# The results of Giwer development

## GeoImage Workflow Editing Resources

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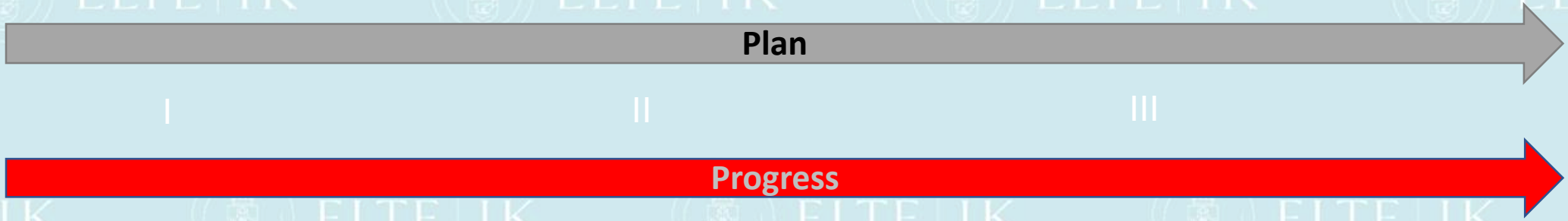
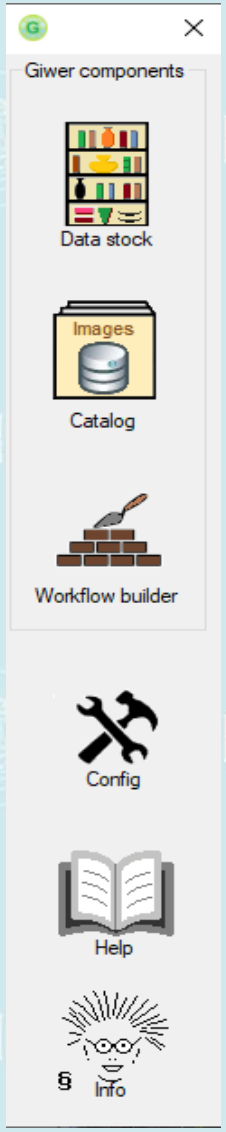
# Objective

I. Create a system for processing images taken from space and air, which can also process images from drones

II. Users can compound their own workflows from the functions available in Giwer and run them on many images



# Sub-systems and modules




1. **Catalog**: It organizes large number of images into a database.
   The Catalog organizes raw images into a database (Sqlite), which reads and stores many images and image parameters from their exif data, and also provides storage options in interactive fields.

2. **DataStock**: It is an interactive image processing system.
   We have implemented large number of image processing functions that can be accessed via the menu system

3. **WorkflowBuilder**: This is a workflow editor. From the available functions, arbitrary workflows can be compiled, so the user can create their own processing procedures based on their individual knowledge, experience and creativity.

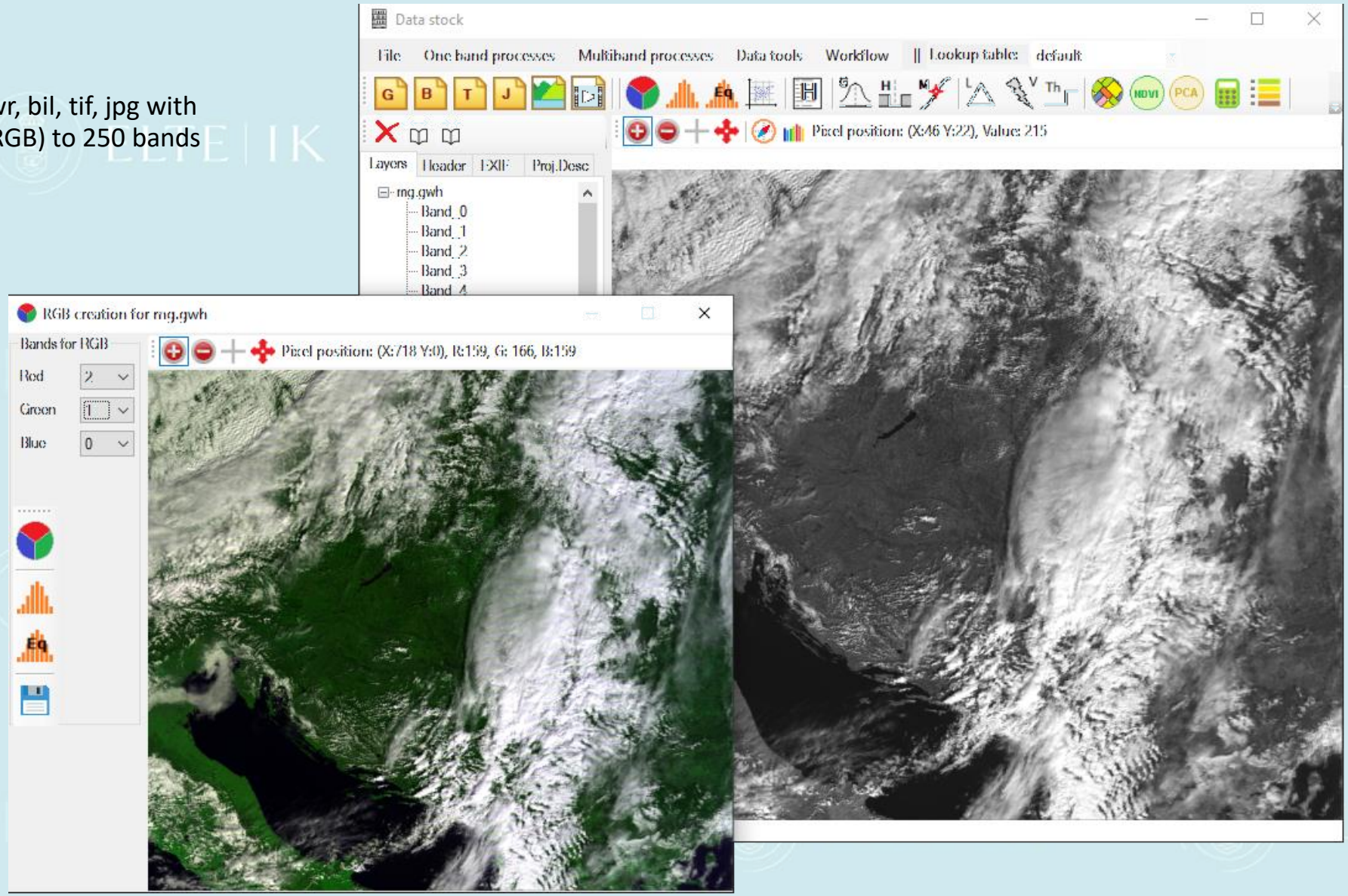
# Results briefly

1. DataStock (interactive) is completed (v1.0 completed)
2. Catalog is completed (v1.0 completed)
3. WorkflowBuilder is completed (v1.0 completed)
4. Giwer source has been uploaded to GitHub as an open source package
5. The necessary documentation is being prepared
    a) users ’guide in Hungarian and English
    b) Developer docs in English
    c) Tutorials in Hungarian and English

