Philippine Space Agency

SENTINEL ASIA

JAXA

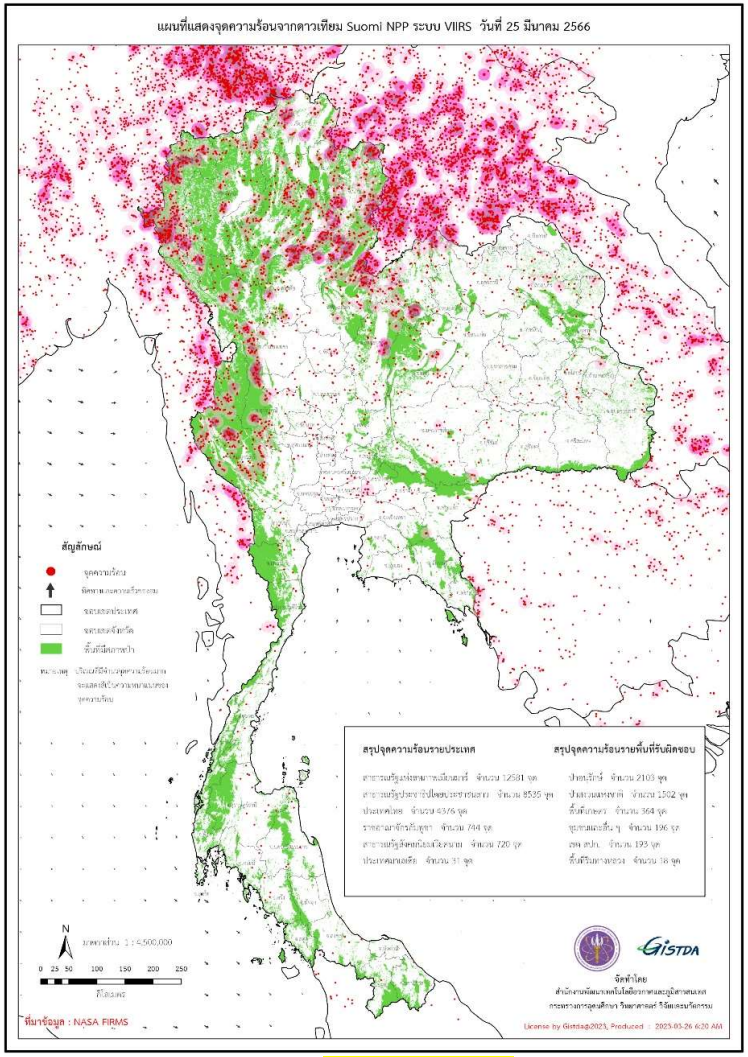
# Forest Fire monitoring


Ms.Thitawadee Suvachananonda

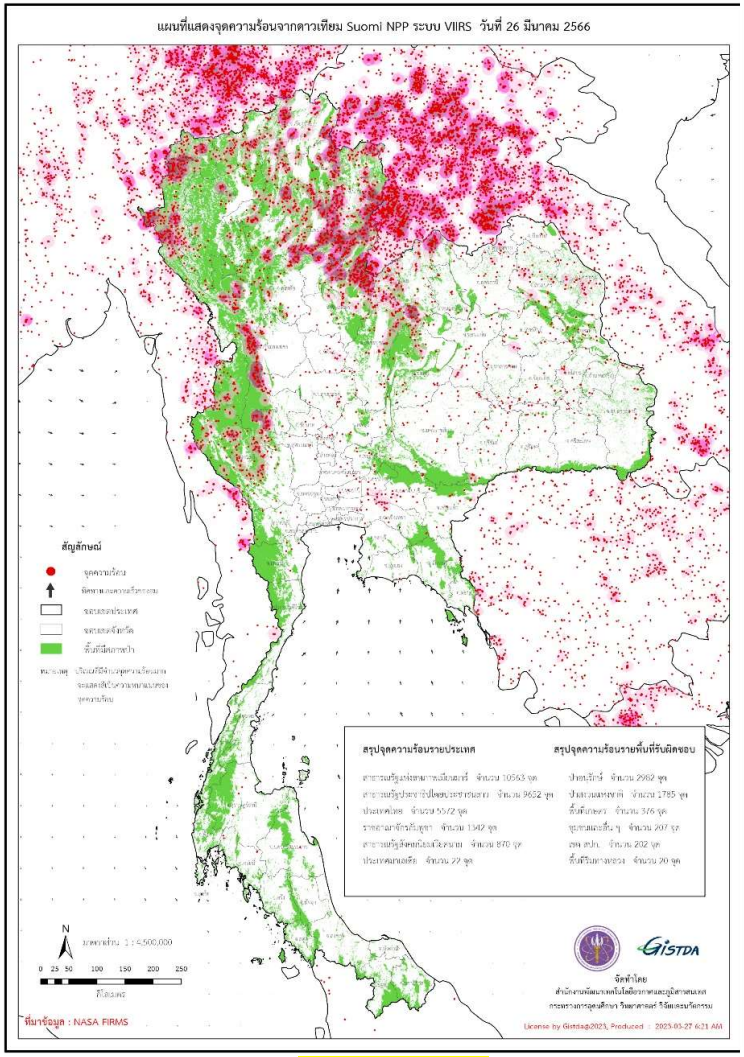
GISTDA Geo-Informatics and Space Technology Development Agency (Public Organization)

