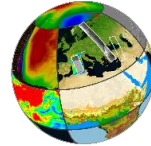




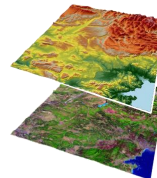
Interactive presentations of Web platforms



VtWeb



DEMIX operations platform



DEM4S2,

DEM4S2

Serge RIAZANOFF
Director

serge.riazanoff@visioterra.fr
<http://www.visioterra.fr>



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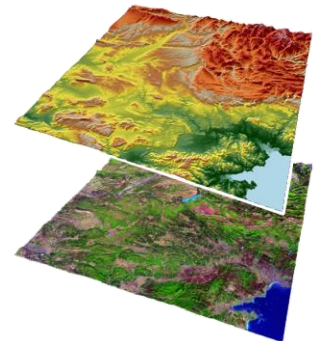
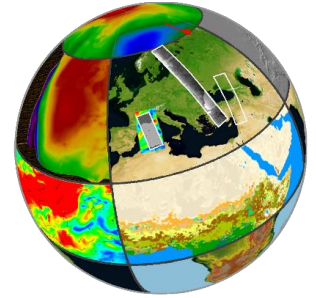
- ☐ VtWeb and “Data Processing Relay” (DPR)
- ☐ VtWeb - Client-server application
- ☐ Hyperlook and layer stack
- ☐ “Elevations” service - 3D display
- ☐ “Finder” service
- ☐ DEM styles
- ☐ DEM difference

➤ **DEMIX operations platform**

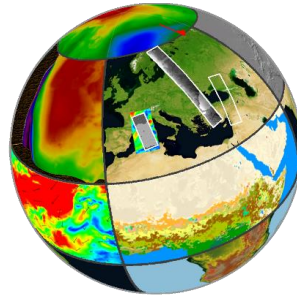
- ☐ General presentation
- ☐ Left panel interface - “Tile export” function
- ☐ Selection of DEMIX tile(s) and DEM
- ☐ Right panel interface (tile list)
- ☐ QGIS installation and tile selection
- ☐ DEM selection and export
- ☐ Import DEMs in QGIS
- ☐ Make the “difference” layer in QGIS
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➤ **DEM4S2 - Production of DEM used to orthorectify a Sentinel-2 tile**

- ☐ General presentation
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- ☐ Sentinel-2 product identifier
- ☐ GeoTIFF export / WMTS export
- ☐ Display in 3D



DEM4S2



VtWeb

On-the-fly processing platform

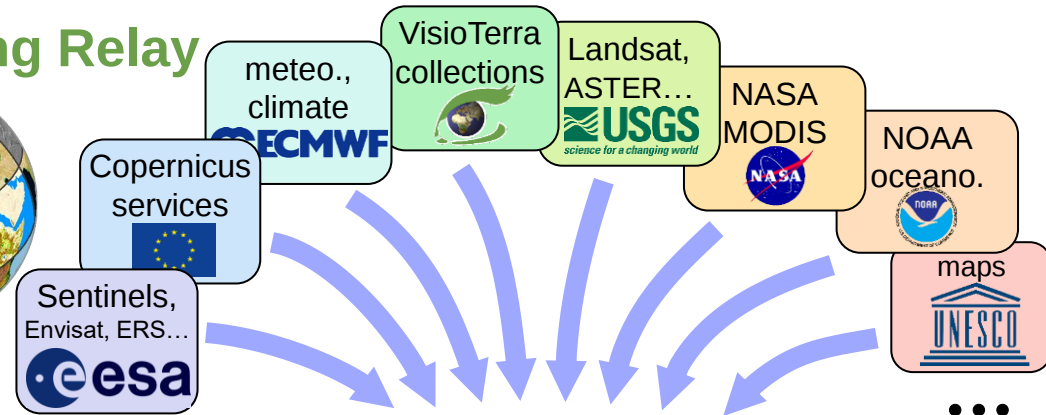
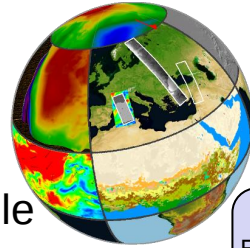