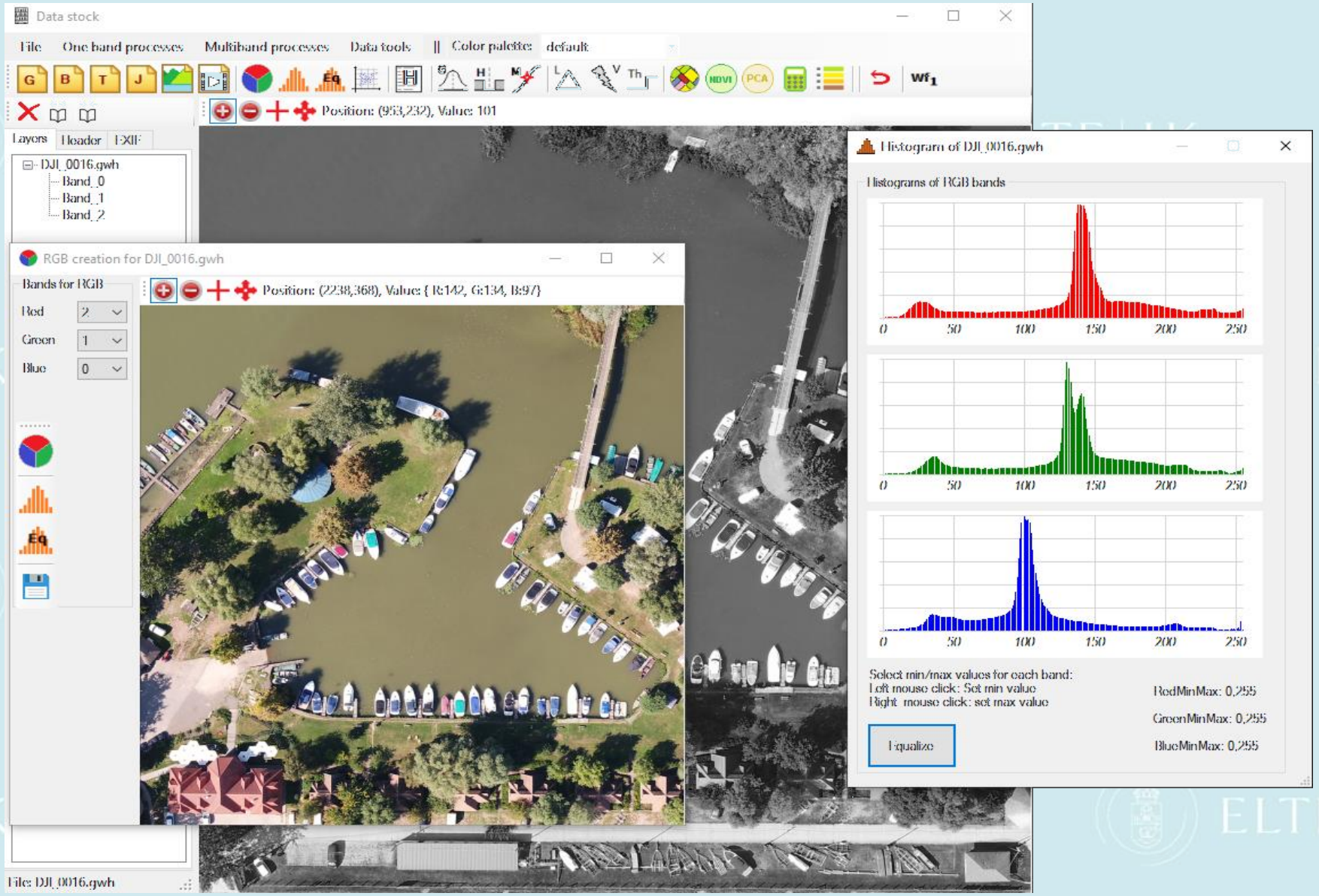
# DataStock

# Snapshots from DataStock's operations

- Loads images from different file format: gwr, bil, tif, jpg with 8,16,24,48 bits, with many bands from 3 (RGB) to 250 bands
- Creates RGB display
- Displays histogram and equalizes
- Draws crossplot with any of two bands
- Displays file header
- Applies functions of the filter bank
- Computes NDVI and PCA
- Loads and displays 3D data (digital terrain modell)
- Runs the raster calculator (select pixels under the given condition)
- Classification, clustering
- Combines images (add, average, exor, subtract, etc)
- Converts from one format to another
- Analyses and displays spectrums
- Extended raster calculator with graphics

