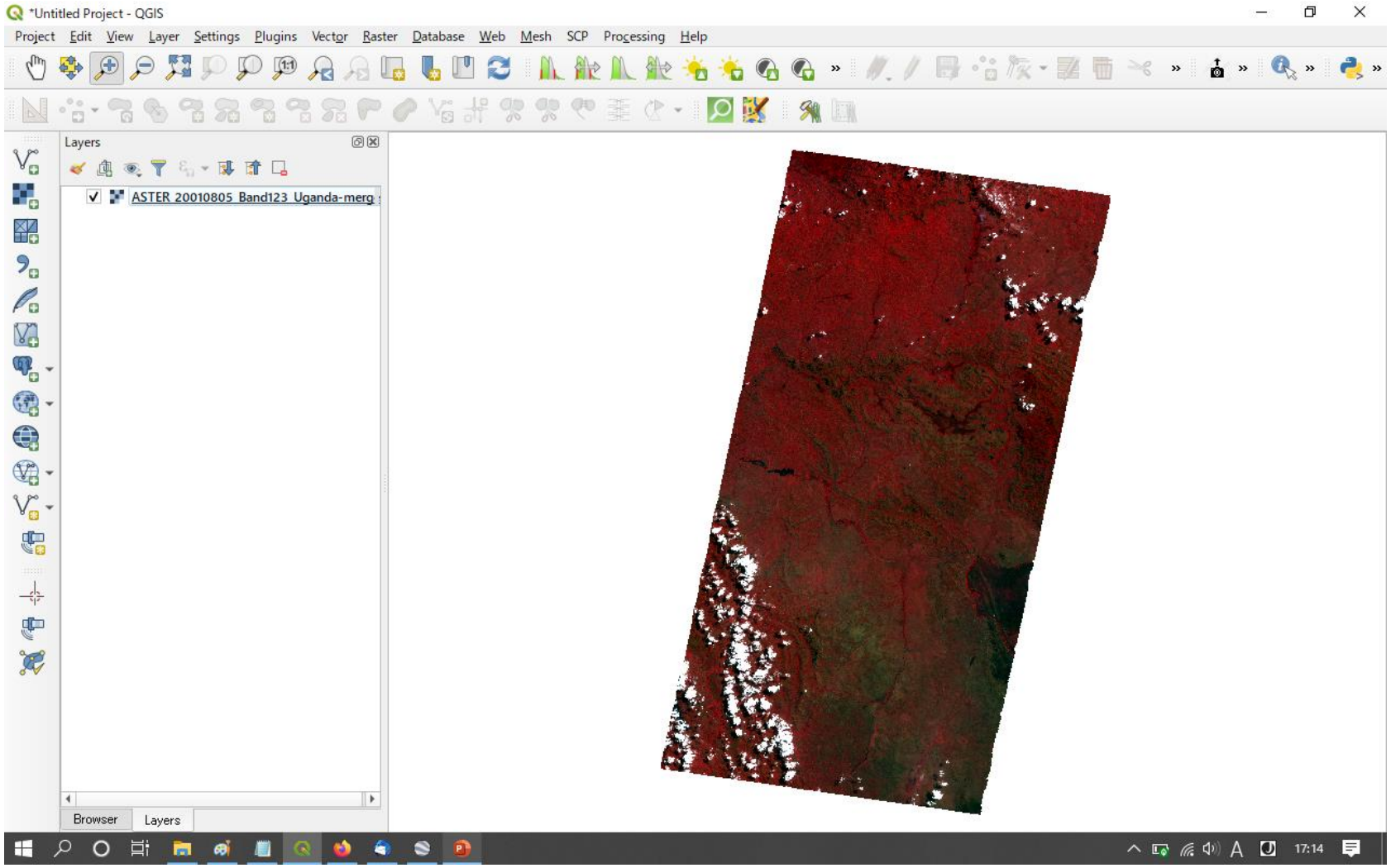
Change property

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



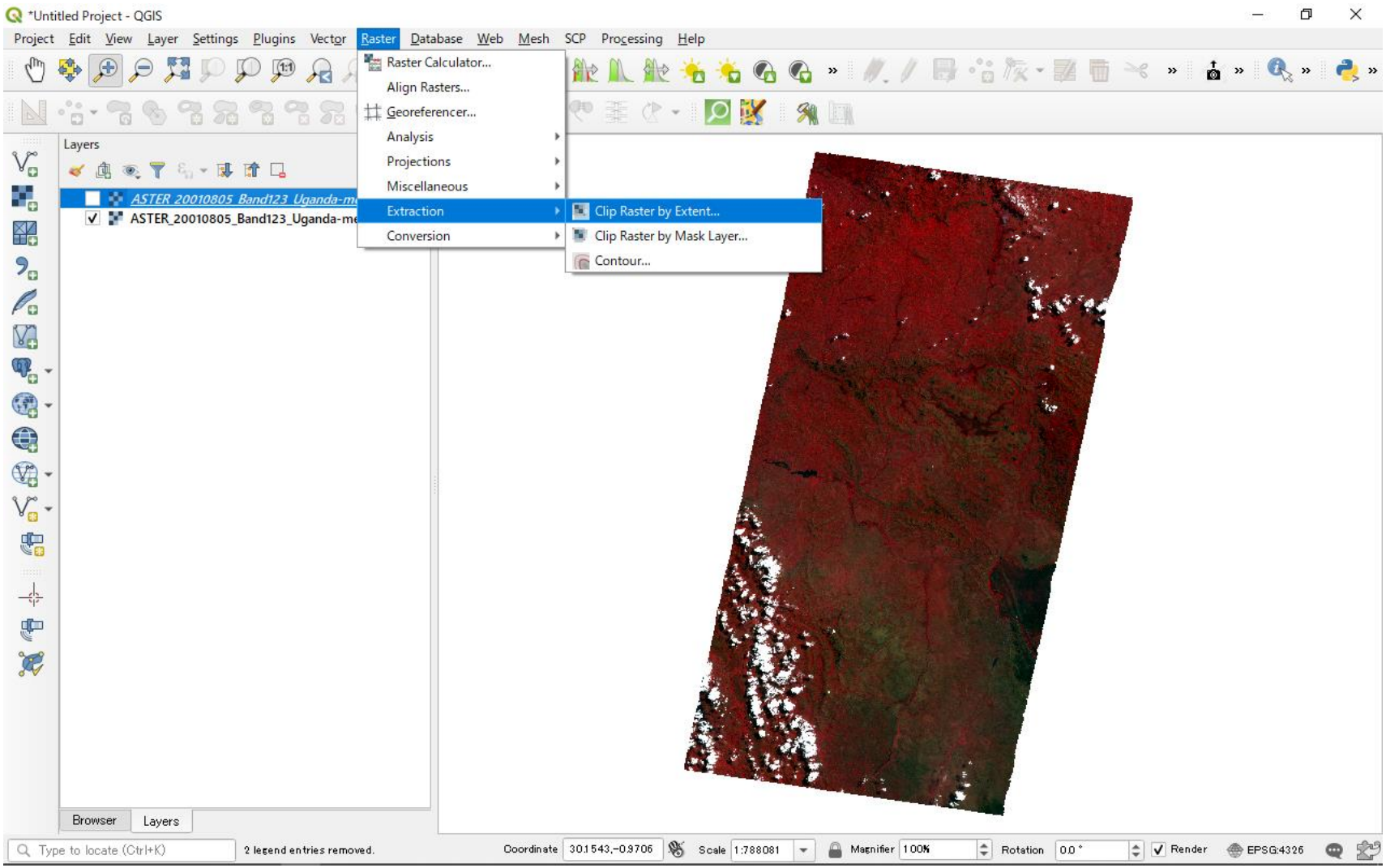
Change property

- Merged image is created.



