

GEMS Application Tool

User Manual

V1.03

contents

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1. OVERVIEW

GEMS Application Tool is a Windows/Linux-based visualization/editing/analysis tool for image and data processing support of geostationary environmental satellite (GEMS) data and domestic and foreign satellite data. In GEMS Application Tool, data can be imported from HDF, NetCDF, Binary, and Text file formats to perform image processing and visualize the processed image. In addition, various analysis editing functions such as precision/comparison analysis, synthesis processing, computational processing, filter processing, and type lab generation can be performed using the imported data.

The satellite data and environmental data currently available in the GEMS Application Tool are as follows.

| Category | Product | Note |
|----------|---------------|---------------|
| GK2 GEMS | L1C | Show/Analysis |
| | L2 AERAOD | Show/Analysis |
| | L2 CHOCHO | Show/Analysis |
| | L2 CLOUD | Show/Analysis |
| | L2 HCHO | Show/Analysis |
| | L2 NO2 | Show/Analysis |
| | L2 O3T | Show/Analysis |
| | L2 SO2 | Show/Analysis |
| | L2 UVI | Show/Analysis |
| GK2 AMI | L1B | Show/Analysis |
| | L2 SST | Show/Analysis |
| | L2 CLD | Show/Analysis |
| | L2 CTPS | Show/Analysis |
| TROPOMI | L2 NO2 | Show/Analysis |
| | L2_UVAI | Show/Analysis |
| | L2_O3T | Show/Analysis |
| | L2_SO2 | Show/Analysis |
| | L2_O3P | Show/Analysis |
| | L2_HCHO | Show/Analysis |
| | L2_CO | Show/Analysis |
| | L2_CH4 | Show/Analysis |
| | L2_Cloud | Show/Analysis |
| | L2_TropoO3 | Show/Analysis |
| L2_ALH | Show/Analysis | |
| AIRKOREA | SO2 | Analysis |

| | | |
|-----|------------------|----------|
| | CO | Analysis |
| | O3 | Analysis |
| | NO2 | Analysis |
| | PM10 | Analysis |
| | PM25 | Analysis |
| AWS | Temperatures | Analysis |
| | WindDirection | Analysis |
| | WindSpeed | Analysis |
| | Precipitation | Analysis |
| | LocalPressure | Analysis |
| | SeaLevelPressure | Analysis |
| | Humidity | Analysis |

2. SOFTWARE REQUIREMENTS

2.1 Specification Requirements

GEMS Application Tool is installed on one PC as a stand-alone software, and the minimum/recommended specifications for operation are as follows.

| category | Minimum Requirements | Recommended Specifications |
|---------------|--|----------------------------|
| CPU | Intel Core i3 | Intel Core i5 or later |
| Memory | 4GB | 8GB or more |
| OS | Linux x64 (CentOS 7 or later), Windows x64 (10 or later) | |

2.2 installation

GEMS Application Tool is provided in a portable manner, and the installation is completed by unzipping the file according to the user's operating environment OS among the provided versions, and no separate installation process is required.

2.3 beginning

Using OS Explorer, GEMS Application Tool releases the portable compression file and double-clicks GEMS Application Tool executable file with the left mouse button in the path.

2.4 The end


The program closes when the [Exit] button is selected under [File] in the software menu, the [ - Exit] button is selected in the toolbar, or the [X] button in the upper right corner of the main screen.



Figure 2-1 Exit GEMS Application Tool

3. SCREEN CONFIGURATION

The software provides a GUI-based screen.

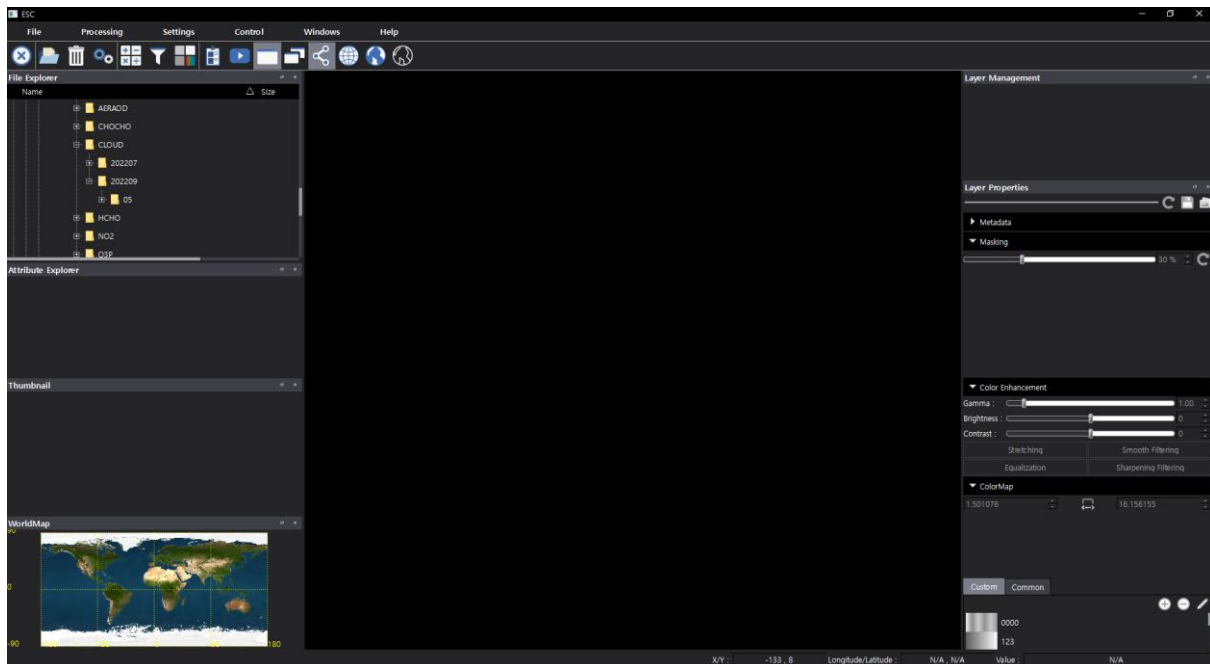


Figure 3-1 Initial screen of GEMS Application Tool

GEMS Application Tool can be freely edited at the user's convenience, except for the video display screen in the center. The secondary screen is provided in the form of a Dock screen, and if the secondary screen is closed and not visible on the screen, the screen can be displayed again under [Windows] in the menu.

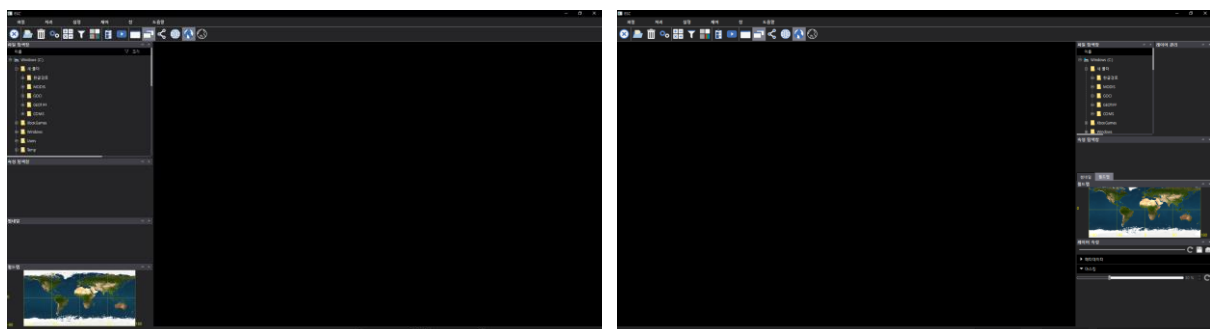


Figure 3-2 Public Utilization Software Screen Layout

3.1 Main menu configuration

When running the software for the use of the people, the main menu is defined and configured as follows. The main menu is located at the top of the top. The main menu consists of six options: File, Processing, Settings, Control, Window, and Help. Each option in the main menu can be clicked to select or view a sub-option.



Figure 3-3 Main Menu Configuration

The sub-configuration menus in each menu are as follows.

| menu | Submenu | explanation |
|------------|--------------------------|--|
| File | Open File | Select and open input materials |
| | Clean | Initialize the entire job |
| | Exit | Close software |
| Processing | Calculator | Open the Operations window |
| | Filter | Open the Filter Processing window |
| | RGB Composite | Open the Composite Processing window |
| | Timelapse | Open the Type-lapse window |
| | Analysis | Open the Precision/Comparative Analysis window |
| Settings | Display Setting | Open the Display Management window |
| | Area Of Interest Setting | Open the Area Of Interest window |
| | Language | Select a language |
| Control | Tab View | View with video display window tabs |
| | Grid View | View in the video display window grid |
| | Synchronization | Synchronization between image display windows |
| | Latitude/Longitude Line | Superposition latitude/longitude lines on images |
| | Background Map | Superimpose a background map on an image |
| | Boundary | Superimpose borders on images |
| Windows | File Explorer | Place in the File Navigation Pane Workspace |
| | Attribute Explorer | Placement in the Navigation Pane Workspace |
| | Layer Management | Place in the Manage Layers window workspace |
| | Layer Properties | Place in the Layer Properties Window workspace |
| | Thumbnail | Place in thumbnail window workspace |
| | WorldMap | Place in the Worldmap Window workspace |
| | Main Toolbar | Main Toolbar Placement |
| Help | Manual | Open Manual |
















| | | |
|--|-------------|----------------------|
| | Information | Open the Info window |
|--|-------------|----------------------|

3.2 Main toolbar configuration

GEMS Application Tool provides the main action menu as a toolbar, and the items in the main toolbar provide the main function items among the functions provided in the main menu.



Figure 3-4 Main Toolbar

| icon | function | icon | function |
|---|-------------------------|---|-----------------|
|  | Exit |  | Open File |
|  | Clean |  | Display Config |
|  | Calculator |  | Filter |
|  | RGB Composite |  | Analysis |
|  | Timelapse |  | Tab View |
|  | Grid View |  | Synchronization |
|  | Latitude/Longitude Line |  | Background Map |
|  | Boundary | | |

3.3 Screen editing

In addition to the file menu provided by default, the task screen of the software can be replaced with the main screen according to the user's settings. The screen layout method is as follows.

- Activate the secondary screen
 - ① From the main menu, click the [Windows] menu
 - ② [Windows] Click the submenu sorted under Menu
 - ✓ Disable on click in active state
 - ✓ Activate on click in the disabled state

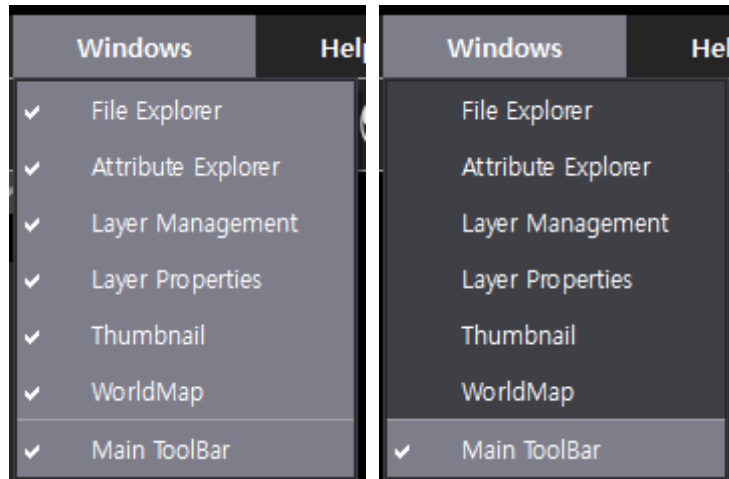


Figure 3-5 [Windows] submenu and enable/disable status screen

■ Secondary screen movement and placement

The secondary screen other than the image display screen placed in the center allows the user to move the position freely, and the moved position is maintained even if the software is restarted. The screen movement and arrangement are as follows.

- ① Select a secondary screen to move while holding down the left mouse button
- ② Move to the desired location and press the left mouse button to release

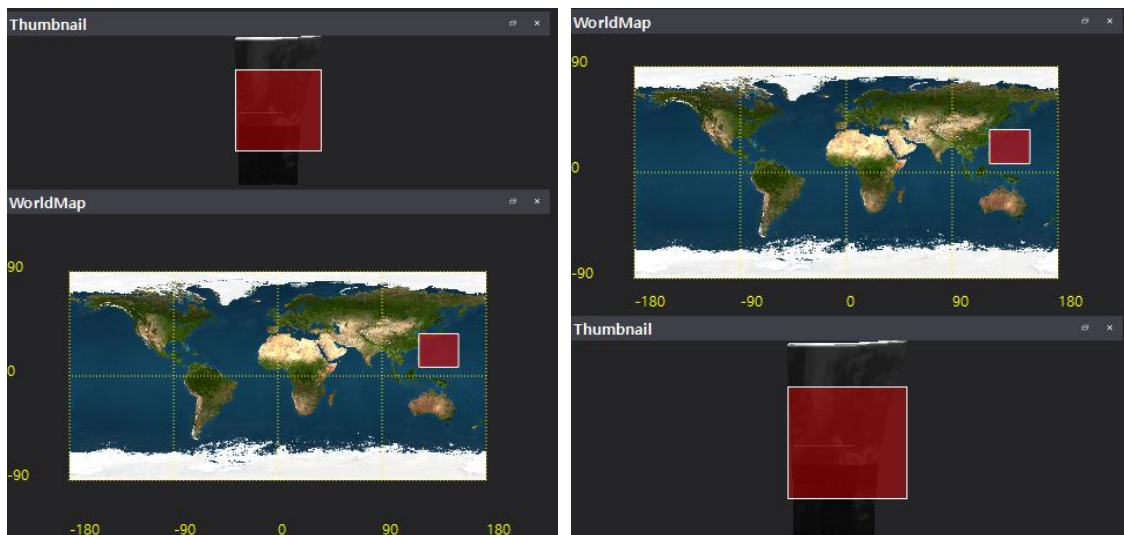


Figure 3-6 Screen Configuration Example – Move

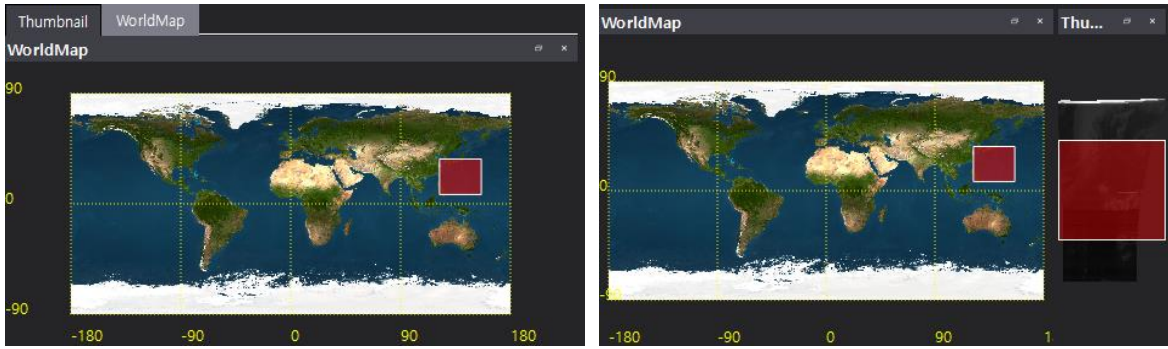



Figure 3-7 Screen Configuration Example – Layout

4. FUNCTION INTRODUCTION

4.1 Initializing a task

After loading, editing, and analyzing satellite data, it summarizes all the current work to perform new tasks and returns it to the program starting state.

- Initialization from the menu
 - ① Select [File] from the top menu of the main screen
 - ② When the menu is displayed, select [Clean]

- Initialization from the toolbar
 - ① Select [ - Clean] in the toolbar

4.2 Display management

Performs a function of performing a custom setting for the display of latitude / longitude lines, boundary lines, and background maps provided as overlapping functions on the image display screen.