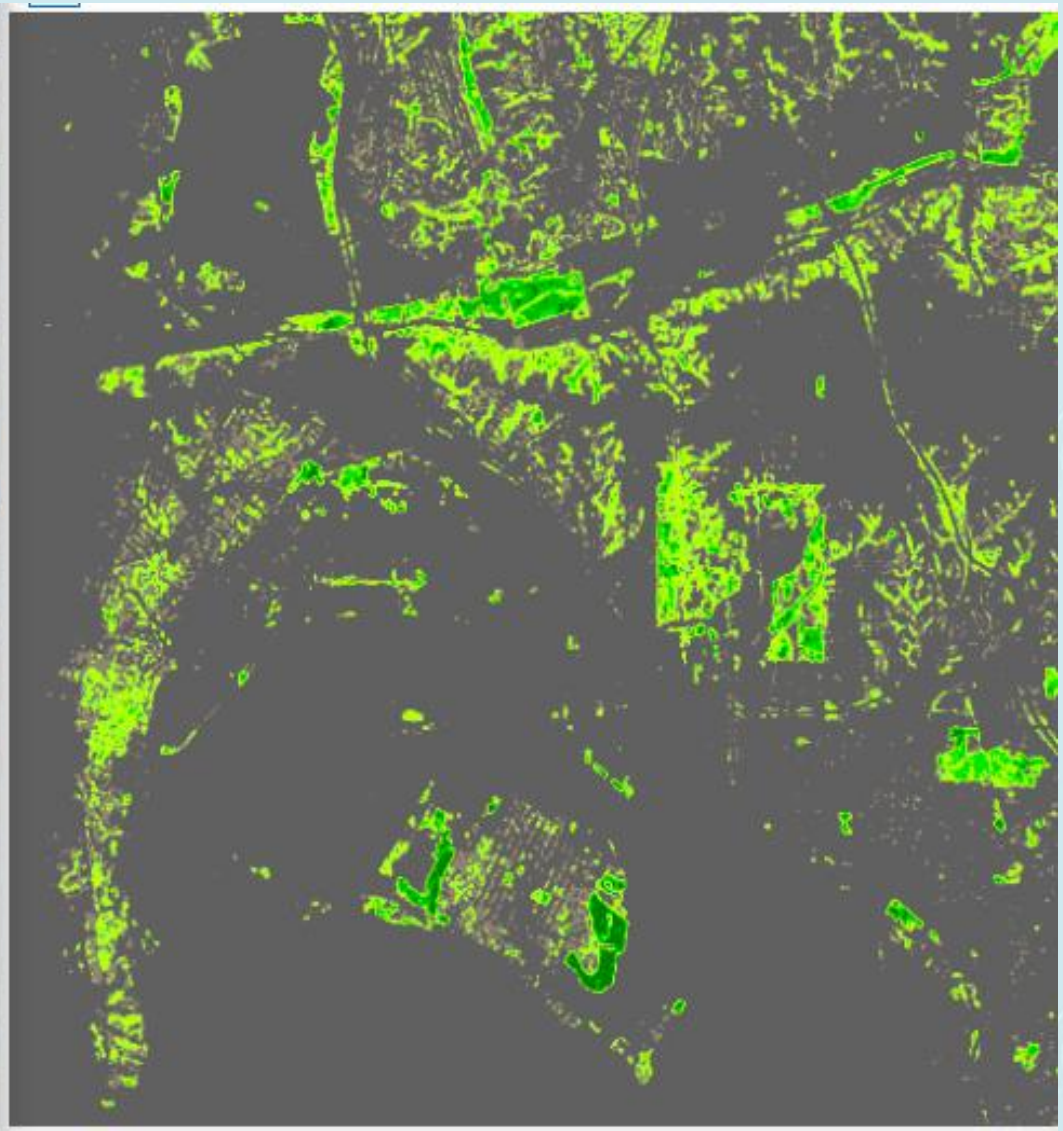


# Snapshots from DataStock's operations



# Snapshots from DataStock's operations

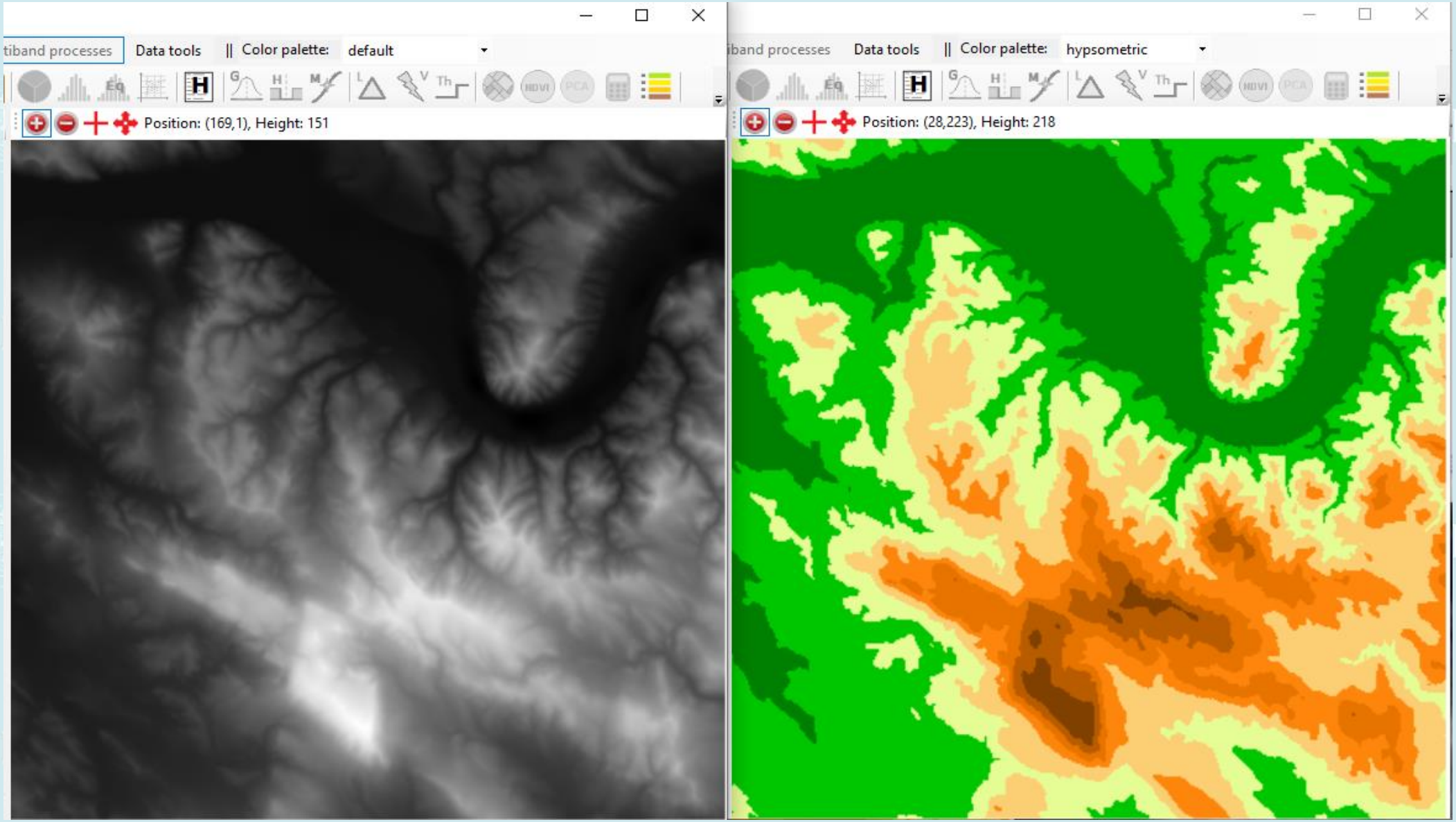
RGB



NDVI

# Snapshots from DataStock's operations

3D

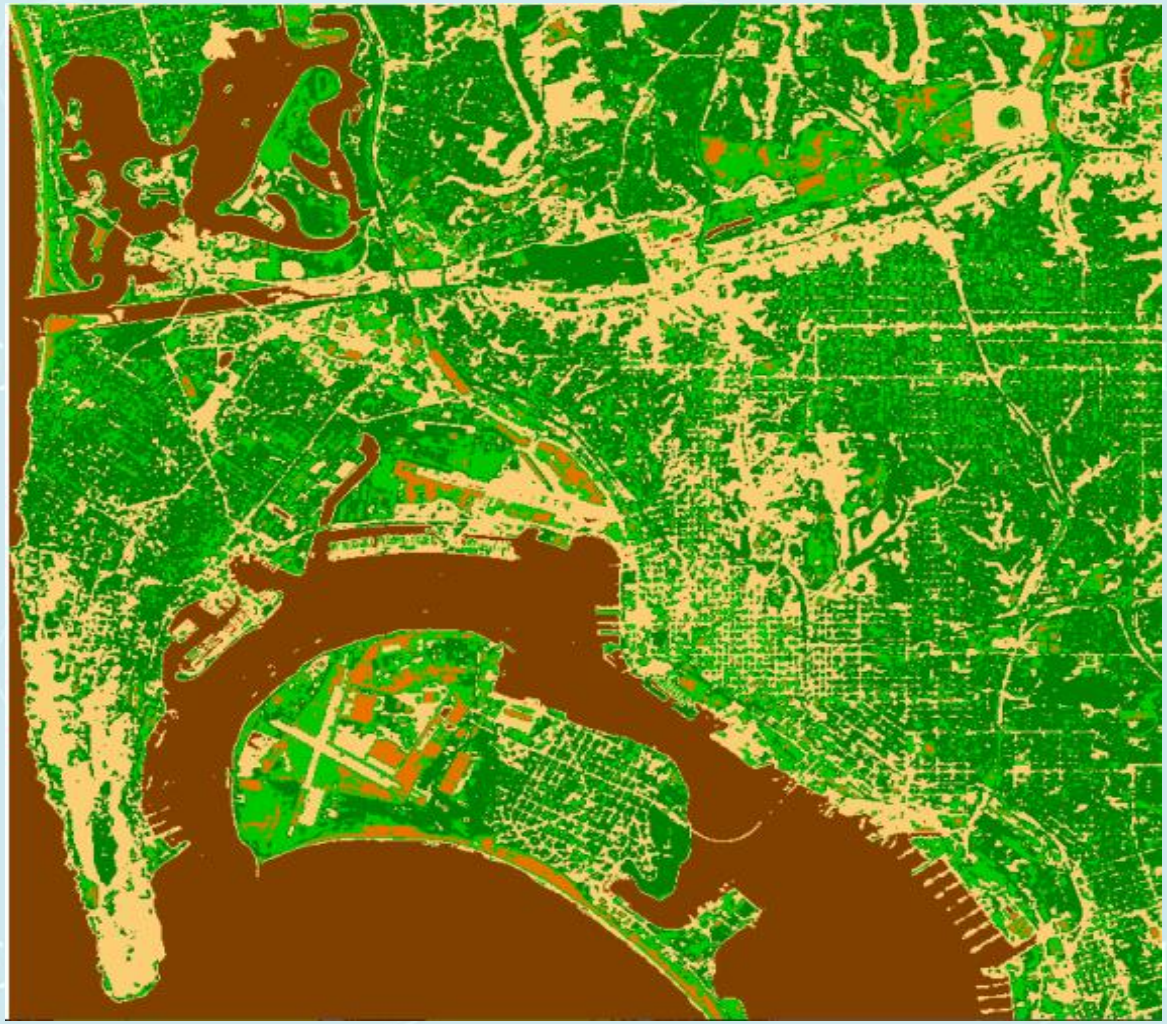


# Snapshots from DataStock's operations

RGB