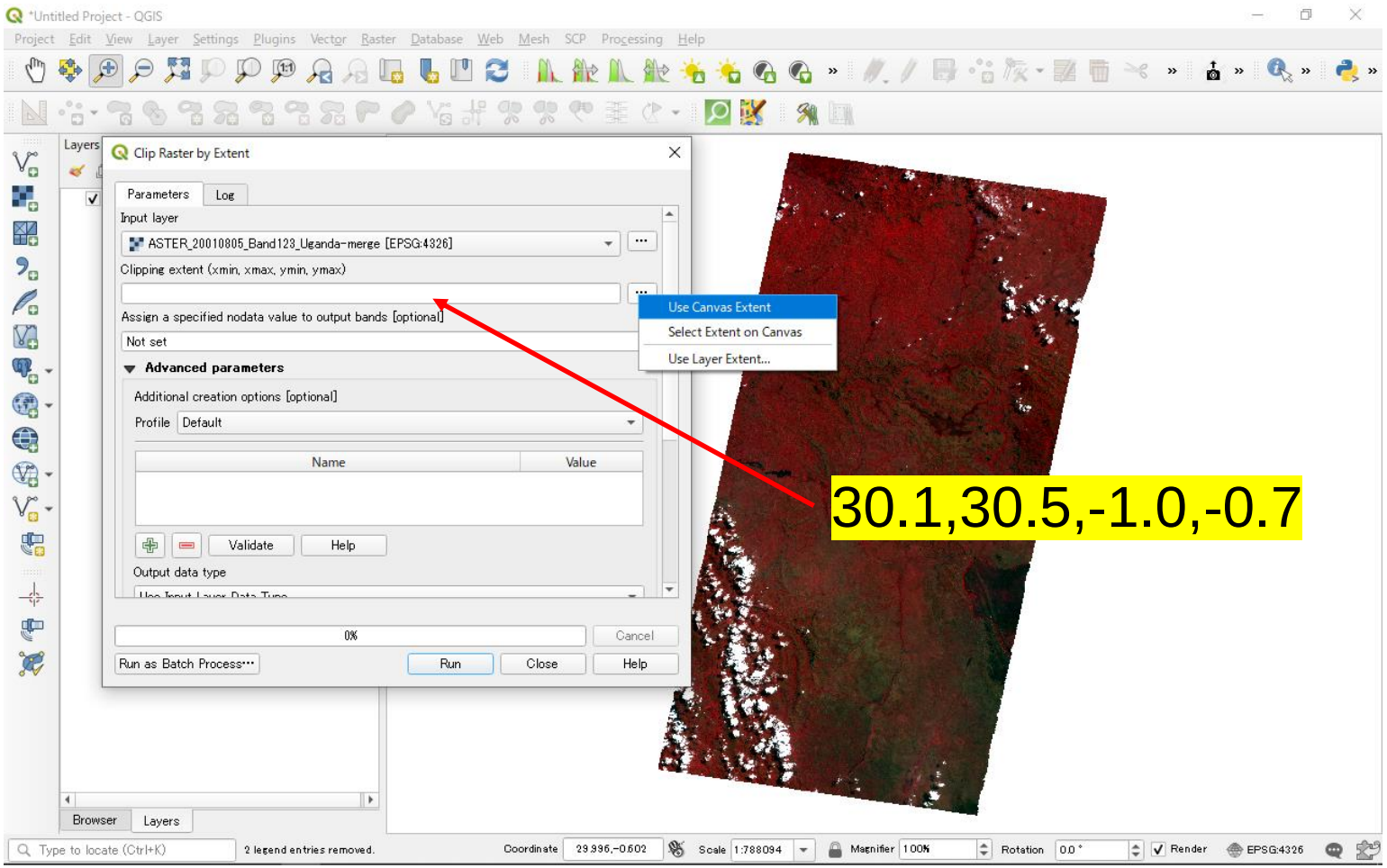
Change property

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



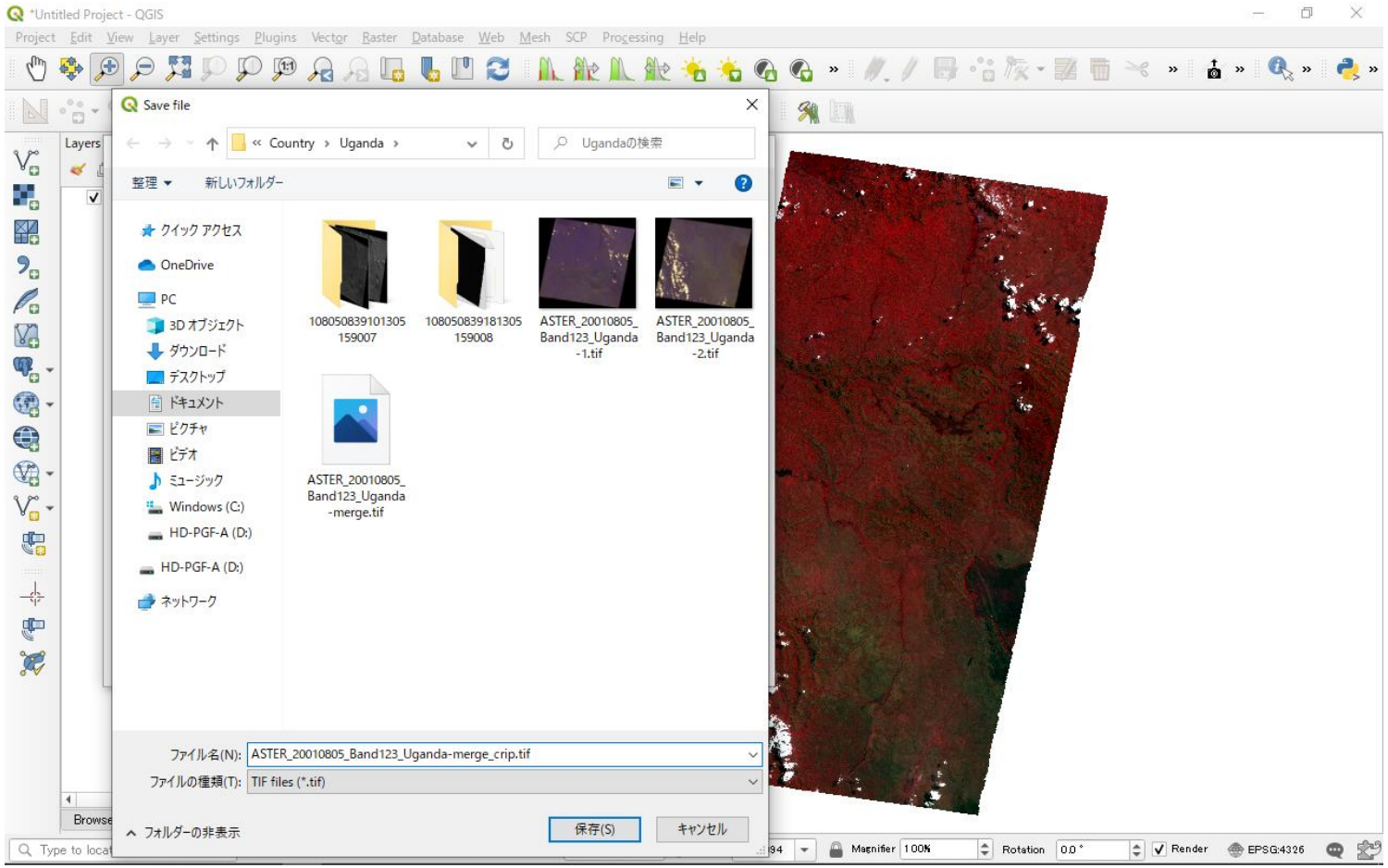
Clip region of interest

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



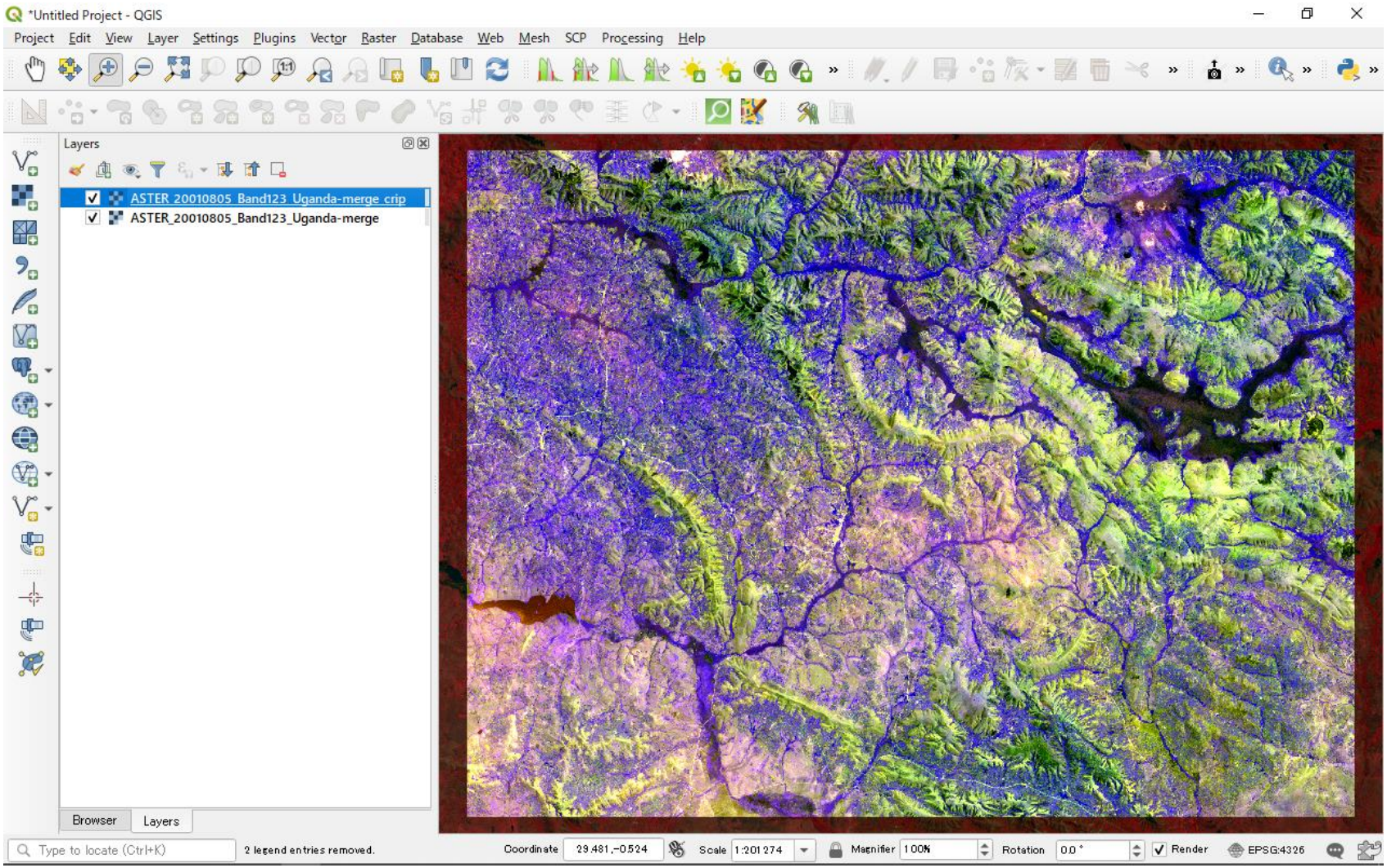
Clip region of interest

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



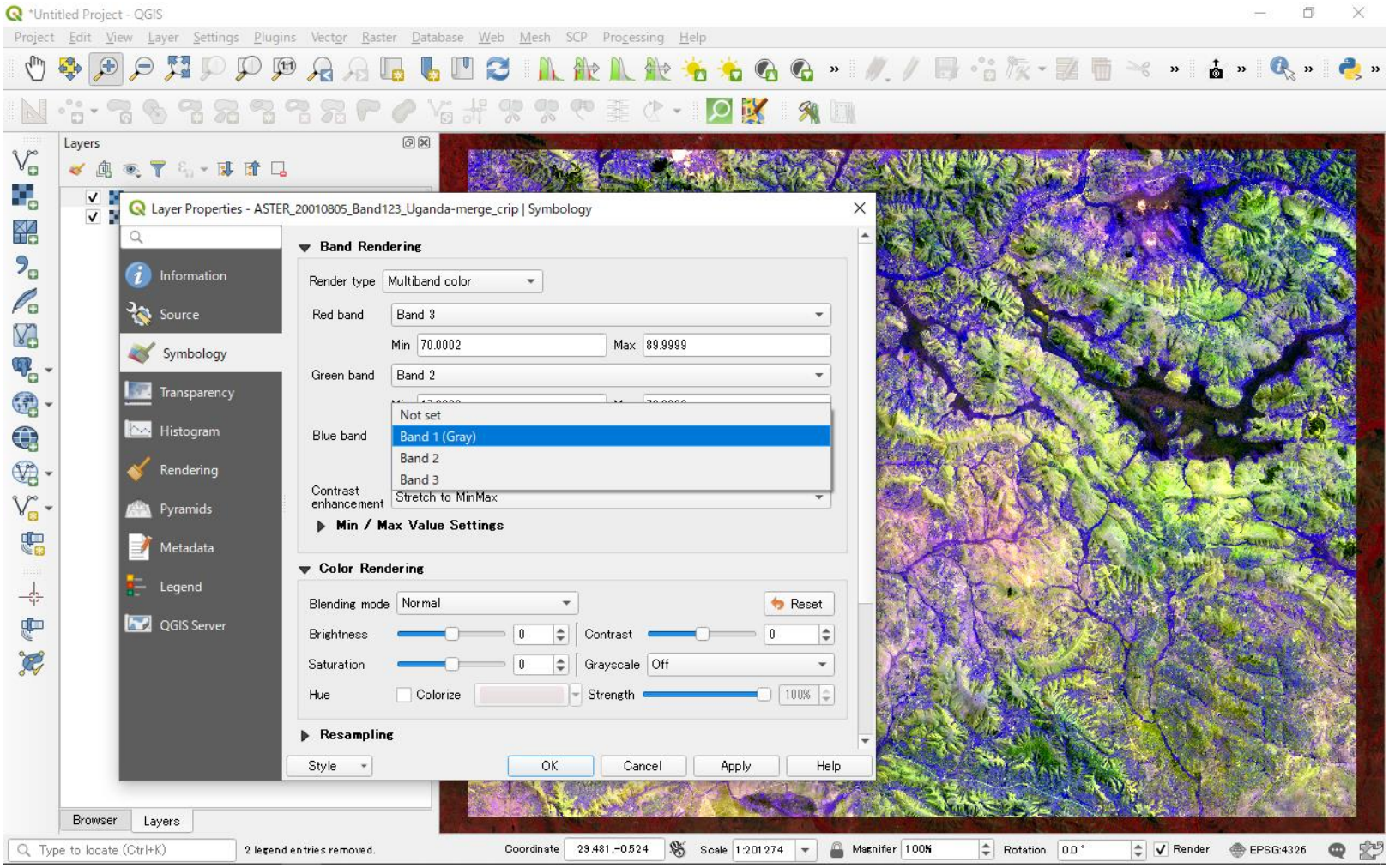
Clip region of interest

- Zoom in and confirm clipped region.



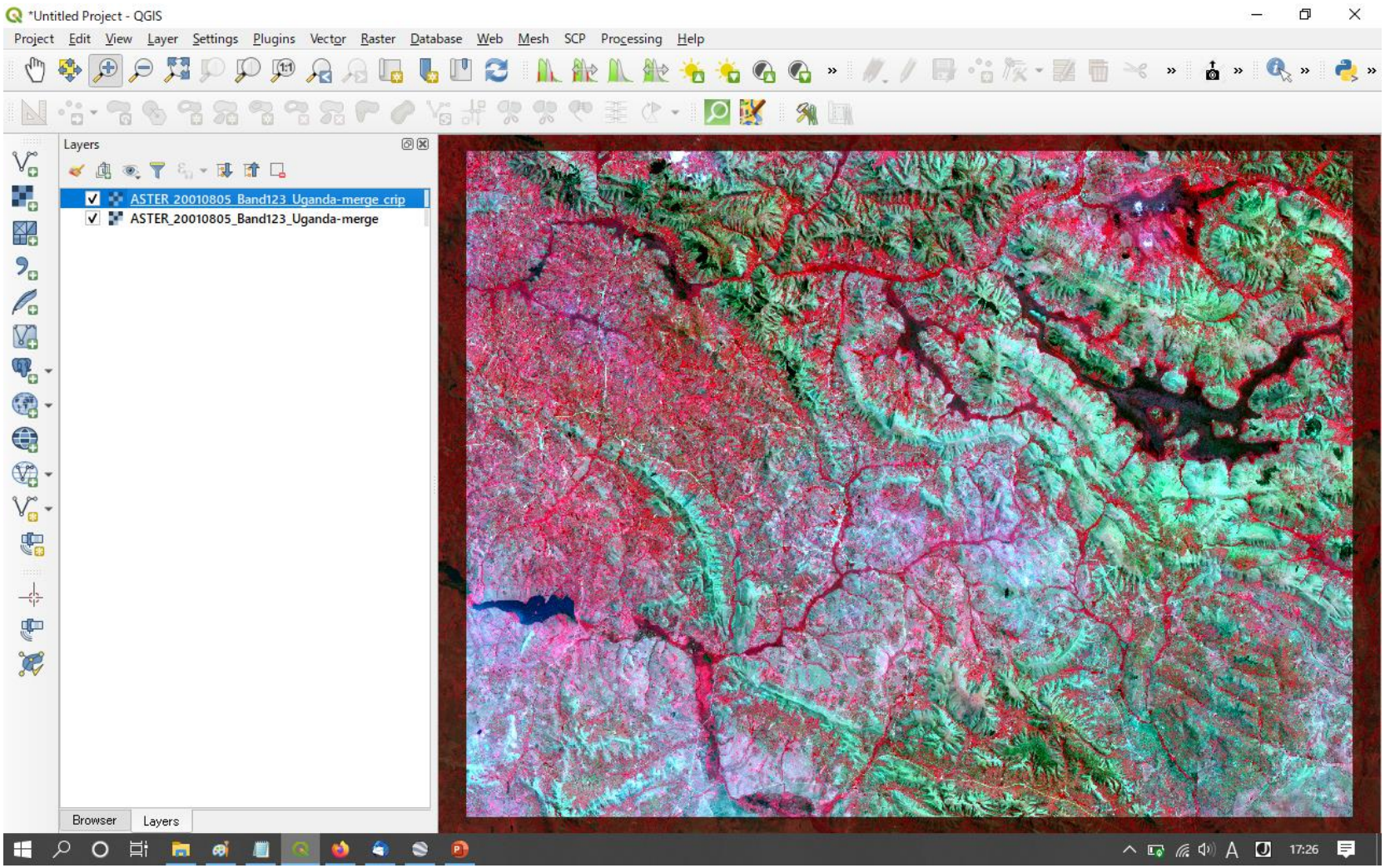
Change property

- Open property window and change color.