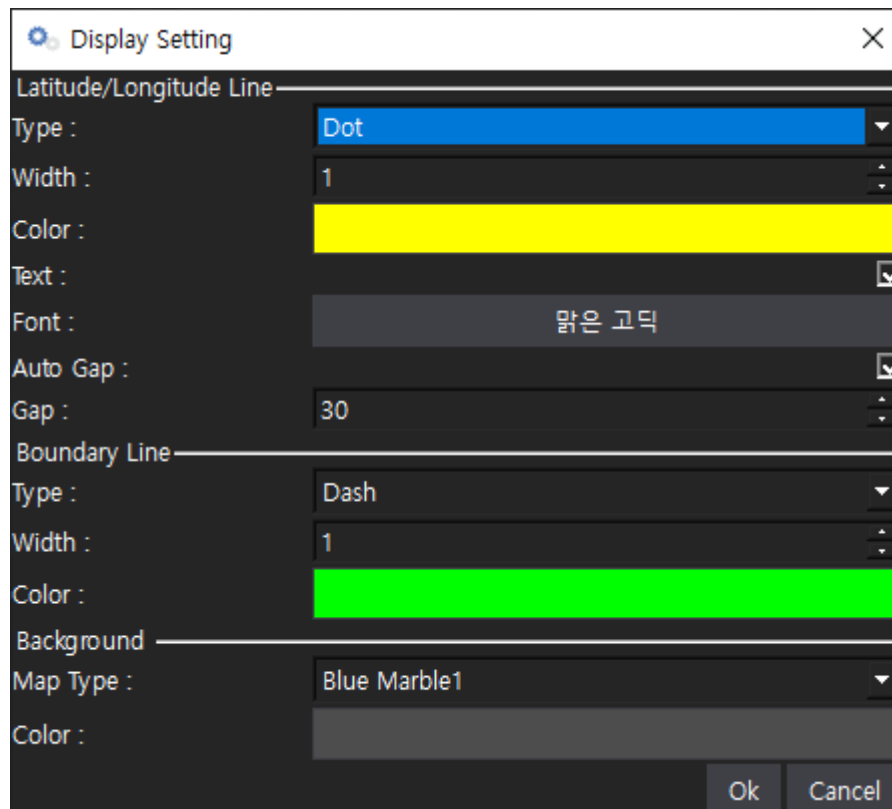



Figure 4-1 Display Management

- Opening the Display Management window from the menu
 - ① Select [Settings] from the menu at the top of the main screen
 - ② When the menu is displayed, select [Display Setting]

- Open the Display Management window in Toolbar
 - ① Select [ - Display Setting] in the toolbar

- Latitude/Longitude Lines
 - ① Perform latitude/longitude line settings
 - Type : Shape of Line
 - Width: Width of the line
 - Color : Color of line
 - Text : Latitude/longitude text displayed

- Font : Latitude/Longitude Text Font
- Auto Gap: Whether the latitude/longitude line is automatically spaced according to zoom
- Gap : The interval value expressed during manual interval

■ boundary

① Perform boundary settings

- Type : Shape of Line
- Width : Width of the line
- Color : Color of line

■ background

① Perform background settings

- Map type: The shape of the map to be used as a background map

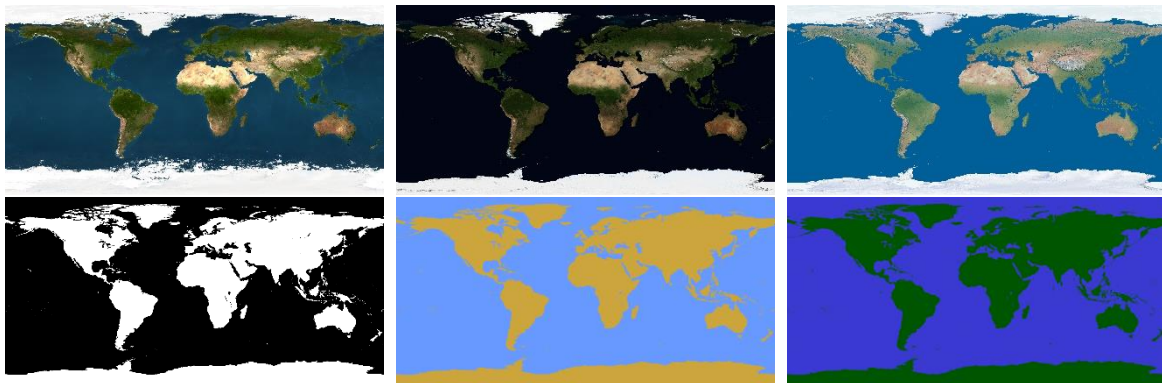


Figure 4-2 Background Map

- Color : Background color of the display window

4.3 Local Disk Management

It uses data stored on the local disk and manages the path and files on the local disk through File Explorer. In the file navigation window, you can create folders, move folders and files, rename folders and files, and delete folders and files.

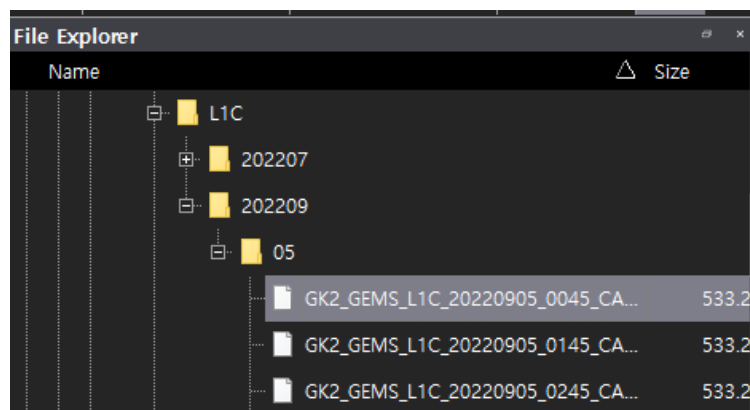


Figure 4-3 Local Disk Management

- Create a folder
 - ① In the file navigation window, select the parent folder you want to create a folder for, and then select the right mouse button
 - ② When the menu appears, select [Create Folder]
 - ③ Create a folder with the name NewFolderXXX

- Move folders and files
 - ① Select the folder and file you want to move in the file navigation window, select it with the left mouse button, and drag it to the folder you want to move.

- Rename folders and files
 - ① In the file navigation pane, select the folders and files you want to rename
 - ② Select the [F2] button or the right mouse button on the keyboard
 - ③ When the menu is displayed, select [Rename]
 - ④ When rename is enabled, enter the change name

- Display file attributes
 - ① Select the satellite data you want to import from the file navigation window and double-click the left mouse button
 - ② Display the file's attribute information in the property navigation window

4.4 Importing Resources

Satellite data is used as input data, satellite data is imported to express the properties of data, and each detailed data in satellite data is set and retrieved to display as an image.

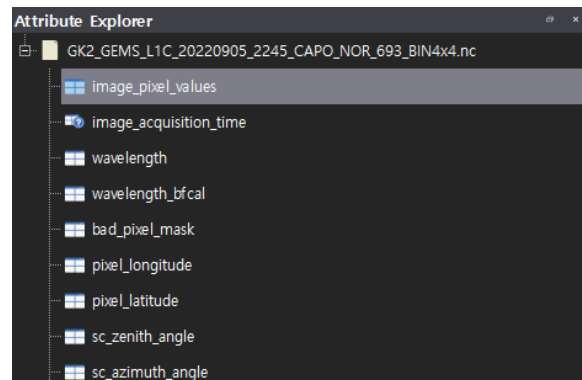



Figure 4-4 Importing Data

- Open input material from a menu
 - ① Select [File] from the top menu of the main screen
 - ② When the menu is displayed, select [Open File]
 - ③ When the file selection window appears, select the file you want to load, and then select the [Open] button
 - ④ Display the attributes of satellite data selected in the property navigation window

- Open input material from the toolbar
 - ① Select [ - Open File] in the toolbar
 - ② When the file selection window appears, select the file you want to load, and then select the [Open] button
 - ③ Display the attributes of satellite data selected in the property navigation window

- Open input material in the property navigation pane
 - ① Select the files you want to load from your operating system's File Explorer
 - ② In the property's navigation bar of the software, left-select and drag the file

- Open input material from the file navigation pane
 - ① Select the satellite data you want to import from the file navigation window and double-click the left mouse button
 - ② Display the file's attribute information in the property navigation window

4.5 Video display and control

It performs the function of retrieving satellite data to generate, display, and control images.

■ Video Display

- ① In the property navigation window, double-click the dataset you want to display as an image
- ② Display dataset setting screen

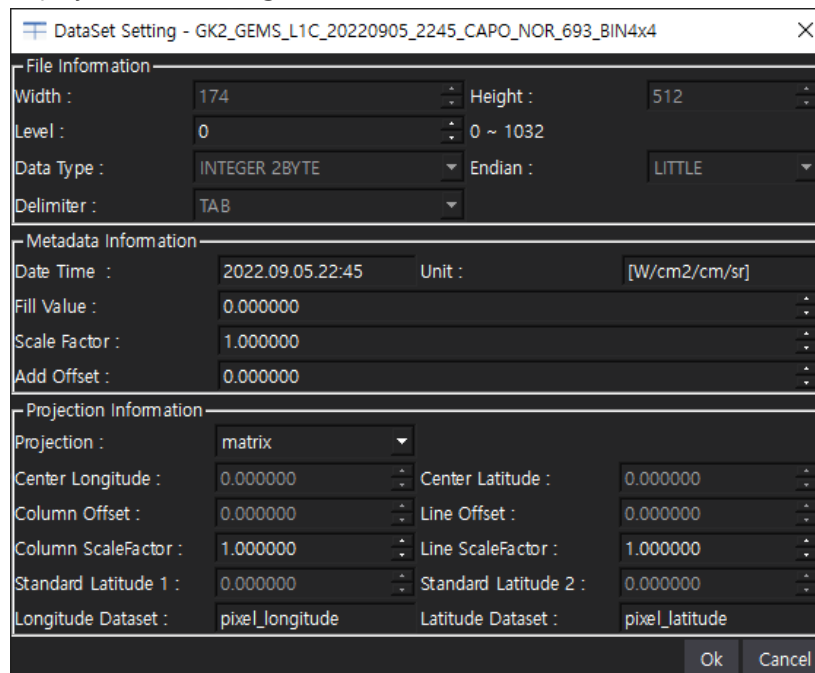


Figure 4-5 Dataset Settings

- ✓ File Information
 - Width : Horizontal Size
 - Height : Vertical Size
 - Level : Data band index (for 3-D)
 - Data Type : Data type (for Binary files)
 - Endian : Endian (for Binary files)
 - Delimiter : Delimiter (for Text files)
- ✓ Metadata Information
 - Date Time : Date Time
 - Unit: unit
 - Fill Value : Fill Value
 - Scale Factor : Scale Factor
 - Add Offset : offset
- ✓ Projection Information
 - Projection : Projection type
 - Center Longitude: center longitude

- Center Latitude: center latitude
 - Column Offset : Horizontal offset
 - Line Offset: Vertical Offset
 - Column ScaleFactor : Horizontal scale factor
 - Line ScaleFactor : Vertical Scale Factor
 - Standard Latitude 1 : reference latitude 1
 - Standard Latitude 2 : reference latitude 2
 - Longitude Dataset : Longitude dataset
 - Latitude Dataset: Latitude dataset
- ③ Perform settings on the dataset settings screen, and then select the [OK] button
- Enlarge images using mouse
- ① Rotate the mouse wheel upwards on the video display screen
- Enlarge images using the keyboard
- ① While the image display screen is selected, select the [+] button on the keyboard
- Reducing video using mouse
- ① Rotate the mouse wheel in a downward direction on the video display screen
- Video reduction using the keyboard
- ① While the image display screen is selected, select the [-] button on the keyboard
- Move the video
- ① On the video display screen, select the left mouse button and drag the mouse to the location you want to move
- Thumbnail
- ① On the video display screen, select the left mouse button and drag the mouse to the location you want to move
- ② Change the currently visible area on the thumbnail screen

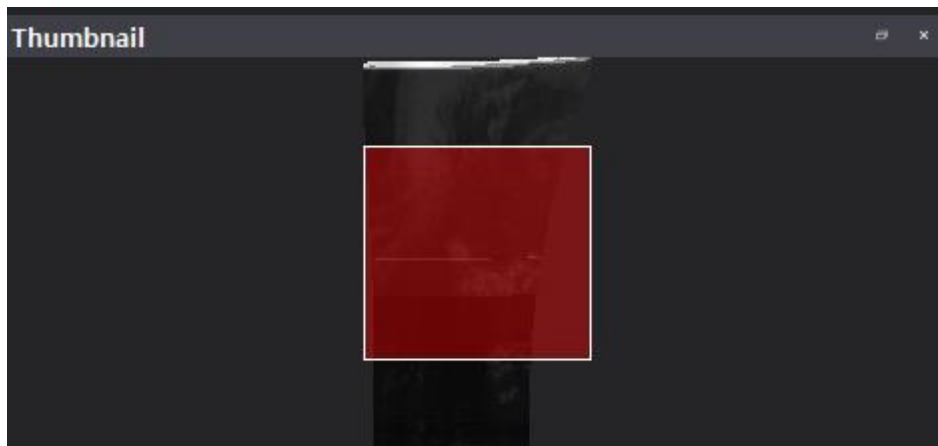


Figure 4-6 Thumbnail

- ③ When panning/zooming an image on a thumbnail, the same function is performed on the image display screen
- World Map
 - ① On the video display screen, select the left mouse button and drag the mouse to the location you want to move
 - ② Change the area currently visible on the Worldmap screen
 - * The World Map function only functions on data containing map projection information.