Space Agency

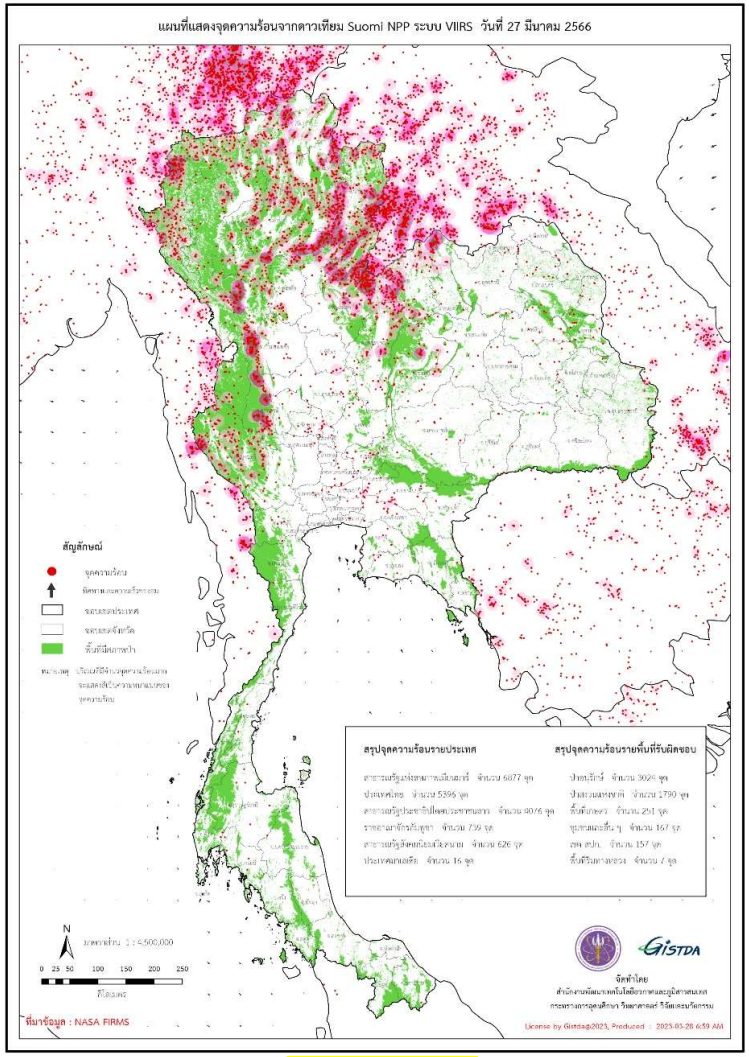
# Fire & Hotspot Monitoring



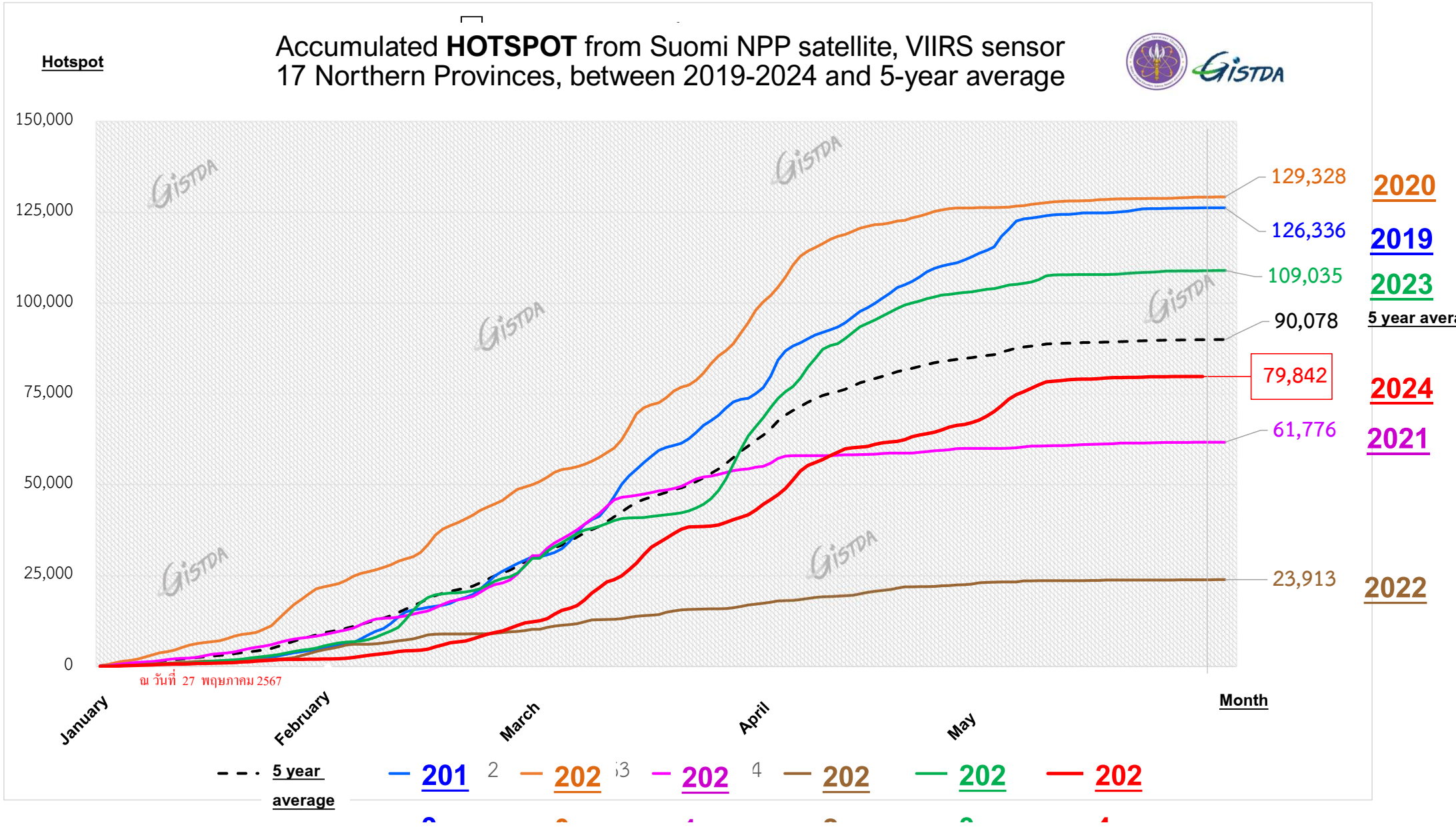

2023.03.25

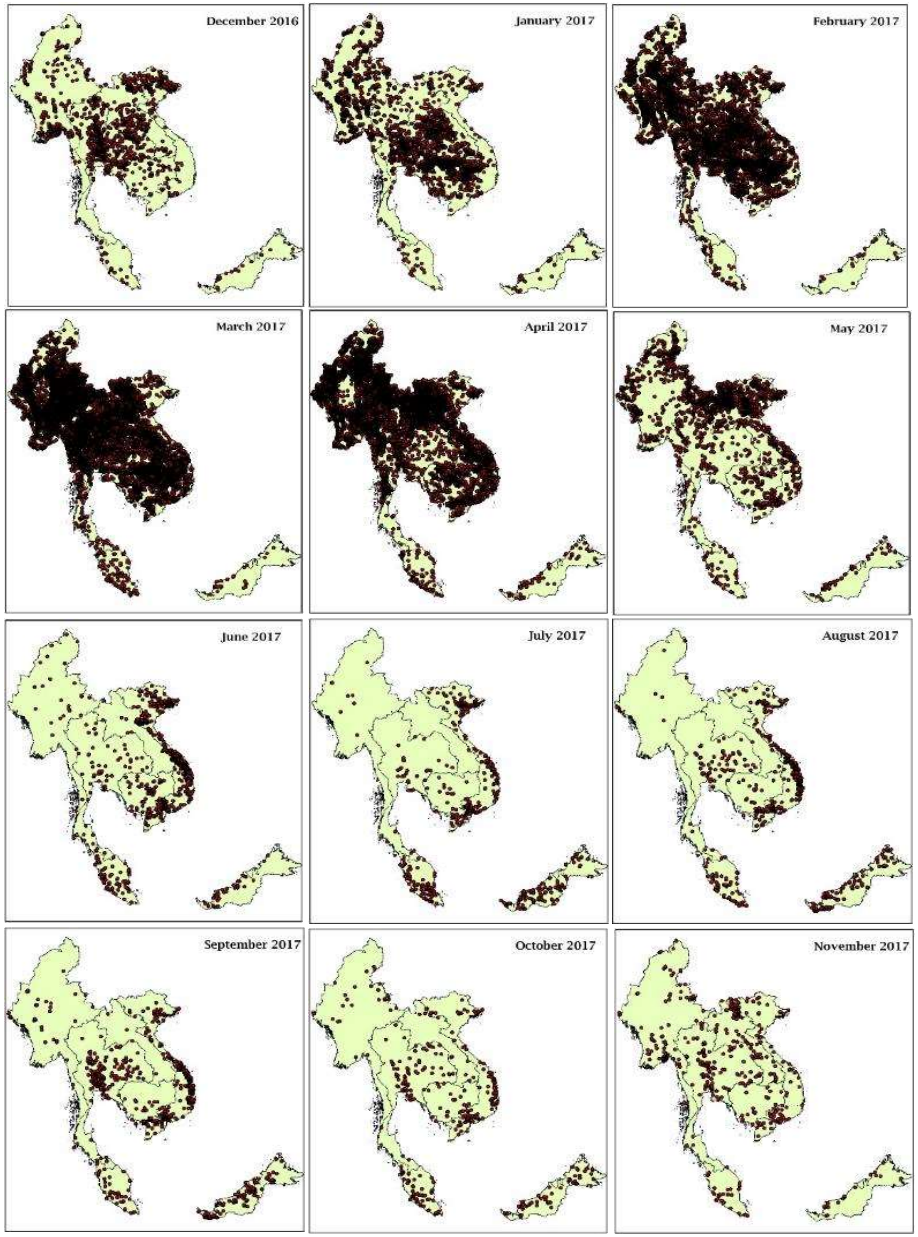



2023.03.26



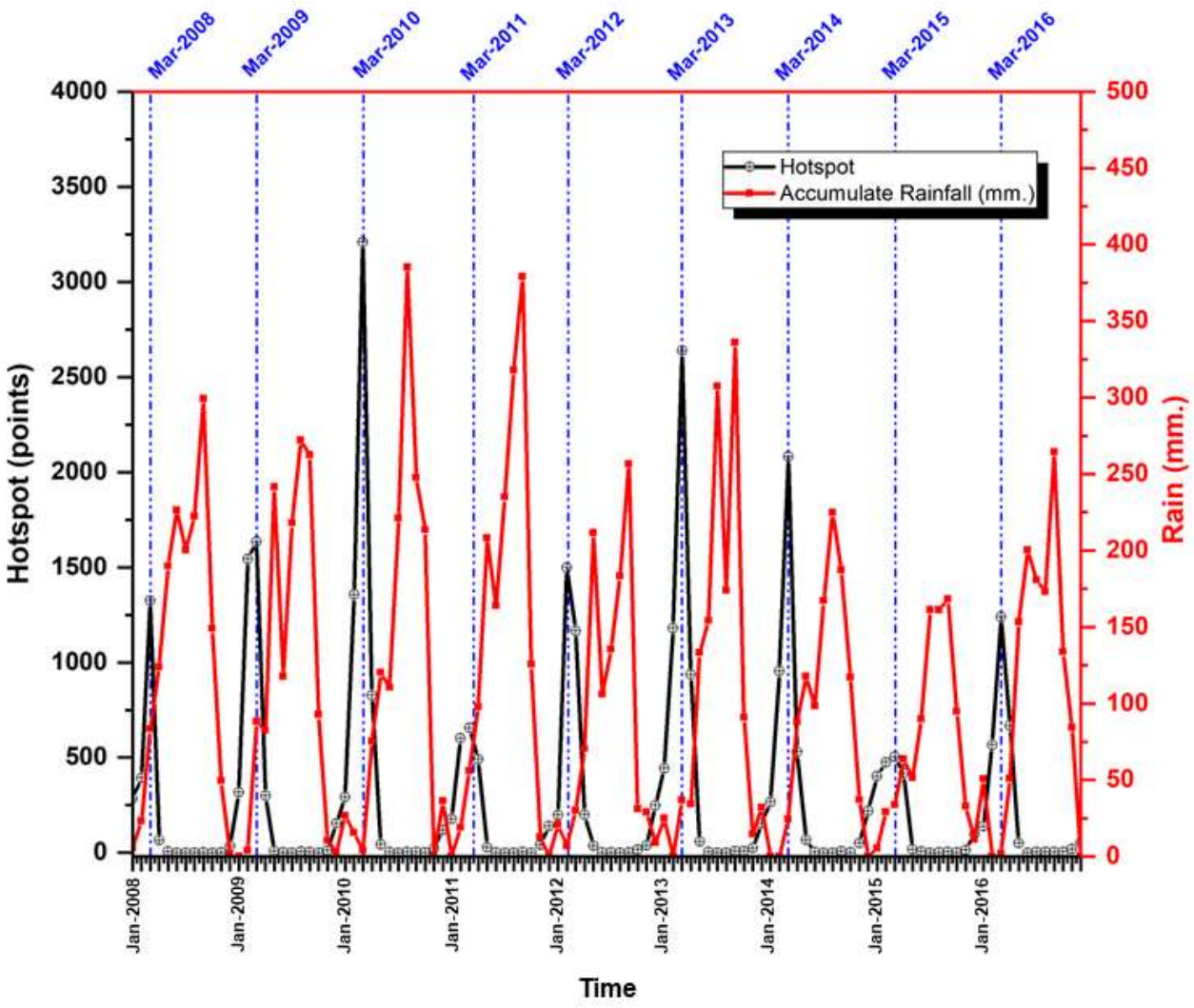

2023.03.27


Hotspot
Accumulated HOTSPOT from Suomi NPP satellite, VIIRS sensor
17 Northern Provinces, between 2019-2024 and 5-year average
GISTDA
150,000
125,000
100,000
75,000
50,000
25,000
0
129,328
2020
126,336
2019
109,035
2023
90,078
5 year aver
79,842
2024
61,776
2021
23,913
2022
ณ วันที่ 27 พฤษภาคม 2567
January
February
March
April
May
Month
5 year average
2012
2013
2014
2022
2023
2024




# การพิจารณากรอบระยะเวลา การวิเคราะห์ข้อมูล

The time-series of MODIS hotspots over one part of the SEA countries acquired between December 2016 and November 2017




The time-series of MODIS hotspots dataset collected between 2008 and 2016 (black line), depicting the wildfire season which occurred within the study area and used to define the timeframe to calculate the burned area from Landsat data. Moreover, the average monthly accumulated rainfall (red line).

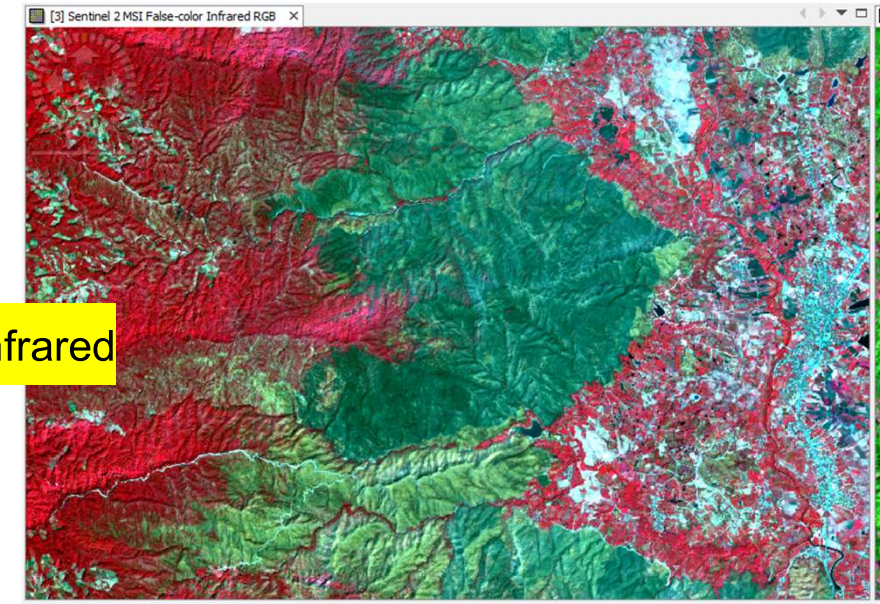
## Burnt scar/Burn area analysis

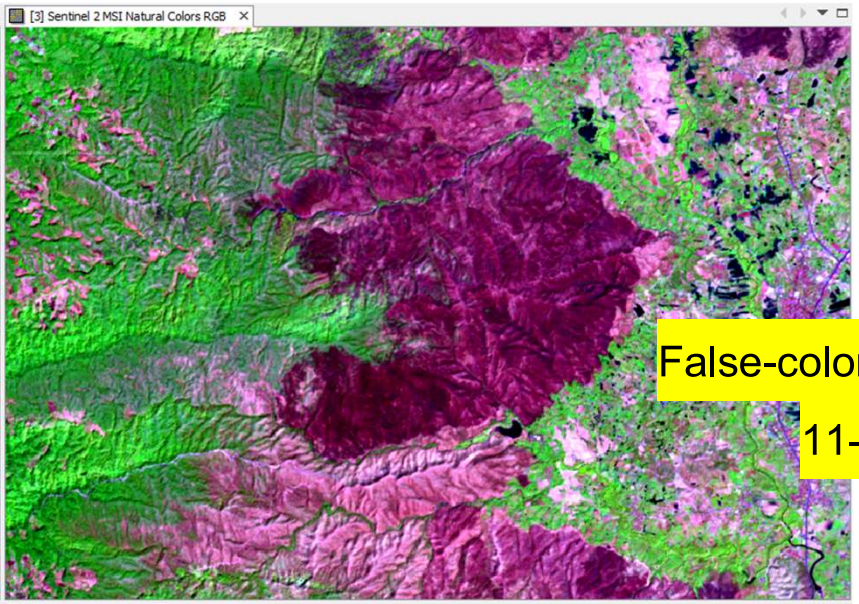
Sentinel-2A, 2B
(2 ดวง)

- 13-band MultiSpectral Instrument (MSI) recording system
  - 4 visible and near-infrared bands, 10 m resolution
  - 6 red edge and shortwave infrared bands, 20 m resolution
  - 3 atmospheric correction bands, 60 m
- resolution• 290 * 290 km imaging width
- Orbiting the same place every 5 days