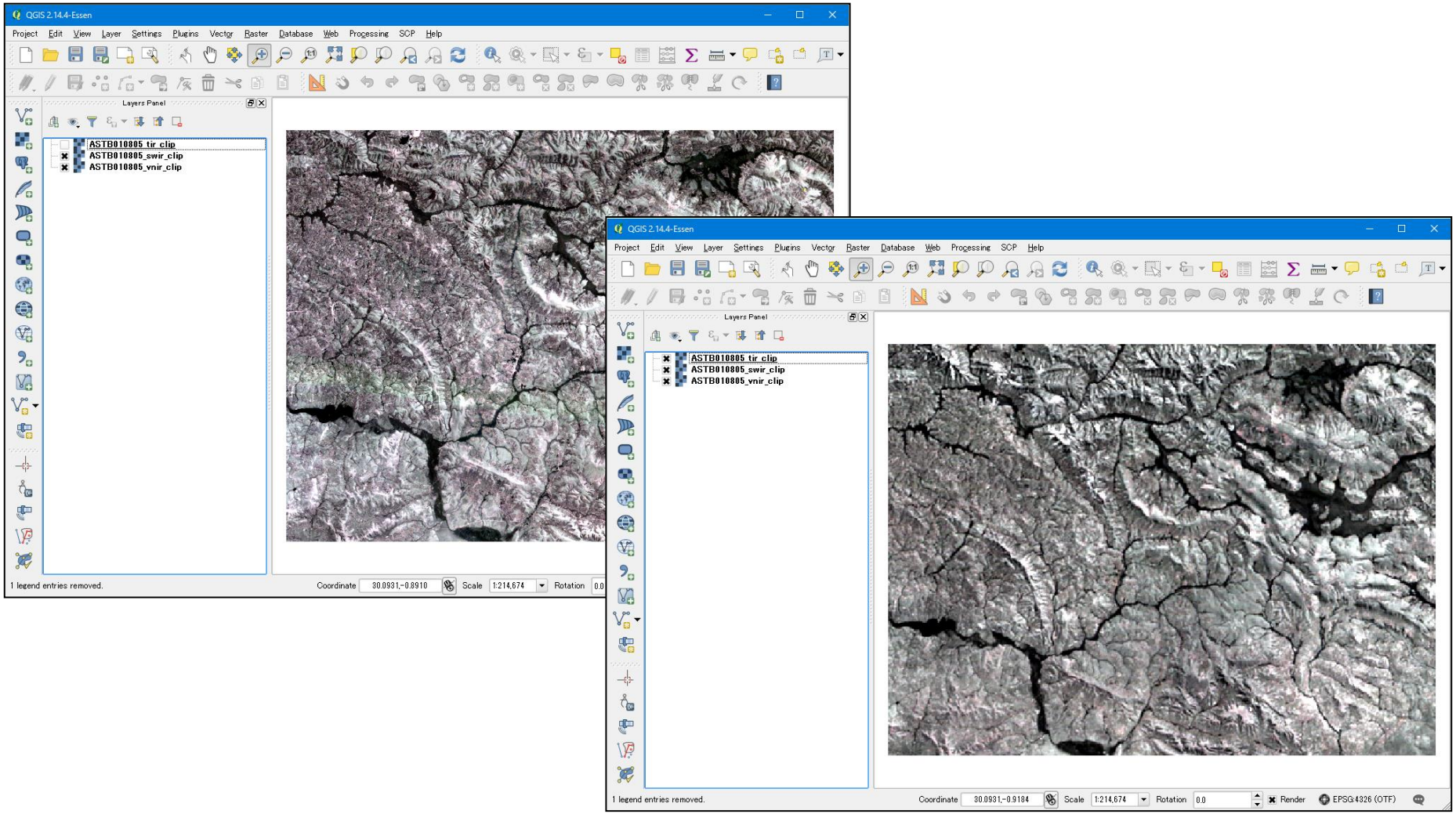
Change property

- Open property window and change color.



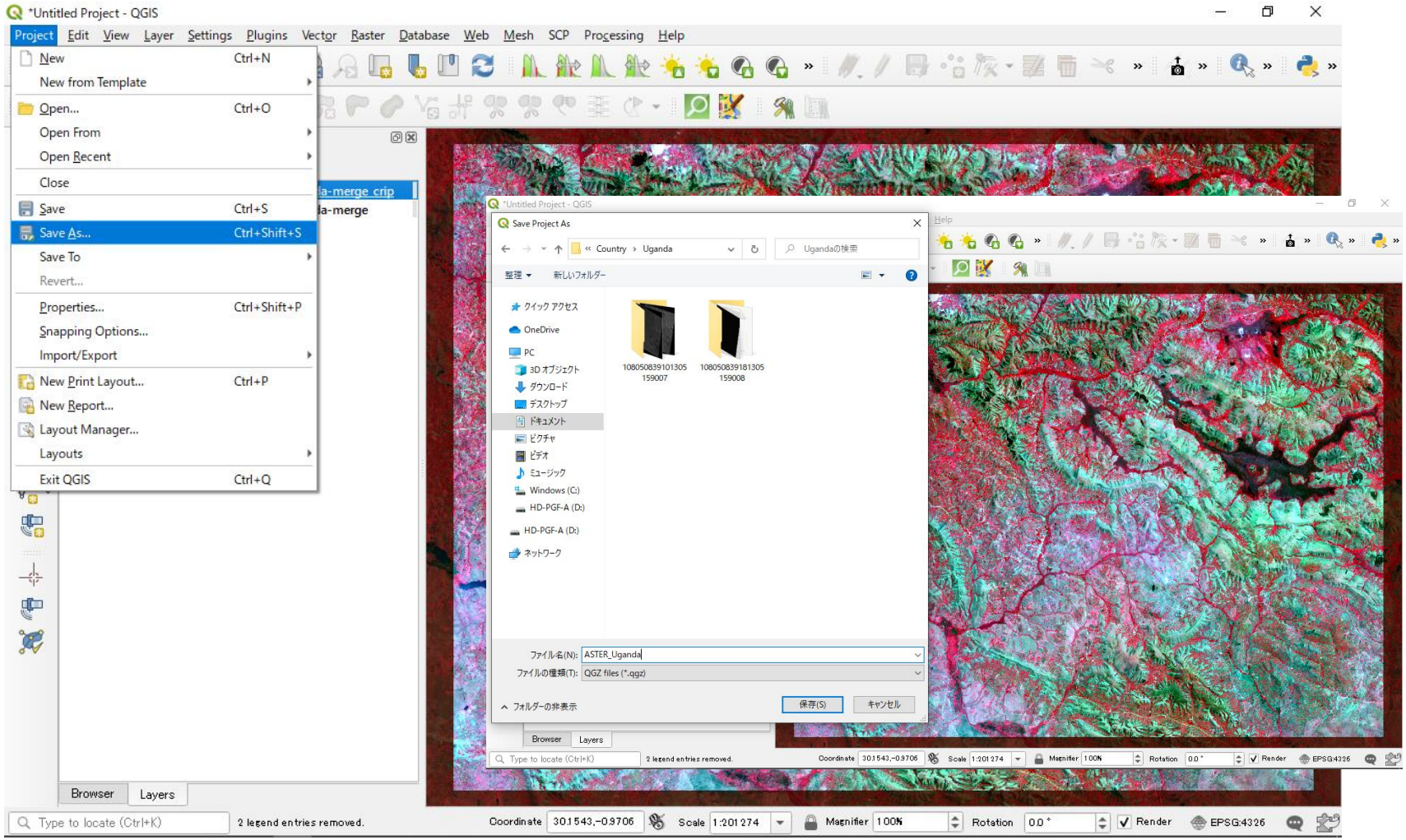
Create SWIR and TIR

- Make clipped images of SWIR and TIR.