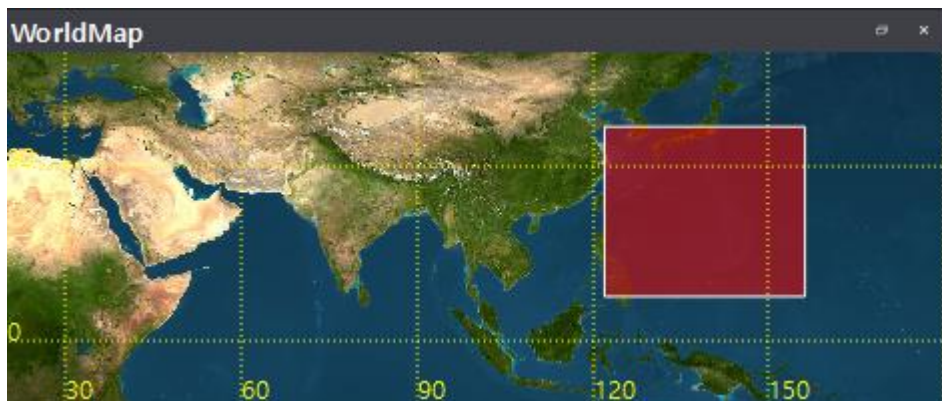



Figure 4-7 World Map

- View the video display screen grid
 - ① Select [ - Grid View] in the toolbar

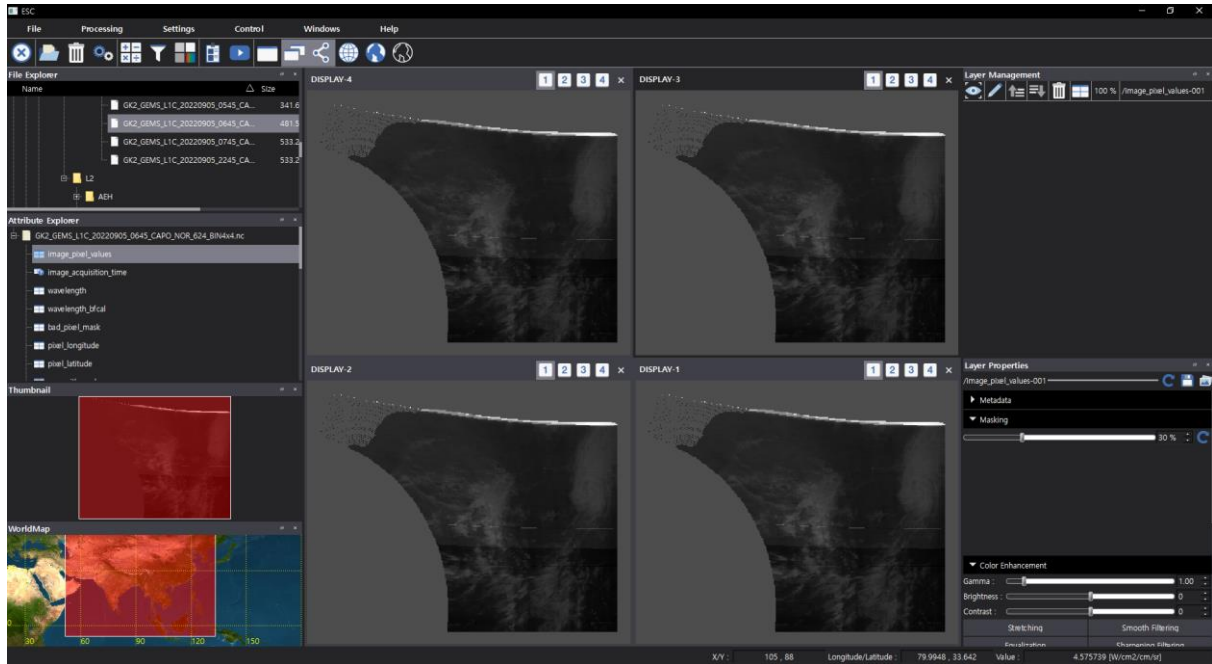



Figure 4-8 Grid View State

- View the video display screen tab

① Select the [ - Tab View] icon in the toolbar

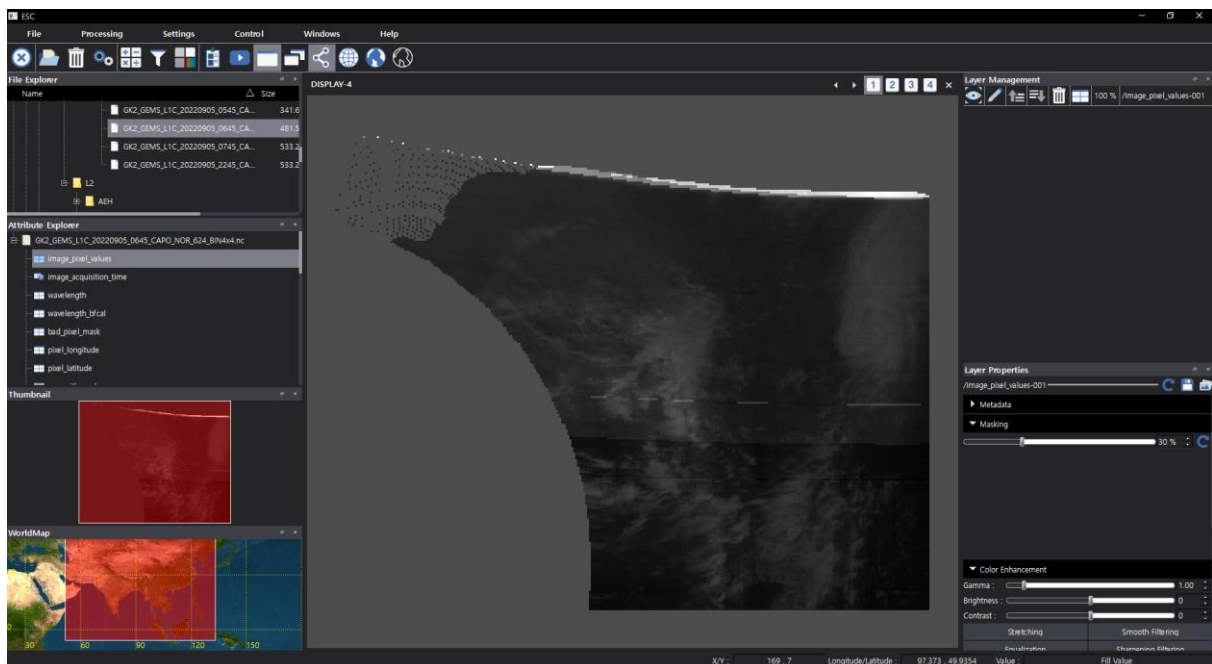


Figure 4-9 Tab View Status

- Superposition latitude/longitude lines on images

① Select [ - Latitude/Longitude Line] in the control toolbar

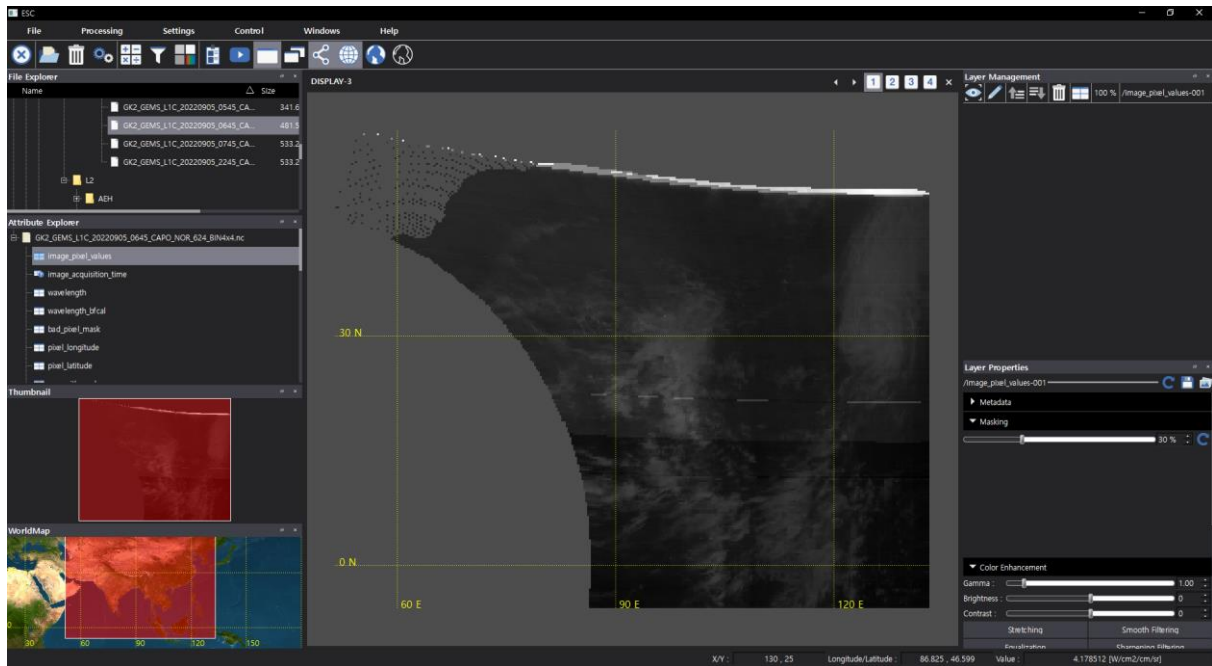


Figure 4-10 Latitude/Longitude Line Overlap

- Superimpose a background map on an image

① Select [ - Background Map] in the control toolbar

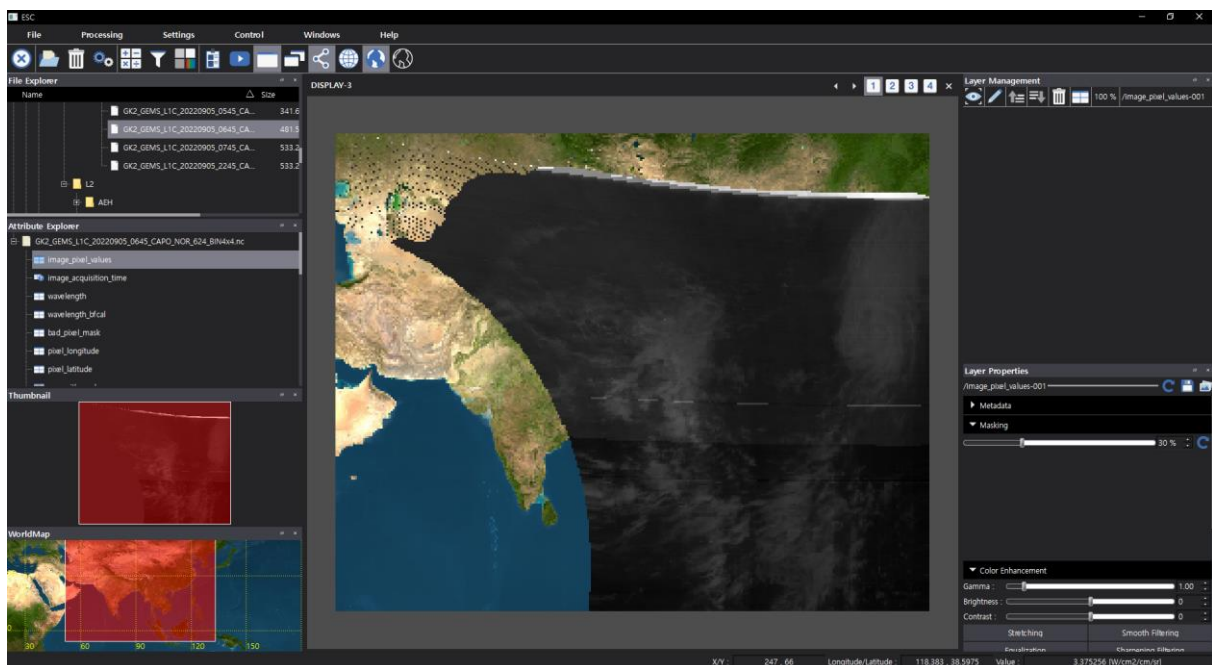



Figure 4-11 Background Map Overlay

- Superimpose borders on images

① Select [ - Boundary] in the control toolbar

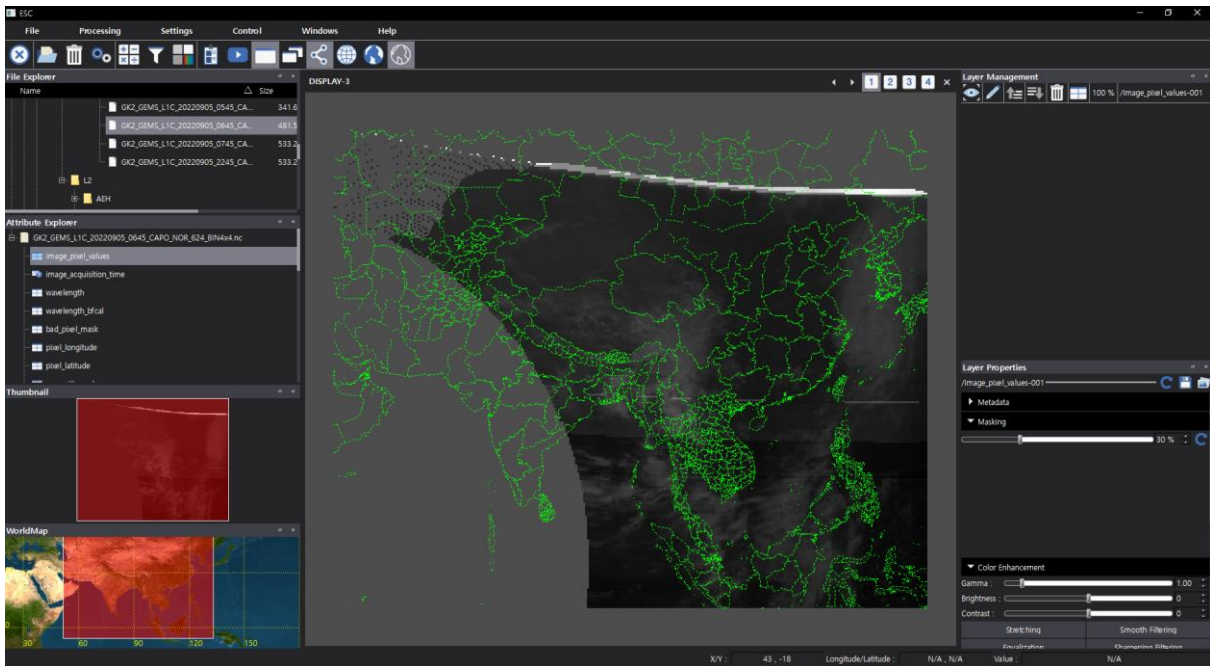


Figure 4-12 Border overlap

4.6 sync

The synchronization function performs spatial synchronization for efficient analysis of the images of the image window and performs the same function when the user performs the control function of image zoom / reduction / movement.

- Enable/disable sync

- ① Select [ - Synchronization] in the toolbar

- Group Management

- ① Select the group button at the top right of the video display screen
* Even if a sync group is set, if the sync is not activated, the sync function does not work



Figure 4-13 Synchronization - Group Management

4.7 Image superposition







The image superposition function performs a function of superimposing different images by performing spatial synchronization on one display screen.

■ Image superposition

- ① In the property navigation window, double-click the dataset you want to display as an image
- ② Display dataset setting screen
- ③ Perform settings on the dataset settings screen, and then select the [OK] button
- ④ Select the image you want to overlay with the left mouse button in the property navigation window and drag it to the image display screen.
- ⑤ Display dataset setting screen
- ⑥ Perform settings on the dataset settings screen, and then select the [OK] button

■ Manage layers

- ① Perform settings related to the display of layers

-  : Enable/Disable
-  : Selection layer
-  : Move to up
-  : Move to bottom
-  : Remove layer
-  : Edit layer data
- Transparency : Adjust layer transparency (0~100%)

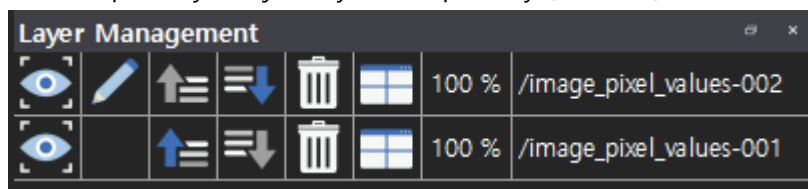


Figure 4-14 Managing Layers

4.8 Layer properties

Displays the basic metadata information of the layer and initializes the layer operation.

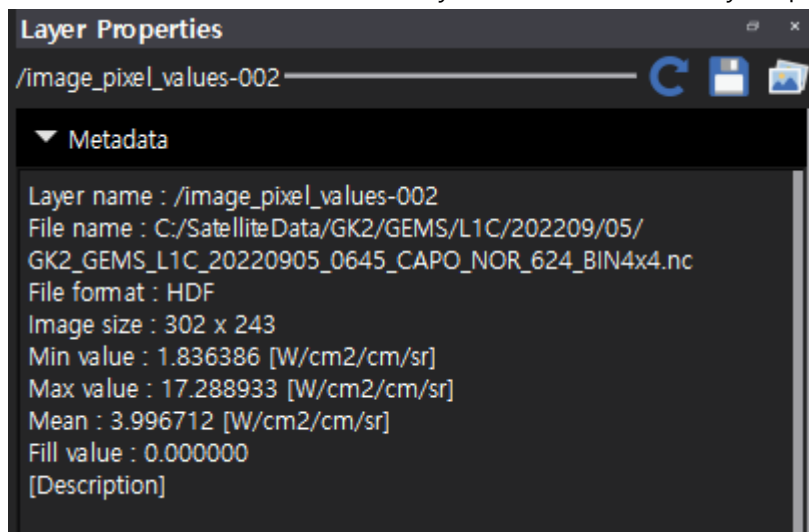



Figure 4-15 Layer Properties

- Display metadata information
 - ① Select the [Metadata] button in the layer properties screen
 - ② Display metadata information

- Initialize layers
 - ① Select the [ - Clean] button on the layer properties screen
 - ② Initialize layer properties

4.9 Color Editing

Adjust the gamma, brightness, and contrast values of the displayed images, and perform histogram stretching, smoothing, smooth filtering, and sharpening filtering functions.