False-color Infrared

8-4-3



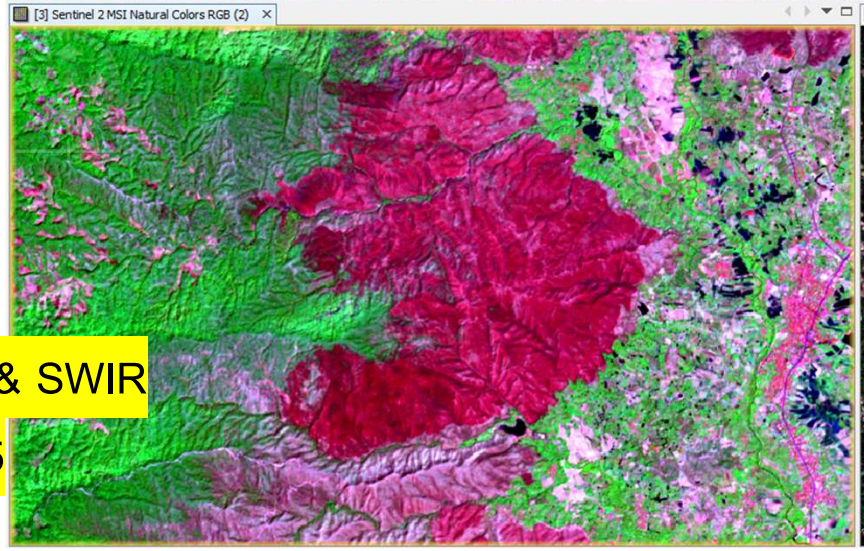



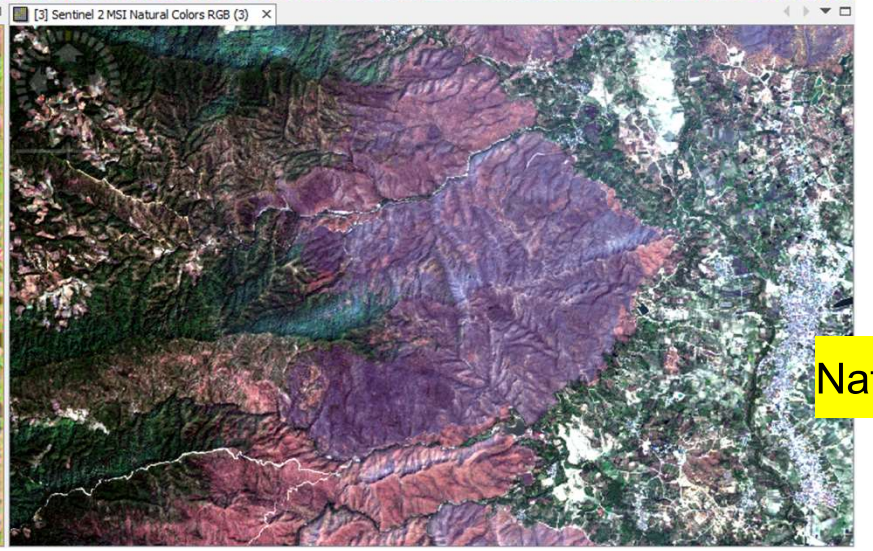

False-color IR & SWIR

11-8A-5

False-color IR & SWIR

12-8A-5



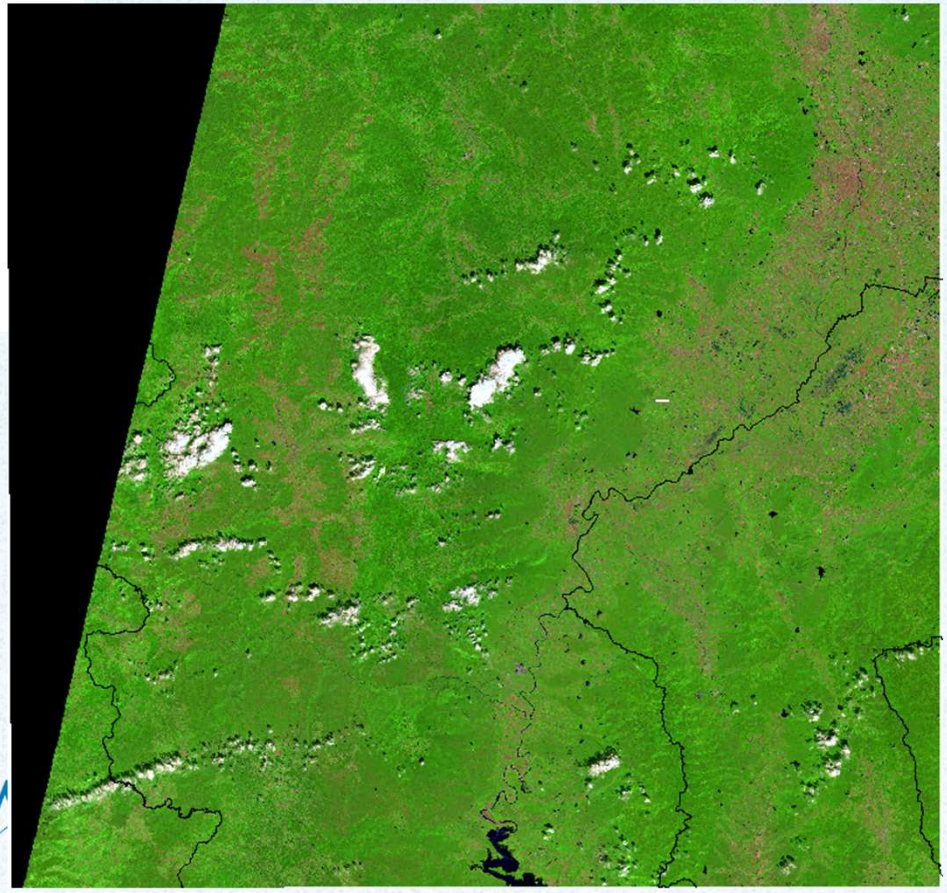



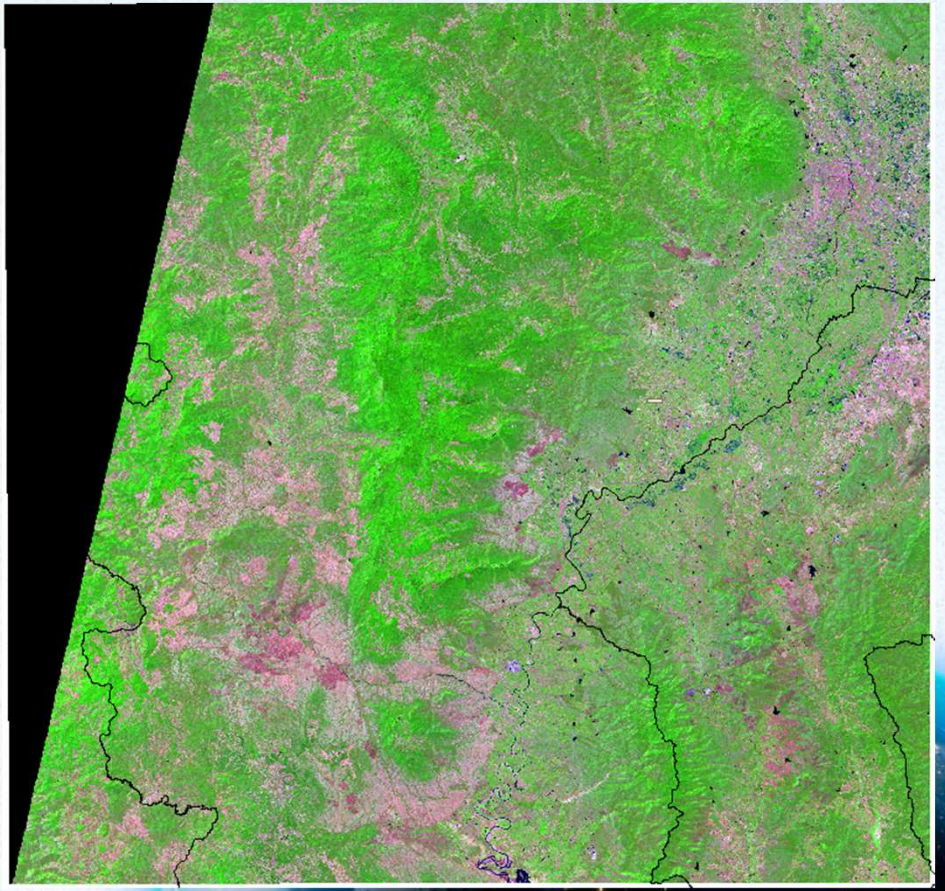

Natural Color

4-3-2

## Data and Software

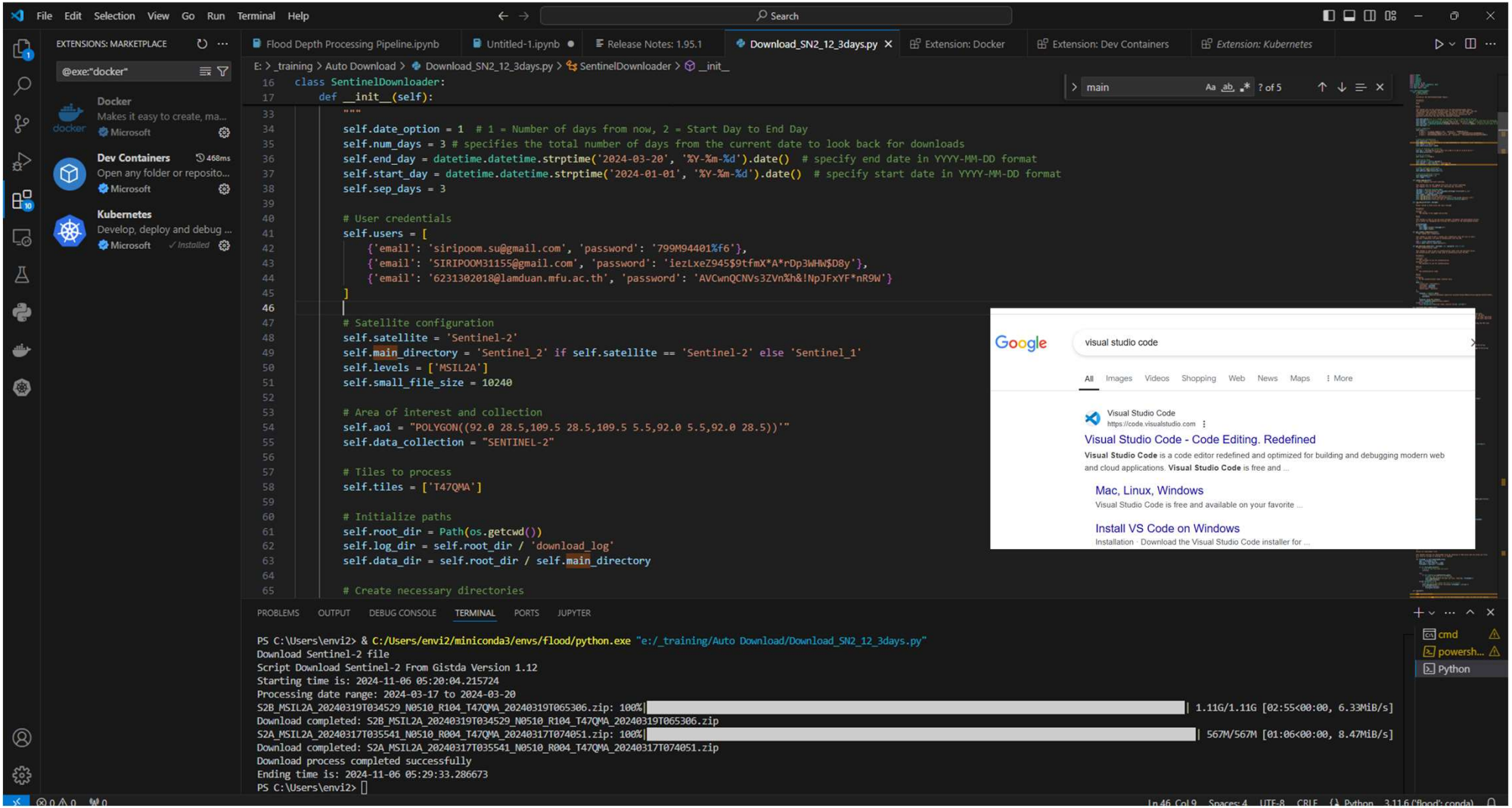
- Python run on Visual Studio Code for Download Sentinel-2 Image
- Sentinel-2 Image ( Pre and Post)
  - S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941.SAFE
  - S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702.SAFE





Philippine Space Agency

# Download Sentinel-2

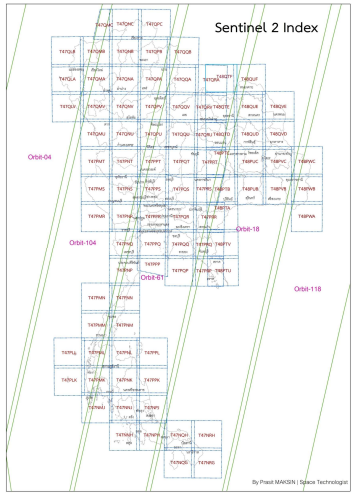


# Change Parameter

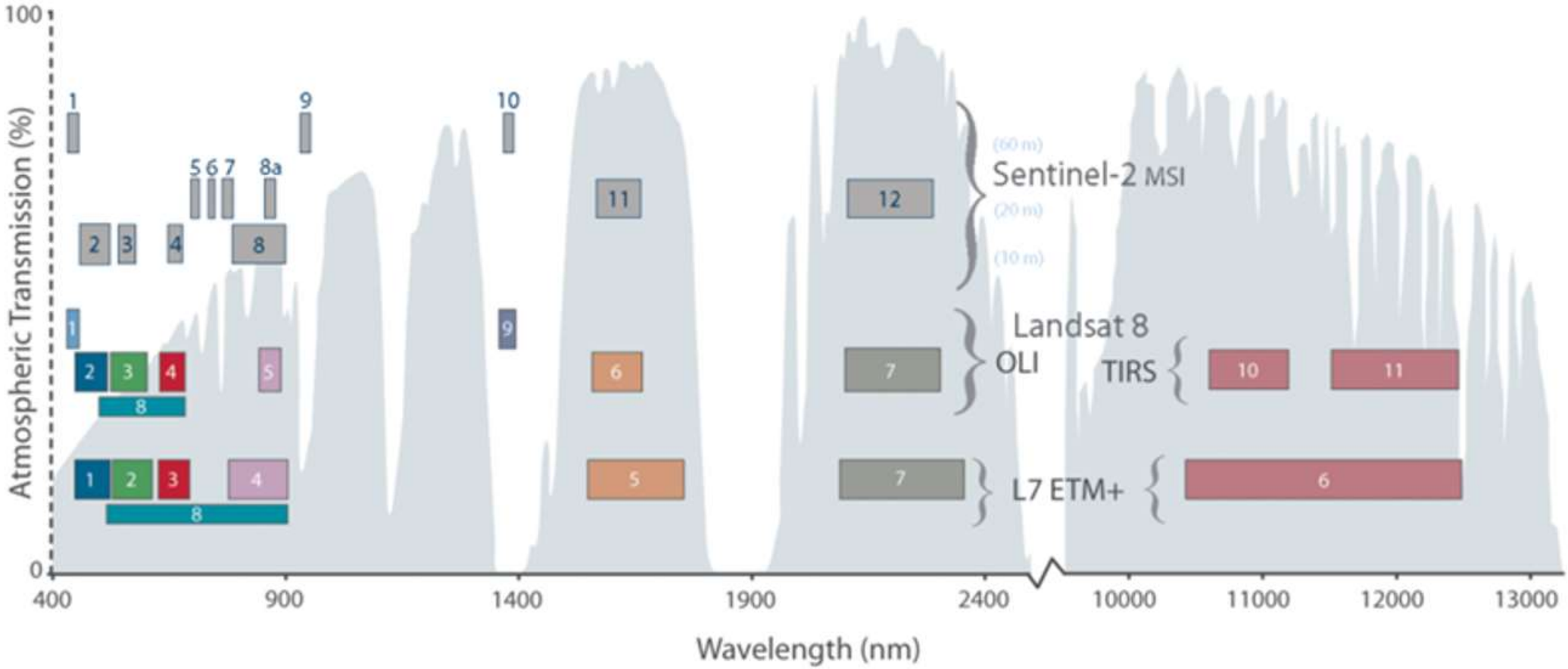
```python
class SentinelDownloader:
    def __init__(self):
        necessary directories and sets up the download tracking.
        """
        self.date_option = 1  # 1 = Number of days from now, 2 = Start Day to End Day
        self.num_days = 10 # specifies the total number of days from the current date to look back for do
        self.end_day = datetime.datetime.strptime('2020-02-20', '%Y-%m-%d').date()  # specify end date in
        self.start_day = datetime.datetime.strptime('2020-02-10', '%Y-%m-%d').date()  # specify start dat
        self.sep_days = 10

        # User credentials
        self.users = [
            {'email': 'siripoom.su@gmail.com', 'password': '799M94401%f6'},
            {'email': 'SIRIPOOM31155@gmail.com', 'password': 'iezLxeZ945$9tfmX*A*rDp3WHW$D8y'},
            {'email': '6231302018@lamduan.mfu.ac.th', 'password': 'AVCwnQCNVs3ZVn%h&!NpJFxYF*nR9W'}
        ]

        # Satellite configuration
        self.satellite = 'Sentinel-2'
        self.main_directory = 'Sentinel_2' if self.satellite == 'Sentinel-2' else 'Sentinel_1'
        self.levels = ['MSIL2A']
        self.small_file_size = 10240

        # Area of interest and collection
        self.aoi = "POLYGON((92.0 28.5,109.5 28.5,109.5 5.5,92.0 5.5,92.0 28.5))'"
        self.data_collection = "SENTINEL-2"

        # Tiles to process
        self.tiles = ['T47QLA', 'T47QLB', 'T47PMR', 'T47PMT', 'T47QQB', 'T48QTE',
                      'T48QTD', 'T47PMS', 'T47QNC', 'T48QTF', 'T47PRR', 'T48QVD',
                      'T47QMC', 'T47QMU', 'T47PRQ', 'T48QVE', 'T47PNP', 'T47QQA',
                      'T48QUF', 'T47PNQ', 'T48PTC']
```

+ DateOption : Set the download time period, choose 1 or 2, where 1 is equal to specifying the number of days (in the next section) back from today, while 2 is specified according to the specified time period (in the next section).
+ NuDays : The number of days (the date of taking the picture) to download back from today, will work when selecting DateOption = 1.
+ StartDay : The start date (the date of taking the picture) to download, will work when selecting DateOption = 2.
+ EndDay : The end date (the date of taking the picture) to download. Will work when selecting DateOption = 2
+ SepDays : Number of days to cut the time period into multiple periods. Every day, the default value is 10, no need to edit
+ NuUser : How many users are entered into the system
+ Userxx : Name of user in sequence xx for xx, which the user must have already registered
+ Pass01 : Password of user in sequence xx for xx, which the user must have already registered
+ Aoi : Geographic Coordinate of AOI
+ Sn2Levels : Type of data required, select one or all, for Sentinel-2, there are 'MSIL1C', 'MSIL2A' to choose from
+ Tiles : Area of data required, specified by Tile of data

Install the python 3 program and must install all related modules such as requests, pandas- Register with the website to request permission to download satellite image data from the website