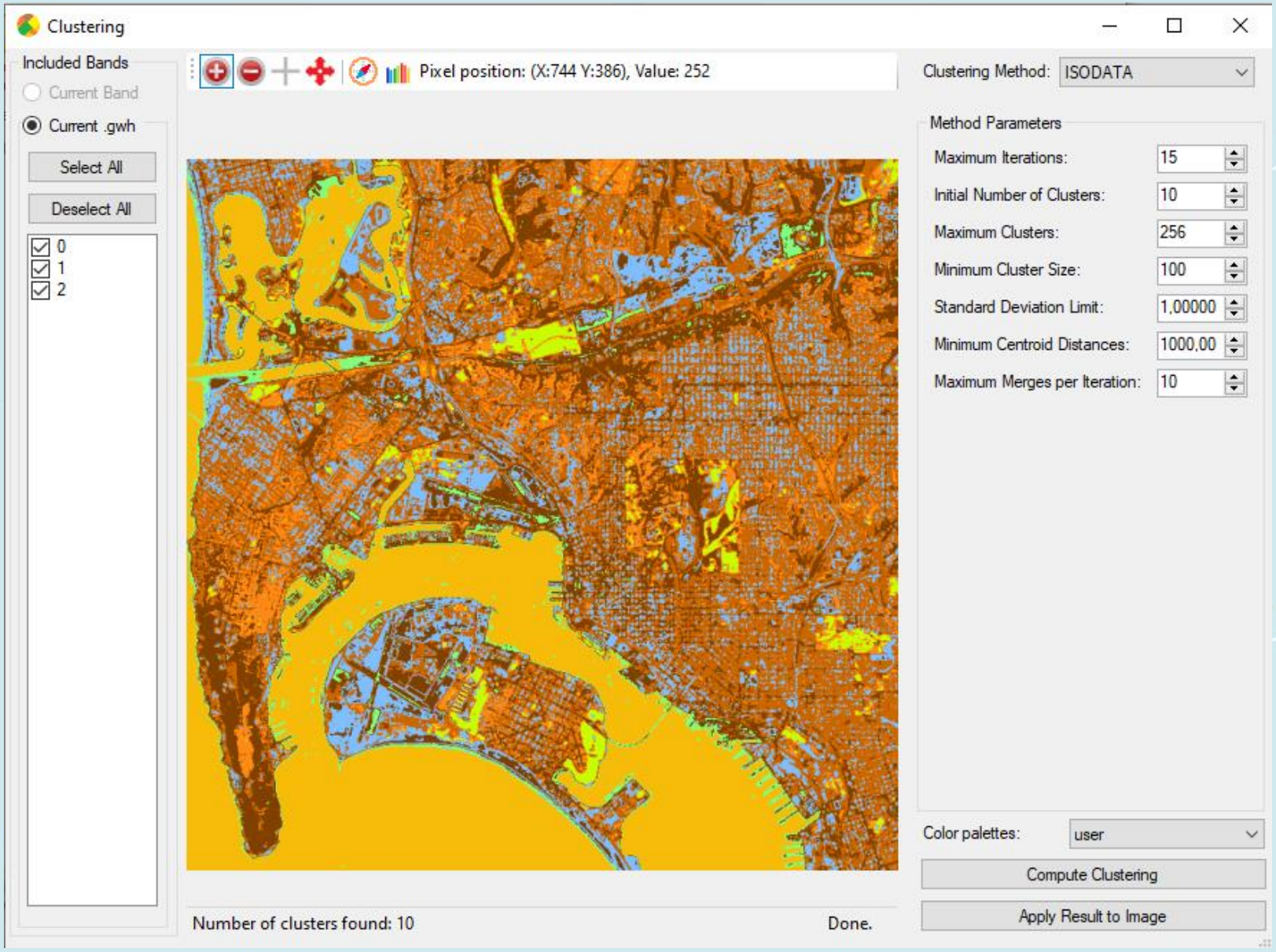
Clustering

SPOT satellite image



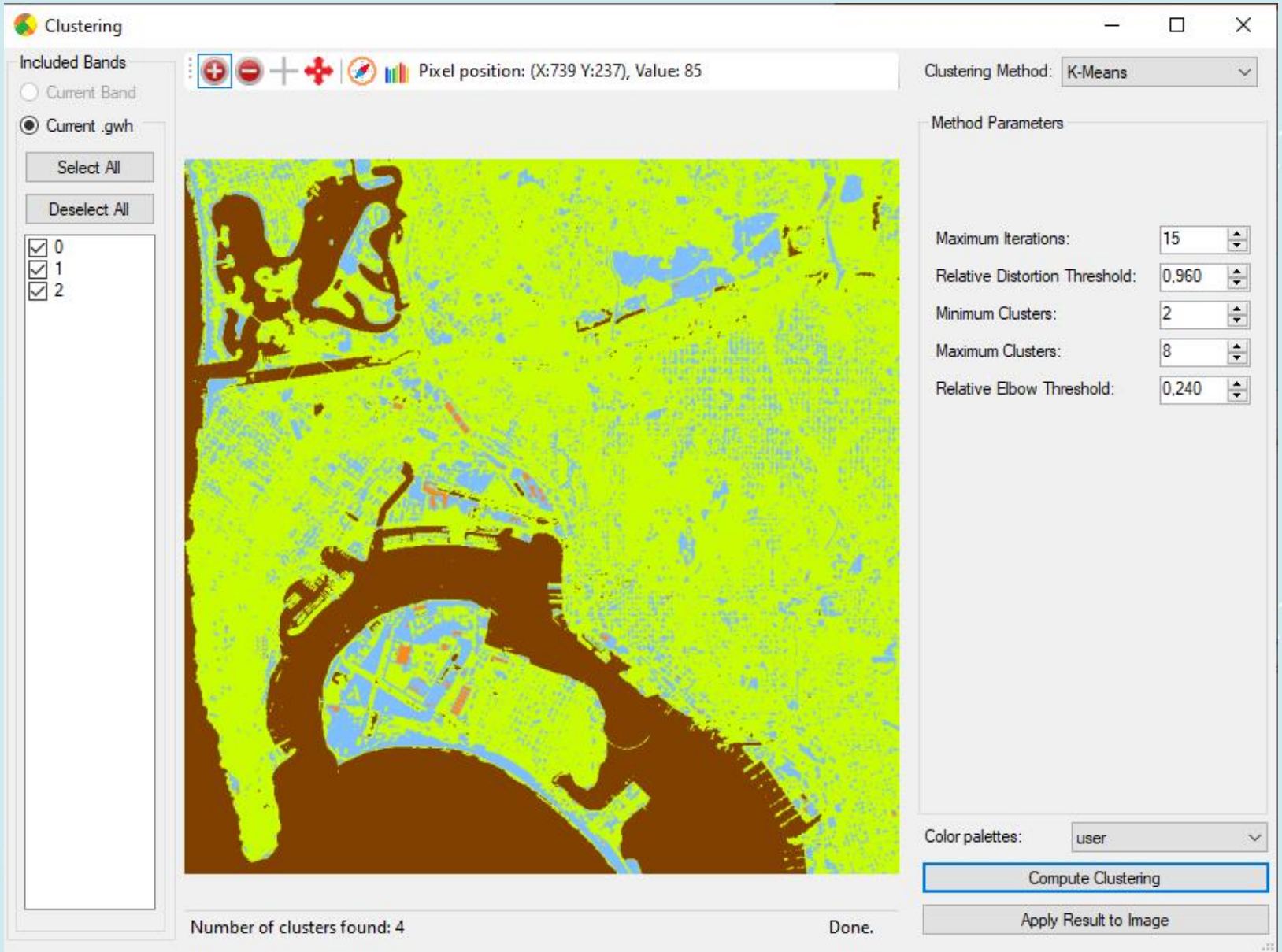
# Snapshots from DataStock's operations

ISODATA clustering



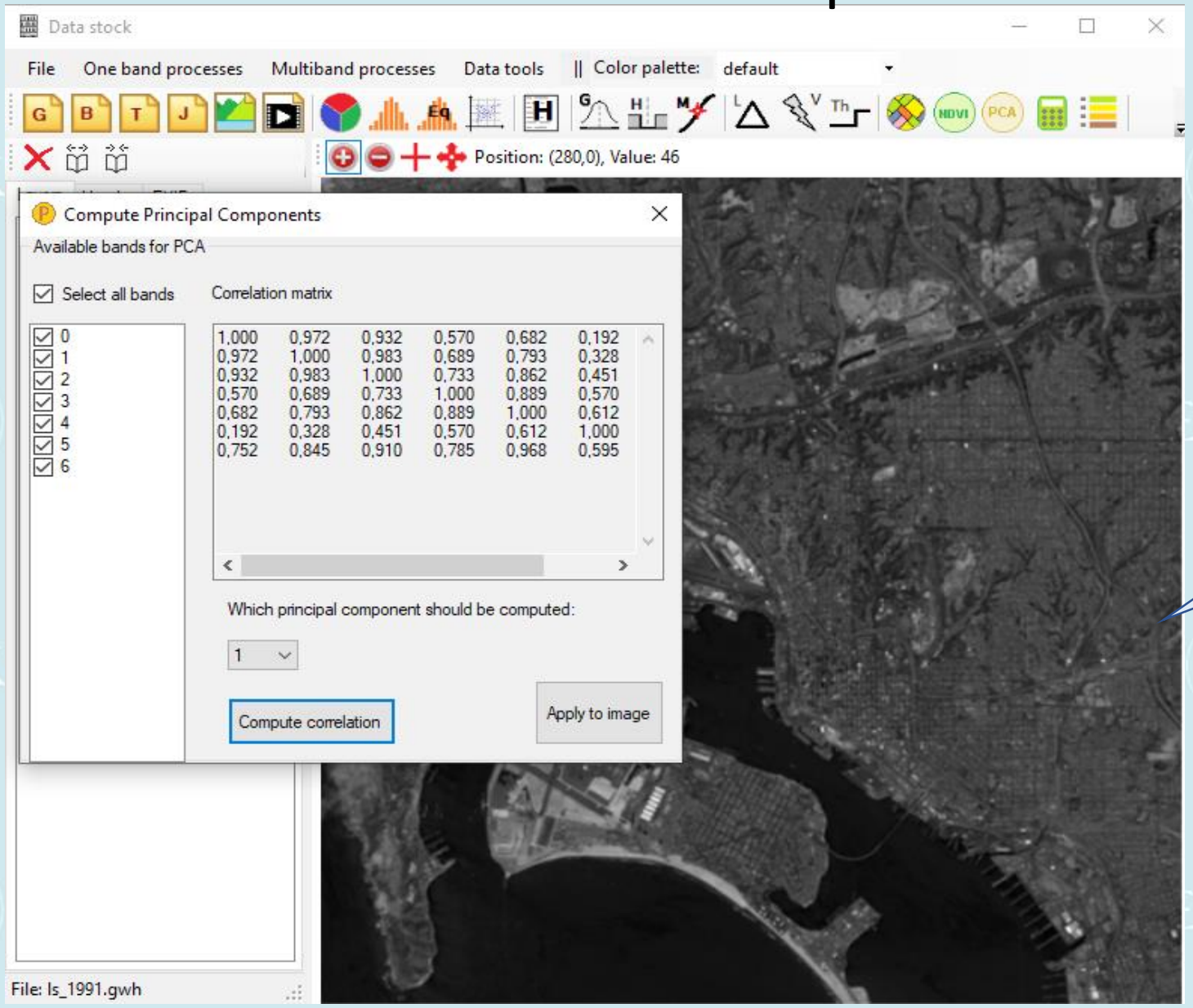
# Snapshots from DataStock's operations

K-Means clustering