VtWeb – Data Processing Relay

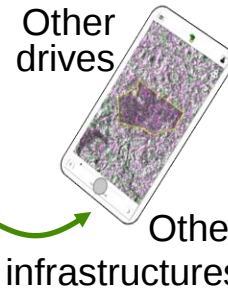
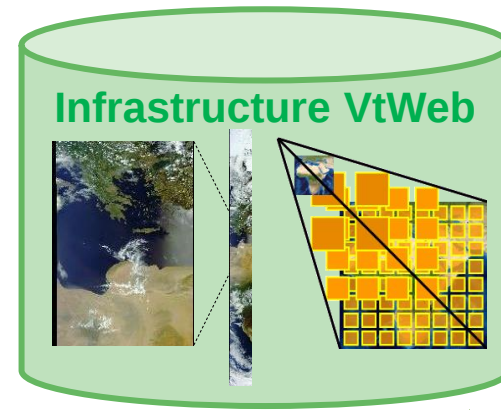
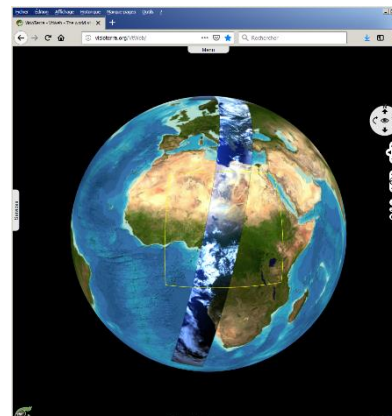
➤ VtWeb infrastructure

- ❑ 1 PB (1000 TB) available
 - 50 TB ASAR and ERS
 - 150 TB MERIS
- ❑ 1 Gb/s symmetric fibre
- ❑ 6 powerful servers

➤ DPR as a solution for Africa

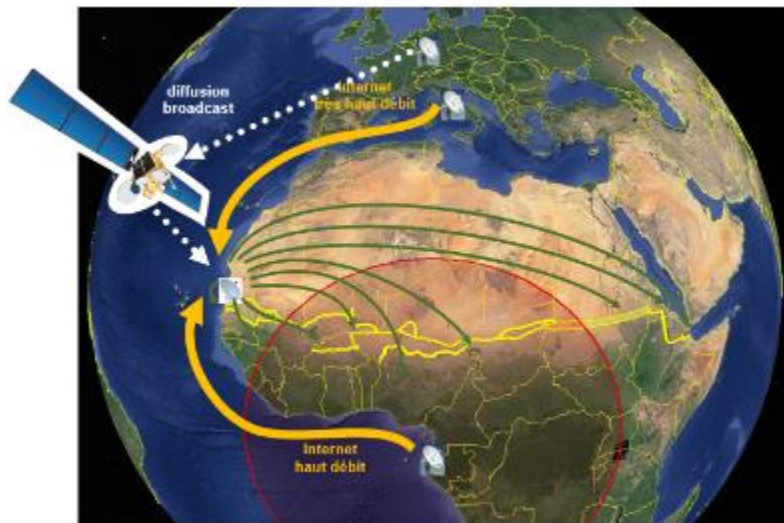
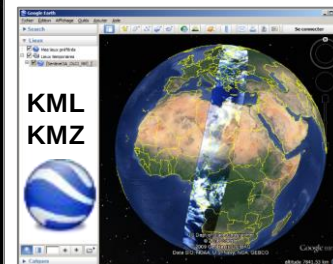


VtWeb client



Google Earth

G.I.S.