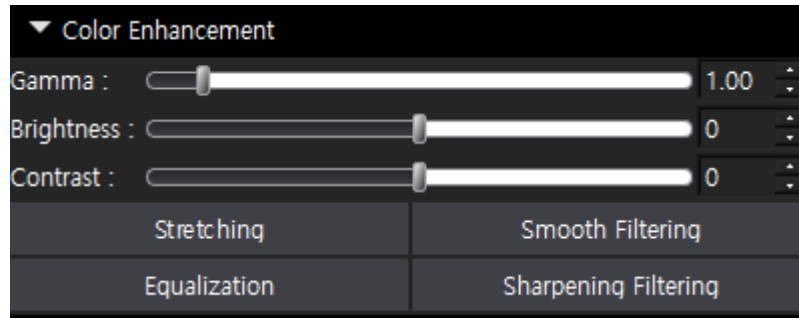
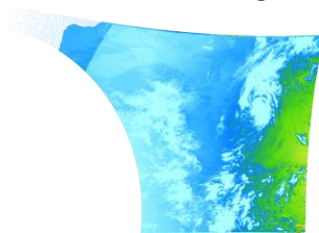


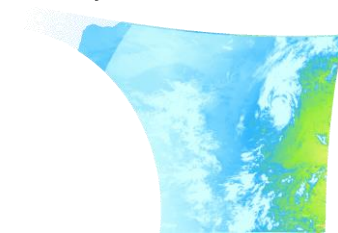
Figure 4-16 Color Editing

■ Gamma adjustment

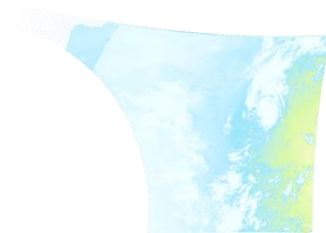
- ① Enter the gamma slider or your own value



<Gamma -50>



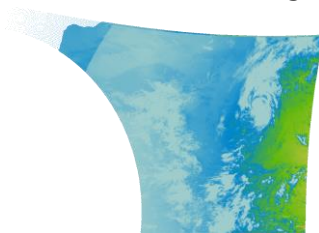
<Gamma 0>



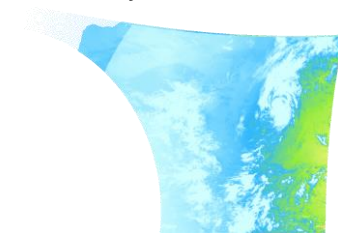
<Gamma +50>

■ Brightness control

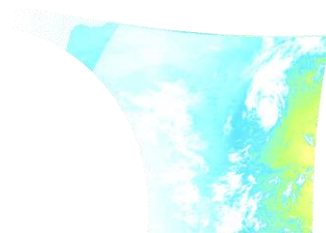
- ① Enter the brightness slider or your own value



<Brightness -50>



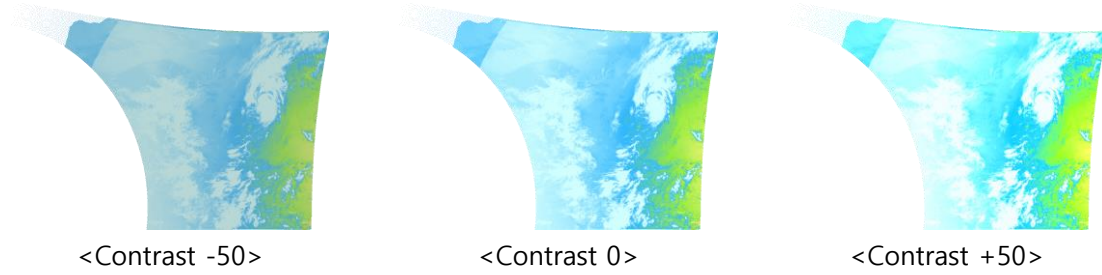
<Brightness 0>



<Brightness +50>

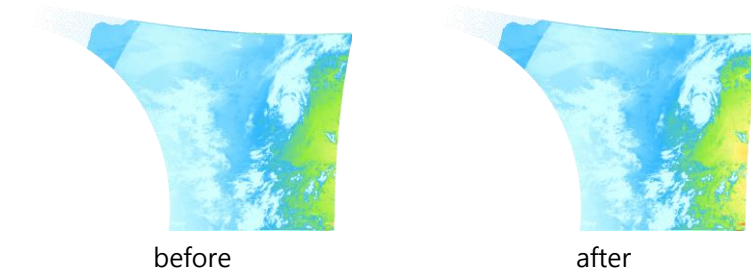
■ Contrast adjustment

- ① Enter a contrast slider or a direct value



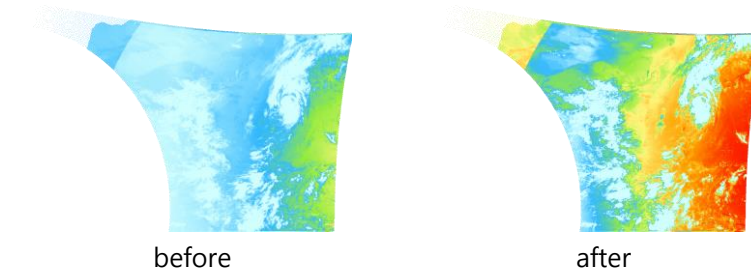
■ stretching

- ① Select the [Stretching] button



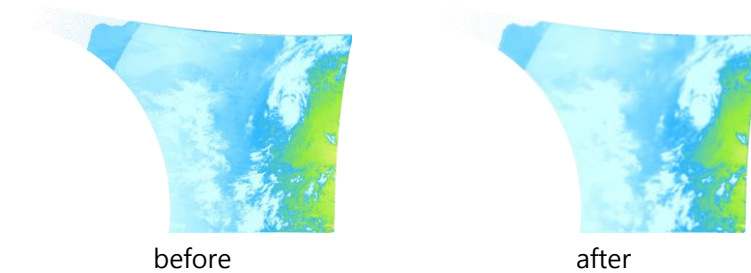
■ Equalization

- ① Select the [Equalization] button



■ Smooth Filtering

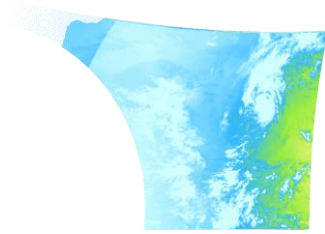
- ① Select the [Smooth Filtering] button



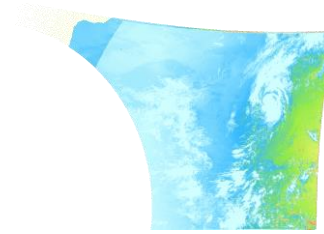
■ Sharpening Filtering

- ① Select the [Sharpening Filtering] button

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before



after

4.10 Colormap

It checks the histogram distribution of the displayed image and performs the function of generating a user-defined image through the color map function.

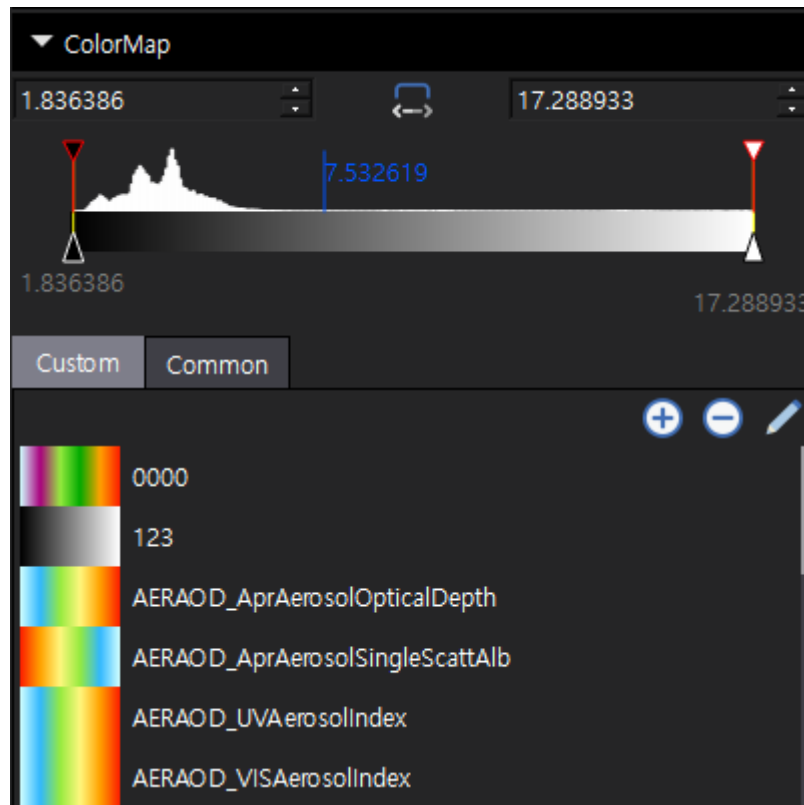



Figure 4-17 Colormap

- Edit item color
 - ① Double-click [Triangle Color Item] at the bottom of the colormap's histogram
 - ② Check after selecting a color in the color selection window
- Move items
 - ① Left-select [Triangle Color Item] at the bottom of the colormap's histogram and drag it left/right
- Add items
 - ① Right-click the location in the colormap's histogram where you want to add an item
 - ② Select the [Add] button from the menu
- Remove an item
 - ① Right-click the item you want to remove from the colormap's histogram

- ② Select the [Remove] button from the menu
- Equal distribution of items
 - ① Right-click an item in the colormap's histogram
 - ② Select the [Equal Distribution] button from the menu
 - Enable/disable gradients
 - ① Right-click the item you want to set in the colormap's histogram
 - ② Select the [Gradation] button from the menu
 - Adjusting color count values
 - ① Select the left or right value of the colormap to enter a value
 - Automatically adjust color range values
 - ① Select the  [Auto Min/Max] button in the colormap
 - Adjusting the color display range
 - ① Select [Windows] from the main menu, and then click [Color Manager]
 - ② In the histogram of the colormap, left-select the top inverted triangle item and move it left/right
 - Color table application
 - ① Double-click the colormap you want to load from the color list at the bottom of the colormap
 - Add custom colormap
 - ① Select the Save button in the Customize Colormap list
 - ② When the color map title input screen is displayed, enter the color map title and select the [OK] button
 - Remove user colormap
 - ① Select the item you want to remove from the list of custom color maps and click the [Remove] button
 - ② When the removal confirmation message appears, select the [OK] button

4.11 Contour

Using the data of the image, it performs the function of generating and displaying a contour according to the interval set by the user.

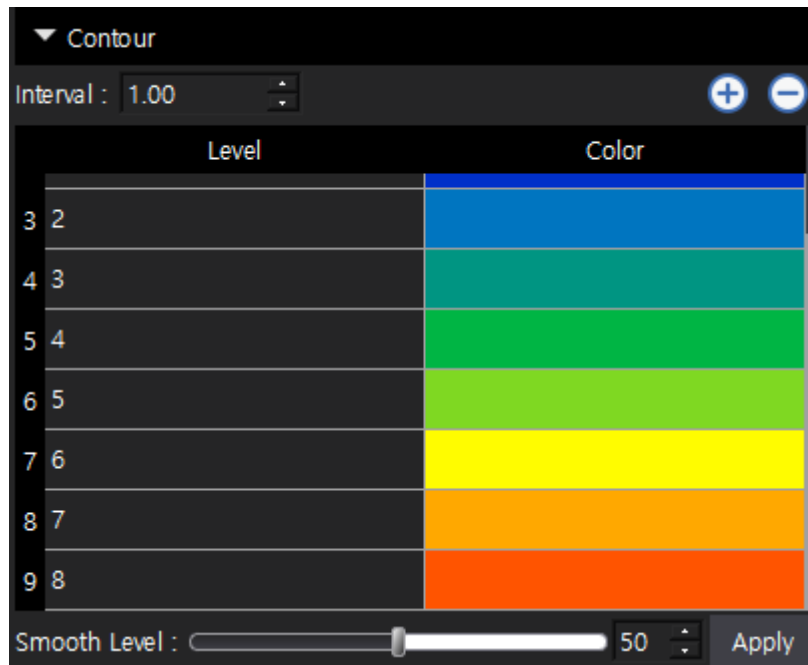




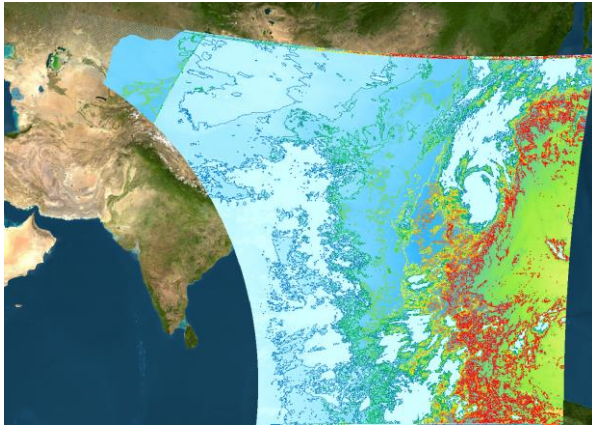
Figure 4-18 contour

- Add a level
 - ① Enter spacing on the contour screen
 - ② Select the [ - Add] button at the top of the level list

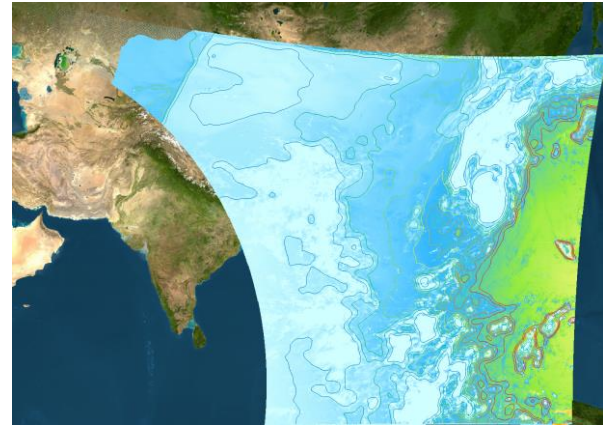
- Remove a level
 - ① Left click select the item you want to remove from the level list on the contour screen.
 - ② Select the [ - Remove] button at the top of the level list

- Edit Levels
 - ① Select the item you want to edit from the level list on the contour screen and enter the level value
 - ② Double-click the color item with the left mouse button
 - ③ Check after selecting a color in the color selection window

- Contour application
 - ① Smooth level slider or enter your own value
 - ② [Apply] Button selection



<Smooth level 0>



<Smooth level 50>

4.12 Cloud masking

It performs the function of masking clouds by using cloud data in the displayed image. For geostationary environmental satellite (GEMS) data, cloud masking can be performed using the EffectiveCloudFraction dataset in the L level2 Cloud output.

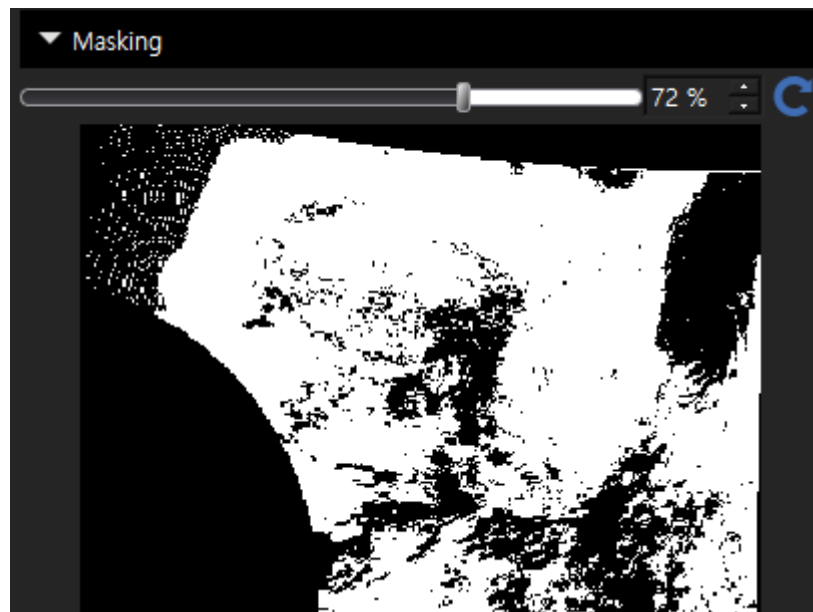
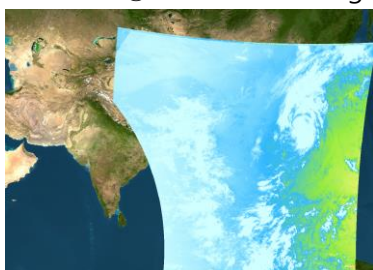


Figure 4-19 Cloud Masking

■ Cloud masking

- ① In the property navigation window, double-click the dataset you want to display as an image
- ② Display dataset setting screen
- ③ Perform settings on the dataset settings screen, and then select the [OK] button
- ④ Left-select the cloud masking dataset in the attribute navigation pane and drag it to the masking screen
- ⑤ Display dataset setting screen
- ⑥ Perform settings on the dataset settings screen, and then select the [OK] button



<Boundary value 0>




<Boundary value 30>



<Boundary value 100>

■ Change cloud boundary values

- ① On the masking screen, enter a slide or a direct value to enter the cloud boundary value

- Remove cloud masking
 - ① On the masking screen, select the [ - Clean] button

4.13 Computational processing

It performs data computation processing using one or two satellite data and performs various computational processing functions such as basic mathematics, trigonometric functions, and logarithmic functions.