Save project

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



Artisanal, Small-scale / Illegal mining monitoring in Kenya

Artisanal, Small-scale Mining in Kenya

IN PICTURES: Kenya's gold rush

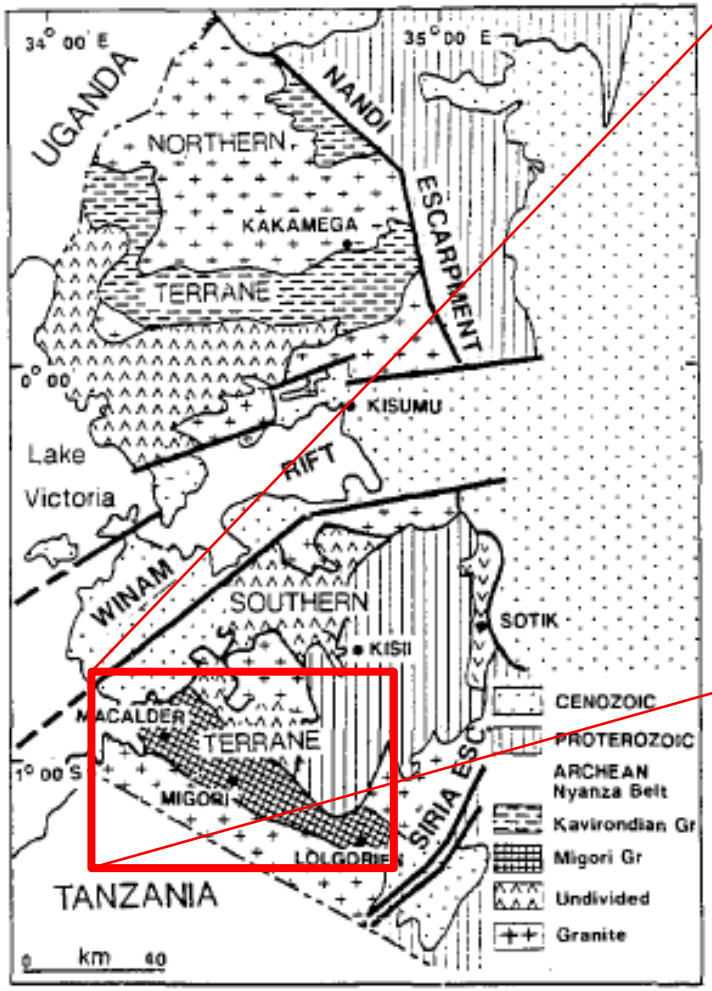
AFRICA Friday 11 March 2016 - 12:25pm

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

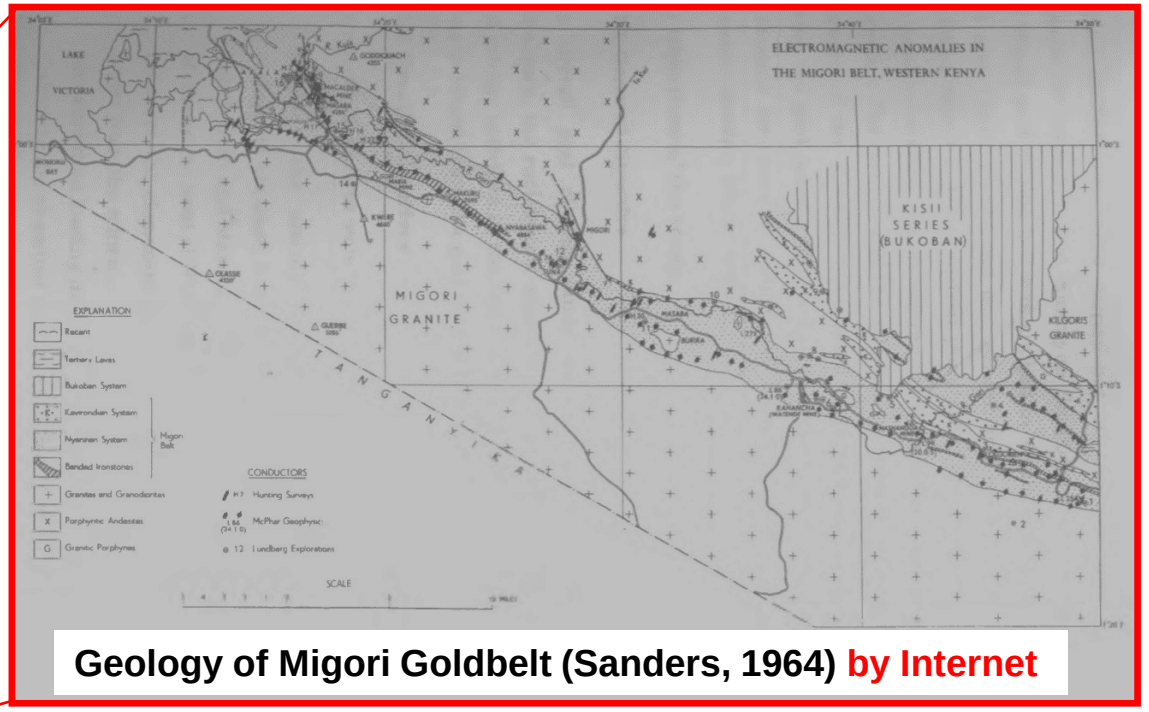
According to the Mines and Geology Department at the Ministry of Environment and Natural Resources of Kenya, the gold capacity of Migori alone stands at 34 tonnes per year. That could earn the country some $670 million (67 billion Kenya shillings) annually, according to a local report.

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

Artisanal, Small-scale Mining in Kenya

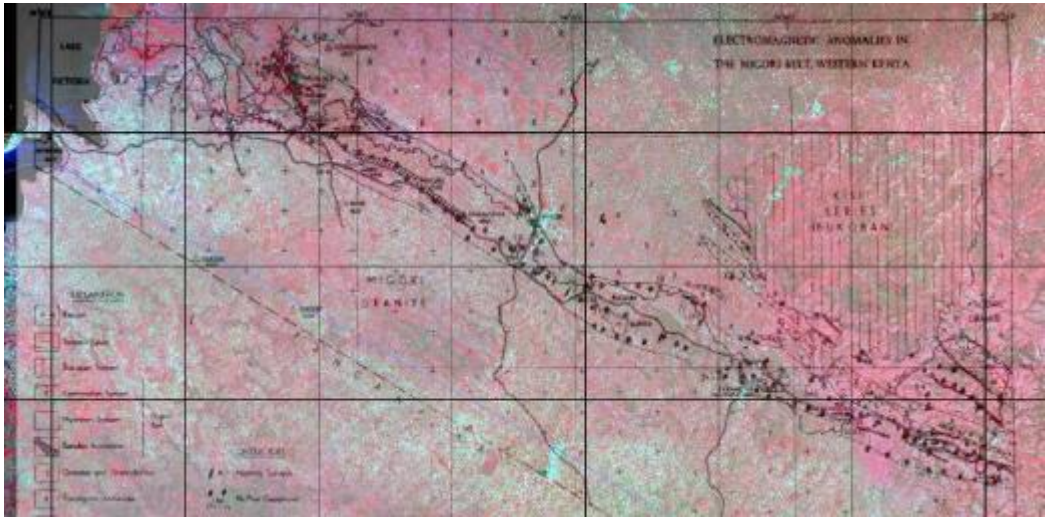


Ichang'I (1990)



Geology of Migori Goldbelt (Sanders, 1964) by Internet

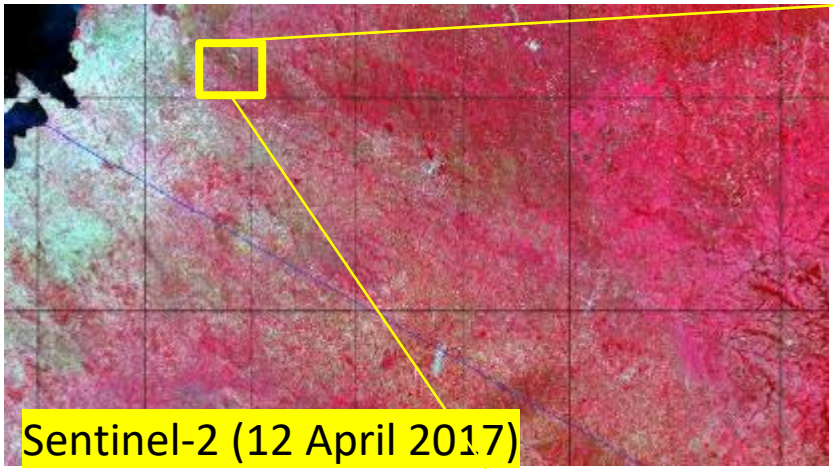
Migori Geology on Sentinel-2

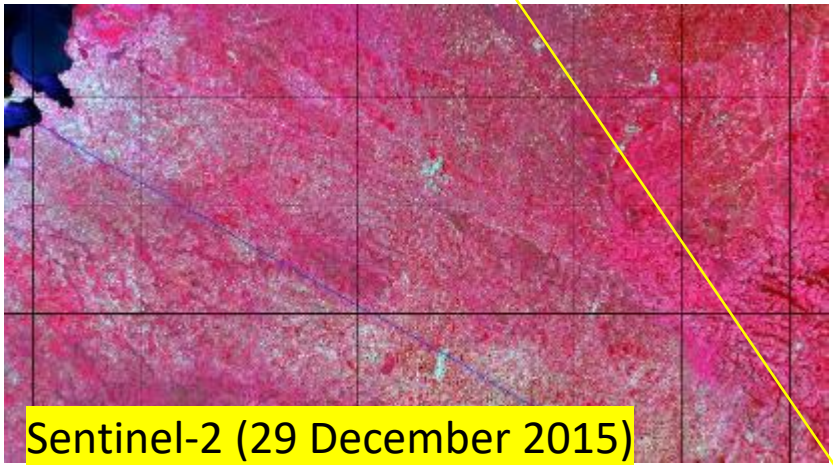


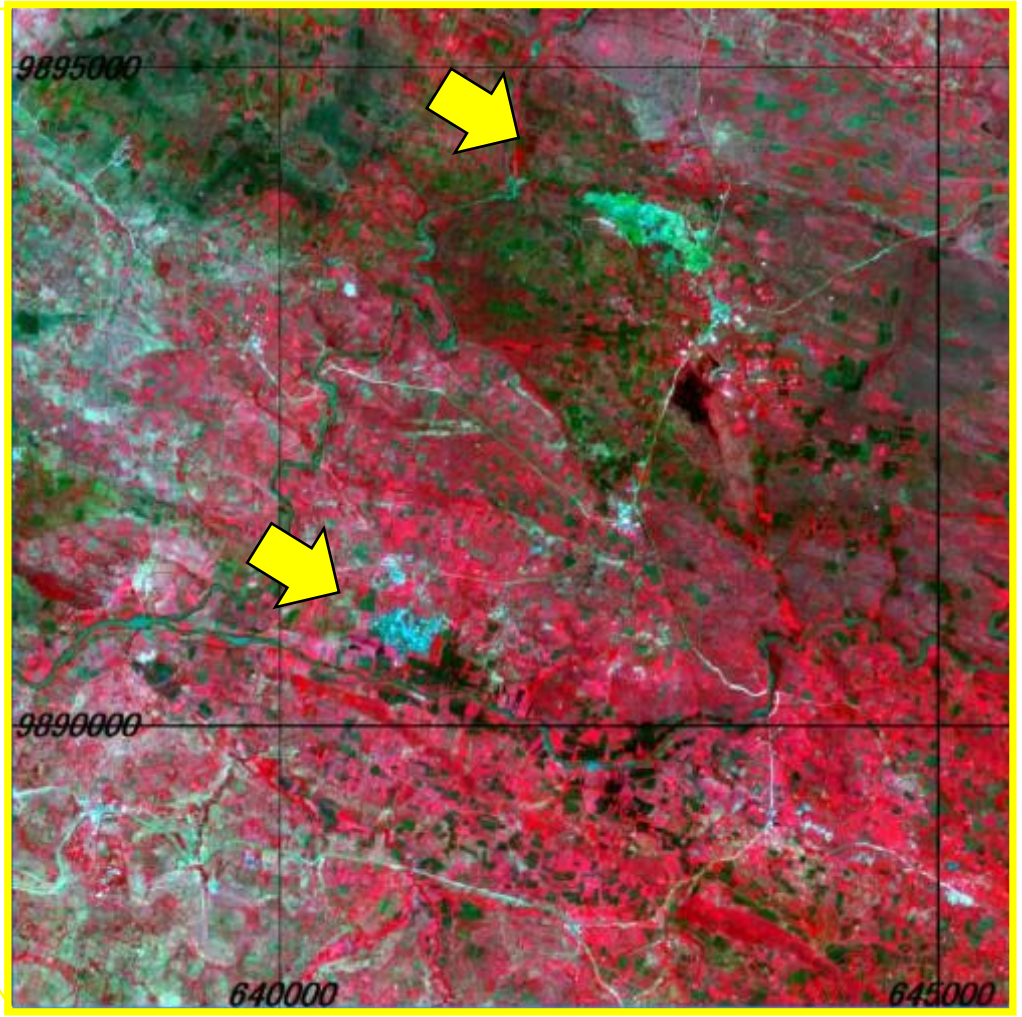
Artisanal, Small-scale Mining in Kenya

◆ **Hypothesis**

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







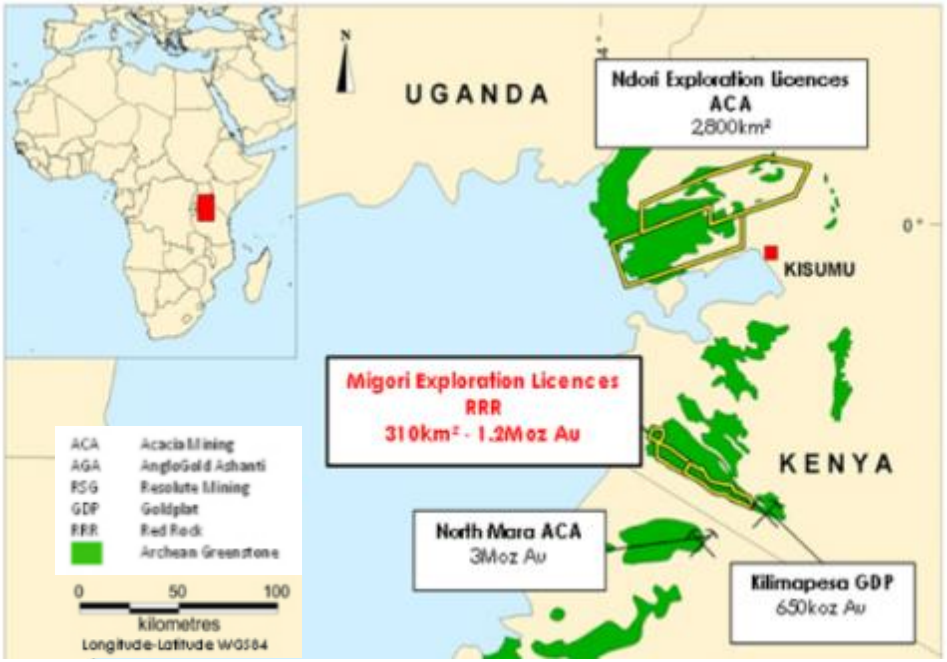
Migori district, Wetern Kenya

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)