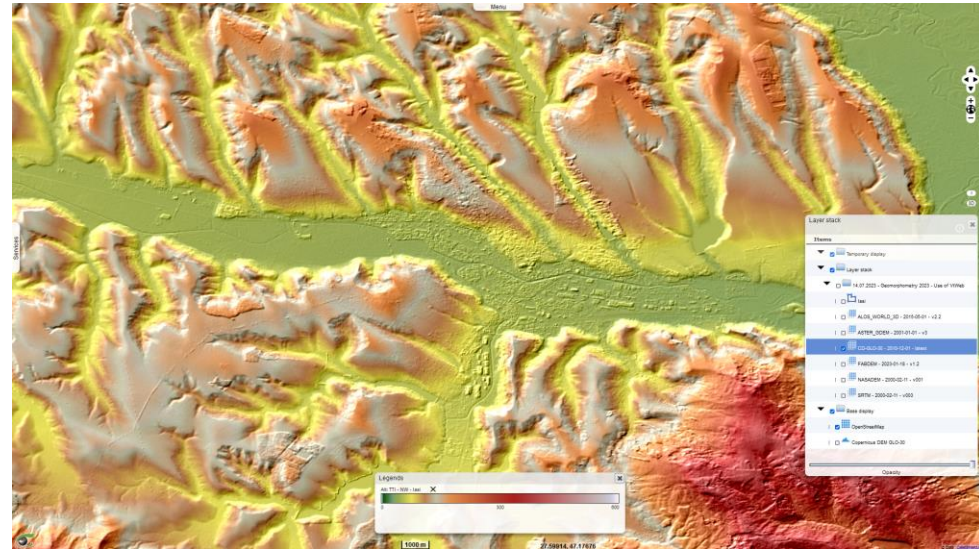




VtWeb - Client-server application

➤ Main features

- ❑ Open access without registration
- ❑ Many datasets in input (image, LiDAR, altimeter, vector fields...)
- ❑ Processing on-the-fly
- ❑ POF-ML macro-language
- ❑ Sharing with hyperlinks → [lasi 2D layer stack](#)
- ❑ Analysis tools
- ❑ Export