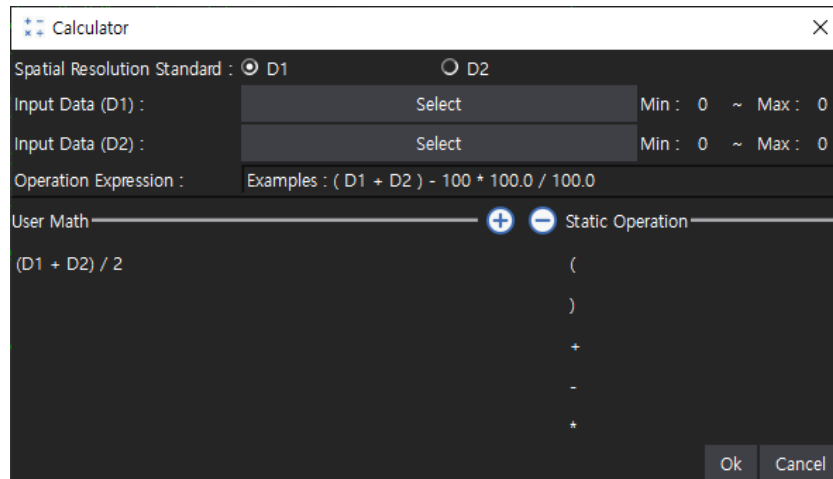




Figure 4-20 Processing Settings Screen Window


■ Computational processing

- ① Select the [ - Operation Processing] button in the toolbar
- ② Select spatial resolution criteria on the calculation processing screen
*Based on spatial resolution: If the width/height sizes of the two data are different, the interpolation method is performed, and the resolution is used as a reference when performing the interpolation method
- ③ [Select] Button selection
- ④ When the Property Explorer screen appears, double-click the data item with the left mouse button
- ⑤ Arithmetic input
Example: $(D1 - D2) * (\sin(D1) - \cos(D2))$
- ⑥ The arithmetic field is marked in green, and then select the [OK] button

■ Adding User-Defined Operations Expressions

- ① On the calculation processing screen, enter the calculation expression, and then select the [ - Add] button

■ Loading user-defined operations

- ① On the operation processing screen, left-click the operation expression in the user-defined operation list
- Remove user-defined arithmetic expressions
 - ① Select the item you want to remove from the list of user-defined operations on the operation processing screen, and then select the [ - Remove] button
- Retrieving basic arithmetic expressions
 - ① On the operation processing screen, double-click the operation expression in the basic operation list

4.14 Filter Processing

It performs a filter processing function that uses satellite data to adjust the threshold of data.

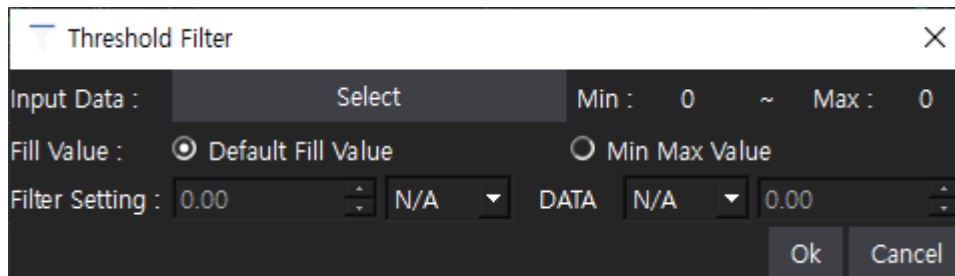

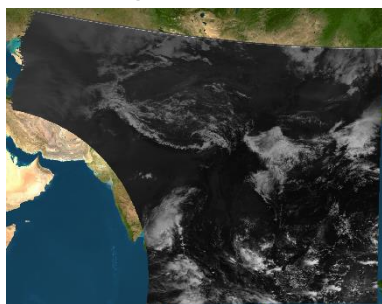


Figure 4-21 Threshold Filter

■ Filter Processing

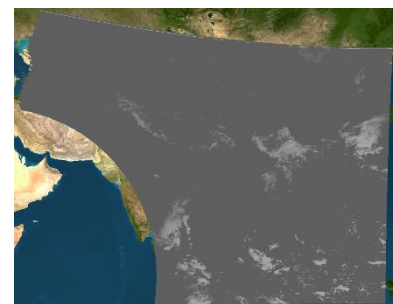
- ① Select the [ - Filter] processing icon in the toolbar
- ② [Select] Button selection
- ③ When the Property Explorer screen appears, double-click the data item with the left mouse button
- ④ Choose a fill value method



<Original>



<Default value>



<Min/Max Value>

- Default value: Treat as fill value of source data
- Min/Max Value: Processed as the min/max value set in the filter settings

- ⑤ After setting the inequality sign and threshold, select the [OK] button

4.15 Synthetic processing

It performs the function of generating RGB images based on three images.

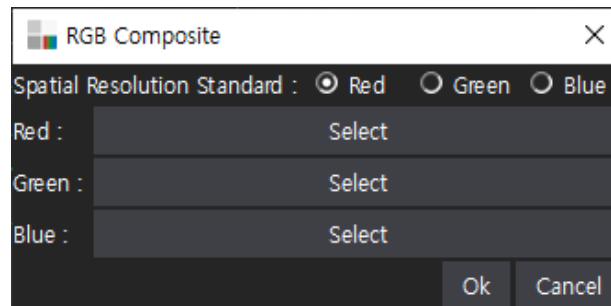

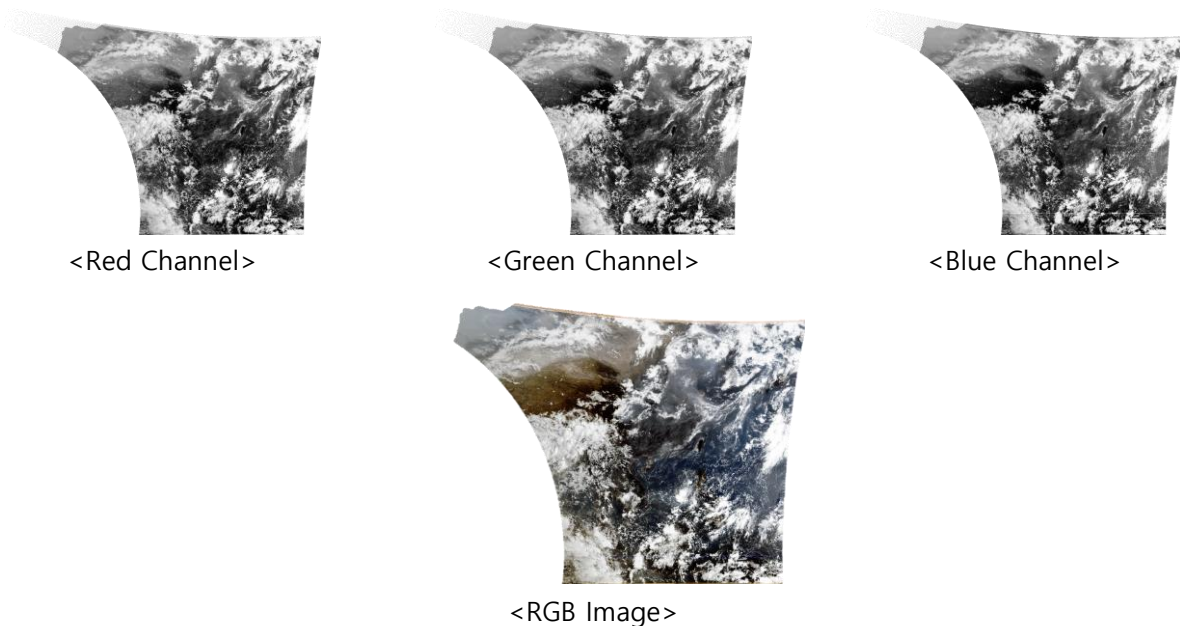


Figure 4-22 Synthetic Processing

■ Generate RGB images

- ① Select the [ - RGB Composite] button in the toolbar
- ② Select spatial resolution criteria on the compositing screen
*Based on spatial resolution: If the width/height sizes of the two data are different, the interpolation method is performed, and the resolution is used as a reference when performing the interpolation method
- ③ [Select] Button selection
- ④ When the Property Explorer screen appears, double-click the data item with the left mouse button
- ⑤ Select all three-channel data, and then select the [OK] button



4.16 Timelapse

Time-lapse performs the function of continuously playing back images imported and processed by the user or continuous images on the local disk and saving them in GIF form.

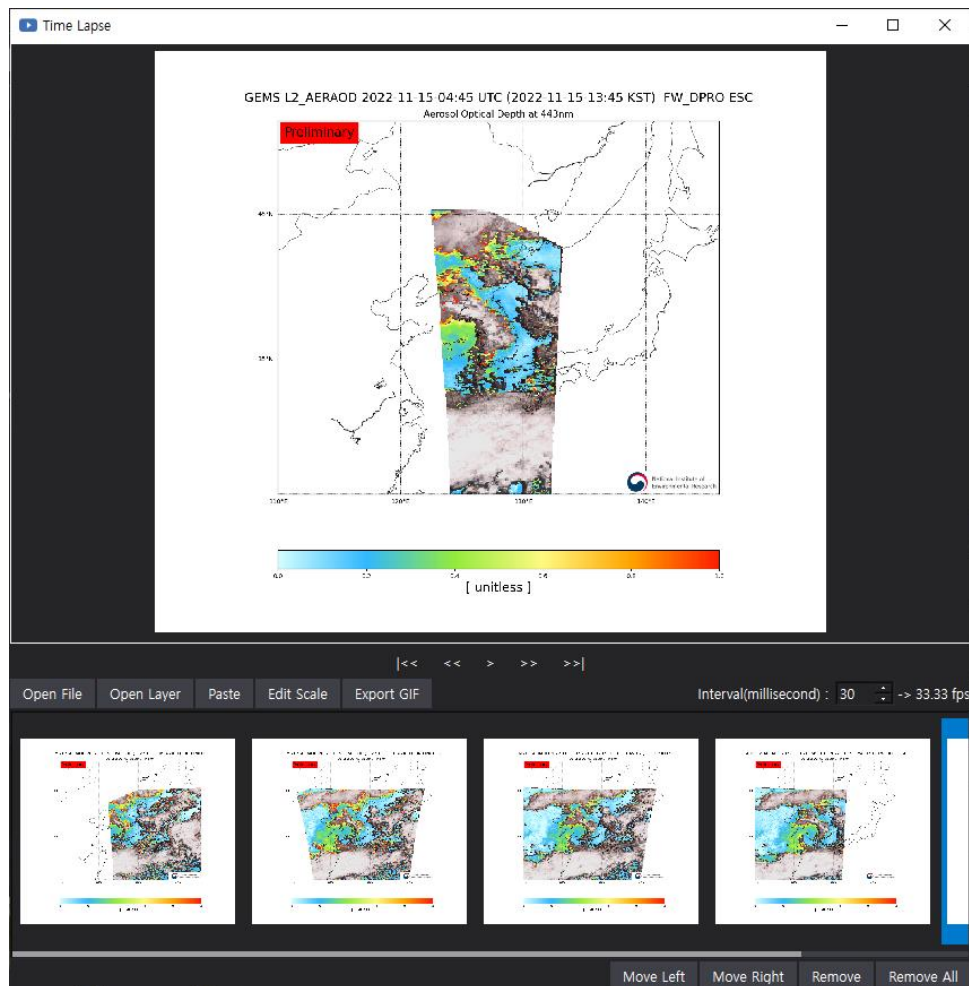



Figure 4-23 Time Lapse

■ Add a time-lapse video

- ① Select the [ - Time Lapse] button on the toolbar
- ② Add video from the time-lapse screen
 - Open File : Video stored on local disk
 - Open layer : Video displayed by software
 - Paste : The image currently stored in the clipboard

* The image is saved on the clipboard when the [Save to Clipboard] function of GEMS Application Tool is performed, or the video file is saved on the clipboard when [Copy, Ctrl+C] the image file through the OS explorer

- Change the order of time-lapse videos
 - ① Select the item you want to change the order of in the time-lapse list with the left mouse button
 - ② Change the order to the left by selecting the [Move left] button at the top right of the time-lapse list
 - ③ Change the order to the right by selecting the [Move Right] button at the top right of the time-lapse list

- Remove time-lapse footage
 - ① Left click the item you want to remove from the timelapse list
 - ② Select the [Remove] button at the top right of the time-lapse list

- Remove the entire time-lapse video
 - ① Select the [Remove All] button at the top right of the timelapse list

- Time Lapse Playback
 - ① Perform time-lapse actions
 - | <<: Go to the very beginning
 - <<: Go to Previous
 - >: Play
 - || : Pause
 - >>: Go to
 - >>| : Go to the end
 - ② Move the screen: Select with the left mouse button in the video display window and drag it to the move position
 - ③ Enlarge: Rotate the mouse wheel upwards in the video display window
 - ④ Shrink the screen: Rotate the mouse wheel in the video display window in the downward direction
 - ⑤ Spacing : Playback speed (millisecond)

- GIF export
 - ① Select the [Export GIF] button on the time-lapse screen
 - ② When the Save As screen is displayed, enter the path and file name, and then select the [Save] button.

4.17 Survey Analysis

The survey analysis function calculates and displays location information, distance, and area based on the position set by the user in the image.

- Add location information
 - ① Select the right mouse button on the image display screen
 - ② Select the [Location] button from the menu
 - ③ Select the left mouse button where you want to display location information in the video

- Add distance information
 - ① Select the right mouse button on the image display screen
 - ② Select the [Distance] button from the menu
 - ③ Select the left mouse button where you want to mark the starting point of the distance in the video
 - ④ Select the left mouse button where you want to mark the distance end point in the video

- Add area information
 - ① Select the right mouse button on the image display screen
 - ② Select the [Area] button from the menu
 - ③ Select the left mouse button where you want to display the area starting point in the image
 - ④ Select the left mouse button where you want to display the area midpoint in succession
 - ⑤ Right-click to finish adding area

- Remove survey information
 - ① Select survey information from the image
 - ② Select the [Delete] button on the keyboard
 - ③ When displaying the removal confirmation message, select the [OK] button

- Remove survey information altogether
 - ① Select the [Ctrl + a] button on your keyboard
 - ② Select the [Delete] button on the keyboard
 - ③ When displaying the removal confirmation message, select the [OK] button

4.18 Areas of Interest

When performing an image display or analysis function, it manages the area that the user mainly analyzes as an area of interest and performs the function of processing only the location.