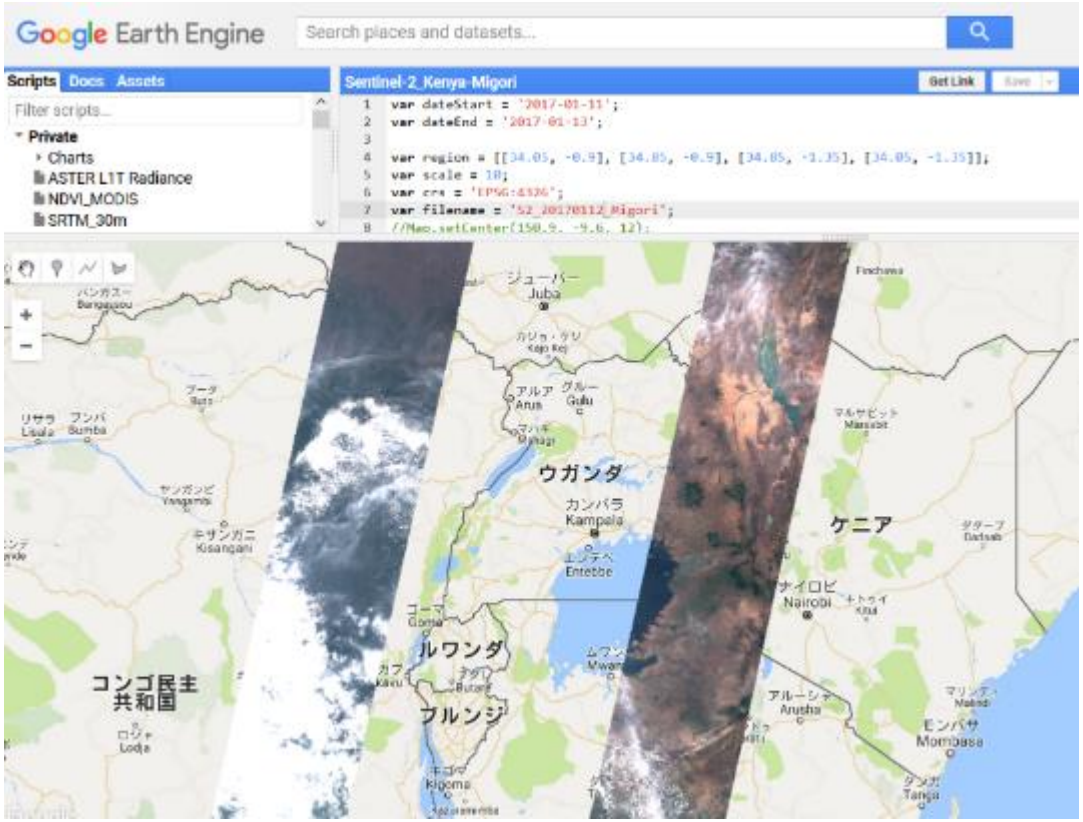
Geology

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 (10m resolution) and Google Earth Images



Sentinel-2 Launch dates:

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

2015/12/29
~2017/05/22

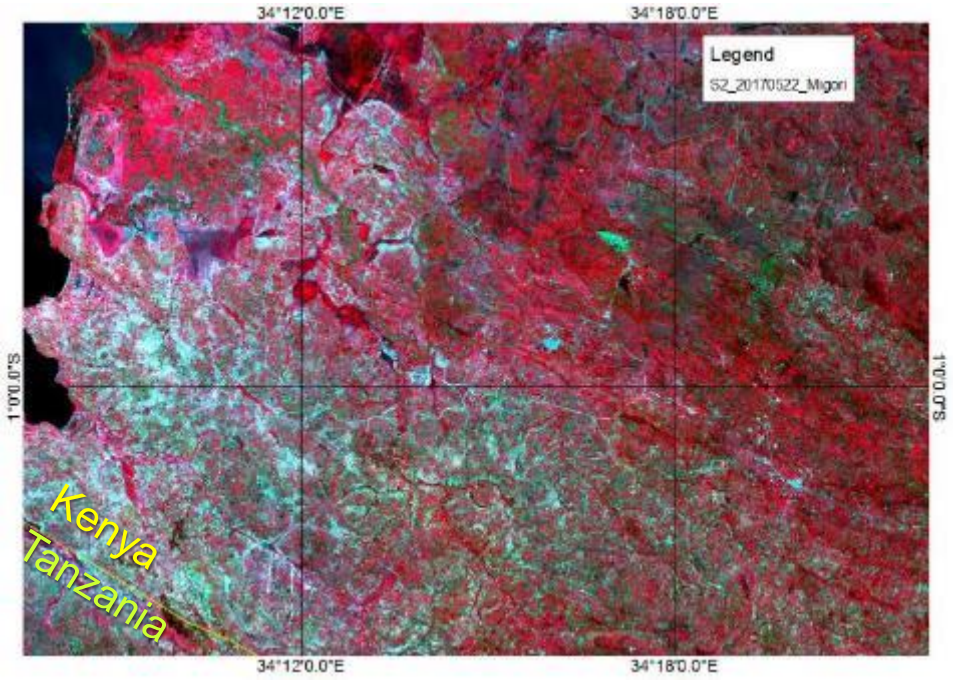
21 scenes

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

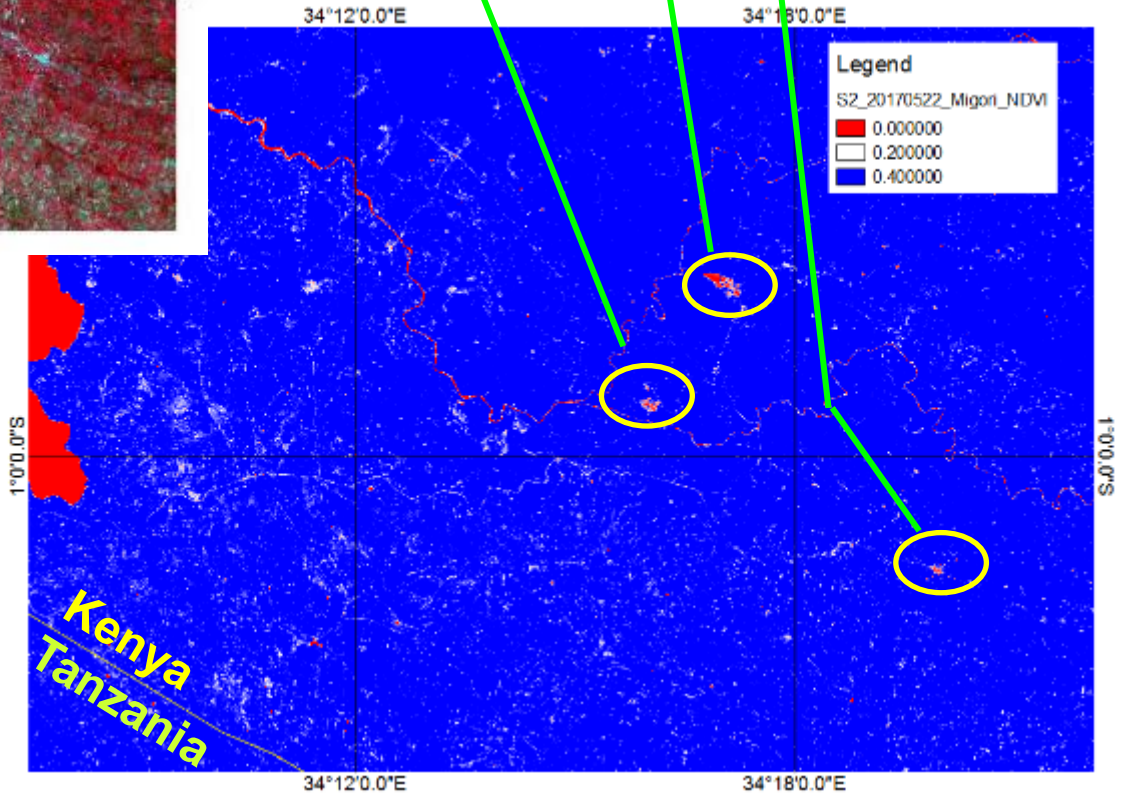
ASTER/Sentinel-2 and Google Earth Images



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

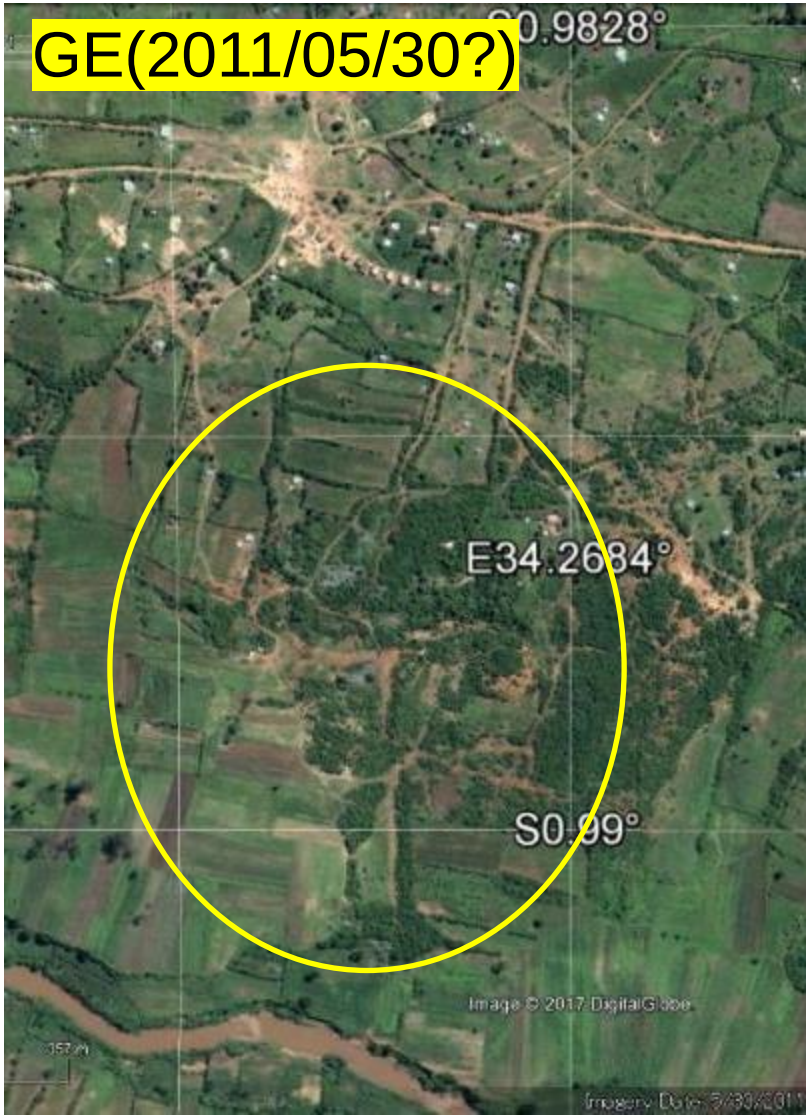
Unknown area:
Illegal mining?