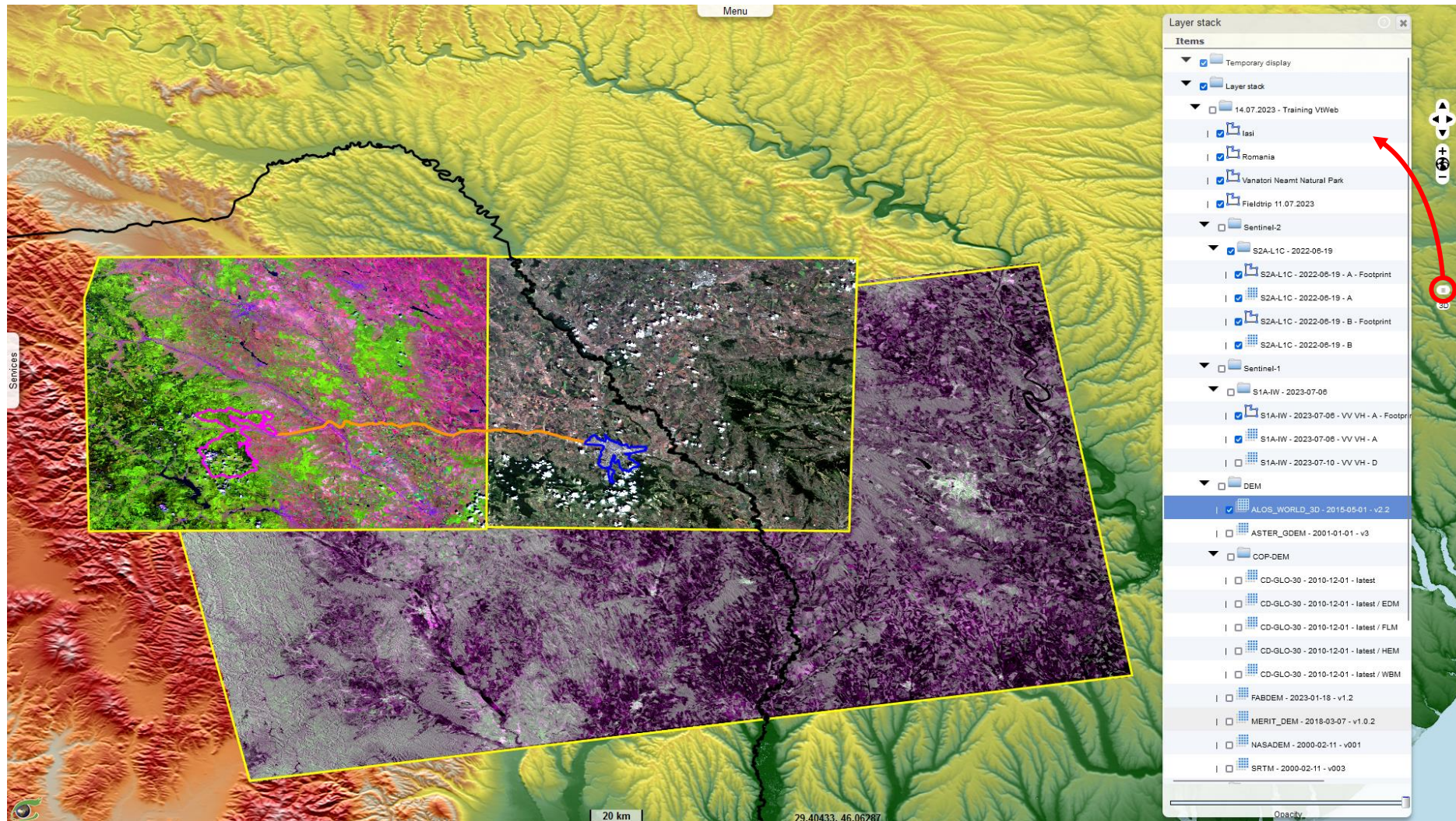


➤ Hyperlink documents

- ❑ [HYP-080-VtWeb-E SRTM ASTER-GDEM ALOS-World-3D comparison](#)
- ❑ [HYP-082-VtWeb-E SRTM ASTER-GDEM local statistics comparison](#)
- ❑ [HYP-086-VtWeb-E DEM impact on orthorectification](#)
- ❑ [HYP-087-VtWeb-E Presentation of ICESat-2 ATLAS](#)
- ❑ [HYP-089-VtWeb-E Comparison of DEMs in Chott Melghir Algeria](#)
- ❑ [HYP-091-VtWeb-E MERIT DEM first assessment](#)
- ❑ [HYP-094-VtWeb-E Assessment of slopes in Alaska LiDAR DEM](#)
- ❑ [HYP-095-VtWeb-E Comparison of Copernicus DEM releases 2020 vs 2019](#)
- ❑ [HYP-096-VtWeb-E Comparison of LiDAR GEDI vs ICESat-1 ICESat-2](#)
- ❑ [HYP-097-VtWeb-E NASADEM SRTMGL1 comparison](#)
- ❑ [HYP-098-VtWeb-E COP-DEM EU-DEM comparison](#)
- ❑ [HYP-099-VtWeb-E COP-DEM GLO-90 vs GLO-30 for Sentinel-2 orthorectification](#)
- ❑ [HYP-106-VtWeb-E Comparison of FABDEM releases 1.0 vs 1.2](#)
- ❑ [HYP-107-VtWeb-E Comparison of Copernicus DEM releases 2022 vs 2021](#)



<https://visioterra.org/VtWeb/hyperlook/d03758e5f4a04dcab29898503cf70073>





“Elevations” service - 3D display



Selection and setting of the altimetry model

The screenshot displays the DEMIX operations platform interface. On the left, a grid of service icons is shown, with 'Copernicus DEM GLO-30' highlighted by a red box. A red arrow points from this icon to the 'Layer stack' panel on the right, where 'Copernicus DEM GLO-30' is also highlighted by a red box and labeled 'right-clip'. Below the 'Layer stack' panel, an 'Elevation settings' dialog box is open, showing a 'Scale' of 1 and a 'Limit the scale factor to values between' field. The main 3D display shows a topographic map of a mountainous region, with a red line indicating the selected area. The interface includes a top menu bar with options like 'Base maps', 'Finder', 'Elevations', 'Geology', 'Proba-V', and 'Time series'. The bottom status bar shows coordinates (26.3204, 47.2601, 1752) and a copyright notice for VT-A003-SLD-110-E-01-00.