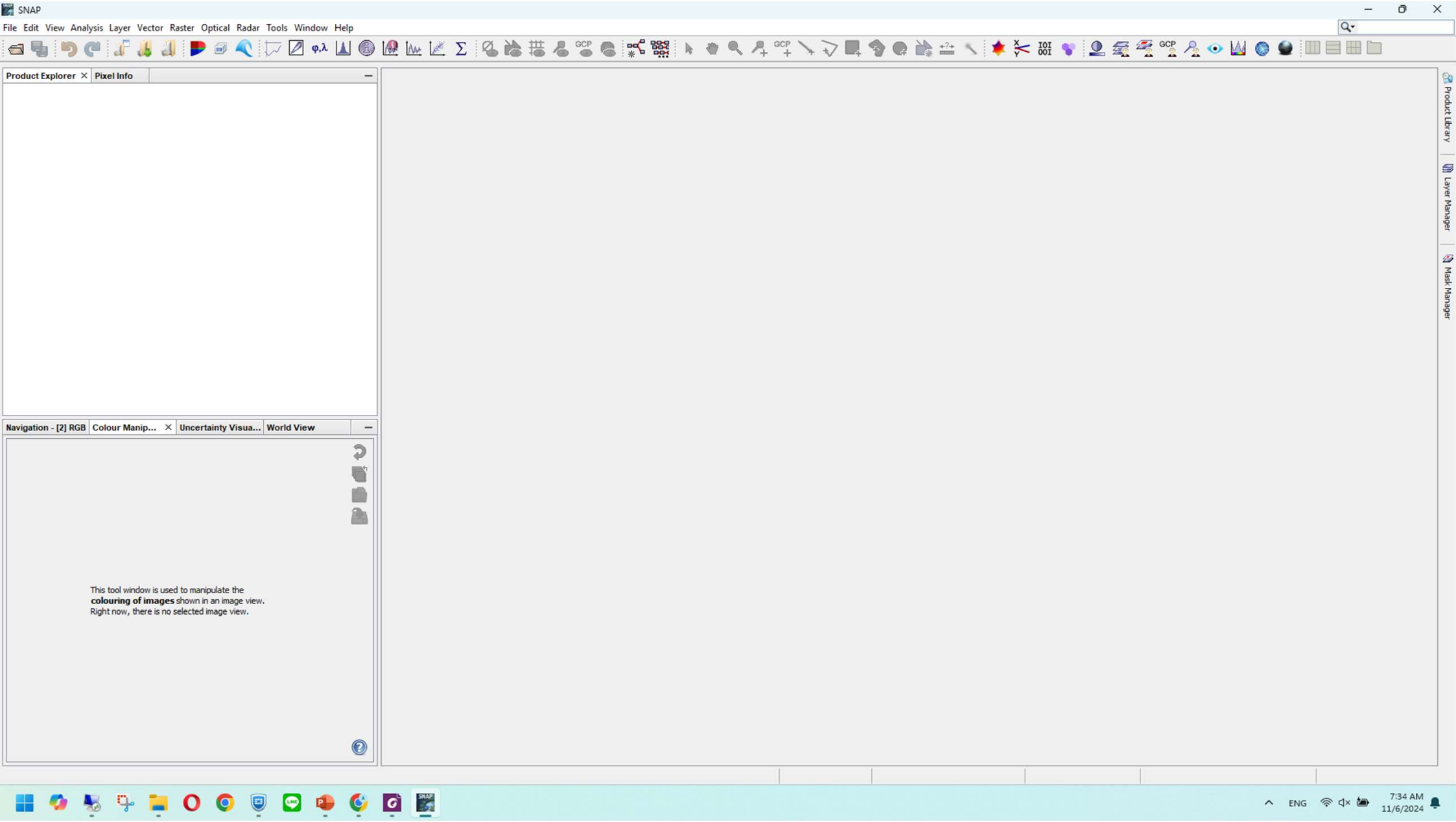


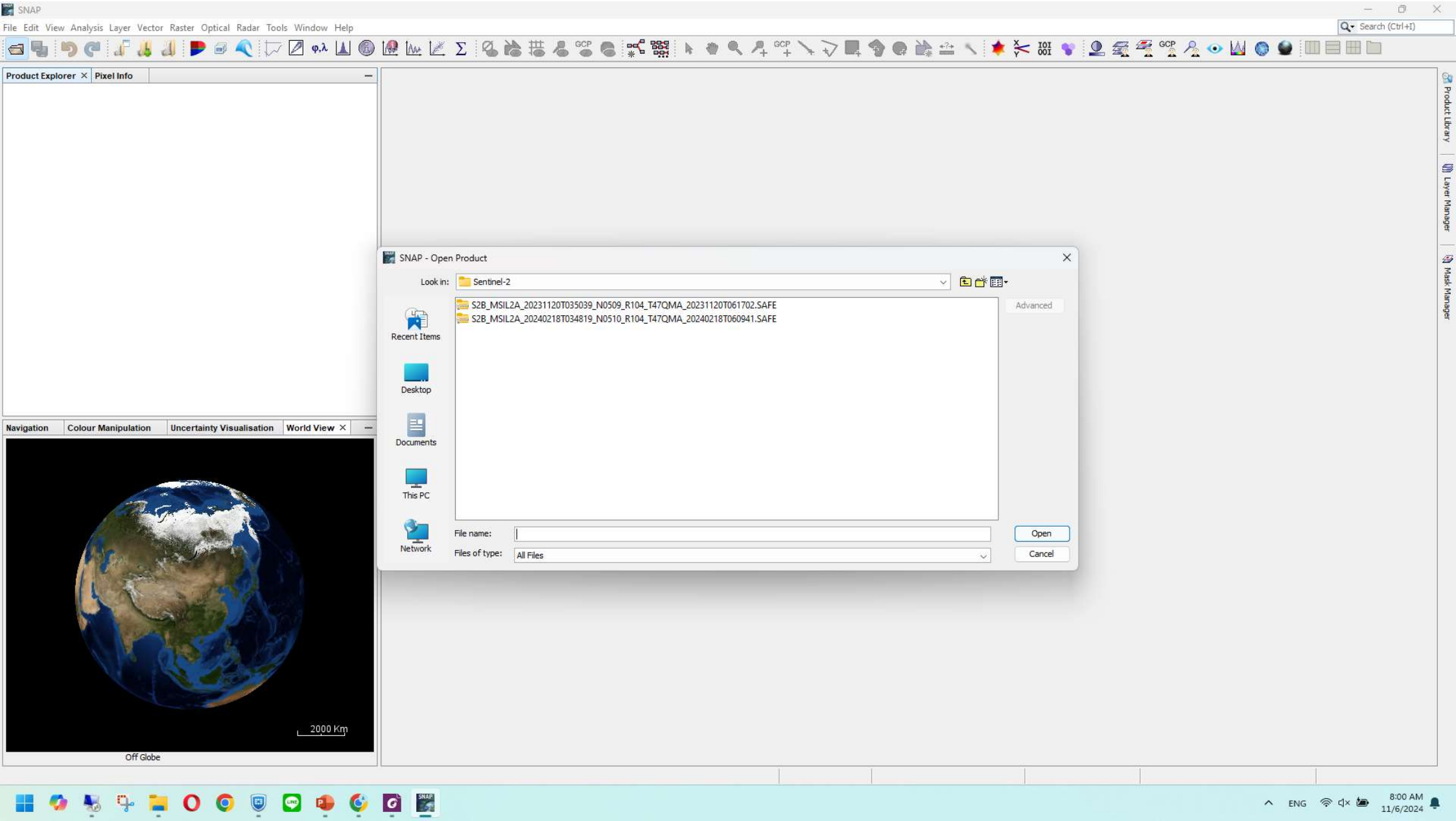
# Sentinel 2 and LANDSAT Bands

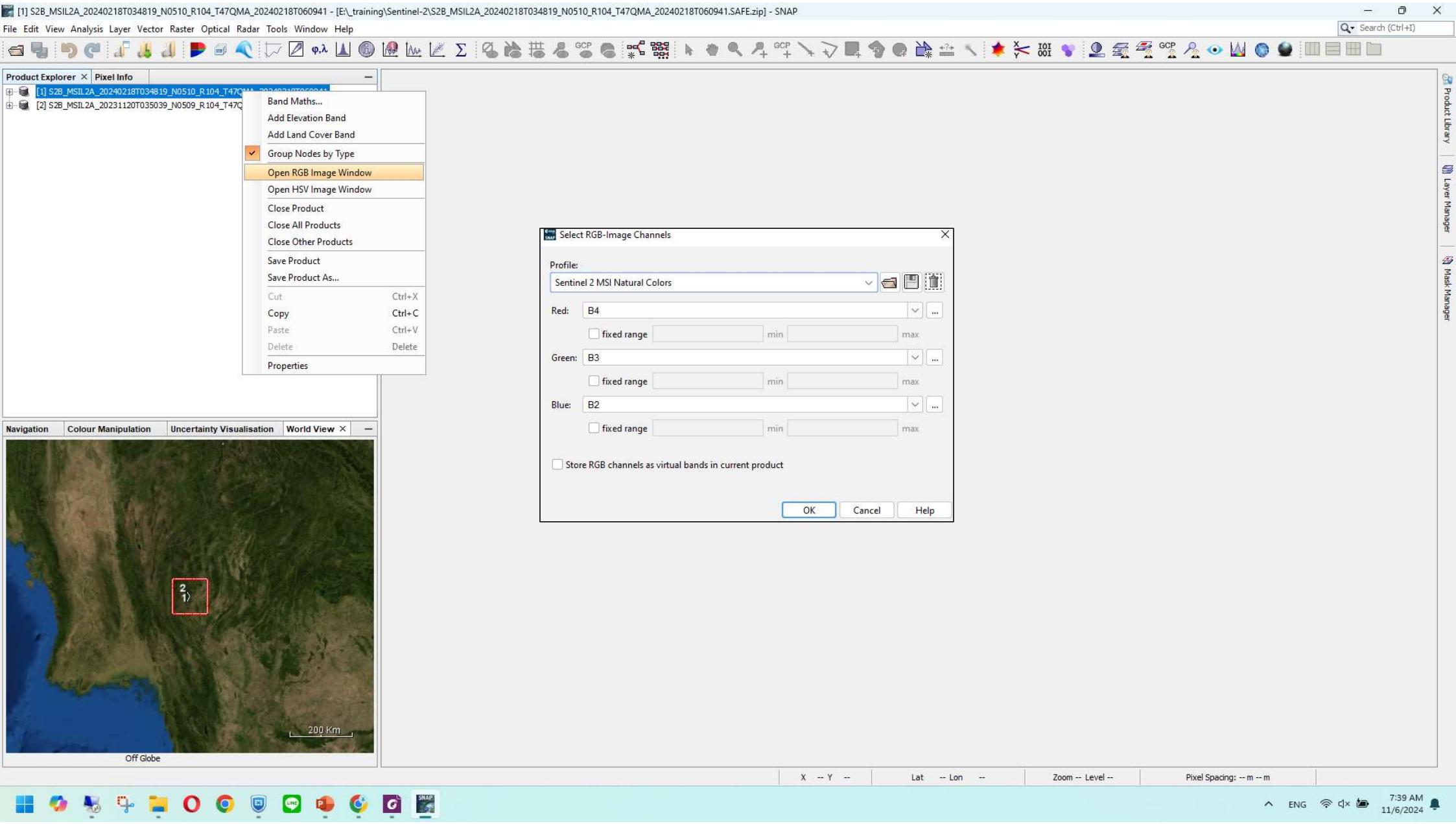


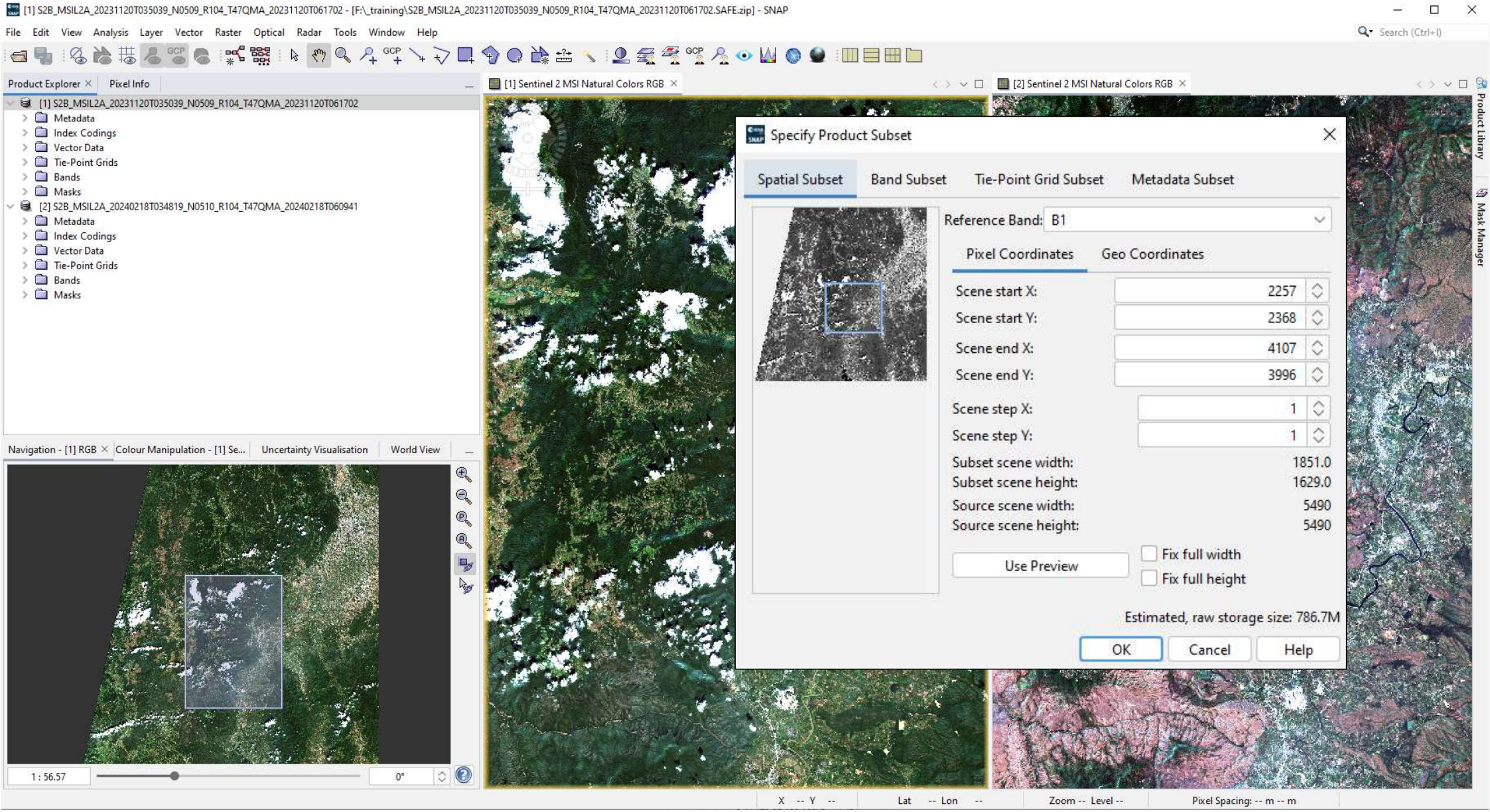
RGB (12,8,4)

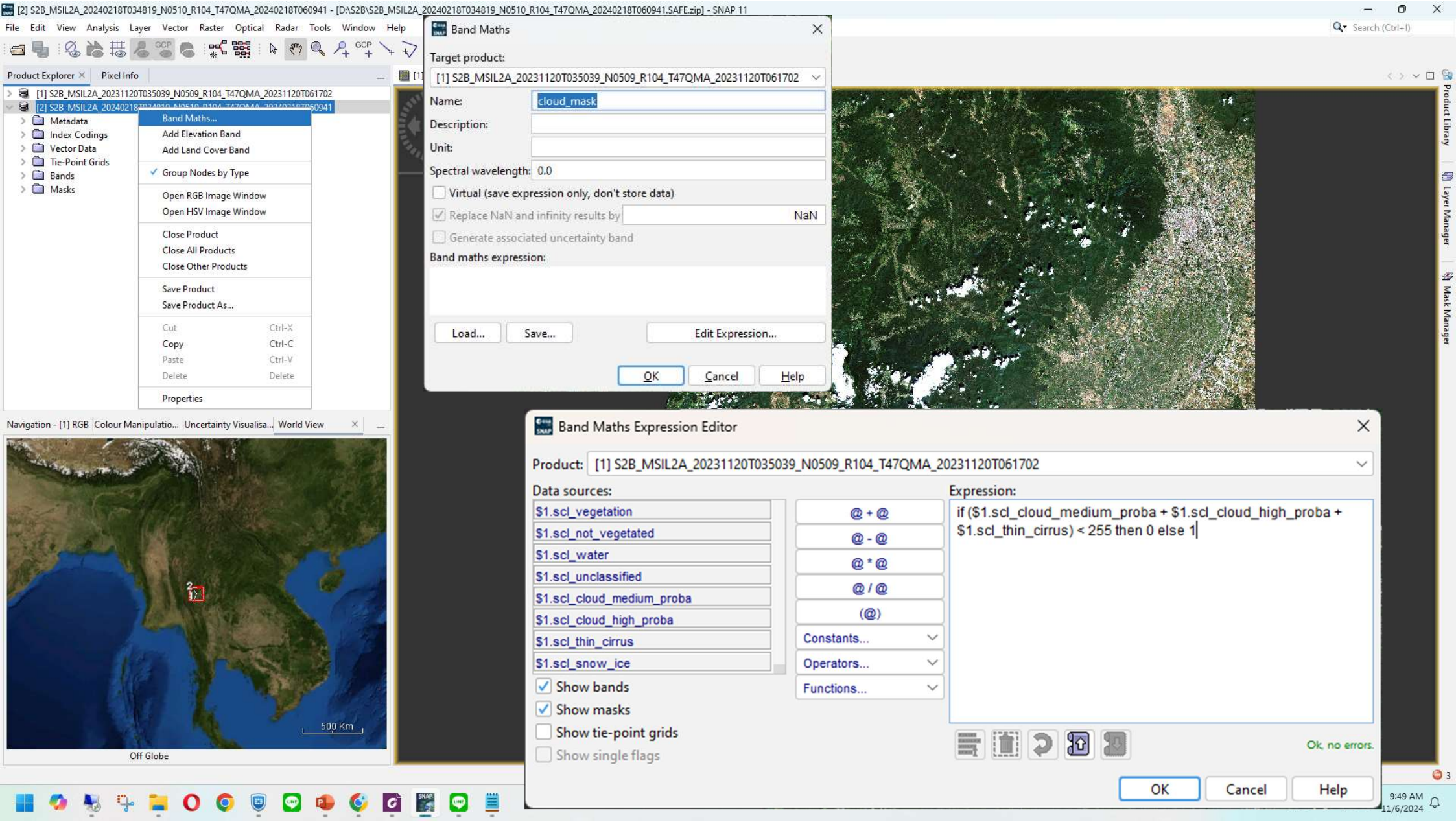
- **Short wave infrared (SWIR)** bands 11 and 12 can help scientists estimate how much water is present in plants and soil, as water reflects SWIR wavelengths. Shortwave-infrared bands are also useful for distinguishing between cloud types (water clouds versus ice clouds), **Newly burned land reflects strongly in SWIR bands**, making them valuable for mapping fire damage. Each rock type reflects shortwave infrared light differently, making it possible to map out geology by comparing reflected SWIR light.
- NIR in B8A is reflected by vegetation and shown in the green channel
- red band in bands 4 can highlight bare soil and builtup areas.

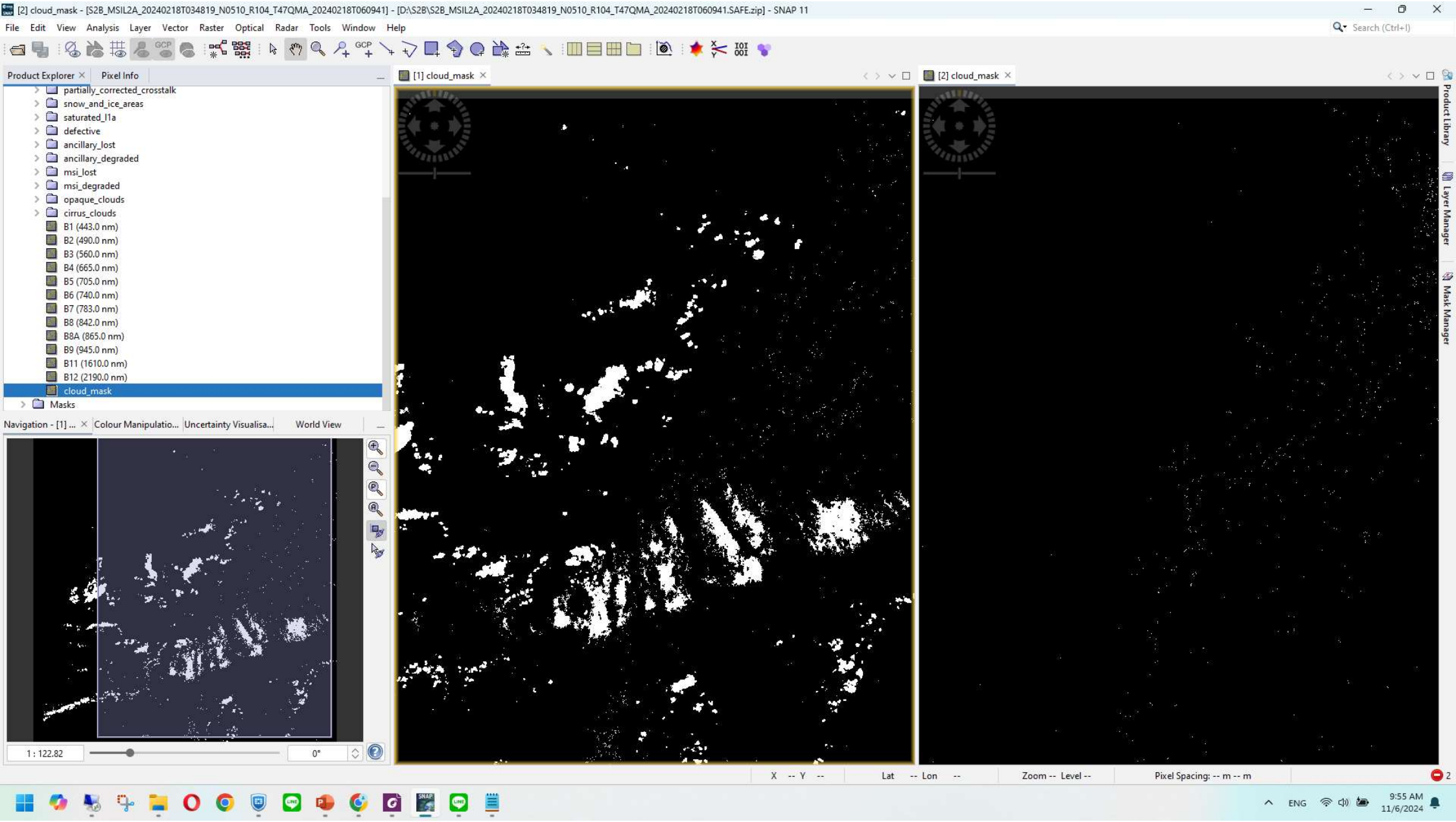

SNAP
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Product Explorer
Pixel Info
Navigation - [2] RGB
Colour Manip...
Uncertainty Visua...
World View
This tool window is used to manipulate the
colouring of images shown in an image view.
Right now, there is no selected image view.
Product Library
Layer Manager
Mask Manager
ENG
7:34 AM
11/6/2024