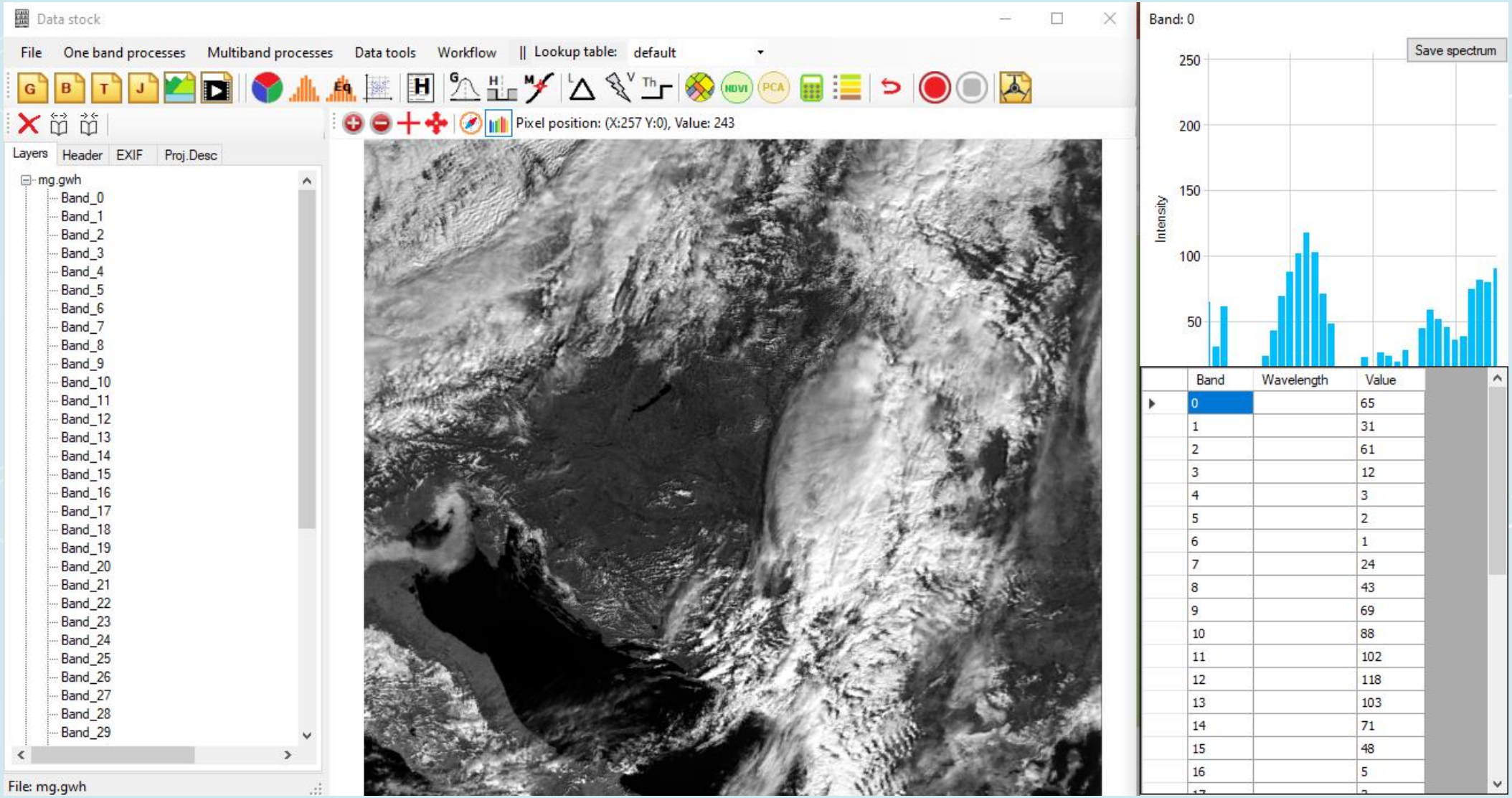
# Snapshots from DataStock's operations

Principal component analysis



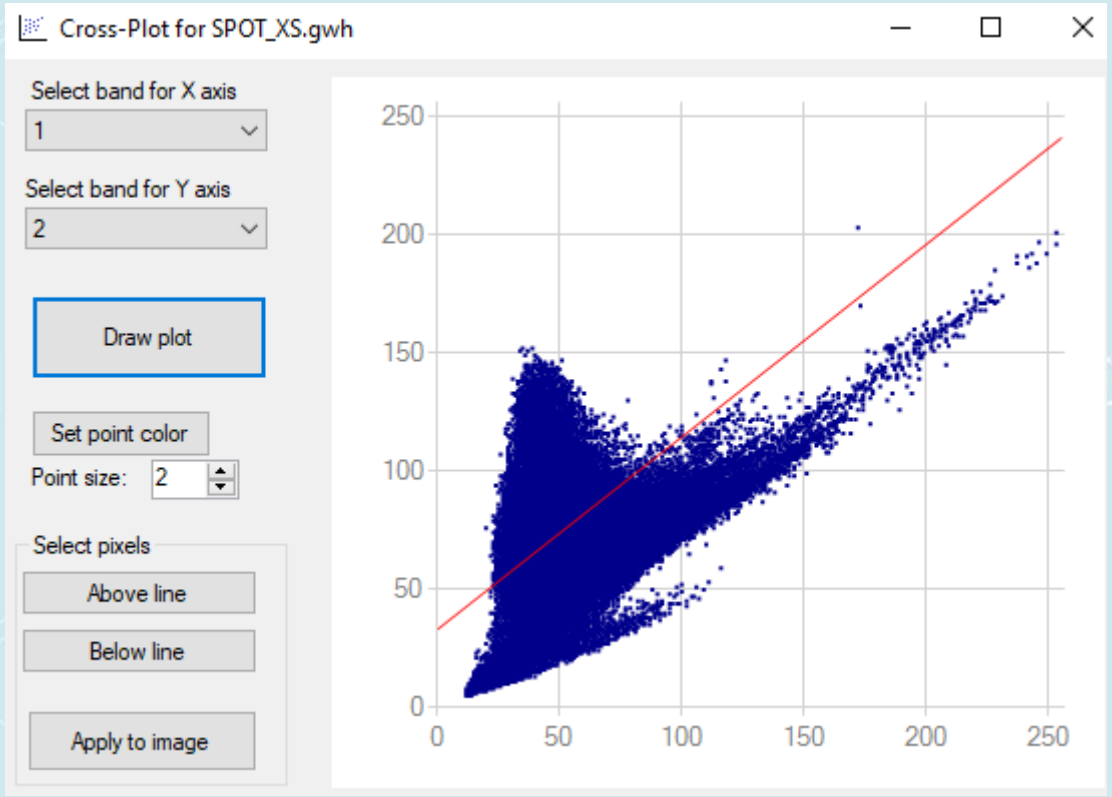
# Snapshots from Giwer's operations

## Methods for analysing hyperspectral images

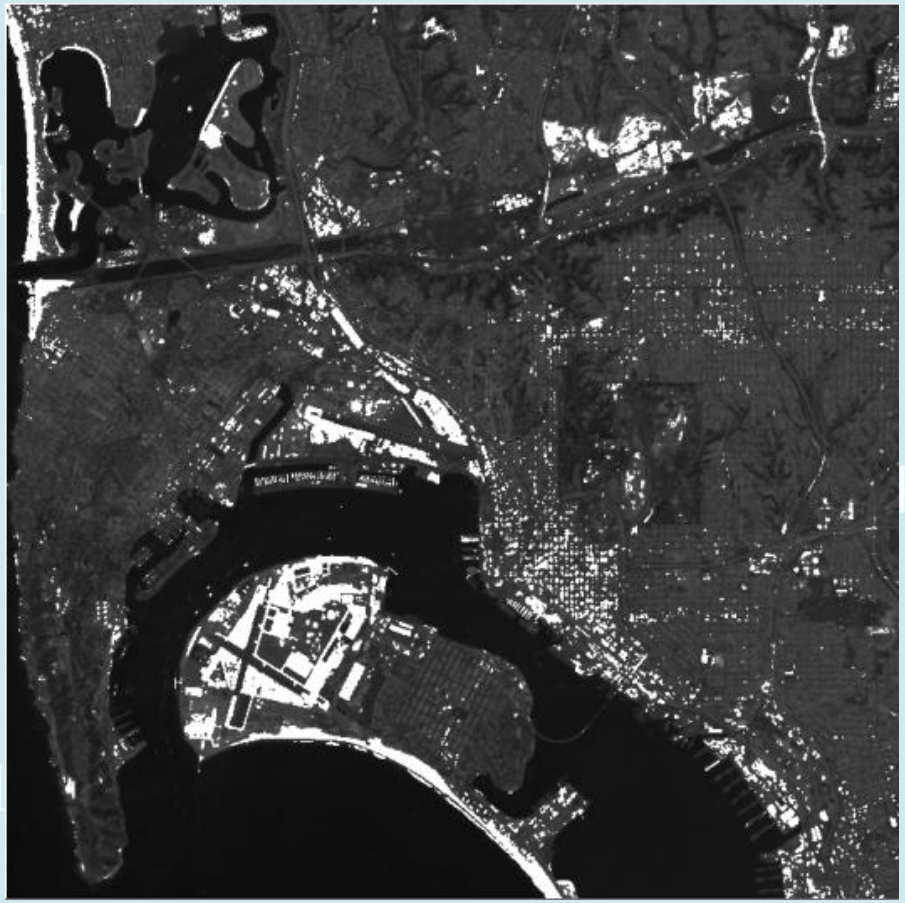