Macalder
Tailing

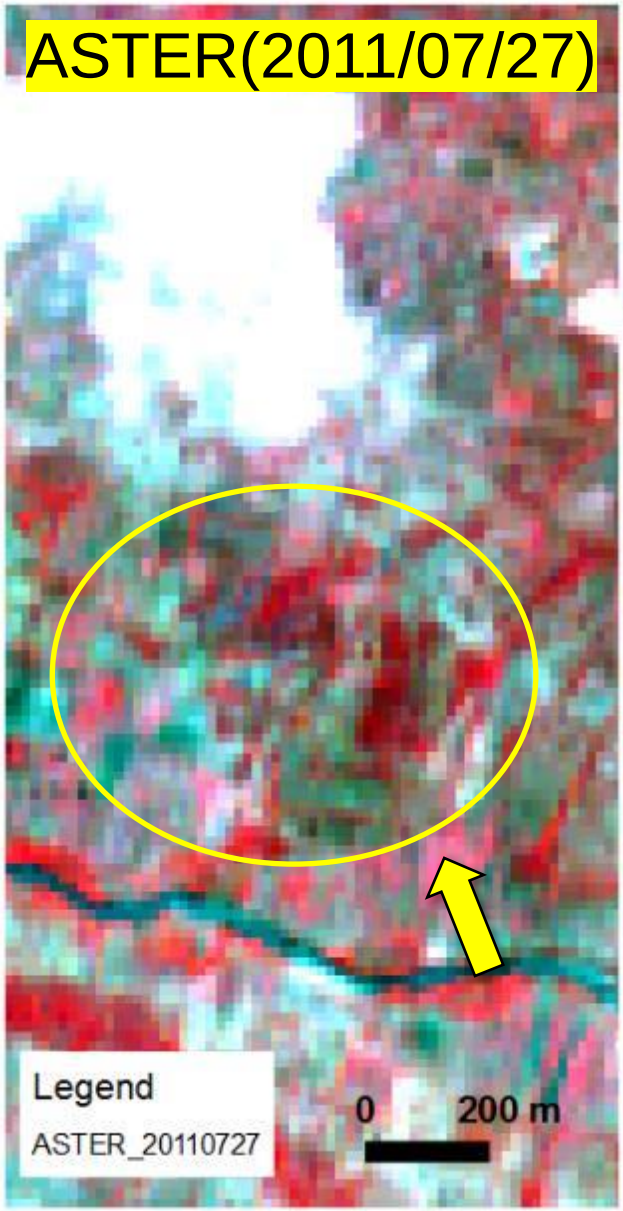


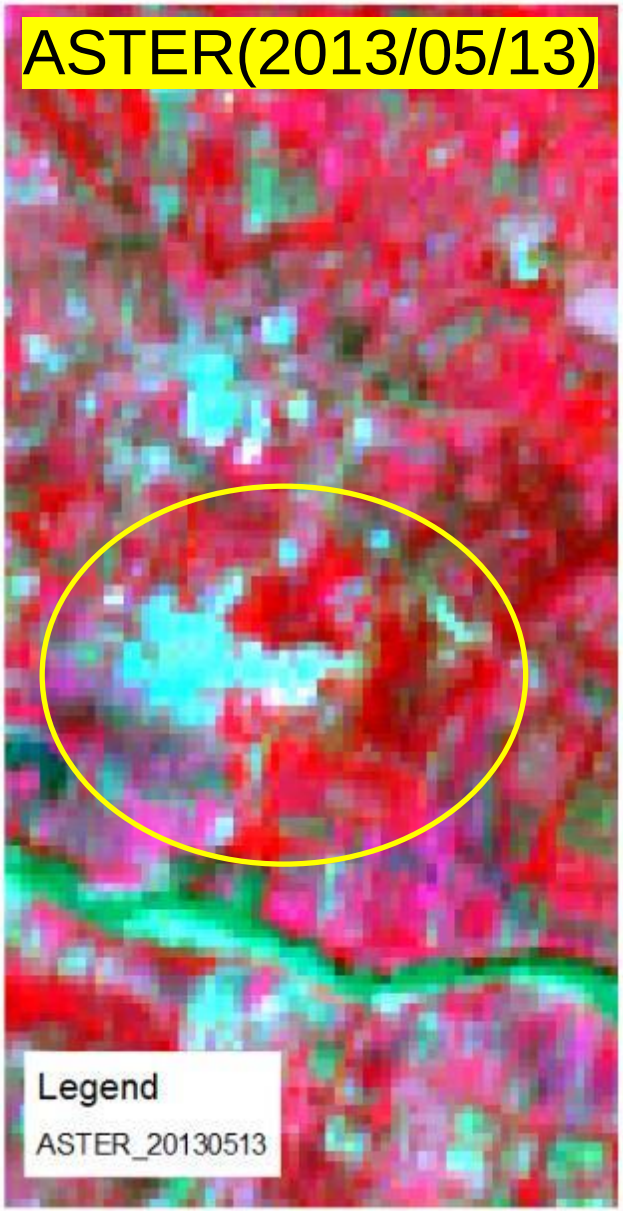
Bare land:
NDVI < 0

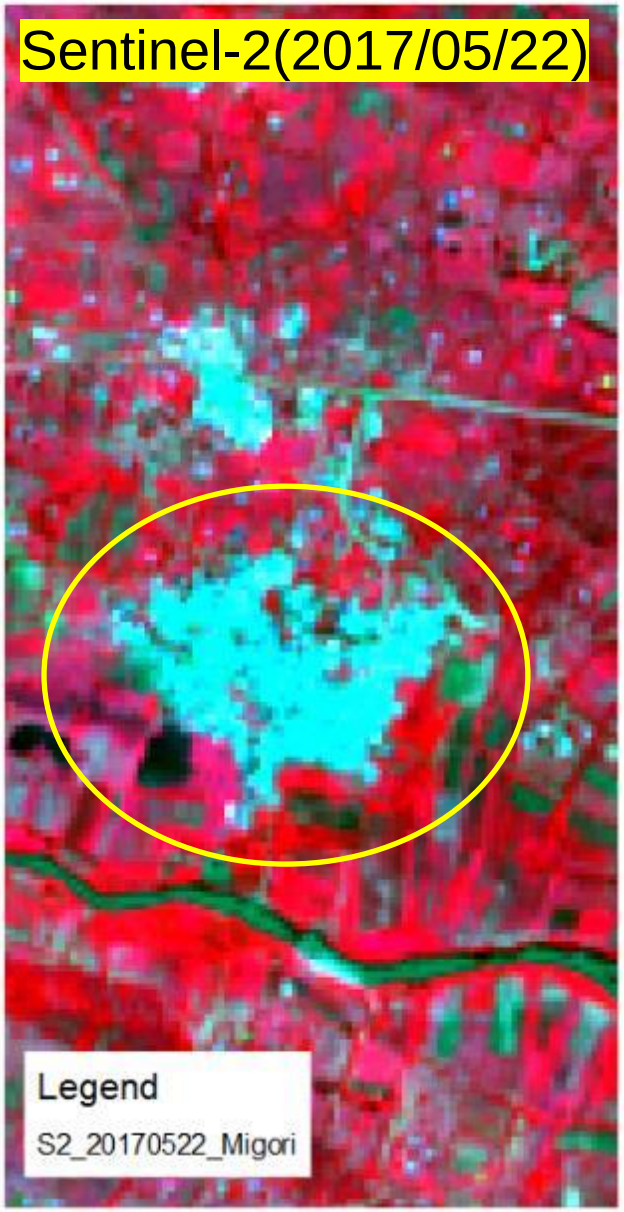
Google Earth Images



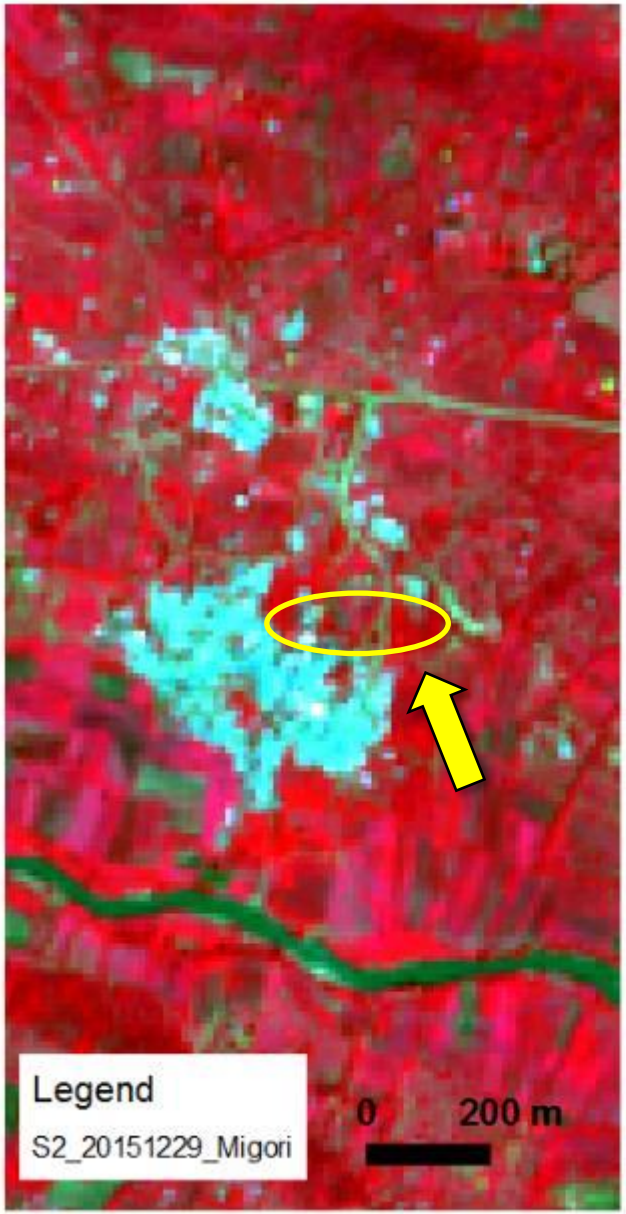
ASTER (15m resolution) and Sentinel-2 (10m resolution)

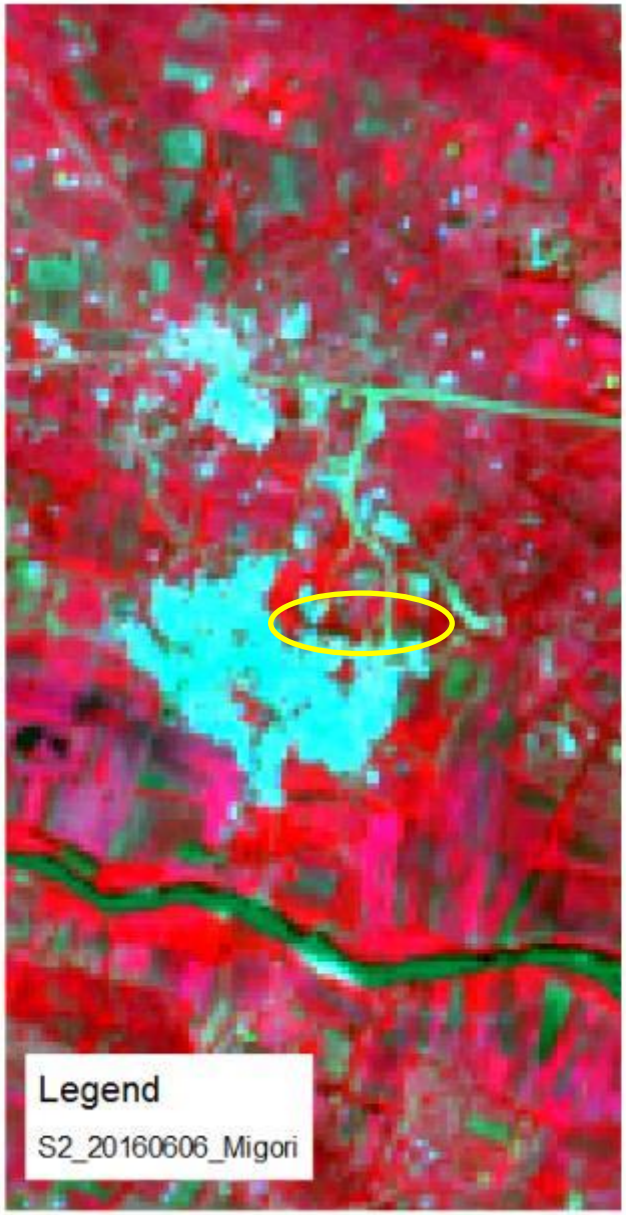


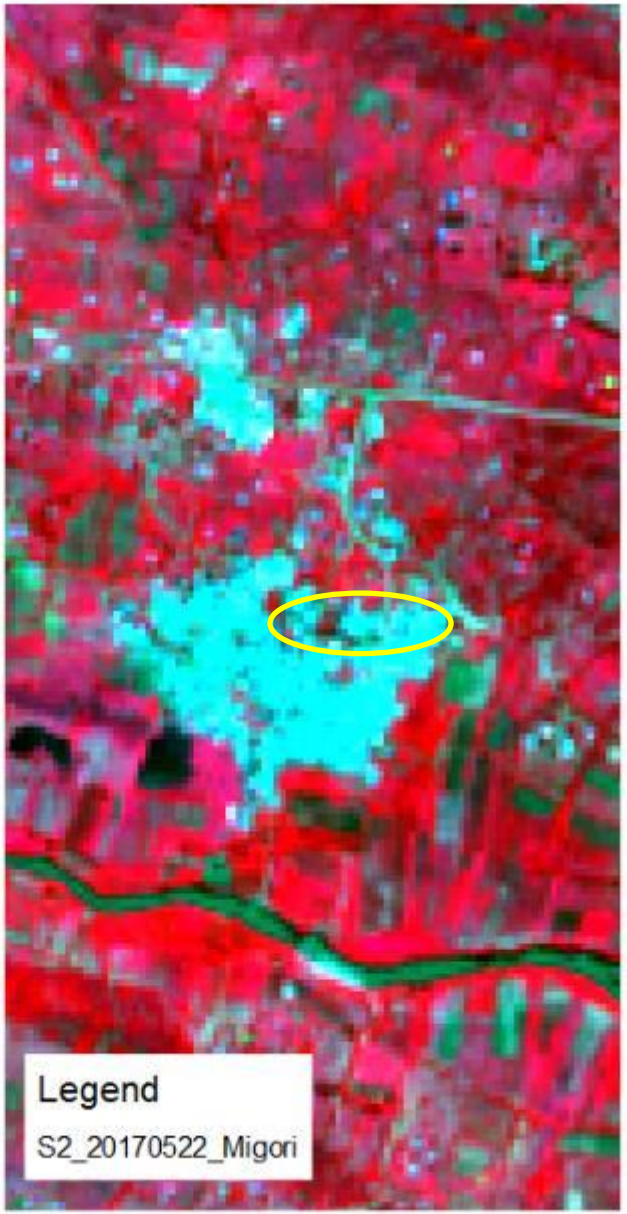




Sentinel-2 (10m resolution)