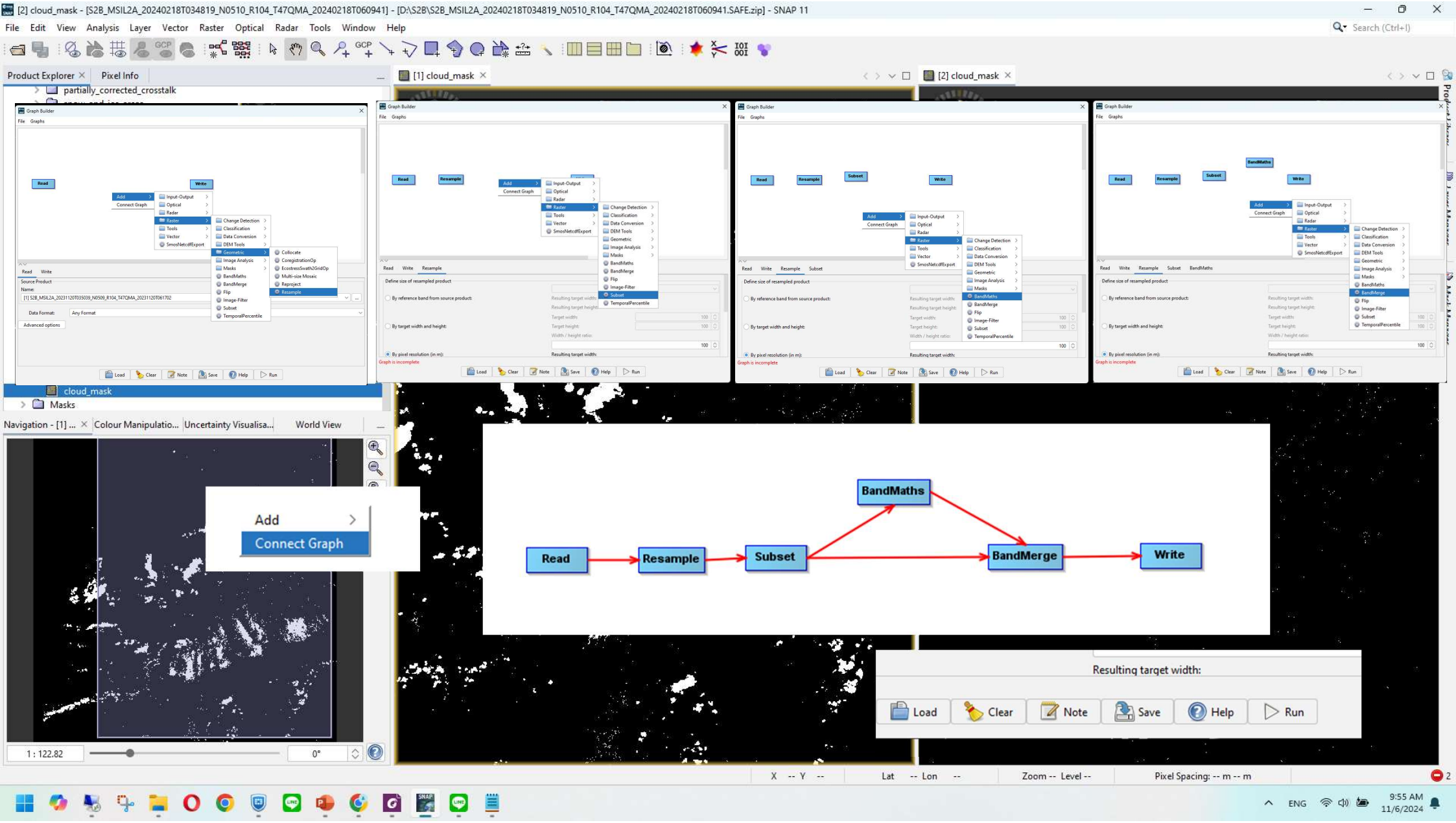

SNAP
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
Navigation
Colour Manipulation
Uncertainty Visualisation
World View
2000 Km
Off Globe
SNAP - Open Product
Look in:
Sentinel-2
S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702.SAFE
S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941.SAFE
Advanced
Recent Items
Desktop
Documents
This PC
Network
File name:
Files of type:
All Files
Open
Cancel
Product Library
Layer Manager
Mask Manager
ENG
8:00 AM
11/6/2024

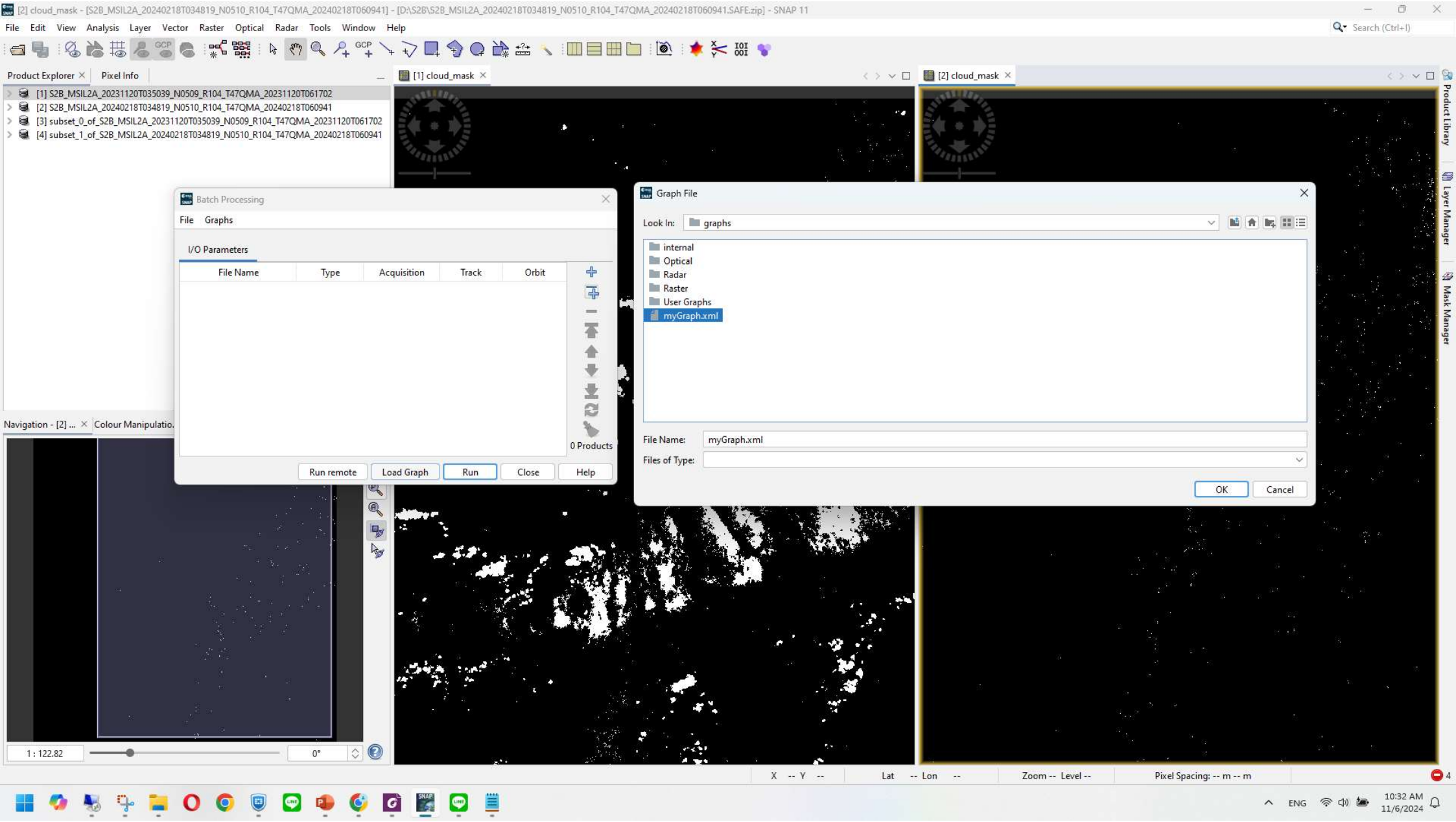

[1] S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941 - [E:_training\Sentinel-2\S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941.SAFE.zip] - SNAP
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
[1] S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA
[2] S2B_MSIL2A_20231120T035039_N0509_R104_T47Q
Band Maths...
Add Elevation Band
Add Land Cover Band
Group Nodes by Type
Open RGB Image Window
Open HSV Image Window
Close Product
Close All Products
Close Other Products
Save Product
Save Product As...
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Delete
Properties
Select RGB-Image Channels
Profile:
Sentinel 2 MSI Natural Colors
Red: B4
fixed range min max
Green: B3
fixed range min max
Blue: B2
fixed range min max
Store RGB channels as virtual bands in current product
OK
Cancel
Help
Navigation
Colour Manipulation
Uncertainty Visualisation
World View
200 Km
Off Globe
Product Library
Layer Manager
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m
ENG
7:39 AM
11/6/2024


[1] S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702 - [F:_training\S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702.SAFE.zip] - SNAP
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
[1] S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702
Metadata
Index Codings
Vector Data
Tie-Point Grids
Bands
Masks
[2] S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941
Metadata
Index Codings
Vector Data
Tie-Point Grids
Bands
Masks
Navigation - [1] RGB
Colour Manipulation - [1] Se...
Uncertainty Visualisation
World View
1 : 56.57
0°
[1] Sentinel 2 MSI Natural Colors RGB
[2] Sentinel 2 MSI Natural Colors RGB
Specify Product Subset
Spatial Subset
Band Subset
Tie-Point Grid Subset
Metadata Subset
Reference Band: B1
Pixel Coordinates
Geo Coordinates
Scene start X: 2257
Scene start Y: 2368
Scene end X: 4107
Scene end Y: 3996
Scene step X: 1
Scene step Y: 1
Subset scene width: 1851.0
Subset scene height: 1629.0
Source scene width: 5490
Source scene height: 5490
Use Preview
Fix full width
Fix full height
Estimated, raw storage size: 786.7M
OK
Cancel
Help
Product Library
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m

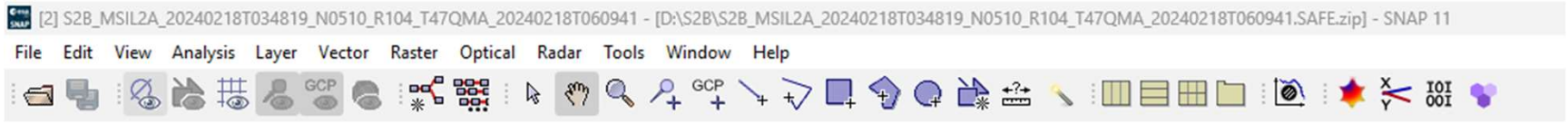

[2] S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941 - [D:\S2B\S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941.SAFE.zip] - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
[1] S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702
[2] S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941
Metadata
Index Codings
Vector Data
Tie-Point Grids
Bands
Masks
Band Maths...
Add Elevation Band
Add Land Cover Band
Group Nodes by Type
Open RGB Image Window
Open HSV Image Window
Close Product
Close All Products
Close Other Products
Save Product
Save Product As...
Cut Ctrl-X
Copy Ctrl-C
Paste Ctrl-V
Delete Delete
Properties
Band Maths
Target product:
[1] S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702
Name: cloud_mask
Description:
Unit:
Spectral wavelength: 0.0
Virtual (save expression only, don't store data)
Replace NaN and infinity results by NaN
Generate associated uncertainty band
Band maths expression:
Load... Save... Edit Expression...
OK Cancel Help
Navigation - [1] RGB
Colour Manipulatio...
Uncertainty Visualisa...
World View
500 Km
Off Globe
Band Maths Expression Editor
Product: [1] S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702
Data sources:
$1.scl_vegetation
$1.scl_not_vegetated
$1.scl_water
$1.scl_unclassified
$1.scl_cloud_medium_proba
$1.scl_cloud_high_proba
$1.scl_thin_cirrus
$1.scl_snow_ice
Show bands
Show masks
Show tie-point grids
Show single flags
@ + @
@ - @
@ * @
@ / @
(@)
Constants...
Operators...
Functions...
Expression:
if ($1.scl_cloud_medium_proba + $1.scl_cloud_high_proba + $1.scl_thin_cirrus) < 255 then 0 else 1
Ok, no errors.
OK Cancel Help
Product Library
Layer Manager
Mask Manager
9:49 AM
11/6/2024

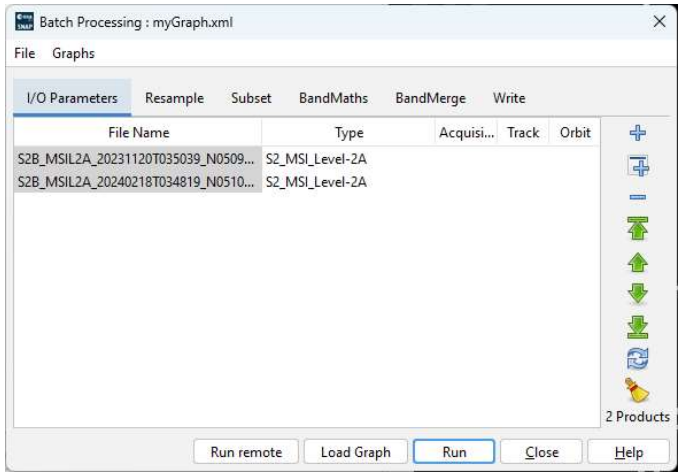

[2] cloud_mask - [S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941] - [D:\S2B\S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941.SAFE.zip] - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
partially_corrected_crosstalk
snow_and_ice_areas
saturated_l1a
defective
ancillary_lost
ancillary_degraded
msi_lost
msi_degraded
opaque_clouds
cirrus_clouds
B1 (443.0 nm)
B2 (490.0 nm)
B3 (560.0 nm)
B4 (665.0 nm)
B5 (705.0 nm)
B6 (740.0 nm)
B7 (783.0 nm)
B8 (842.0 nm)
B8A (865.0 nm)
B9 (945.0 nm)
B11 (1610.0 nm)
B12 (2190.0 nm)
cloud_mask
Masks
Navigation - [1] ...
Colour Manipulatio...
Uncertainty Visualisa...
World View
1 : 122.82
0°
[1] cloud_mask
[2] cloud_mask
Product Library
Layer Manager
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m
ENG
9:55 AM
11/6/2024

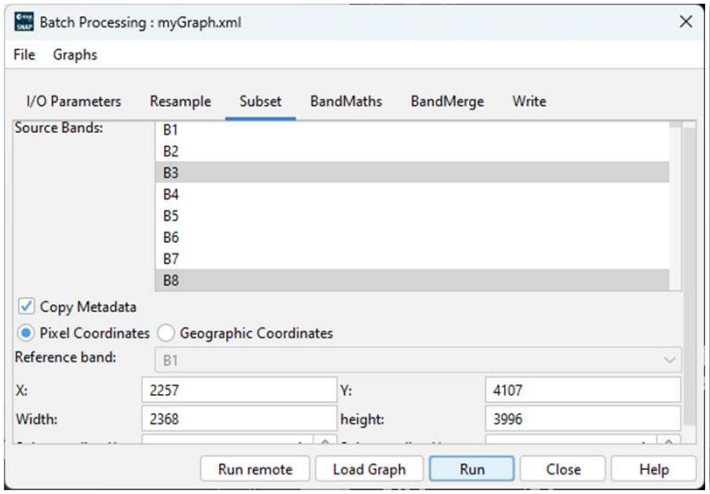

[2] cloud_mask - [S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941] - [D:\S2B\S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941.SAFE.zip] - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Product Explorer
Pixel Info
[1] cloud_mask
[2] cloud_mask
Graph Builder
Read
Resample
Subset
BandMaths
BandMerge
Write
Add
Connect Graph
Navigation - [1] ...
Colour Manipulatio...
Uncertainty Visualisa...
World View
Resulting target width:
Load
Clear
Note
Save
Help
Run
1 : 122.82
0°
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m
ENG
9:55 AM
11/6/2024