# Snapshots from Giwer's operations

## Raster calculator

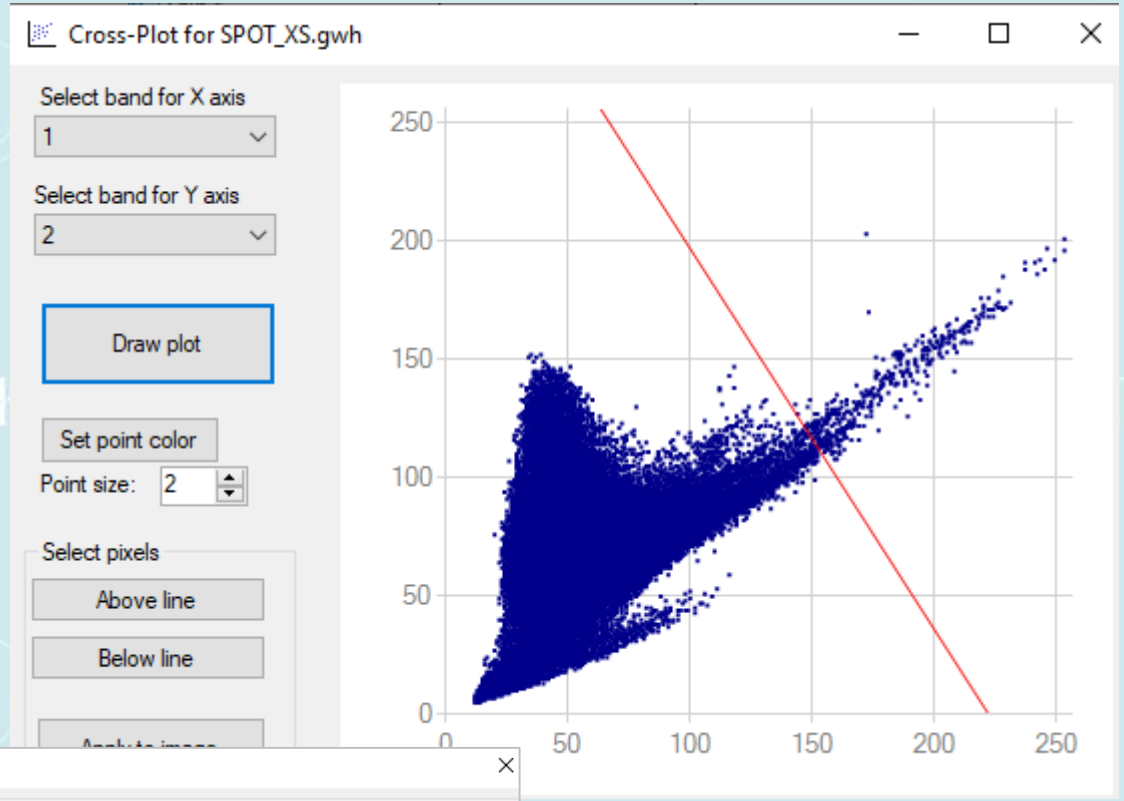


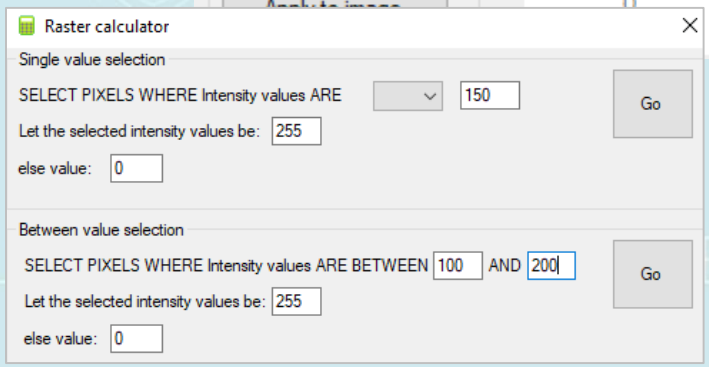

By plotting the intensities of the different frequency bands in a cross-plot, certain areas can be queried by graphical selection. For now, only one arbitrary line is the tool of separation.