“Finder” service

Selection of a DEM and Land Use / Land Cover (LU/LC) datasets

The screenshot displays the Finder service interface, which is used for selecting datasets for a visualization. The interface is divided into several panels:

- Left Panel (Dataset List):** A table listing various datasets. The columns are S, Dataset, Date, and Properties. The datasets are categorized by type (DEM, LU/LC) and date. A red circle highlights the 'CD-GLO-30 : C3S-LC' dataset, which is selected.
- Top Panel (Filters):** Includes tabs for Base maps, Finder, Elevations, Geology, Proba-V, and Time series. The 'Finder' tab is active, showing filters for Area of Interest (AOI), Minimum overlay (%), Date start, Date stop, Status, Dataset, CloudCover, and Limit.
- Right Panel (Layer Stack):** A list of layers added to the map. The 'DEM' layer is selected, and the 'CD-GLO-30 - 2010-12-01 00:00:00 - latest' dataset is chosen. Other layers include 'LULC', 'Base display', and 'Bing Map (Microsoft)'.
- Bottom Panel (Legend):** A color scale legend for the 'AH TTI - NW' dataset, ranging from 0 to 6,000.

The main map area shows a 3D visualization of the terrain, with a red arrow pointing to the 'CD-GLO-30 : C3S-LC' dataset in the left panel.



DEM styles

Default / predefined / user-defined styles

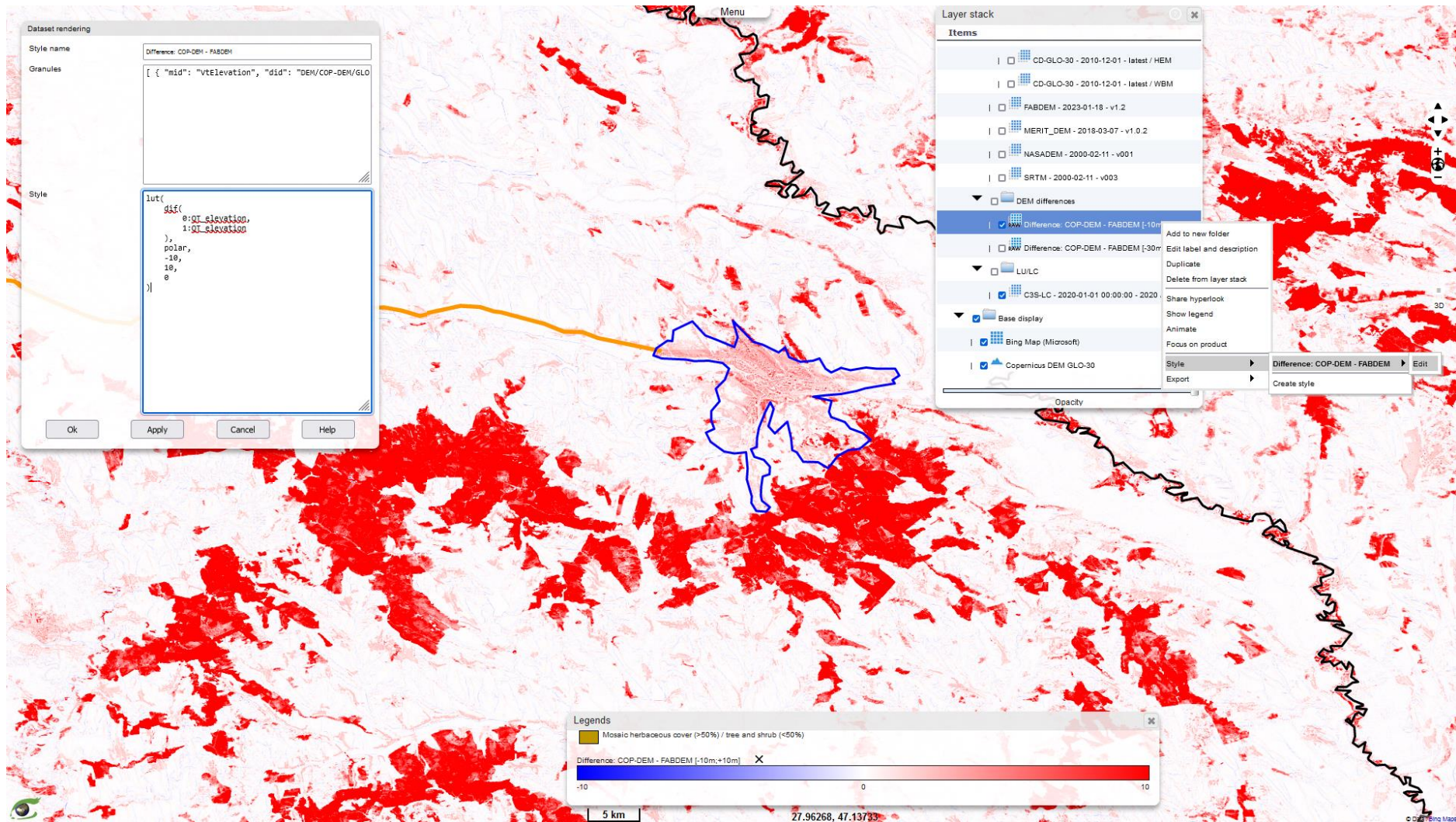
The screenshot displays the DEMIX operations platform interface, showing a 3D terrain model of Iasi, Romania. The main window displays a 3D view of the terrain, with a blue line indicating a specific path or boundary. The interface includes several tool windows:

- Dataset rendering:** A panel on the left for configuring the style. It includes fields for Style name (Alti TTI - NW - Romania), Greyscale (elevation), Red, Green, and Blue channels, and options for Same preprocessing, Greyscale, Stretching, Filtering, Lookup table, Negative, and Mask. Buttons for Ok, Apply, Cancel, and Help are at the bottom.
- Look-up table parameters:** A panel in the bottom left for configuring the look-up table. It includes fields for Output range, Left range, Right range, and Lookup table (Alti TTI). A preview shows a 3x3 gradient N-S. Buttons for Ok, Apply, Cancel, Reset, and Help are at the bottom.
- Layer stack:** A panel on the right showing the list of layers in the stack. It includes layers like Temporary display, Iasi_footprint, Layer stack, 14.07.2023 - Training VtWeb, Iasi, Romania, Vanatori Neamt Natural Park, Fieldtrip 11.07.2023, Sentinel-2, Sentinel-1, DEM, ALOS_WORLD_3D - 2015-05-01 - v2.2, ASTER_GDEM - 2001-01-01 - v3, COP-DEM, CD-GLC, and FABDEM. A context menu is open over the CD-GLC layer, showing options like Add to new folder, Edit label and description, Duplicate, Delete from layer stack, Share hyperlink, Show legend, Animate, and Focus on product.
- Legends:** A panel in the bottom right showing the legend for the Alti TTI - NW - Romania style. It includes a color bar ranging from 0 to 2,000.



DEM difference

POF-ML - Processing On-the-Fly Macro-Language





DEMIX

operations platform



General presentation

➤ DEMIX Operations Platform

- ❑ Open - <https://visioterra.org/DemixOperationsPlatform/>
- ❑ Current version – v1.1 ([changelog](#))
- ❑ Retrieve DEM elevations inside DEMIX tiles (10x10km areas)
- ❑ Compute ranking of DEMs (Work in progress)



The screenshot displays the DEMIX Operations Platform interface. On the left, a settings panel allows users to export DEMIX tiles or compute criteria and ranking. The settings include options for DEM (Copernicus DEM GLO-30), Version (v2023-1), CRS (Geographic, UTM), VRs (EGM2008, EGM96, WGS84), GSD (1 arcseconds), Resampling (Interpolation), Method (Bilinear), and Pixel-type (Point, Area). In the center is a globe showing the Earth's topography. On the right, a table provides a summary of the Copernicus DEM GLO-30 data.