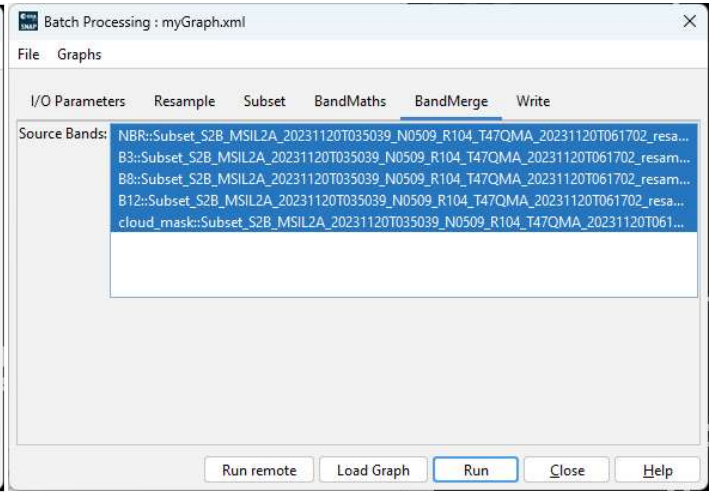

[2] cloud_mask - [S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941] - [D:\S2B\S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941.SAFE.zip] - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
[1] S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702
[2] S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941
[3] subset_0_of_S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702
[4] subset_1_of_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941
[1] cloud_mask
[2] cloud_mask
Batch Processing
File Graphs
I/O Parameters
File Name
Type
Acquisition
Track
Orbit
0 Products
Run remote
Load Graph
Run
Close
Help
Graph File
Look In:
graphs
internal
Optical
Radar
Raster
User Graphs
myGraph.xml
File Name:
myGraph.xml
Files of Type:
OK
Cancel
Navigation - [2] ...
Colour Manipulatio...
1 : 122.82
0°
Product Library
Layer Manager
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m
ENG
10:32 AM
11/6/2024

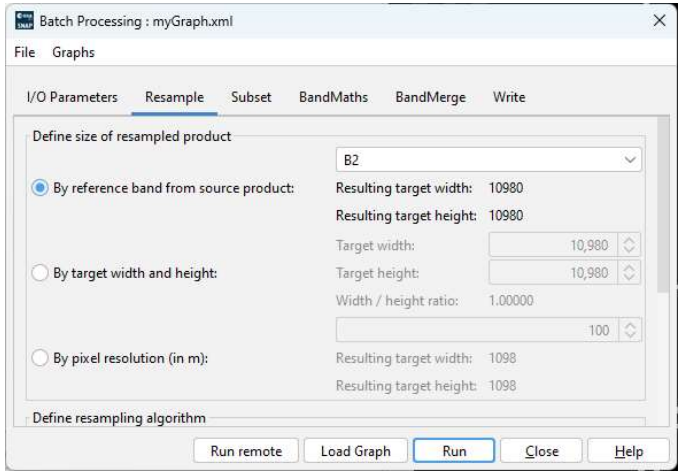
# Batch Processing  Load mygraph.xml

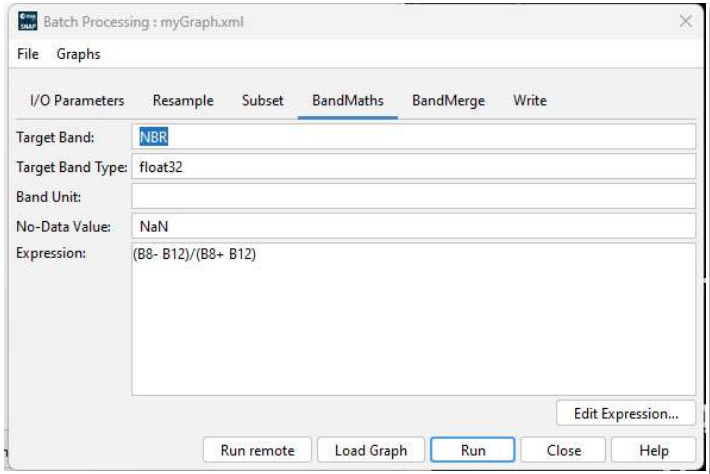


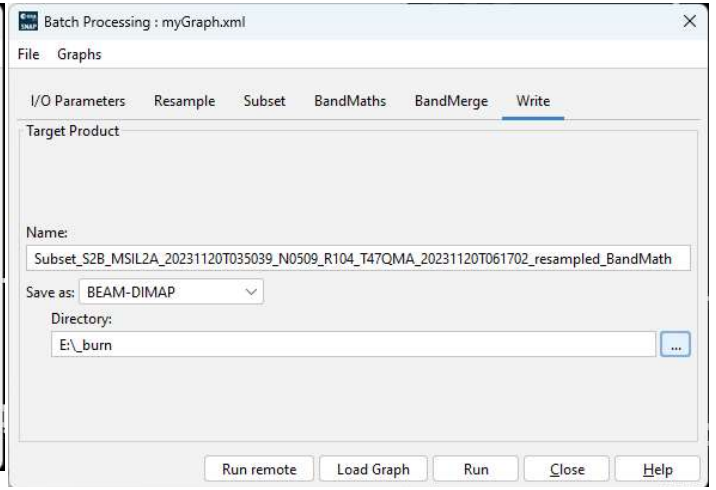



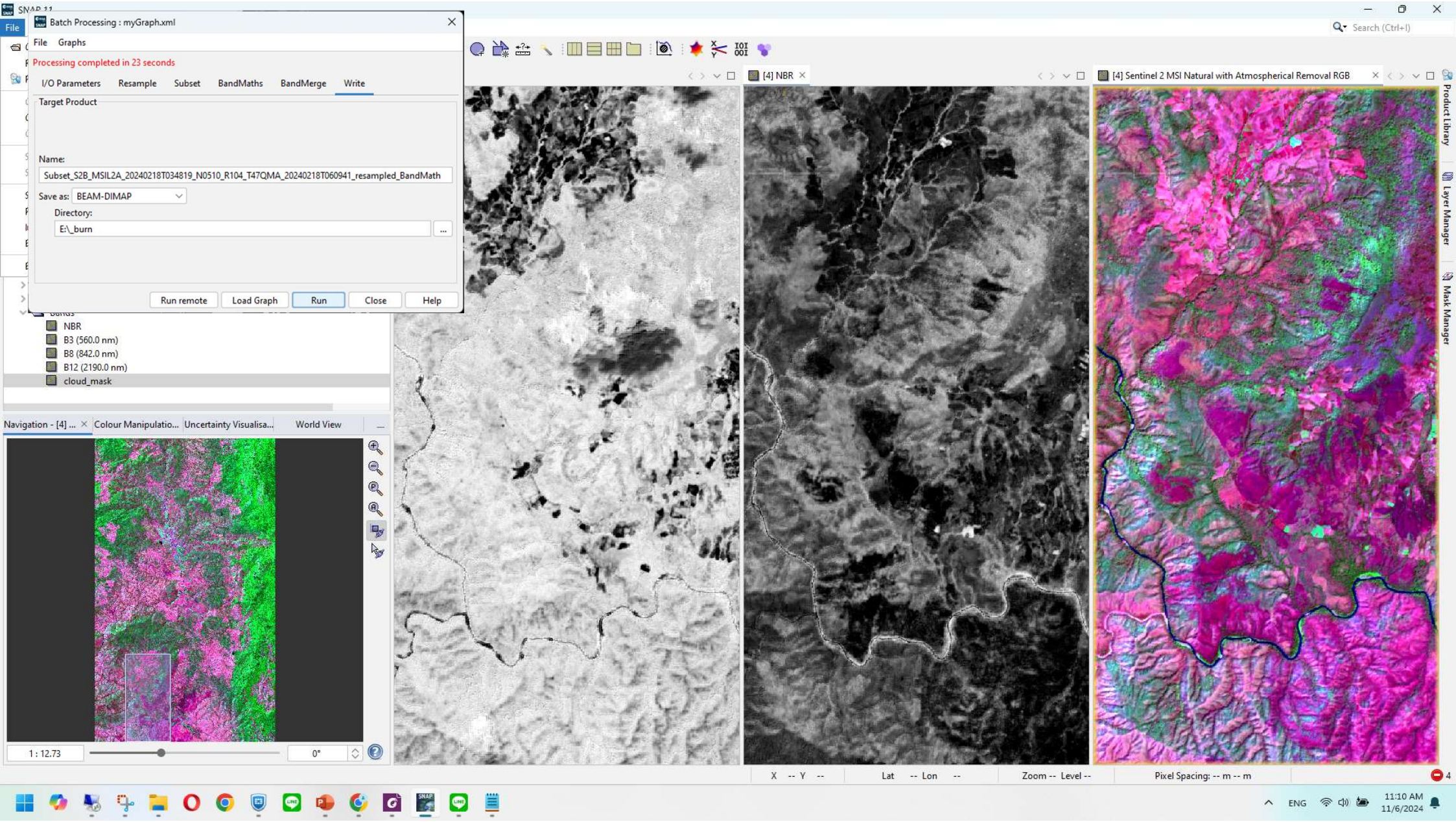



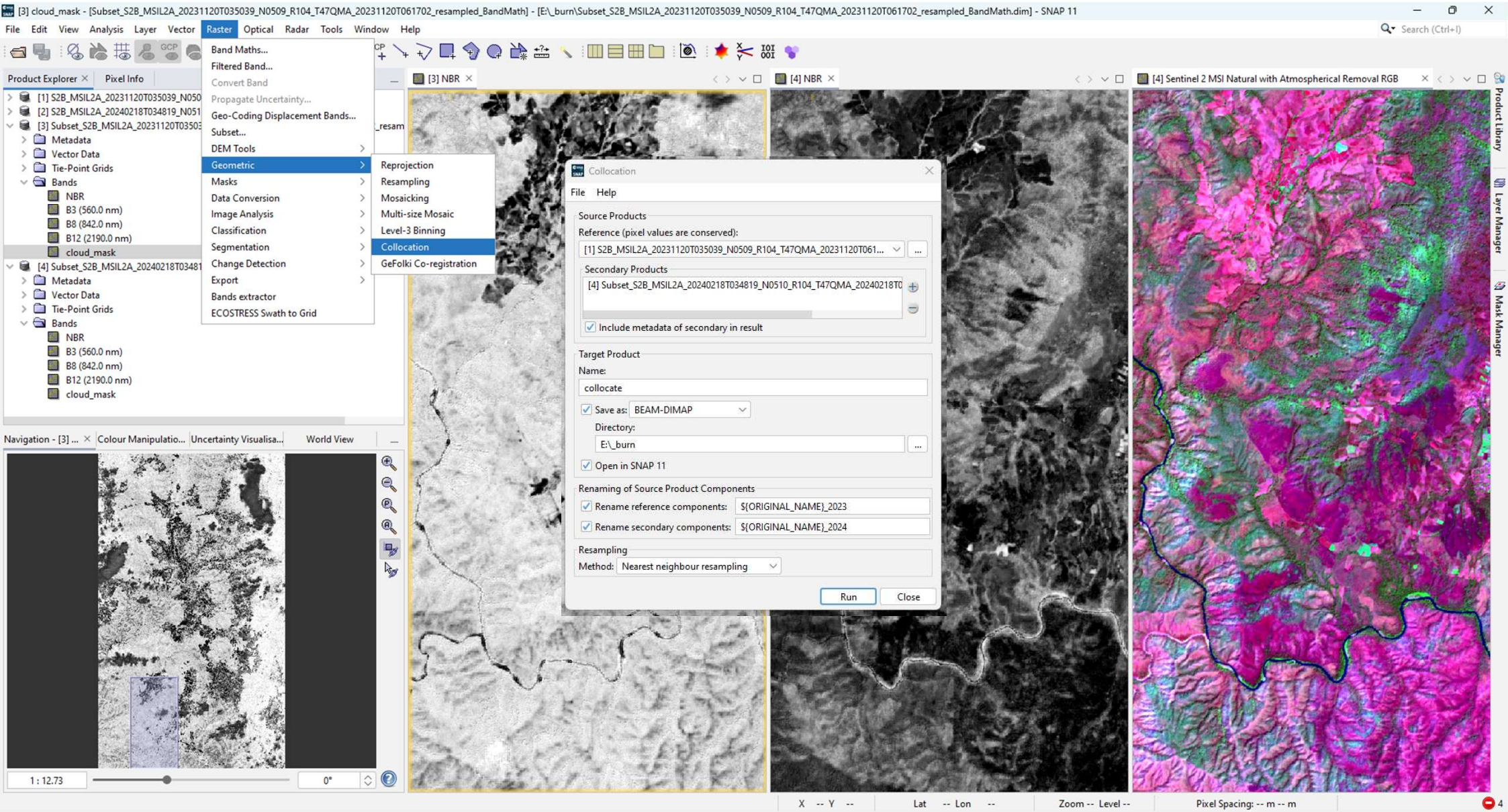



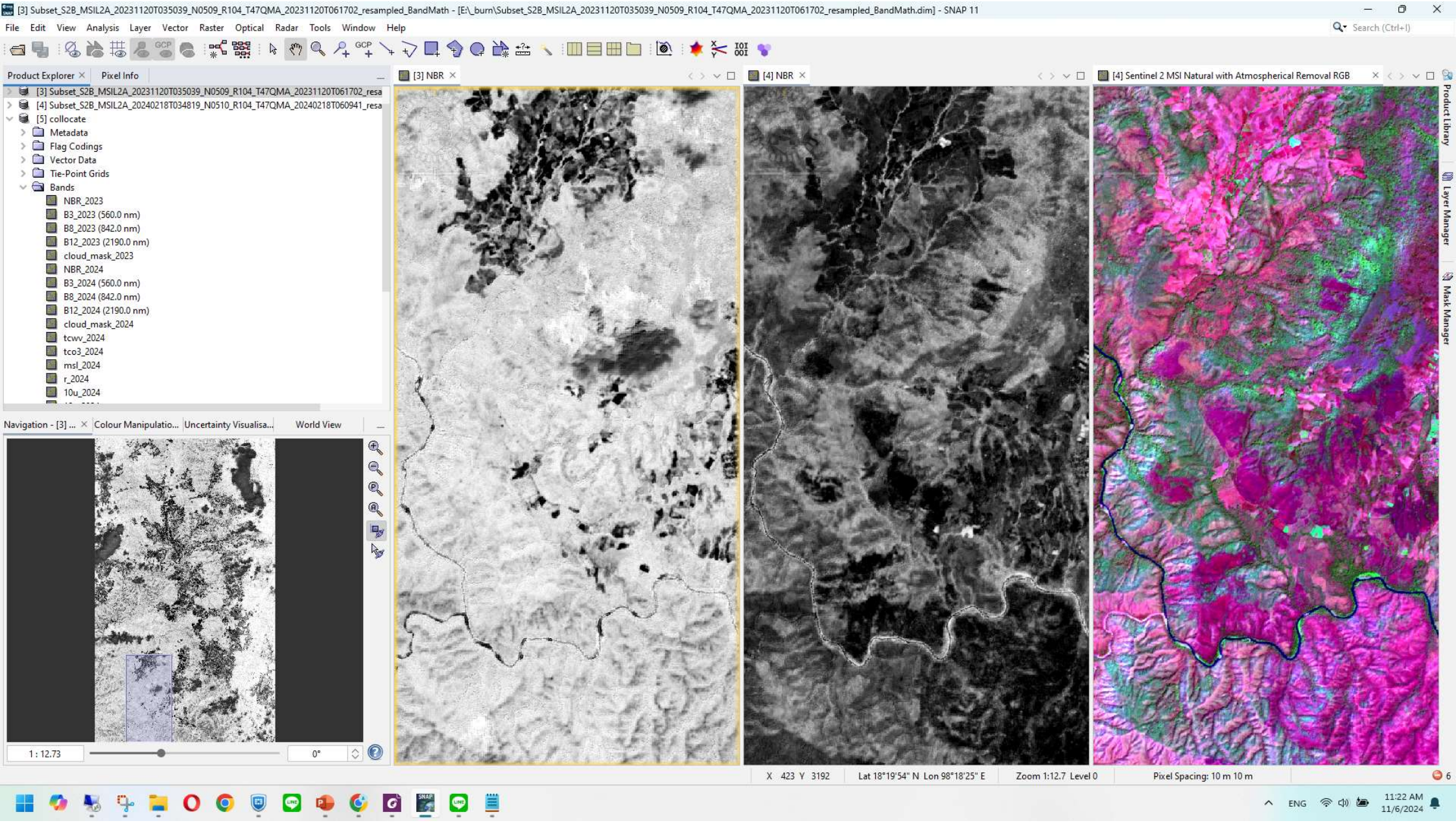




Batch Processing : myGraph.xml
File
Graphs
Processing completed in 23 seconds
I/O Parameters
Resample
Subset
BandMaths
BandMerge
Write
Target Product
Name:
Subset_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941_resampled_BandMath
Save as:
BEAM-DIMAP
Directory:
E:_burn
Run remote
Load Graph
Run
Close
Help
NBR
B3 (560.0 nm)
B8 (842.0 nm)
B12 (2190.0 nm)
cloud_mask
Navigation - [4] ...
Colour Manipulatio...
Uncertainty Visualisa...
World View
1 : 12.73
0°
[4] NBR
[4] Sentinel 2 MSI Natural with Atmospherical Removal RGB
Product Library
Layer Manager
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m
ENG
11:10 AM
11/6/2024