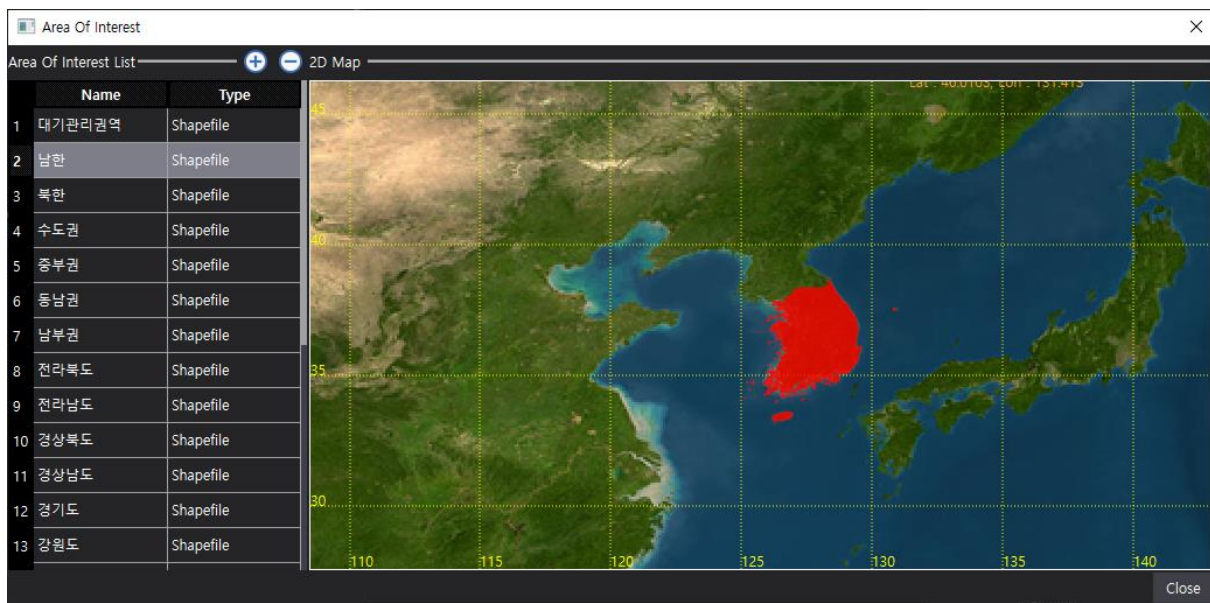

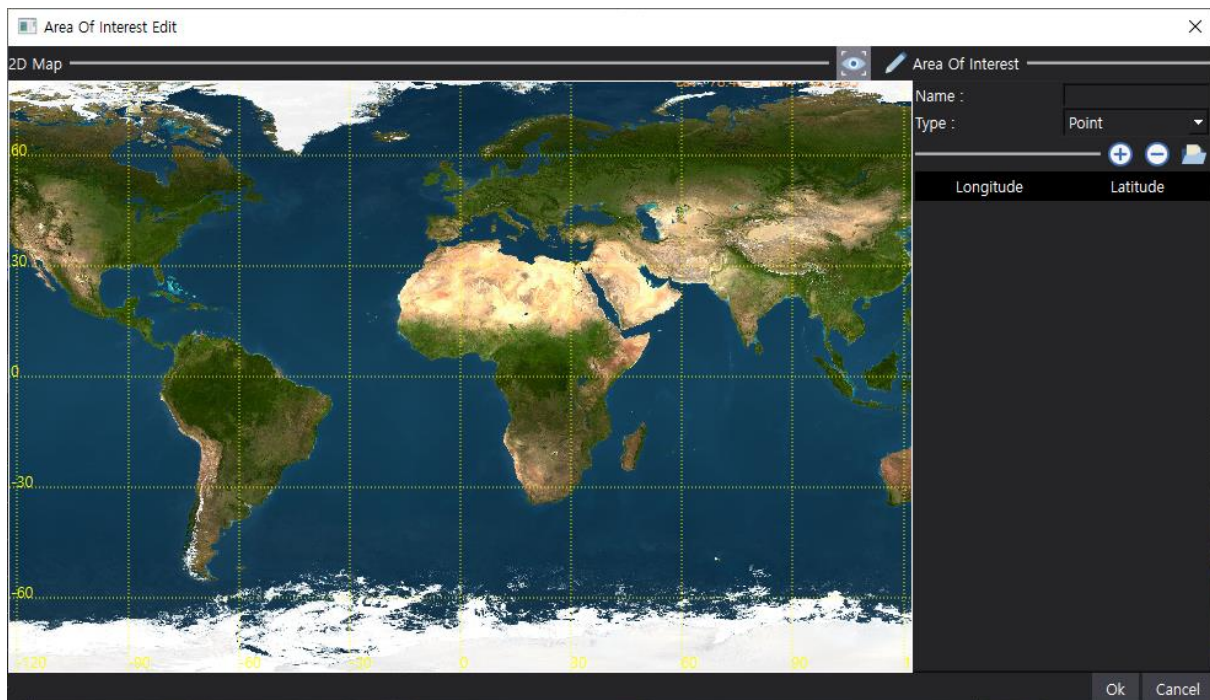


Figure 4-24 Areas of Interest

- Add area of interest item
 - ① Select the [Settings - Area of Interest Setting] button on the toolbar
 - ② Select the [ - Add] button on the Region of Interest screen
 - ③ Display of area of interest editing screen
 - ④ Select the [OK] button after setting on the Edit Region of Interest screen



- Name: Name of region of interest
- Type: Type of region of interest (Point, Line, Rectangle, Polygon)




- : View mode (use mouse to zoom in/out/move)



- : Edit mode (use the mouse to select and control the area)

■ Add area of interest using Shapefile

- ① Select the [ -Load Shapefile] button on the Edit Area of Interest screen
- ② When the file selection screen is displayed, select the shp file and click the [Open] button

When the Proj4 text input screen is displayed, enter Proj4 text suitable for the selected shp file and select the [OK] button.


*If map projection information is included in the Shapefile, it is automatically recognized and the Proj4 text input screen is not displayed

- ③ Interest area information is added, and the area is displayed on the 2D map

*In the case of Shapefile, detailed editing is not possible

■ Remove area of interest entries

- ① Select the [Settings - Area of Interest Setting] button on the toolbar

- ② After selecting the item to be removed from the list of areas of interest, select the
[ -Remove] button
- ③ Select the [Confirm] button when the removal confirmation message is displayed

4.19 Change map projection

The map projection method change function performs the function of changing the original image in the form of a map projection set by the user.

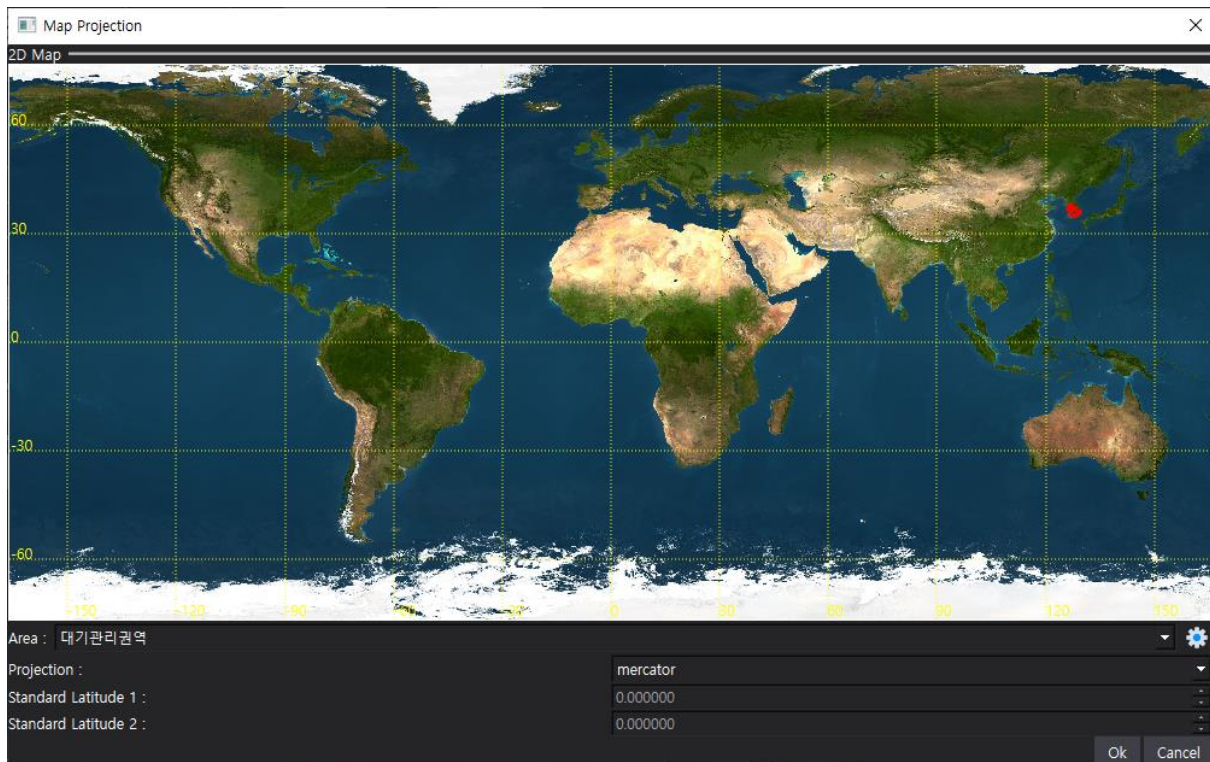
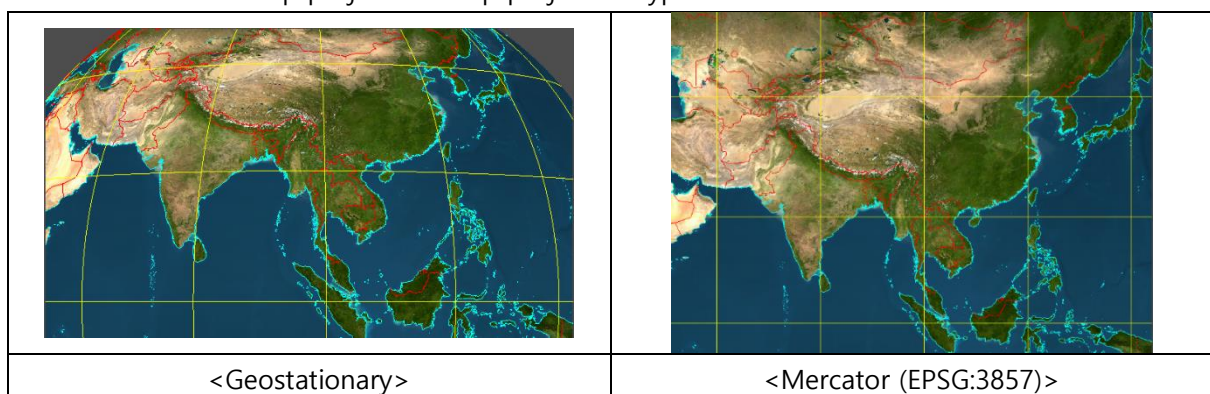
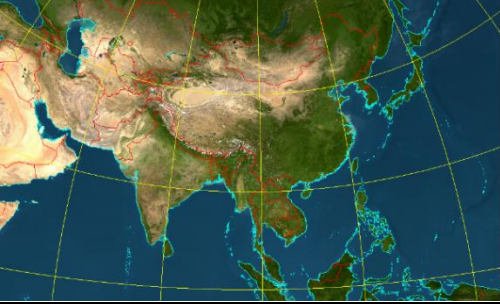
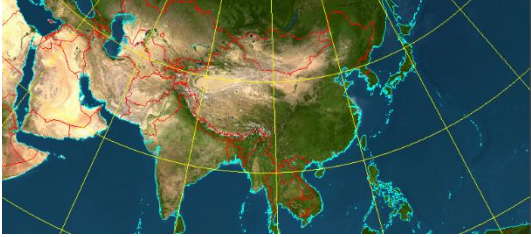


Figure 4-25 Changing the Map Projection

- Change map projection
 - ① Select the right mouse button on the image display screen
 - ② Select the [Map Projection] button from the menu
 - ③ Select the item you want to change from the area list on the map projection screen
 - ④ Enter the map projection setting information and select the [OK] button
 - Map projection: map projection type



| | |
|---|--|
|  |  |
| <p><Polarstereo></p> | <p><Lambert Conic></p> |

- Standard latitude 1: Latitude 1 value used in lambert_conic
- Standard latitude 2: Latitude 2 value used in lambert_conic

4.20 analysis

Geostationary environmental satellites (GEMS), domestic and foreign latitude data, and atmospheric environment data are used to perform precise/comparative analysis functions for the entire area or area of interest.

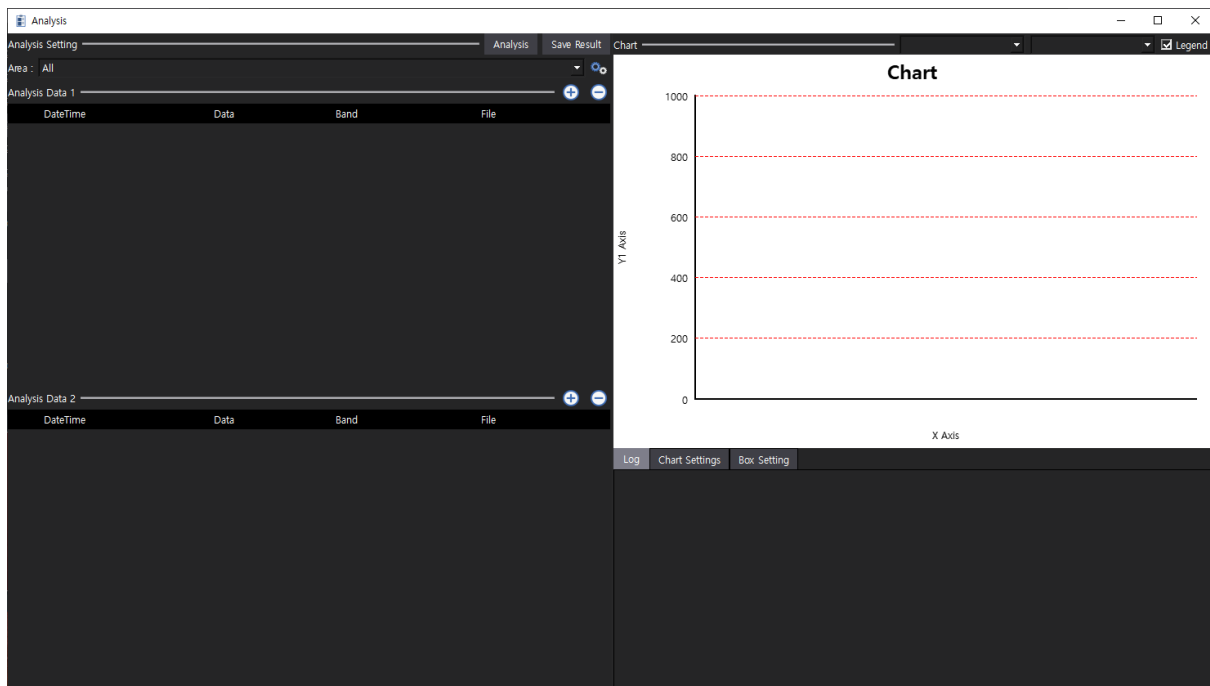



Figure 4-26 Data Storage


■ Add input data

- ① Select the [ - Add] button from the input data list
- ② When the opening screen is displayed, select the file, and then select the [Open] button
 *Performance degradation may occur with more input data
- ③ When items are displayed in the input data list, additional settings

| DateTime | Data | Band | File |
|------------------|----------------------------------|------|--|
| 2022/03/04 03:45 | GK2_GEMS_L2_AERAOD_VISAerosollnd | 0 | GK2_GEMS_L2_20220304_0345_AERAOD_FW_DPRO_ORI |

- Date : Date/time of data
- Data : The type of data you want to import
- Band: Index for 3D data

■ Remove input data

- ① Select the item you want to remove from the input data list, and then select the [ - Remove] button

■ Forensic analysis



- ① Select the [- Analyze] button in the toolbar
- ② Select an analysis area from the Analysis screen
- ③ Add data to Analysis data1, and then select the [Analyze] button

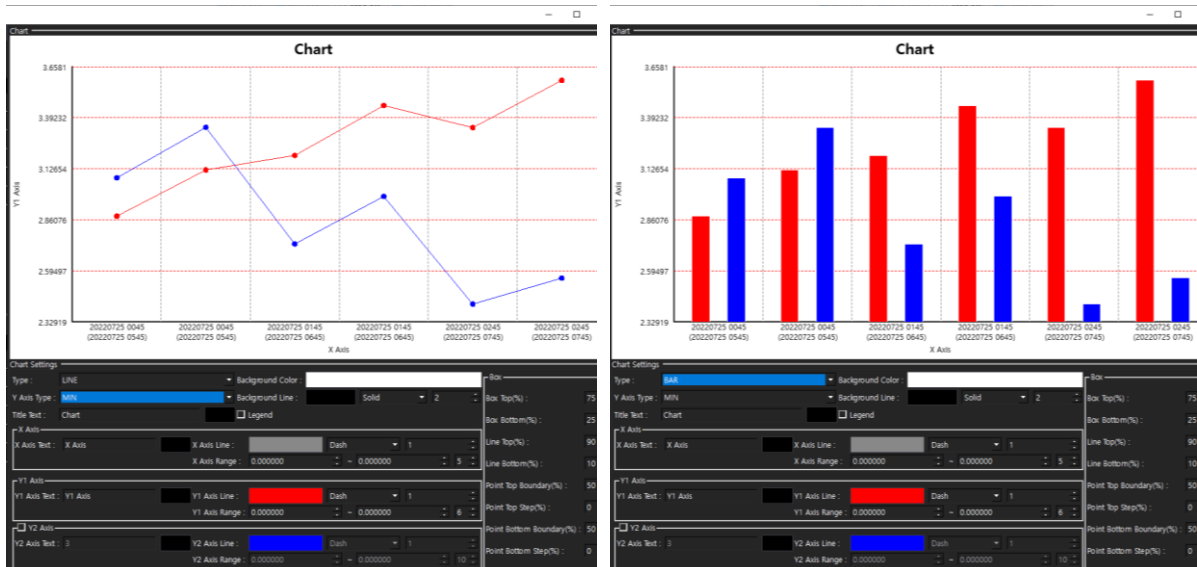
■ Comparative analysis



- ① Select the [- Analyze] button in the toolbar
- ② Select an analysis area from the Analysis screen
- ③ Add data to analytical data1
- ④ Add data to Analysis data2, and then select the [Analyze] button