# Snapshots from Giwer's operations

## Rastercalculator




# Image catalogue

# Catalog's operations briefly

- Catalog is an SQLite-based program for registering images  in the file system and store their attributes to an SQLite data table.
- It allows you to import taken images directly from the drone's media, read their attribute data, and store them in an SQLite data file. We can store data either from the EXIF automatically, some fields can be filled interactively or even a deployment report can be writen too.
- The Sql command editor helps you find the images you need.

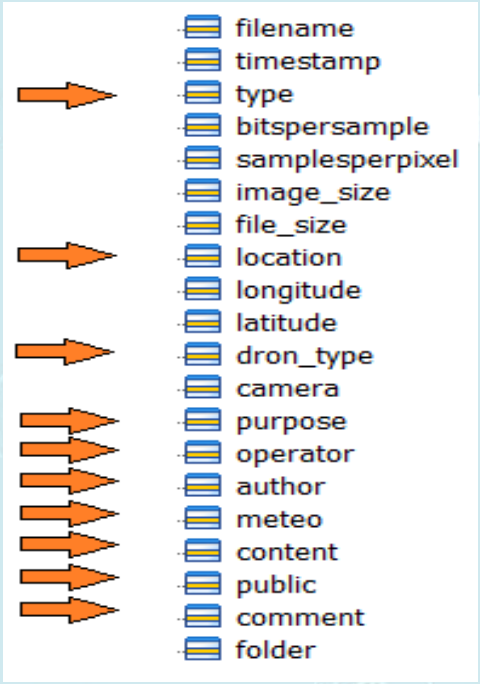
# Snapshots from Catalog's operations

C:\Users\eleki\Desktop\cat\dronimagecatalog.s3db

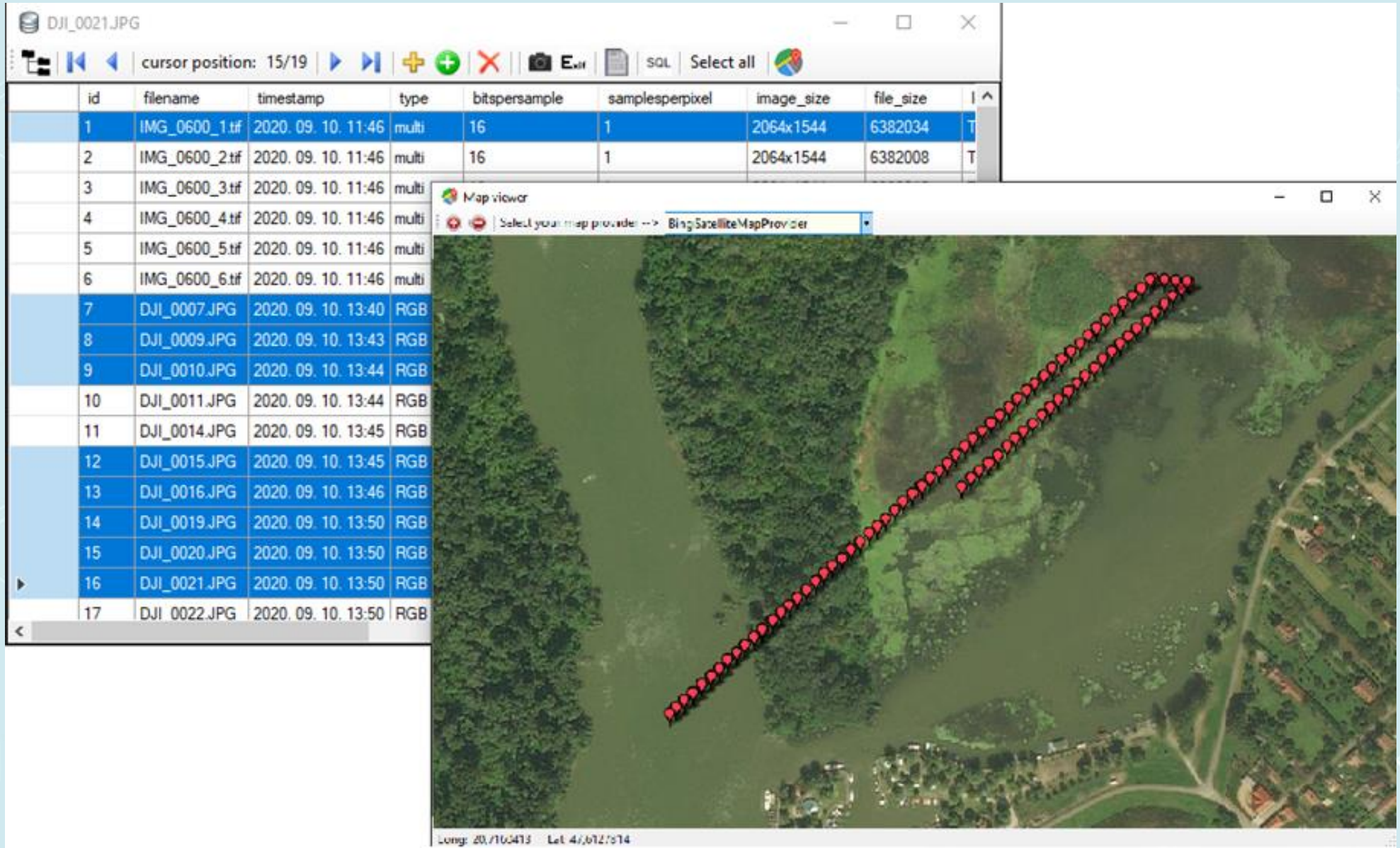
cursor position: 1 / 18 932 | Exif | SQL | Select all

| id | filename | timestamp | type | bitspersample | samplesperpixel | image_size | file_size | l |
|---|---|---|---|---|---|---|---|---|
| 1 | IMG_0600_1.tif | 2020. 09. 10. 11:46 | multi | 16 | 1 | 2064x1544 | 6382034 | T |
| 2 | IMG_0600_2.tif | 2020. 09. 10. 11:46 | multi | 16 | 1 | 2064x1544 | 6382008 | T |
| 3 | IMG_0600_3.tif | 2020. 09. 10. 11:46 | multi | 16 | 1 | 2064x1544 | 6382012 | T |
| 4 | IMG_0600_4.tif | 2020. 09. 10. 11:46 | multi | 16 | 1 | 2064x1544 | 6382004 | T |
| 5 | IMG_0600_5.tif | 2020. 09. 10. 11:46 | multi | 16 | 1 | 2064x1544 | 6382018 | T |
| 6 | IMG_0600_6.tif | 2020. 09. 10. 11:46 | multi | 16 | 1 | 160x120 | 44722 | T |
| 7 | DJI_0007.JPG | 2020. 09. 10. 13:40 | RGB | 8 | 3 | 5280x2970 | 6799825 | T |
| 8 | DJI_0009.JPG | 2020. 09. 10. 13:43 | RGB | 8 | 3 | 5280x2970 | 7026657 | T |
| 9 | DJI_0010.JPG | 2020. 09. 10. 13:44 | RGB | 8 | 3 | 5280x2970 | 6602686 | T |
| 10 | DJI_0011.JPG | 2020. 09. 10. 13:44 | RGB | 8 | 3 | 5280x2970 | 6592771 | T |
| 11 | DJI_0014.JPG | 2020. 09. 10. 13:45 | RGB | 8 | 3 | 5280x2970 | 6968375 | T |
| 12 | DJI_0015.JPG | 2020. 09. 10. 13:45 | RGB | 8 | 3 | 5280x2970 | 6973159 | T |
| 13 | DJI_0016.JPG | 2020. 09. 10. 13:46 | RGB | 8 | 3 | 5280x2970 | 6972641 | T |
| 14 | DJI_0019.JPG | 2020. 09. 10. 13:50 | RGB | 8 | 3 | 5280x2970 | 7224836 | T |
| 15 | DJI_0020.JPG | 2020. 09. 10. 13:50 | RGB | 8 | 3 | 5280x2970 | 7192925 | T |
| 16 | DJI_0021.JPG | 2020. 09. 10. 13:50 | RGB | 8 | 3 | 5280x2970 | 7014559 | T |
| 17 | DJI_0022.JPG | 2020. 09. 10. 13:50 | RGB | 8 | 3 | 5280x2970 | 6984827 | T |