[3] cloud_mask - [Subset_S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702_resampled_BandMath] - [E:_burn\Subset_S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702_resampled_BandMath.dim] - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Band Maths...
Filtered Band...
Convert Band
Propagate Uncertainty...
Geo-Coding Displacement Bands...
Subset...
DEM Tools
Geometric
Masks
Data Conversion
Image Analysis
Classification
Segmentation
Change Detection
Export
Bands extractor
ECOSTRESS Swath to Grid
Reprojection
Resampling
Mosaicking
Multi-size Mosaic
Level-3 Binning
Collocation
GeFolki Co-registration
Product Explorer
Pixel Info
[1] S2B_MSIL2A_20231120T035039_N050
[2] S2B_MSIL2A_20240218T034819_N051
[3] Subset_S2B_MSIL2A_20231120T03503
Metadata
Vector Data
Tie-Point Grids
Bands
NBR
B3 (560.0 nm)
B8 (842.0 nm)
B12 (2190.0 nm)
cloud_mask
[4] Subset_S2B_MSIL2A_20240218T03481
Metadata
Vector Data
Tie-Point Grids
Bands
NBR
B3 (560.0 nm)
B8 (842.0 nm)
B12 (2190.0 nm)
cloud_mask
Navigation - [3] ...
Colour Manipulatio...
Uncertainty Visualisa...
World View
1 : 12.73
0°
[3] NBR
[4] NBR
[4] Sentinel 2 MSI Natural with Atmospherical Removal RGB
Collocation
File Help
Source Products
Reference (pixel values are conserved):
[1] S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061...
Secondary Products
[4] Subset_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T0
Include metadata of secondary in result
Target Product
Name:
collocate
Save as: BEAM-DIMAP
Directory:
E:_burn
Open in SNAP 11
Renaming of Source Product Components
Rename reference components: ${ORIGINAL_NAME}_2023
Rename secondary components: ${ORIGINAL_NAME}_2024
Resampling
Method: Nearest neighbour resampling
Run
Close
Product Library
Layer Manager
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m


[3] Subset_S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702_resampled_BandMath - [E:_burn\Subset_S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702_resampled_BandMath.dim] - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
[3] Subset_S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702_resa
[4] Subset_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941_resa
[5] collocate
Metadata
Flag Codings
Vector Data
Tie-Point Grids
Bands
NBR_2023
B3_2023 (560.0 nm)
B8_2023 (842.0 nm)
B12_2023 (2190.0 nm)
cloud_mask_2023
NBR_2024
B3_2024 (560.0 nm)
B8_2024 (842.0 nm)
B12_2024 (2190.0 nm)
cloud_mask_2024
tcwv_2024
tco3_2024
msl_2024
r_2024
10u_2024
Navigation - [3] ...
Colour Manipulatio...
Uncertainty Visualisa...
World View
1 : 12.73
0°
[3] NBR
[4] NBR
[4] Sentinel 2 MSI Natural with Atmospherical Removal RGB
Product Library
Layer Manager
Mask Manager
X 423 Y 3192
Lat 18°19'54" N Lon 98°18'25" E
Zoom 1:12.7 Level 0
Pixel Spacing: 10 m 10 m
ENG
11:22 AM
11/6/2024

# RUS NDWI

The Normalized Difference Water Index (NDWI)

$$NDWI = \frac{Green - NIR}{Green + NIR} = \frac{B3 - B8}{B3 - B8}$$

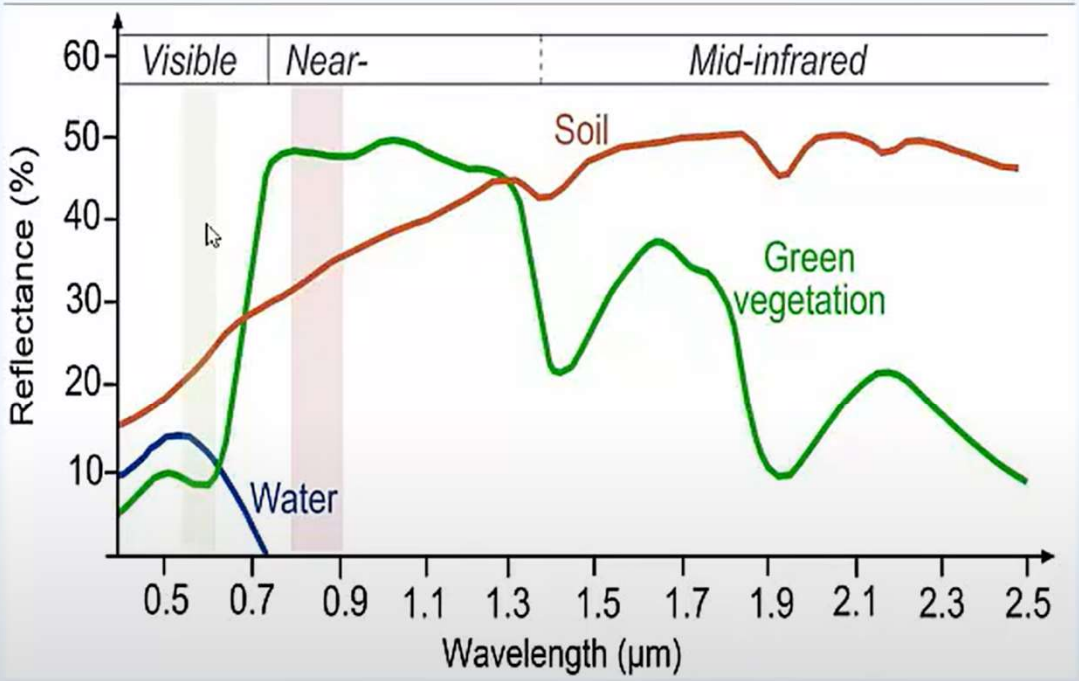
Water body:

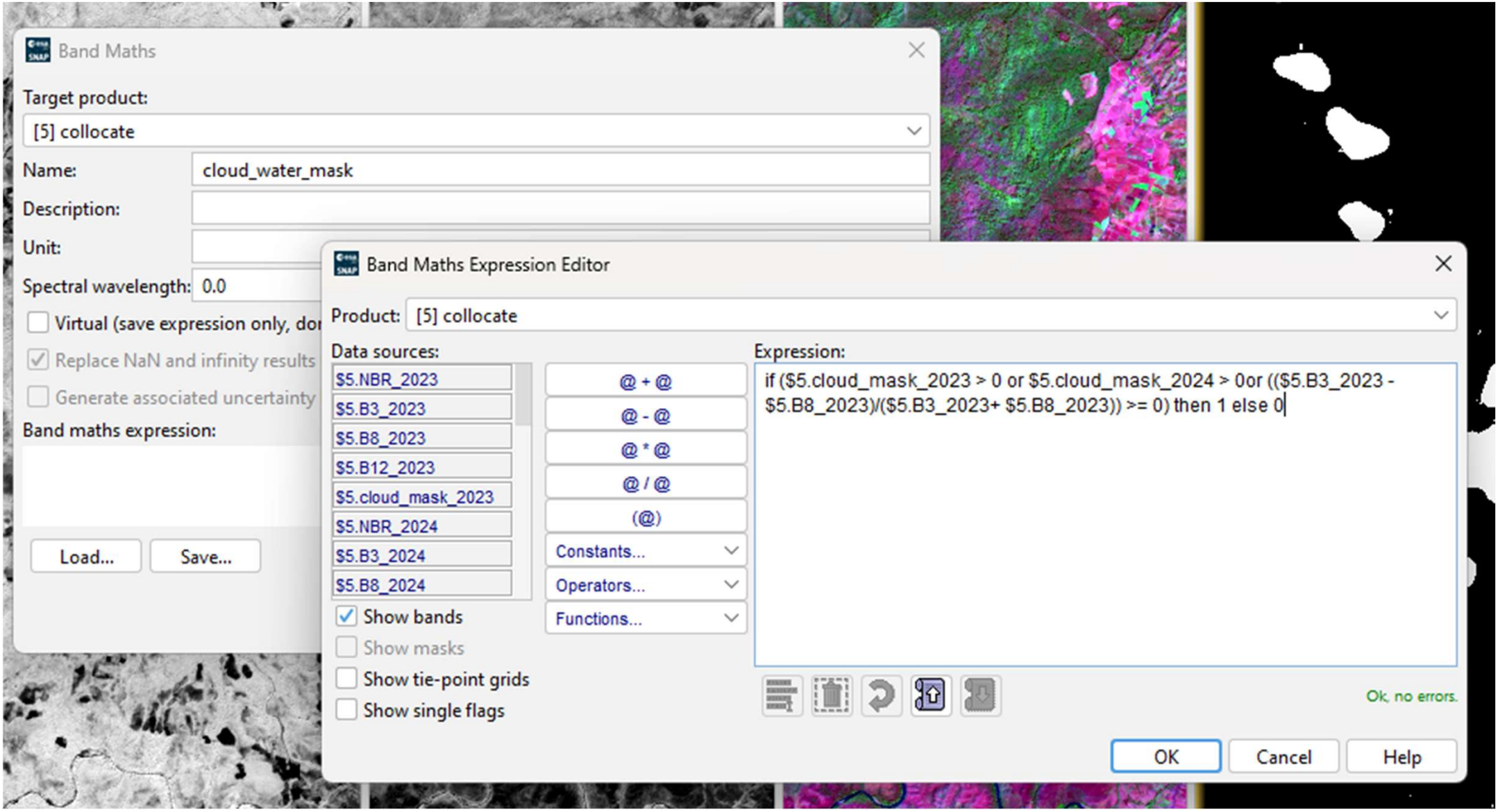
Green band= High reflectance

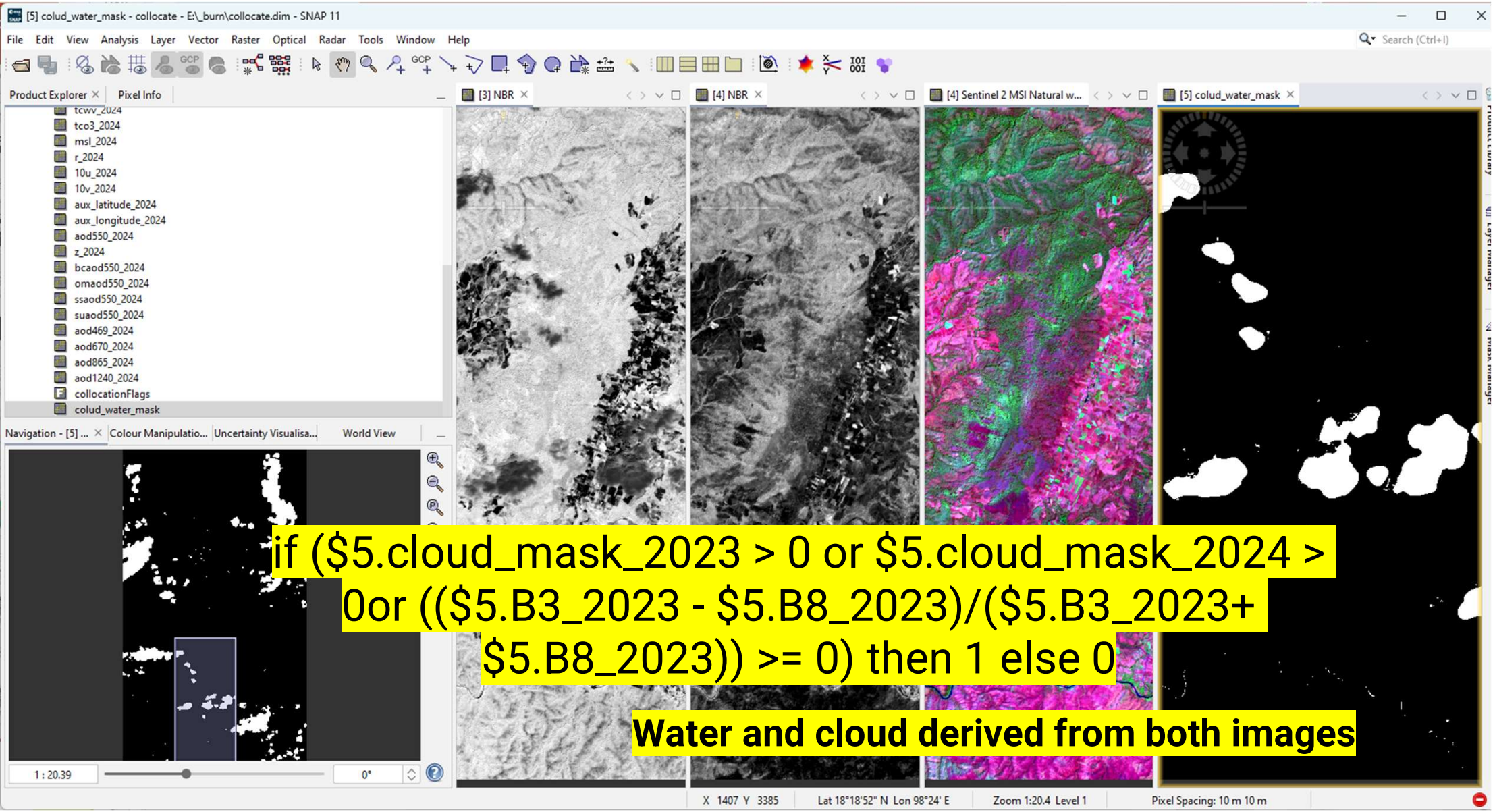
NIR band = Low reflectance

**NDWI**

**Land < 0.0 <= Water**




Band Maths
Target product:
[5] collocate
Name:
cloud_water_mask
Description:
Unit:
Spectral wavelength:
0.0
Virtual (save expression only, do
Replace NaN and infinity results
Generate associated uncertainty
Band maths expression:
Load...
Save...
Band Maths Expression Editor
Product:
[5] collocate
Data sources:
$5.NBR_2023
$5.B3_2023
$5.B8_2023
$5.B12_2023
$5.cloud_mask_2023
$5.NBR_2024
$5.B3_2024
$5.B8_2024
Show bands
Show masks
Show tie-point grids
Show single flags
@ + @
@ - @
@ * @
@ / @
(@)
Constants...
Operators...
Functions...
Expression:
if ($5.cloud_mask_2023 > 0 or $5.cloud_mask_2024 > 0or (($5.B3_2023 -
$5.B8_2023)/($5.B3_2023+ $5.B8_2023)) >= 0) then 1 else 0
Ok, no errors.
OK
Cancel
Help