Ministry of Mining

Mining Cadastre Portal

MADINI KENYA

Mining Cadastre

- Home
- Mining Cadastre Map
- Sign In

Help and FAQ

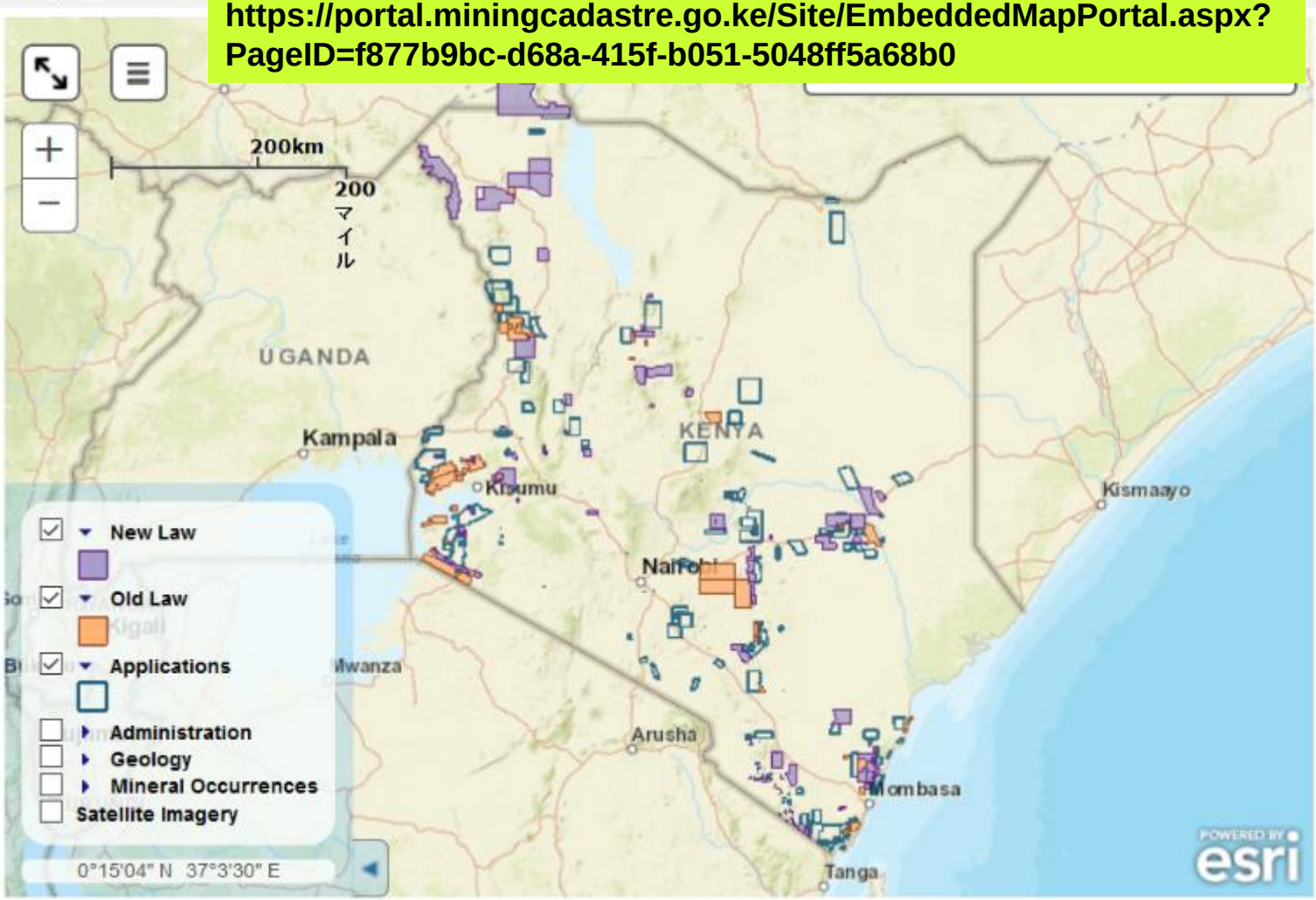
- Registration
- Licence Applications
- Conversion to WGS84
- Managing my Licence
- Payments
- Mineral Dealers
- Explosives

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



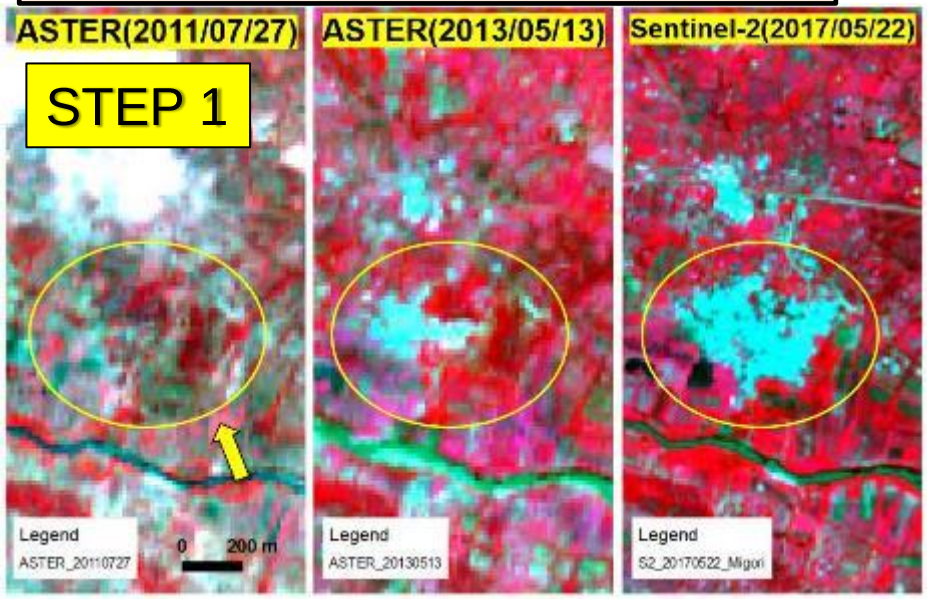
Simple steps for sustainable illegal mining monitoring

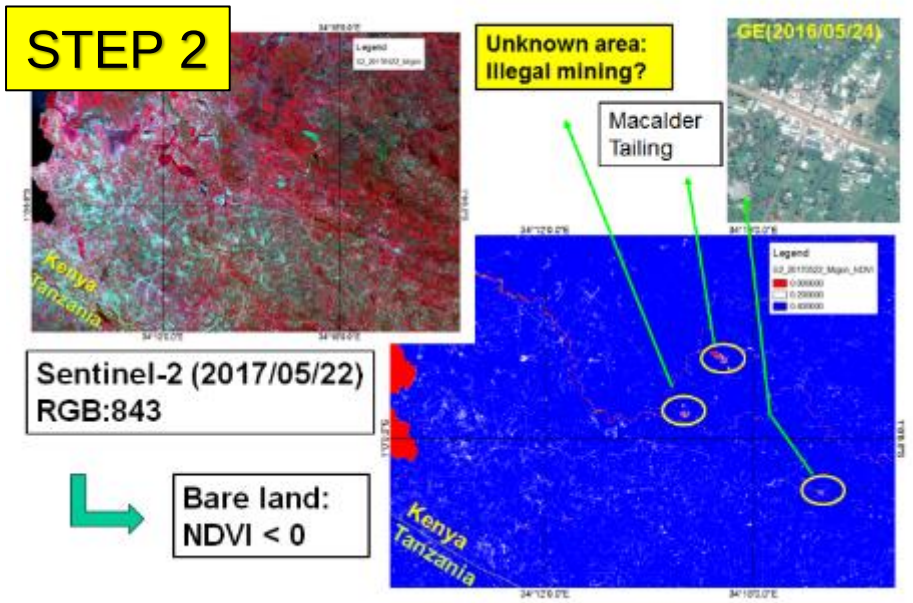
Step 1. Monitoring of Free images (L-8, ASTER and Sentinel-2)

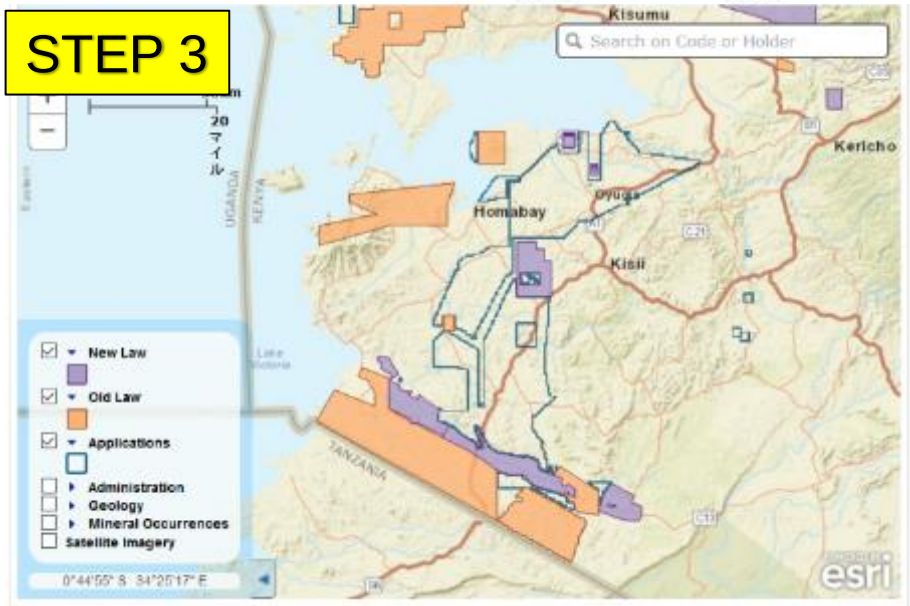
Step 2. Assessing images by NDVI with Google Earth on QGIS

Step 3. Comparing cadastre data

Step 4. Detecting illegal mining







Illegal mining monitoring by others for same place

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.

UKaid from the British people

ALLIANCE FOR RESPONSIBLE MINING

pact building local promise.

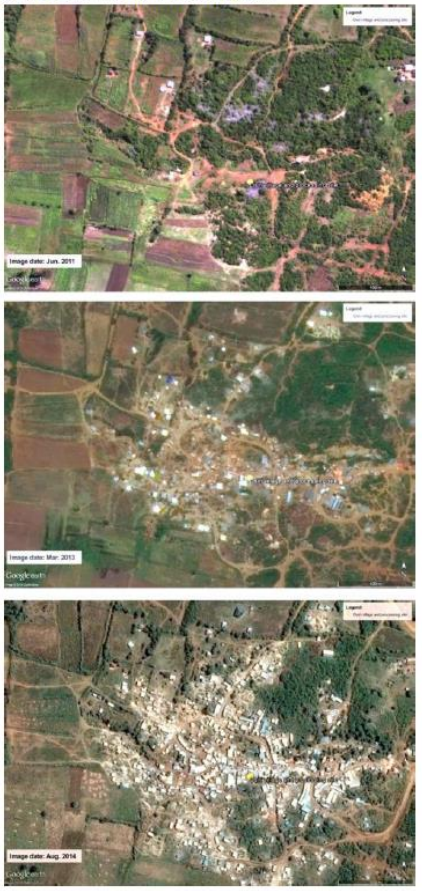
Economic Contributions of Artisanal and Small-Scale Mining in Kenya: Gold and Gemstones

January 2018

EARF EAST AFRICA RESEARCH FUND

This document is an output from a project funded by the UK Department for International Development (DFID) through the Research for Evidence Division (RED) for the benefit of developing countries. However, the views expressed and information contained in it is not necessarily those of, or endorsed by DFID, which can accept no responsibility for such views or information or for any reliance placed on them.