Editable mezők



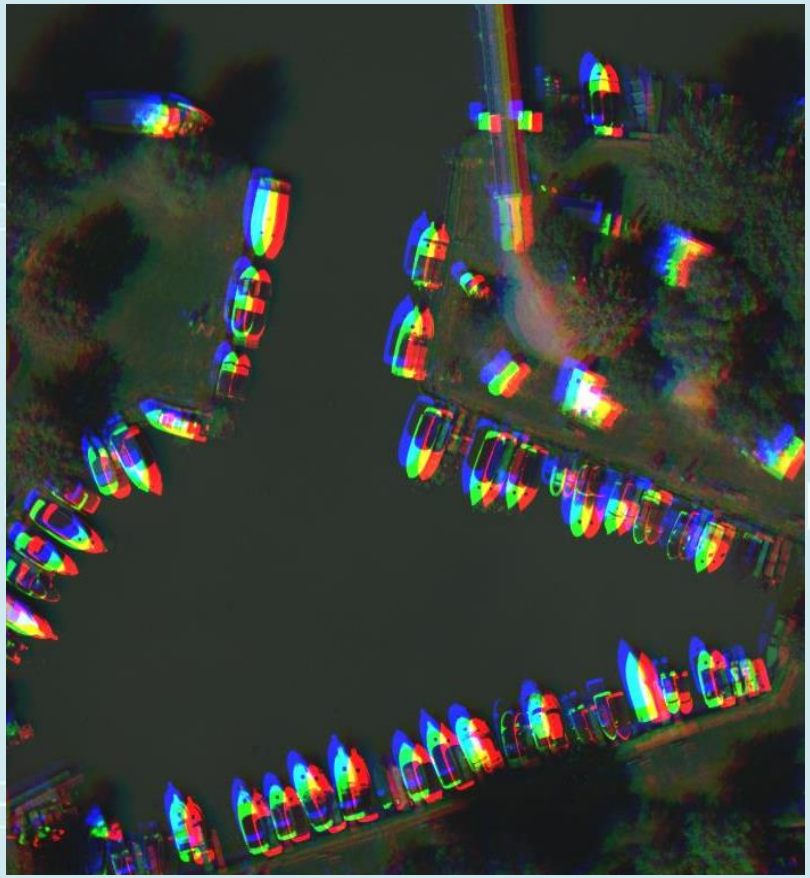
# Snapshots from Catalog's operations



# Snapshots from Catalog's operations

Micasense camera correction

The correction procedure for shifted individual frequency bands  were prepared by Máté Cserép. The process is based on an affine transformation which computes the cross correlation between images, and computes the shifts in this way.

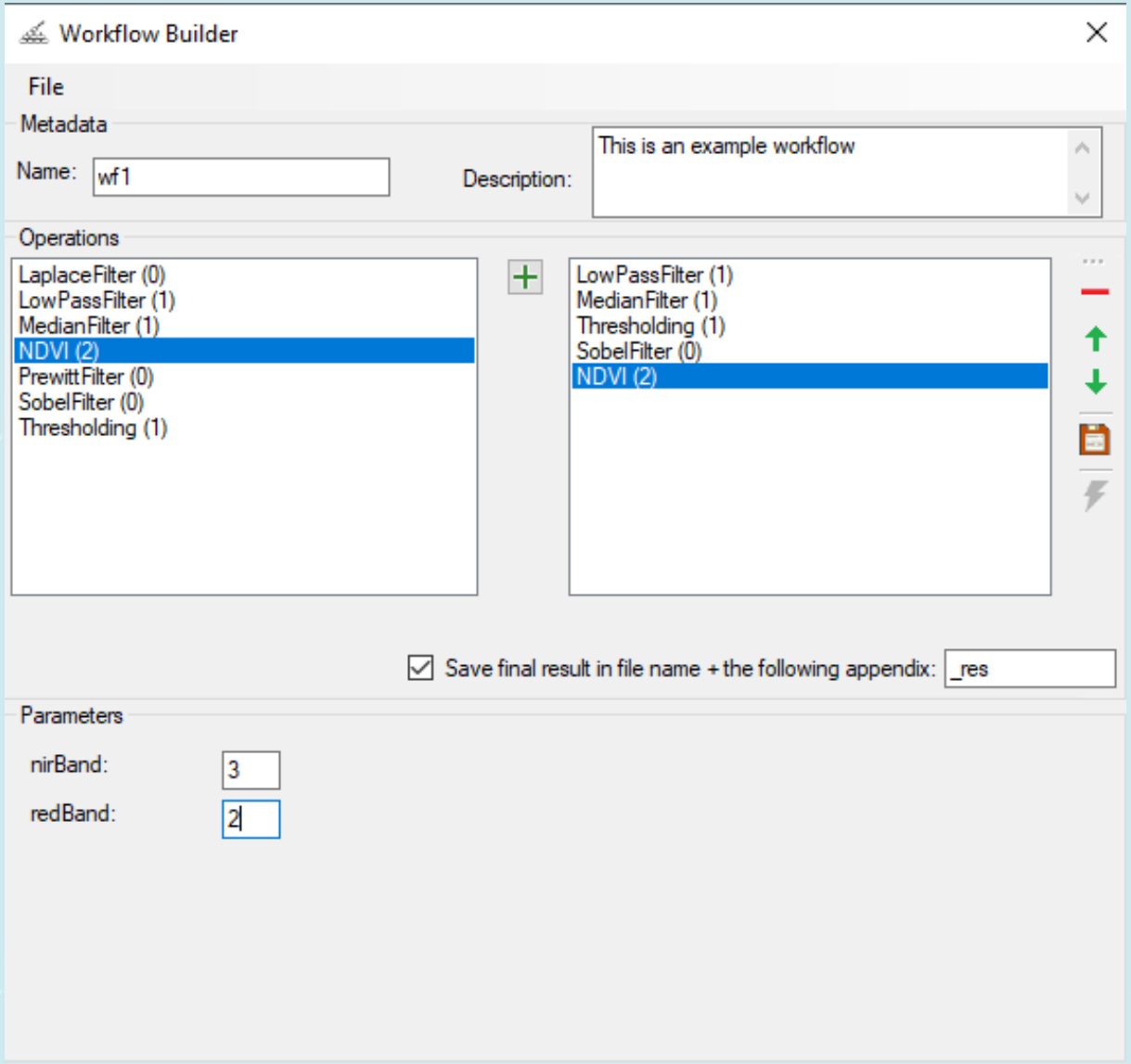



# Workflow builder

# Snapshots from Workflow's operations

From Giwer's functions you can create any workflow that can be saved, edited and run. If an experienced user wants to create their own processing procedures, they can do so with workflow builder. If the task is to do some processing on hundreds of images, the workflow builder is a great tool for that. However, we need to create a project file in advance, which we will use workflow.

Development is complete, but it should be emphasized that this is only the version 1.0.



# Publications

1. Istvan Elek: Boundary Detection of Point Clouds on the Images of Low-Resolution Cameras for the Autonomous Car Problem, Intelligent Computing : Proceedings of the 2020 Computing Conference, Volume 2, Cham: Springer, pp 572-581 (2020) (Advances in Intelligent Systems and Computing ; 1229)
2. Elek István – Cserép Máté: Drón képek feldolgozása a nyílt forráskódú Giwer programcsomaggal, GITA, 16. Műszaki Térinformatika online konferencia, 2021. június
3. Istvan Elek – Máté  Cserép: Processing drone images with the open source Giwer software package, FTC 2021 - Future Technologies Conference 2021, 28-29 October 2021, Vancouver
4. Nour Naaouf – István Elek: Geospatial Analysis for assessing the Potentials of Large-Scale generation of Solar Energy in SYRIA, Geodézia és Kartográfia, 2022.