[5] colud_water_mask - collocate - E:_burn\collocate.dim - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Product Explorer
Pixel Info
tcwv_2024
tco3_2024
msl_2024
r_2024
10u_2024
10v_2024
aux_latitude_2024
aux_longitude_2024
aod550_2024
z_2024
bcaod550_2024
omaod550_2024
ssaod550_2024
suaod550_2024
aod469_2024
aod670_2024
aod865_2024
aod1240_2024
collocationFlags
colud_water_mask
Navigation - [5] ...
Colour Manipulatio...
Uncertainty Visualisa...
World View
1 : 20.39
0°
[3] NBR
[4] NBR
[4] Sentinel 2 MSI Natural w...
[5] colud_water_mask
if ($5.cloud_mask_2023 > 0 or $5.cloud_mask_2024 > 0or (($5.B3_2023 - $5.B8_2023)/($5.B3_2023+ $5.B8_2023)) >= 0) then 1 else 0
Water and cloud derived from both images
X 1407 Y 3385
Lat 18°18'52" N Lon 98°24' E
Zoom 1:20.4 Level 1
Pixel Spacing: 10 m 10 m

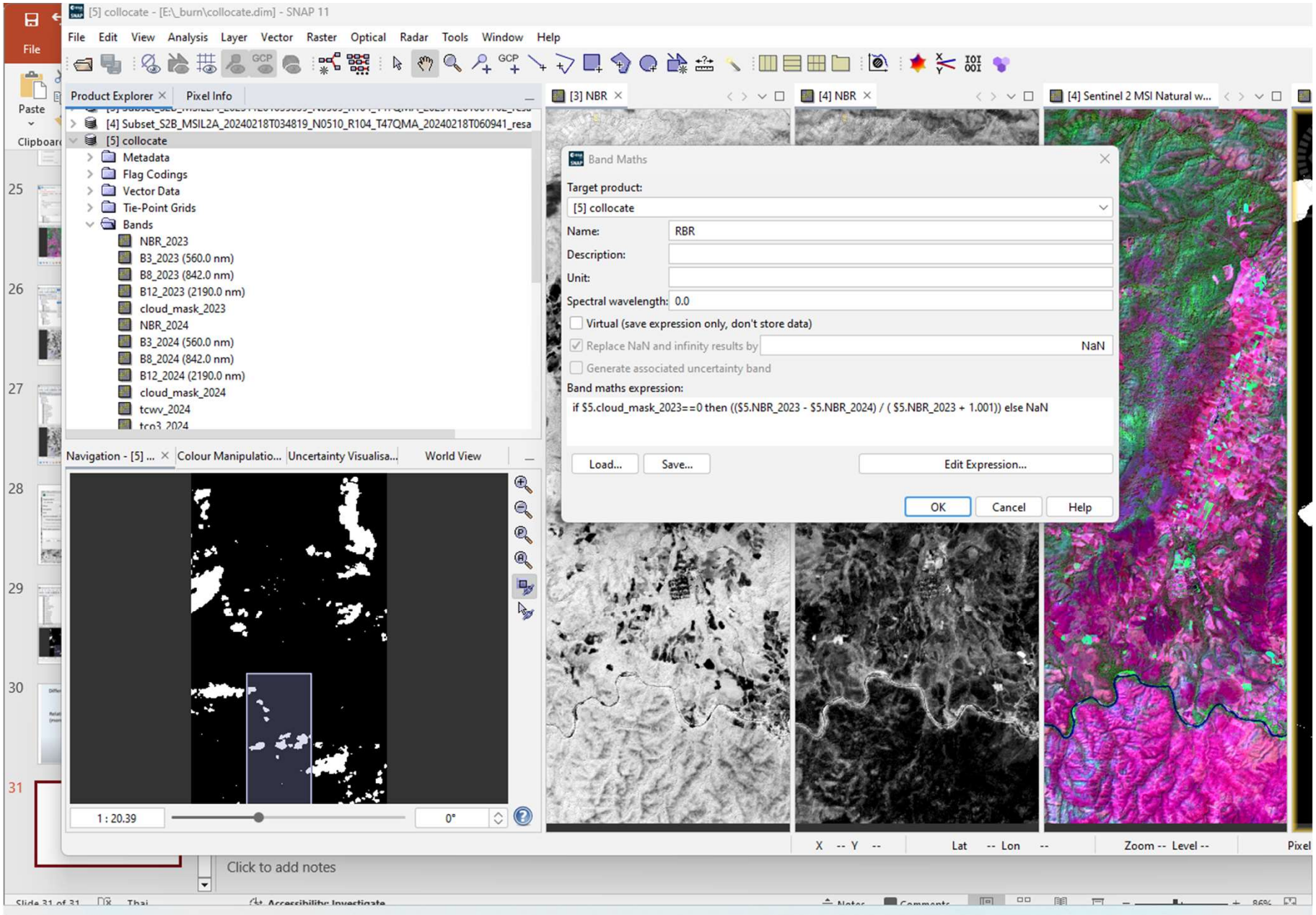
Difference between pre-fire and post-fire NBR => *dNBR*

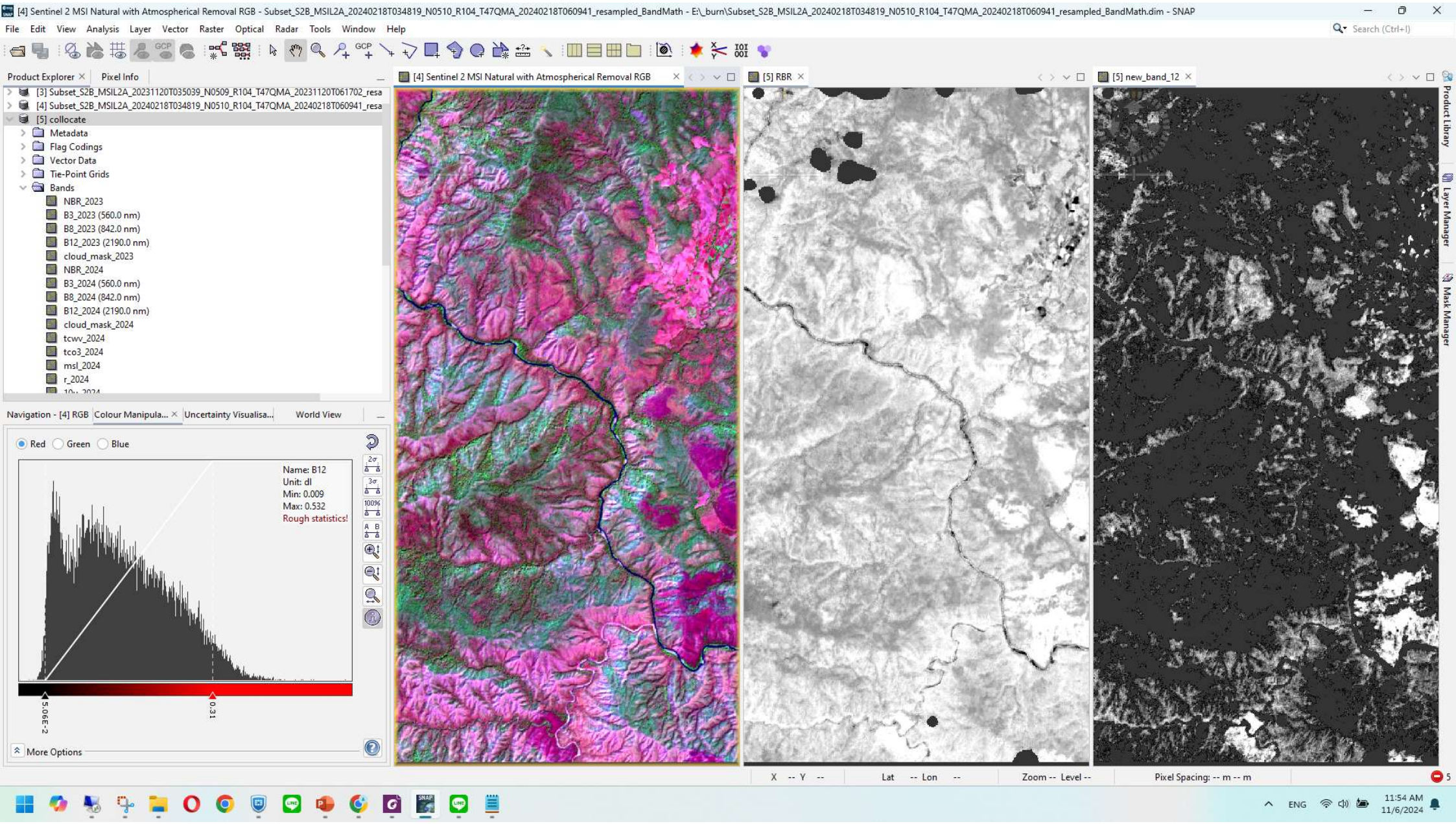
$$dNBR = NBR_{pre-fire} - NBR_{post-fire}$$

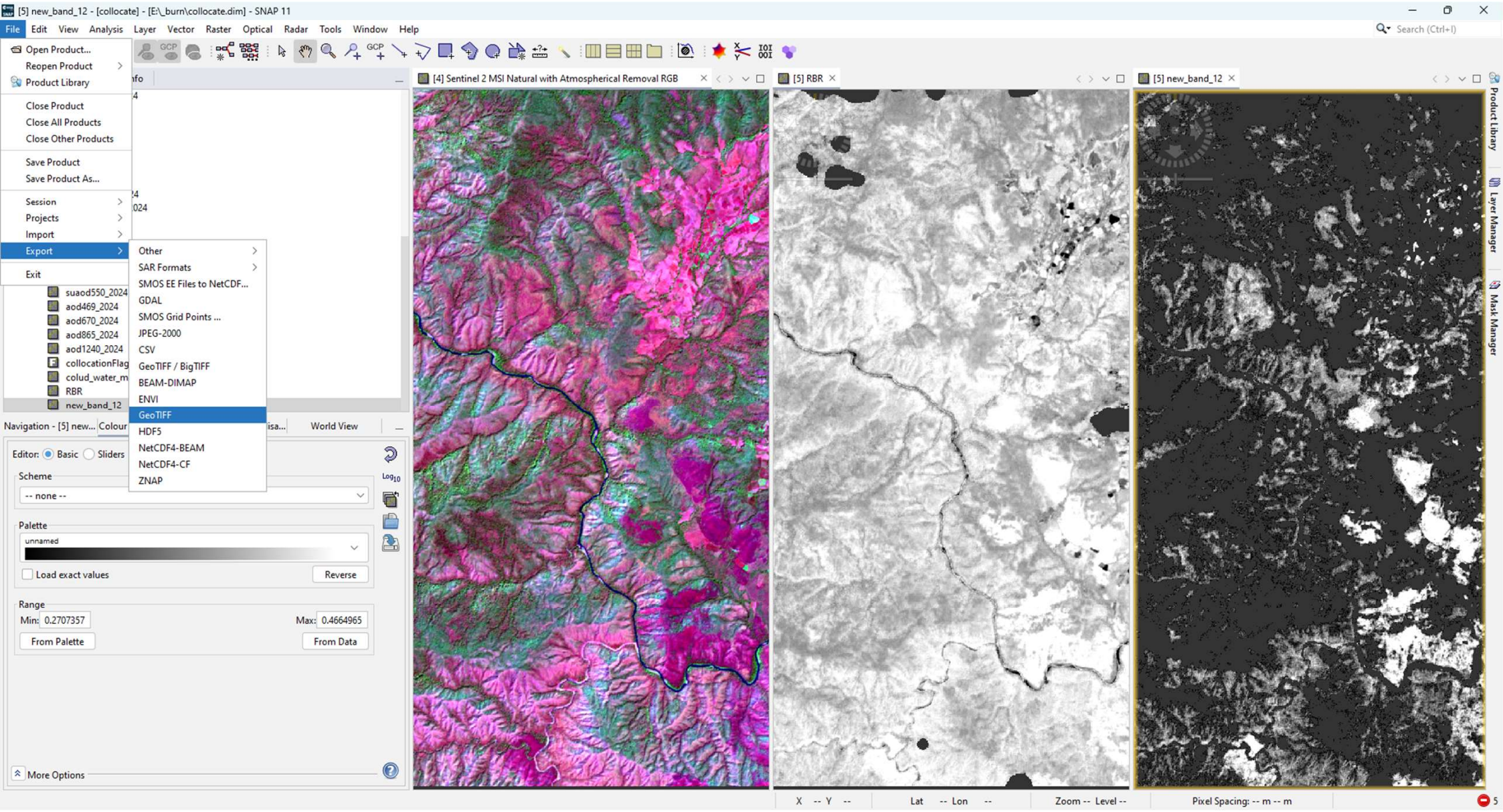
Relativized version of burn severity
(more robust than *dNBR*):

$$RBR = \left( \frac{dNBR}{(NBR_{pre-fire} + 1.001)} \right)$$

$$\boldsymbol{RBR = \left( \frac{NBR_{pre-fire} - NBR_{post-fire}}{(NBR_{pre-fire} + 1.001)} \right)}$$


[5] collocate - [E:_burn\collocate.dim] - SNAP 11
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Product Explorer
Pixel Info
[4] Subset_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941_resa
[5] collocate
Metadata
Flag Codings
Vector Data
Tie-Point Grids
Bands
NBR_2023
B3_2023 (560.0 nm)
B8_2023 (842.0 nm)
B12_2023 (2190.0 nm)
cloud_mask_2023
NBR_2024
B3_2024 (560.0 nm)
B8_2024 (842.0 nm)
B12_2024 (2190.0 nm)
cloud_mask_2024
tcwv_2024
Navigation - [5] ...
Colour Manipulatio...
Uncertainty Visualisa...
World View
1 : 20.39
0°
[3] NBR
[4] NBR
[4] Sentinel 2 MSI Natural w...
Band Maths
Target product:
[5] collocate
Name: RBR
Description:
Unit:
Spectral wavelength: 0.0
Virtual (save expression only, don't store data)
Replace NaN and infinity results by NaN
Generate associated uncertainty band
Band maths expression:
if $5.cloud_mask_2023==0 then (($5.NBR_2023 - $5.NBR_2024) / ( $5.NBR_2023 + 1.001)) else NaN
Load...
Save...
Edit Expression...
OK
Cancel
Help
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel
Click to add notes


[4] Sentinel 2 MSI Natural with Atmospherical Removal RGB - Subset_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941_resampled_BandMath - E:_burn\Subset_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941_resampled_BandMath.dim - SNAP
File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
[3] Subset_S2B_MSIL2A_20231120T035039_N0509_R104_T47QMA_20231120T061702_resa
[4] Subset_S2B_MSIL2A_20240218T034819_N0510_R104_T47QMA_20240218T060941_resa
[5] collocate
Metadata
Flag Codings
Vector Data
Tie-Point Grids
Bands
NBR_2023
B3_2023 (560.0 nm)
B8_2023 (842.0 nm)
B12_2023 (2190.0 nm)
cloud_mask_2023
NBR_2024
B3_2024 (560.0 nm)
B8_2024 (842.0 nm)
B12_2024 (2190.0 nm)
cloud_mask_2024
tcwv_2024
tco3_2024
msl_2024
r_2024
Navigation - [4] RGB
Colour Manipula...
Uncertainty Visualisa...
World View
Red
Green
Blue
Name: B12
Unit: dl
Min: 0.009
Max: 0.532
Rough statistics!
5.06E-2
0.31
More Options
[4] Sentinel 2 MSI Natural with Atmospherical Removal RGB
[5] RBR
[5] new_band_12
Product Library
Layer Manager
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m
ENG
11:54 AM
11/6/2024


[5] new_band_12 - [collocate] - [E:_burn\collocate.dim] - SNAP 11
File
Edit
View
Analysis
Layer
Vector
Raster
Optical
Radar
Tools
Window
Help
Search (Ctrl+I)
Open Product...
Reopen Product
Product Library
Close Product
Close All Products
Close Other Products
Save Product
Save Product As...
Session
Projects
Import
Export
Exit
Other
SAR Formats
SMOS EE Files to NetCDF...
GDAL
SMOS Grid Points ...
JPEG-2000
CSV
GeoTIFF / BigTIFF
BEAM-DIMAP
ENVI
GeoTIFF
HDF5
NetCDF4-BEAM
NetCDF4-CF
ZNAP
suaod550_2024
aod469_2024
aod670_2024
aod865_2024
aod1240_2024
collocationFlag
colud_water_m
RBR
new_band_12
Navigation - [5] new...
Colour
World View
Editor:
Basic
Sliders
Scheme
-- none --
Palette
unnamed
Load exact values
Reverse
Range
Min:
0.2707357
Max:
0.4664965
From Palette
From Data
More Options
[4] Sentinel 2 MSI Natural with Atmospherical Removal RGB
[5] RBR
[5] new_band_12
Product Library
Layer Manager
Mask Manager
X -- Y --
Lat -- Lon --
Zoom -- Level --
Pixel Spacing: -- m -- m

# THANK YOU FOR YOUR EXTENTION

Philippine Space Agency

SENTINEL ASIA

JAXA