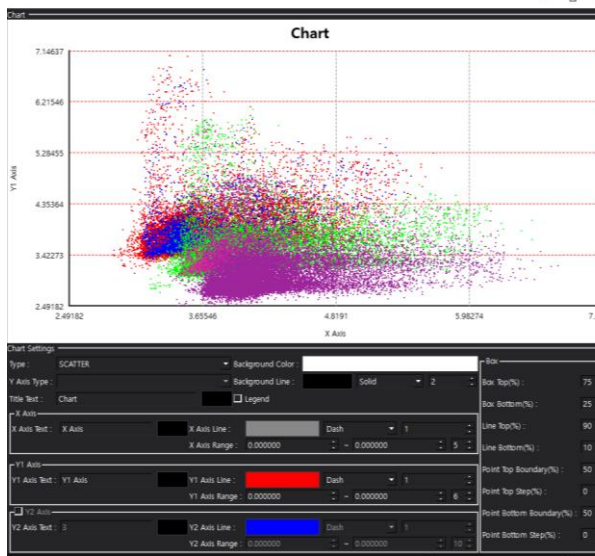
■ Check analysis results

- ① Select a chart type at the top right of the analysis screen

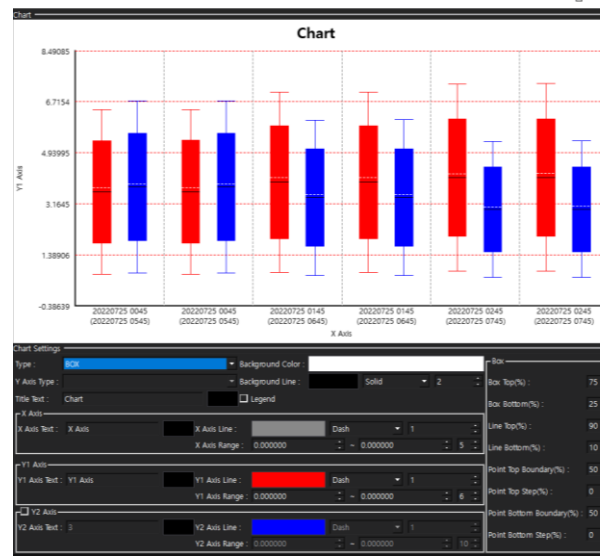


<Geostationary>

<Bar chart>



<Scatter chart>



<Box chart>

② Select analysis information at the top right of the analysis screen


| 항목 | 설명 | 비고 |
|--------|----------------------------|---------------------------------------|
| Min | Minimum | Precise analysis/comparative analysis |
| Max | Maximum | Precise analysis/comparative analysis |
| Mean | Medium | Precise analysis/comparative analysis |
| Median | Median | Precise analysis/comparative analysis |
| Stdev | Standard deviation value | Precise analysis/comparative analysis |
| R | Correlation coefficient | Comparative analysis |
| MAE | Absolute mean error | Comparative analysis |
| MSE | Mean squared error | Comparative analysis |
| RMSE | Mean squared root of error | Comparative analysis |
| BIAS | Intercept (deflection) | Comparative analysis |
| SLOPE | Slope (weight) | Comparative analysis |

| | | |
|--------|--|----------------------|
| OFFSET | The error value of the value calculated using intercept and slope and the actual value | Comparative analysis |
|--------|--|----------------------|

- ③ Select the Chart Settings button at the bottom right of the analysis screen
- ④ Set the chart display method
 - Title text : The text represented by the title at the top of the chart
 - Title text color: Expression color of title text
 - X-axis text: Text displayed as the X-axis title at the bottom of the chart
 - X-axis text color : The expression color of the X-axis text
 - X-axis line type : Type of X-axis dividing line
 - X-axis line thickness: The thickness of the X-axis dividing line
 - X-axis display range: X-axis display range
 - Number of X-axis divisions: Number of divisions of X-axis
 - Y1-axis text : Text displayed by the Y1-axis title on the left side of the chart
 - Y1-axis text color: The display color of Y1-axis text
 - Y1 axis line type: Type of Y1 axis separator line
 - Y1 axis line thickness: The thickness of the Y1 axis separator line
 - Y1 axis display range: Y1 axis expression range
 - Number of Y1 axis divisions: Number of divisions of Y1 axis
 - Y2-axis text : Text displayed by the Y2-axis title on the left side of the chart
 - Y2-axis text color: Expression color of Y2-axis text
 - Y2 axis line type: Type of Y2 axis separator line
 - Y2-axis line thickness: The thickness of the Y2-axis dividing line
 - Y2 axis display range: Y2 axis expression range
 - Number of Y2 axis divisions: Number of divisions of Y2 axes
- ⑤ Select the box setting button at the bottom right of the analysis screen
- ⑥ Setting the display method of box chart
 - Top of Box (%): Position at the top of the box in the box chart
 - Bottom of the box (%) : The position of the bottom of the box in the box chart
 - Top of Line (%) : The position of the top of the line in the box chart
 - Bottom of Line (%) : The position at the bottom of the line in the box chart
 - Point Top Boundary Value (%) : The top point start position of the box chart
 - Point Top Spacing (%) : The interval from the start position of the top point of the box chart
 - Point bottom boundary value (%) : The starting position of the bottom point in the box chart
 - Point bottom spacing (%) : The interval from the starting position of the bottom point of the box chart

■ Save results




- ① Select the [ - Analyze] button in the toolbar
- ② Select an analysis area from the Analysis screen
- ③ Set up input data and perform analytical processing
- ④ [Save Results] Button selection
- ⑤ When the Save As screen is displayed, enter the path and file name, and then select the [Save] button.

4.21 Video Storage

Performs a function of storing a working screen or an image displayed on the image display screen.

■ Save basic images (save only single-layer images)



- ① Select the [ - Save image] button on the layer property screen
- ② When the Save As screen is displayed, enter the path and file name, and then select the [Save] button.

■ Save edited image (save the display status of the image display screen as an image)

- ① Select the right mouse button on the image display screen
- ② Select the [Save image] button from the menu
- ③ When the Save As screen is displayed, enter the path and file name, and then select the [Save] button.

■ Clipboard capture (save selected area to clipboard)

- ① Select the right mouse button on the image display screen
- ② Select the [Clipboard Capture] button from the menu
- ③ Left click and hold the start point of the capture area and drag it to the end point

■ Clipboard capture (save selected area as file)

- ① Select the right mouse button on the image display screen
- ② Select the [Clipboard Capture] button from the menu
- ③ Left click and hold the start point of the capture area and drag it to the end point
- ④ When the Save As screen is displayed, enter the path and file name, and then select the [Save] button.

4.22 Data Storage

It performs a function of saving the working data displayed on the image display screen as a binary or text file.

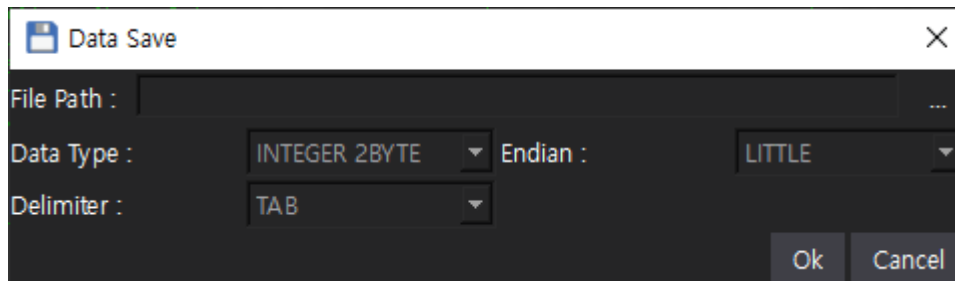




Figure 4-27 Saving Data

■ Save Binary files

- ① Select the [ - Save Data] button on the layer property screen
- ② The file path of [...] Button selection
- ③ When the Save As screen is displayed, enter the path and file name, enter the extension, and then select the [Save] button
- ④ Enter the data type and endian information, and then select the [OK] button

| Category | Item | Description |
|-----------|---------------|--------------------------------|
| Data type | INTEGER 1BYTE | Integer 1-byte format |
| | INTEGER 2BYTE | Integer 2-byte format |
| | INTEGER 4BYTE | Integer 4-byte format |
| | INTEGER 8BYTE | Integer 8-byte format |
| | REAL 4BYTE | Real 4-byte format |
| | REAL 8BYTE | Real 8-byte format |
| Endian | LITTLE | data storage order LITTLE type |
| | BIG | data storage order BIG type |

■ Save Text files

- ① Select the [ - Save Data] button on the layer property screen
- ② The file path of [...] Button selection
- ③ When the Save As screen is displayed, enter the path and file name, enter the extension txt, and then select the [Save] button.
- ④ Enter the separator information, and then select the [OK] button

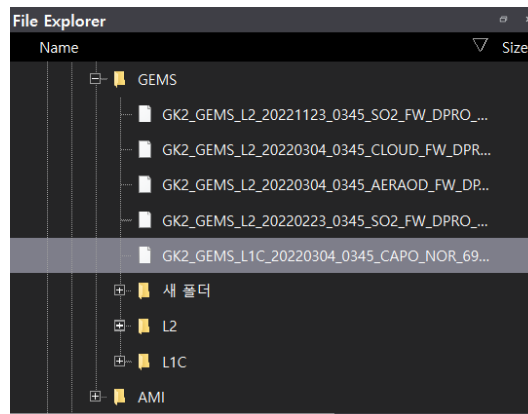
5. SCENARIO

5.1 Satellite data image display and editing analysis

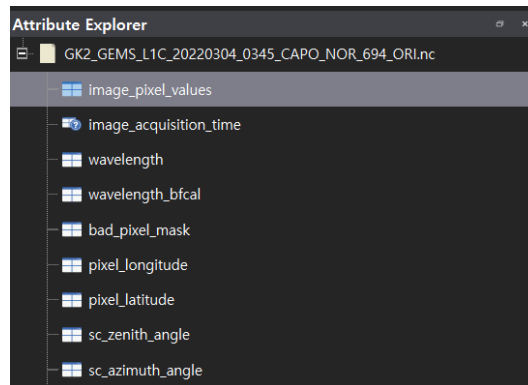
The data of the satellite data is called, the image is created, displayed on the screen, and the image is analyzed by performing the function of zooming in/out/moving using the mouse.

1. Display data properties

Move to the collected satellite data path in the file search window and double-click the satellite data with the mouse.

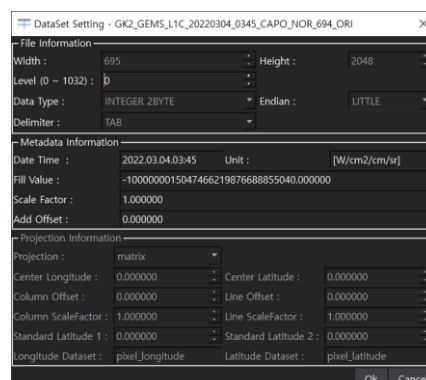


As shown in the figure below, properties are displayed in the property search window.



2. Data set setup and display

Double-click the dataset you want to analyze in the property search window with the left mouse button.



The dataset setting screen is displayed, and if necessary, change the setting information and select the OK button.

- In the case of GEMS satellite data, values are automatically entered

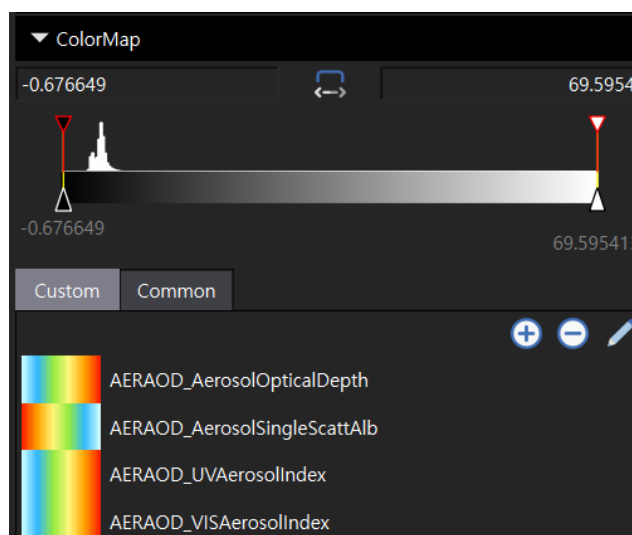


3. Video display control

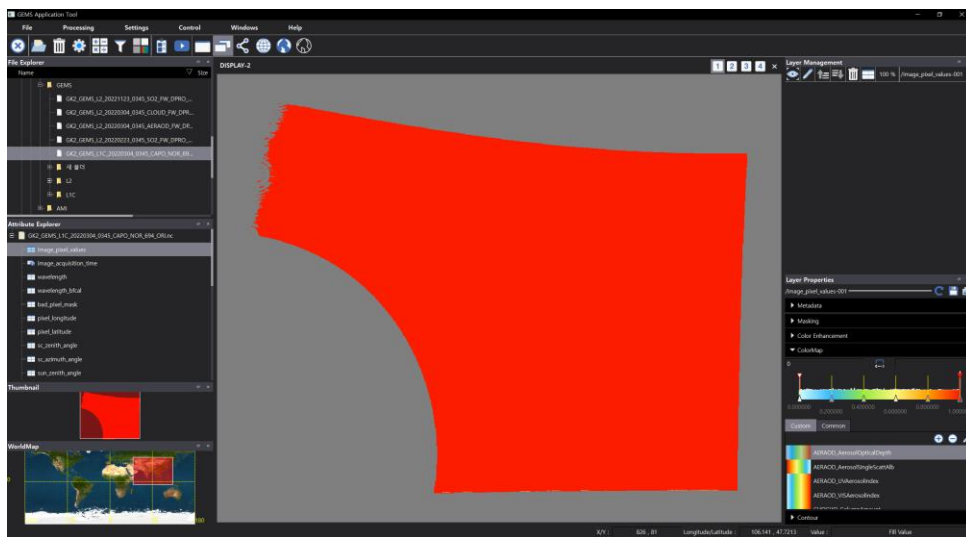
The image can be controlled using a mouse or keyboard on the image display screen.

4. Video color editing

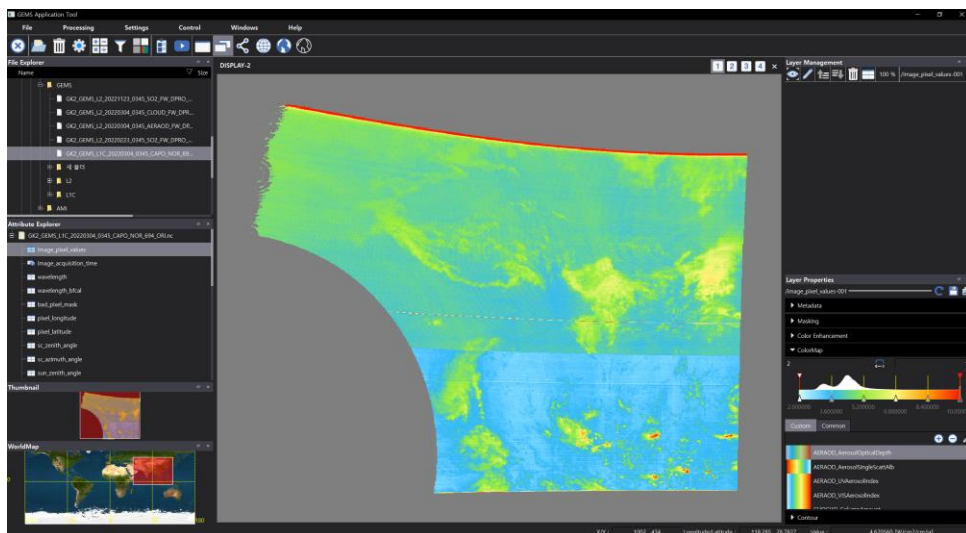
You can edit the color of the image through the color map screen of the layer properties.



Double-click the color map you want to apply from the color map list on the color map screen with the left mouse button.



After applying the color map to the image, set the minimum and maximum values of the color map according to the data to adjust the color distribution.