Figure A38: Evolution of Osiri between 2011 and 2014: The environmental footprint has increased as the area's economic significance has grown.



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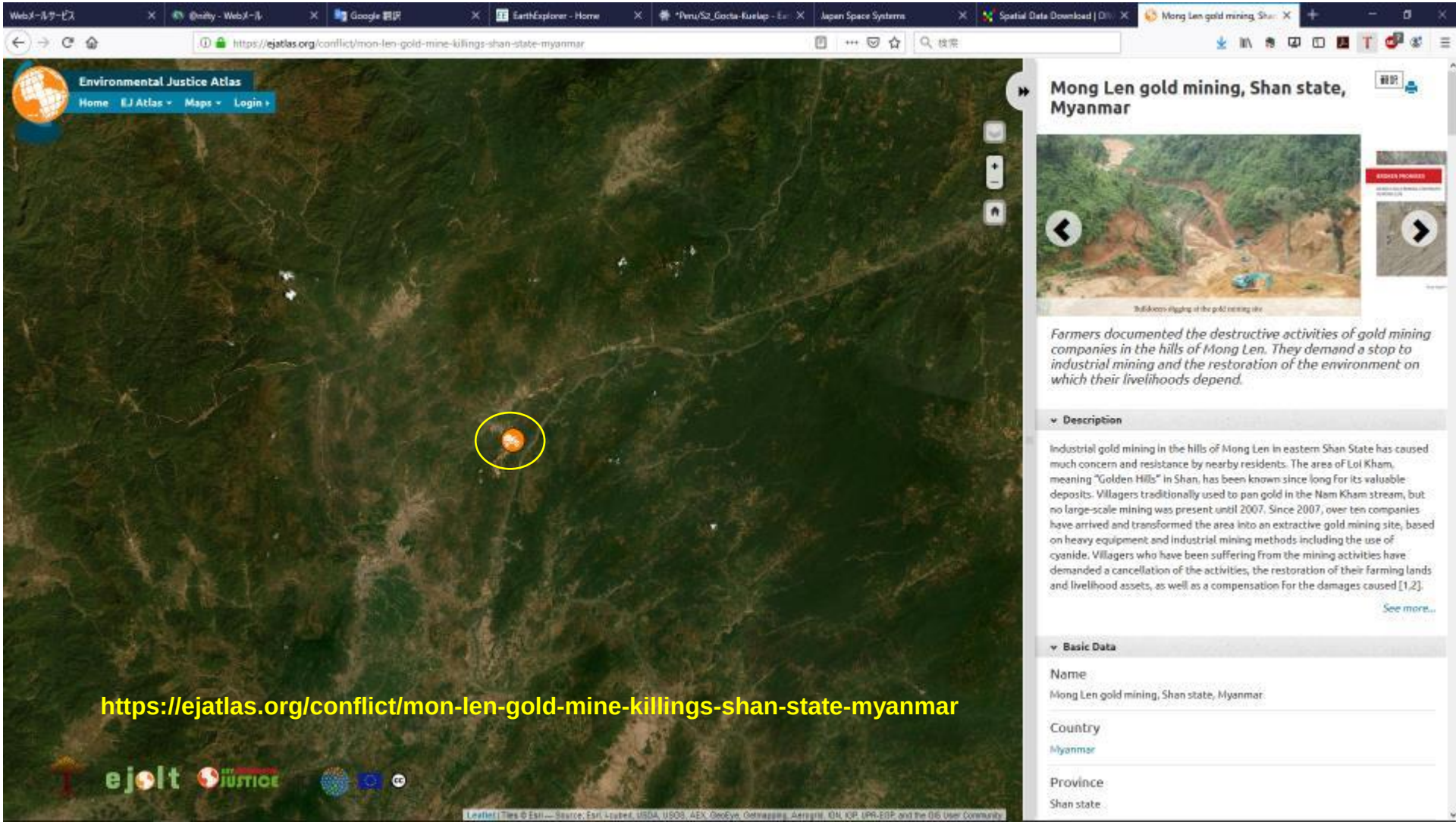
Artisanal, Small-scale / Illegal mining monitoring in Myanmar

3) Project experience with Myanmar (2016)

■ Environmental Justice Atlas (Mong Len Gold Mining)



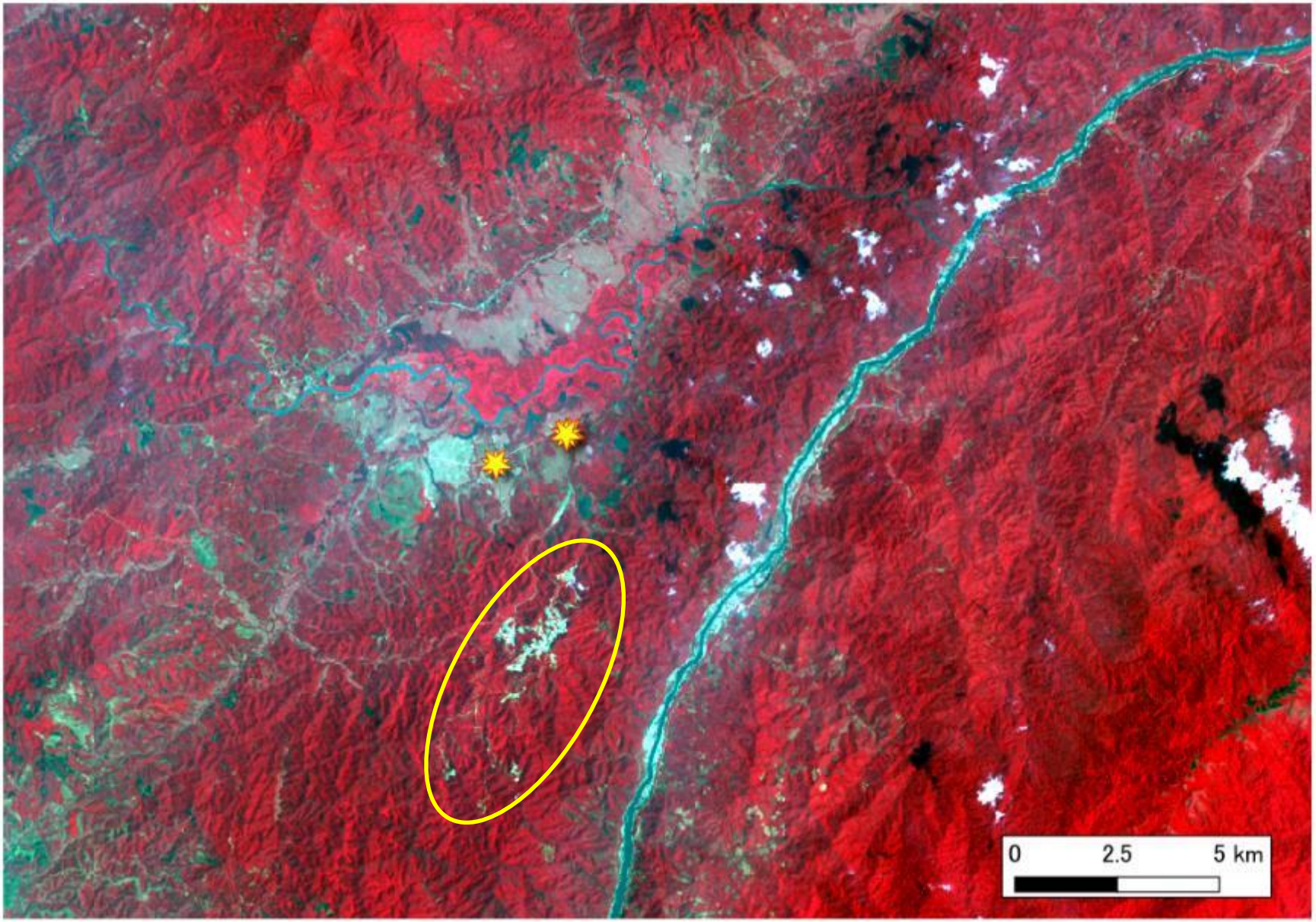
3) Project experience with Myanmar (2016)

3) Project experience with Myanmar (2016)

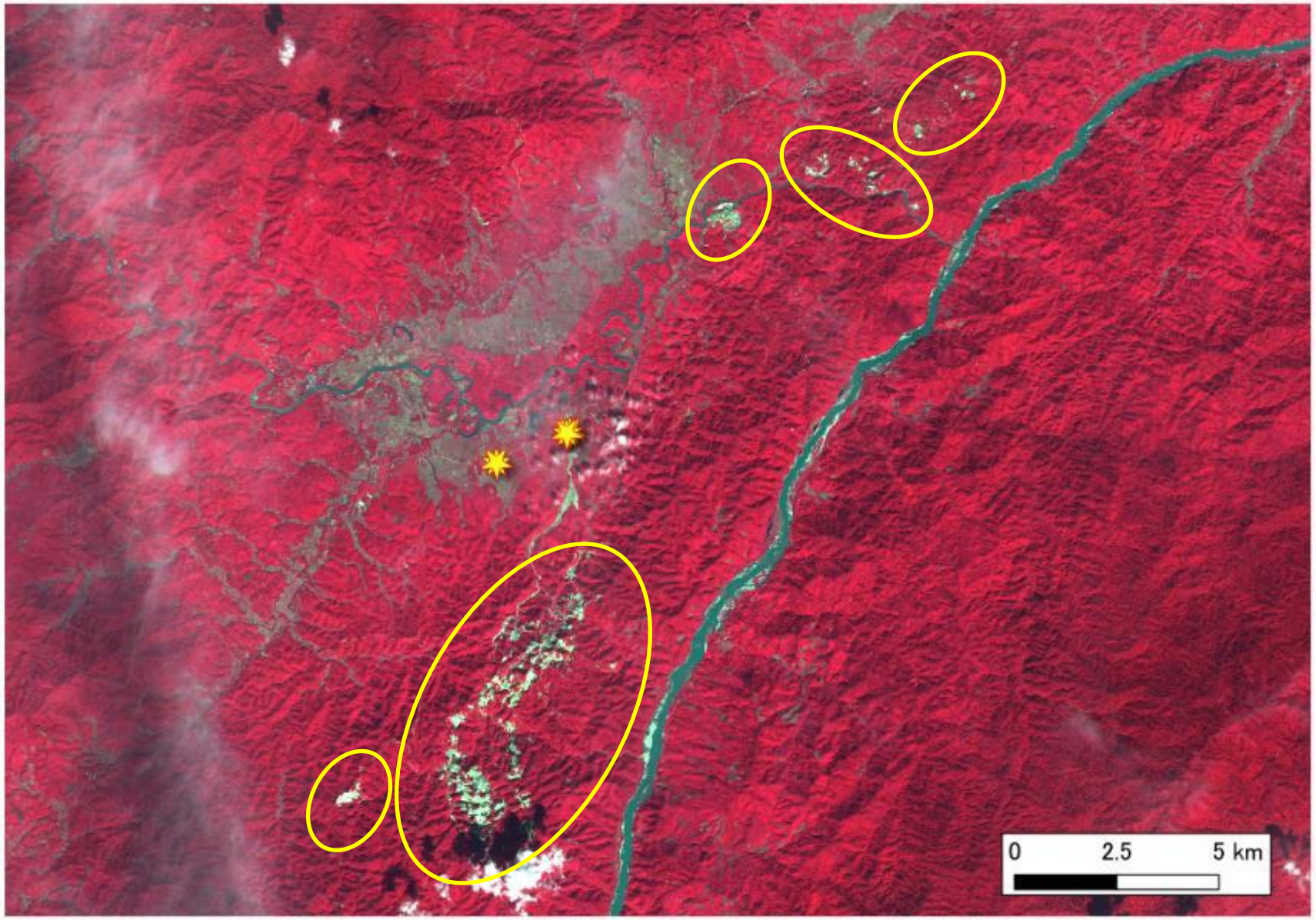
- The dominant method used by large scale gold mines is chemical leaching using cyanide, while small-scale miners use mercury.
- While cyanide and mercury are both hazardous substances.
- Cyanide can obtain very high recovery rates - often 90% of the gold in the ore - and it is cheap.
- Innovations in 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’

3) Mong Len Mining Area (Landsat-8, 2013/04/01)



3) Mong Len Mining Area (Sentinle-2, 2017/11/17)



3) Mong Len Mining Area (Sentinle-2, 2019/05/05)