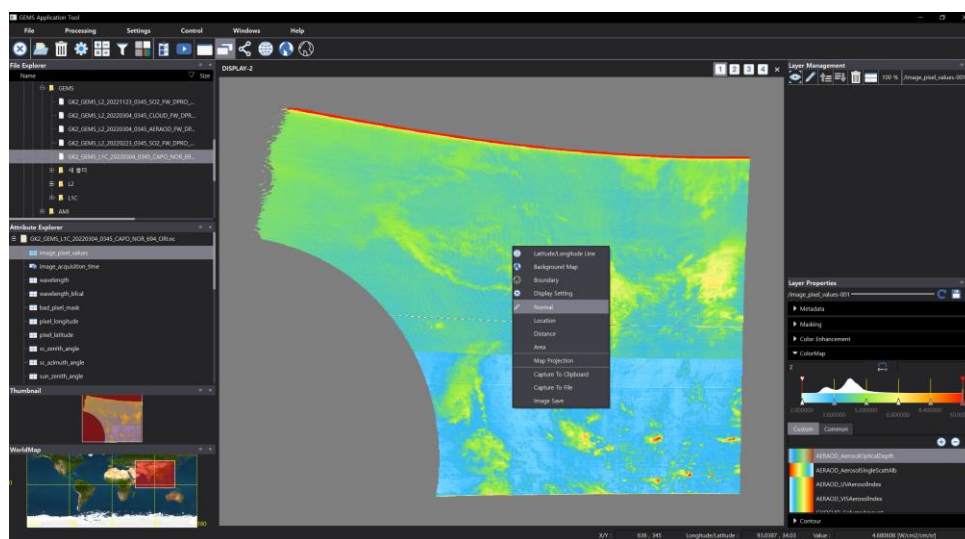
5.2 Analysis of AOI data

When analyzing satellite data, data is extracted and analyzed for the area of interest to the user, not the entire area.

1. Map Projection Conversion

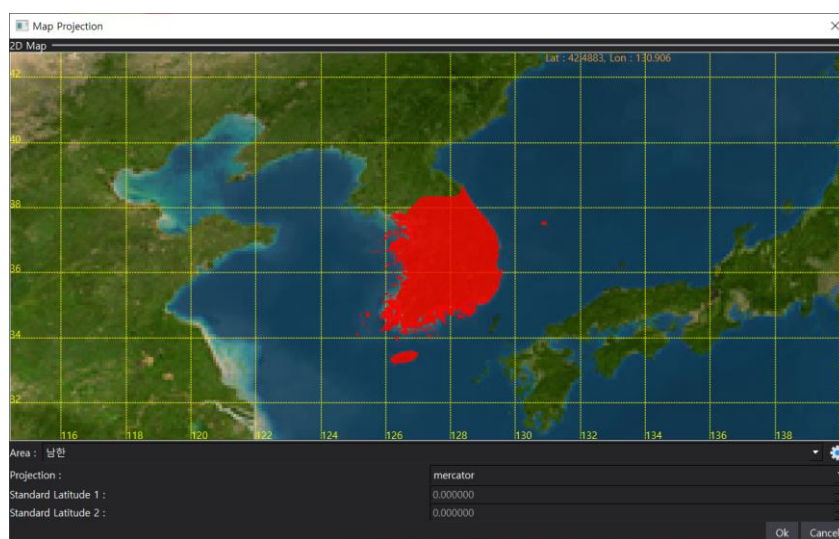
It is performed in the state where images are displayed through satellite data image display and editing scenarios.

If you select the right button of the mouse on the image display screen, the menu is displayed, and select the map projection button from the menu.



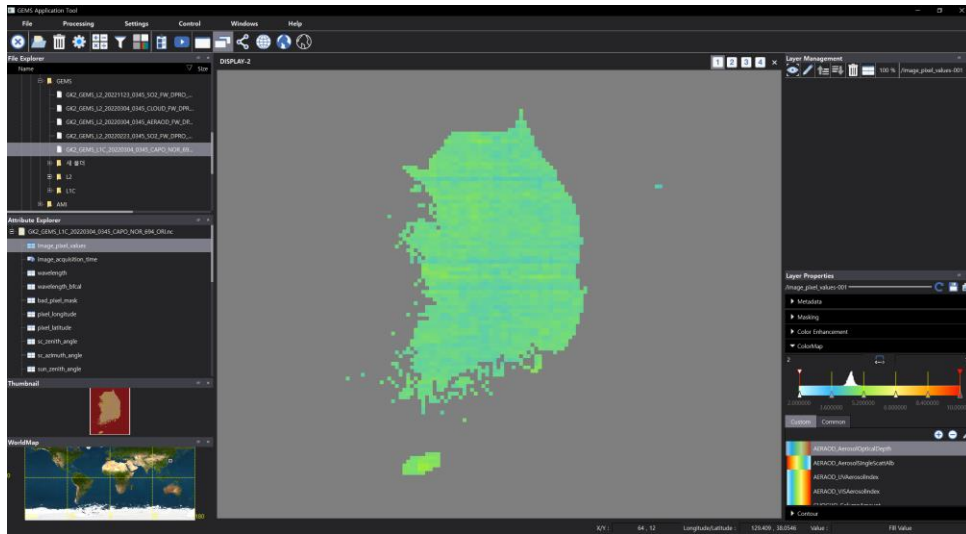
The map projection screen is displayed.

Select an area on the map projection screen and set the map projection.



Complete the settings and select the OK button.

An image of the region of interest selected by the user is displayed.

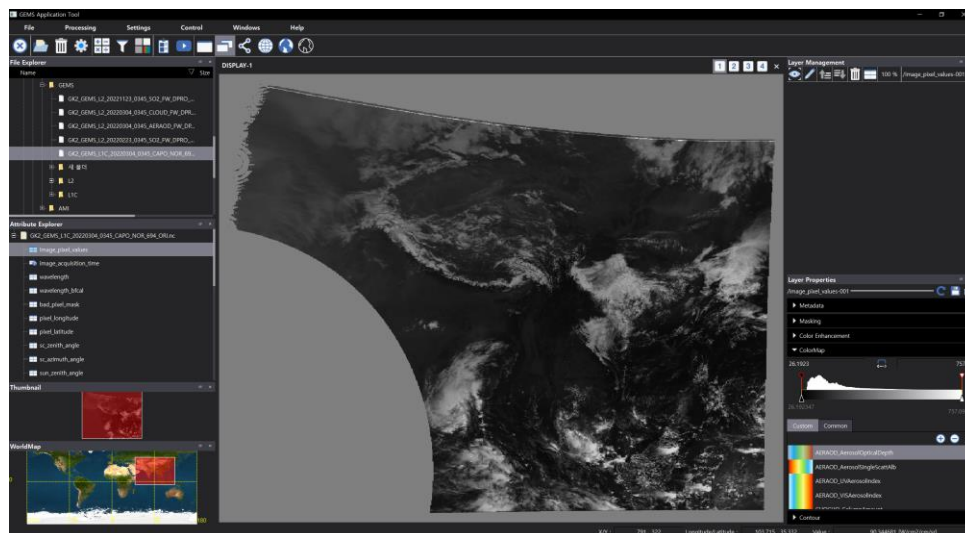


5.3 Analysis of specific values through filter processing

Efficiently analyze data by removing invalid or unnecessary data from satellite data.

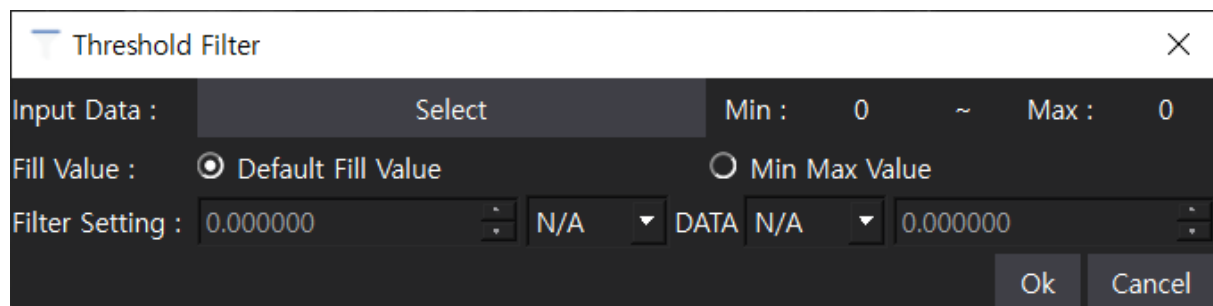
1. Image filter processing

It is performed in the state where images are displayed through satellite data image display and editing scenarios.

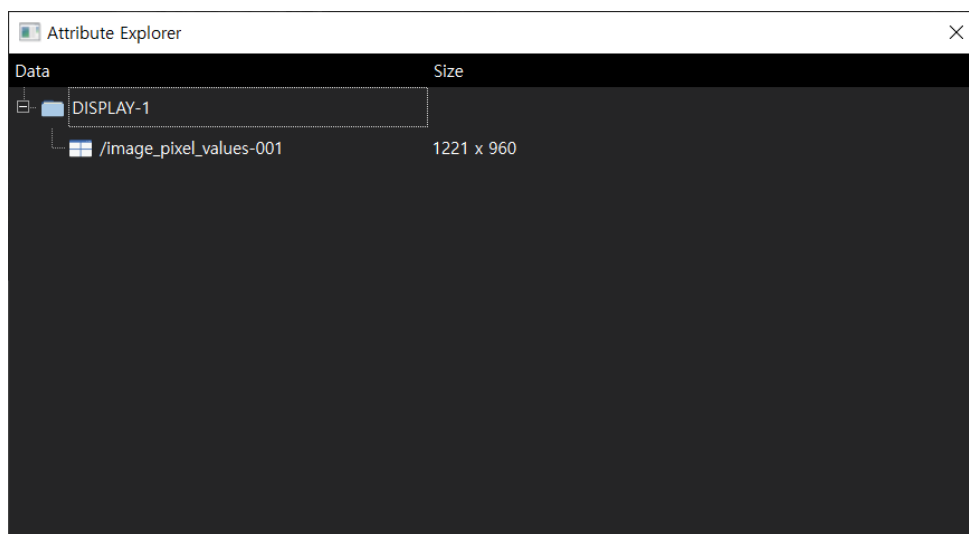


Select Filter Process from the menu at the top.

When the filter processing screen is displayed, select the data selection button of the input data.

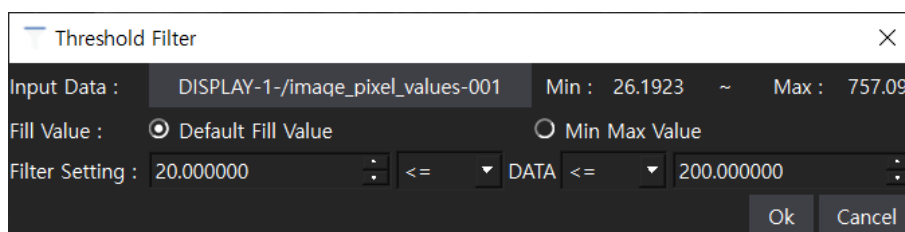


When the property explorer screen is displayed, double-click the item to be filtered with the left mouse button.

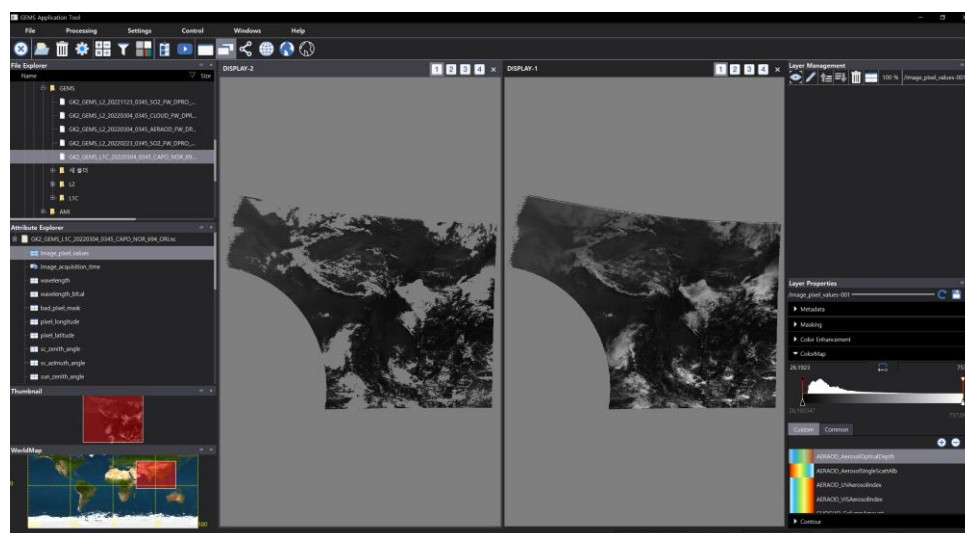


The property explorer screen is closed, and the input data items of the threshold filter screen are entered as the items selected by the user.

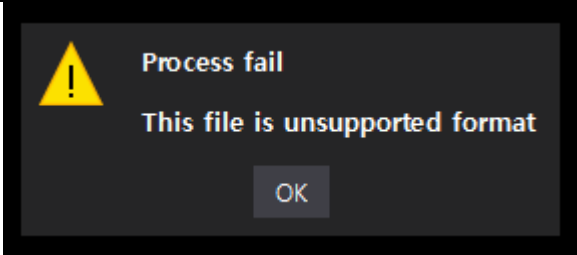
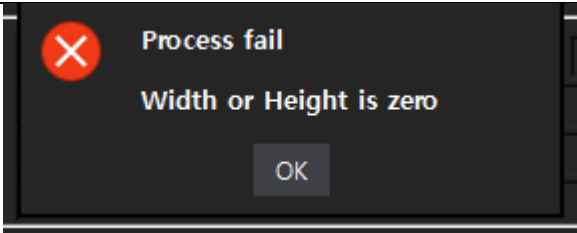
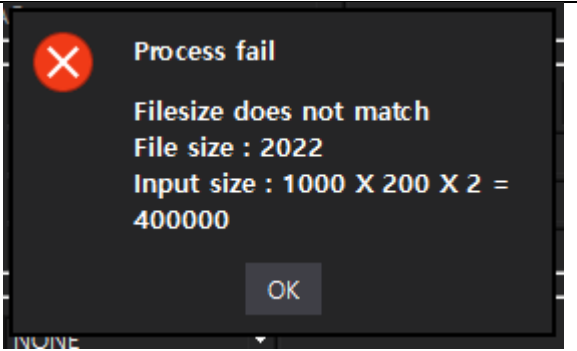
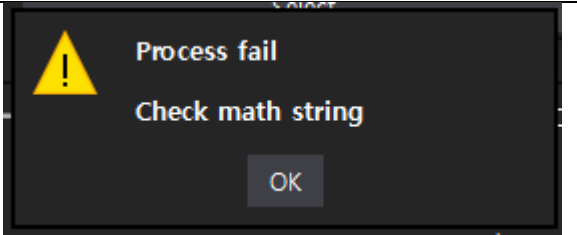
After setting the filter range by referring to the minimum/maximum value of the screen, select the OK button.

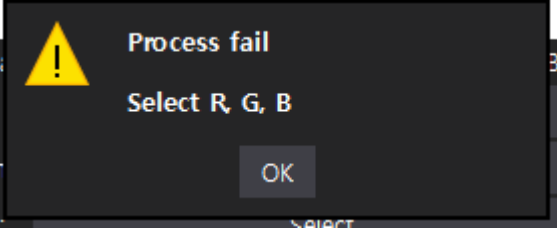


The threshold filter screen is closed, and the filter processing result image is added and displayed.



6. TROUBLESHOOTING

| category | symptom | Solution |
|--------------------------|---|--|
| Local Disk Management | If moving/deleting/renaming some folders and files is restricted | For major directories and files related to OS, move/delete/rename functions are limited |
| Open File Properties |  <p>When attempting to attribute a file, the following message is displayed:</p> | The file is not formatted data supported by software. Official Support Data: Hdf5, NetCDF, Binary, Text |
| Open a dataset |  <p>If the following message is displayed when attempting to open the dataset</p> | When performing the setting to load the dataset, the user enters the width/height value as 0 and enters the corresponding part according to the width/height size of the actual data. |
| Open a dataset |  <p>If the following message is displayed when attempting to open the dataset</p> | If the size of the actual data file and the size of the width and height entered by the user do not match when performing the settings to load the dataset, enter the width/height size according to the actual data |
| Computational processing |  <p>If the following message is displayed when attempting to process an operation</p> | Settings for operation processing are not entered normally, check the input data, and check whether the calculation expression is entered correctly |

| | | |
|-----------------------------------|--|---|
| <p>Synthetic processing</p> |  <p>If the following message is displayed when attempting compositing</p> | <p>Settings for synthesis processing are not entered normally, check that the three channels R, G, and B are entered correctly</p> |
| <p>borderline</p> | <p>If the boundary line is not displayed when the boundary line is activated</p> | <p>Make sure the image has a map projection Verify that the SHP directory exists in the software path Inside the Shp directory. Verify that the shp file exists</p> |
| <p>World Map</p> | <p>If the navigation world map function does not work properly</p> | <p>Make sure the image has a map projection</p> |
| <p>Mouse position information</p> | <p>When the longitude/latitude of the mouse location information is displayed as N/A</p> | <p>Make sure the image has a map projection</p> |