Copernicus DEM GLO-30 DEM informations summary	
Identifier	GLO_DSM_30_COP-DEM_GLO-30-DGED
Integration status	Done
Full name	Copernicus DEM Global 30 metres
Spatial coverage	Global
GSD (m)	1*arcsecond (= 30 metres at equator)
Type (DTM/DSM/DBM/DEM)	DSM
Versions (latest to oldest)	2022_1
Data URL(s)	https://spacedata.copernicus.eu/fr/collections/copernicus-digital-elevation-model
Average download speed	-
Size estimation	-
Datatype	Float (32 bits)



Left panel interface - “Tile export” function

DEMIX Operations Platform
Version 1.1 - [See changelog](#)
[See credits](#)

Export DEMIX tiles | **Compute criteria and ranking**

DEMIX tile(s) 6/30 tiles selected

DEM ? ? ?

Version ? Native

CRS

VRS

GSD " arcseconds
(≈ 30.922 m equator)

Resampling

Method

Pixel-type

1. Click on the map to select DEMIX tiles

2. Select export parameters

3. Export tiles as GeoTIFF



Selection of DEMIX tile(s) and DEM

See DEM informations

esa	Copernicus DEM GLO-30	DEMIX
European Space Agency	DEM informations summary	
Identifier	GLO_DTM_30_COP_DEM_GLO-30-DEM	
Integration status	Done	
Full name	Copernicus DEM Global 30 metres	
Spatial coverage	Global	
GSD (m)	1"arcsecond (> 30 metres at equator)	
Type (DTM/DEM/DSM/DEM)	DEM	
Versions (latest to oldest)	2022_1	
Data URL(s)	https://spacadata.esa.int/collections/copernicus-digital-elevation-model	
Average download speed	-	
Size estimation	-	
Datatype	Float (32 bits)	

DEMIX tile(s) 6/30 tiles selected

DEM Copernicus DEM GLO-30   

Version v2022-1  Native

CRS

Geographic

UTM

VRS

EGM2008

EGM96

WGS84

GSD  1 " arcseconds
(≈ 30.922 m equator)

Resampling

Interpolation

Method Bilinear

Pixel-type

Point

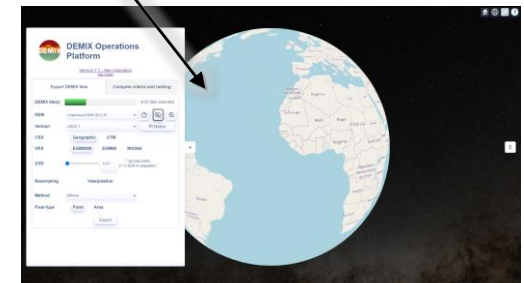
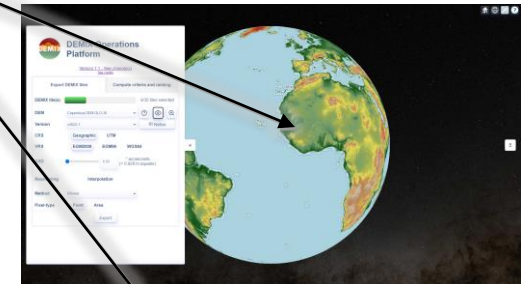
Area

Export

Zoom on full extent

Display / hide DEM

Tune output to native DEM characteristics





Right panel interface (tile list)

**Manage DEMIX tiles
(add, remove and zoom)**

Click on a tile to
highlight its identifier

DEMIX tiles

Click on the map or type to
select DEMIX tiles.

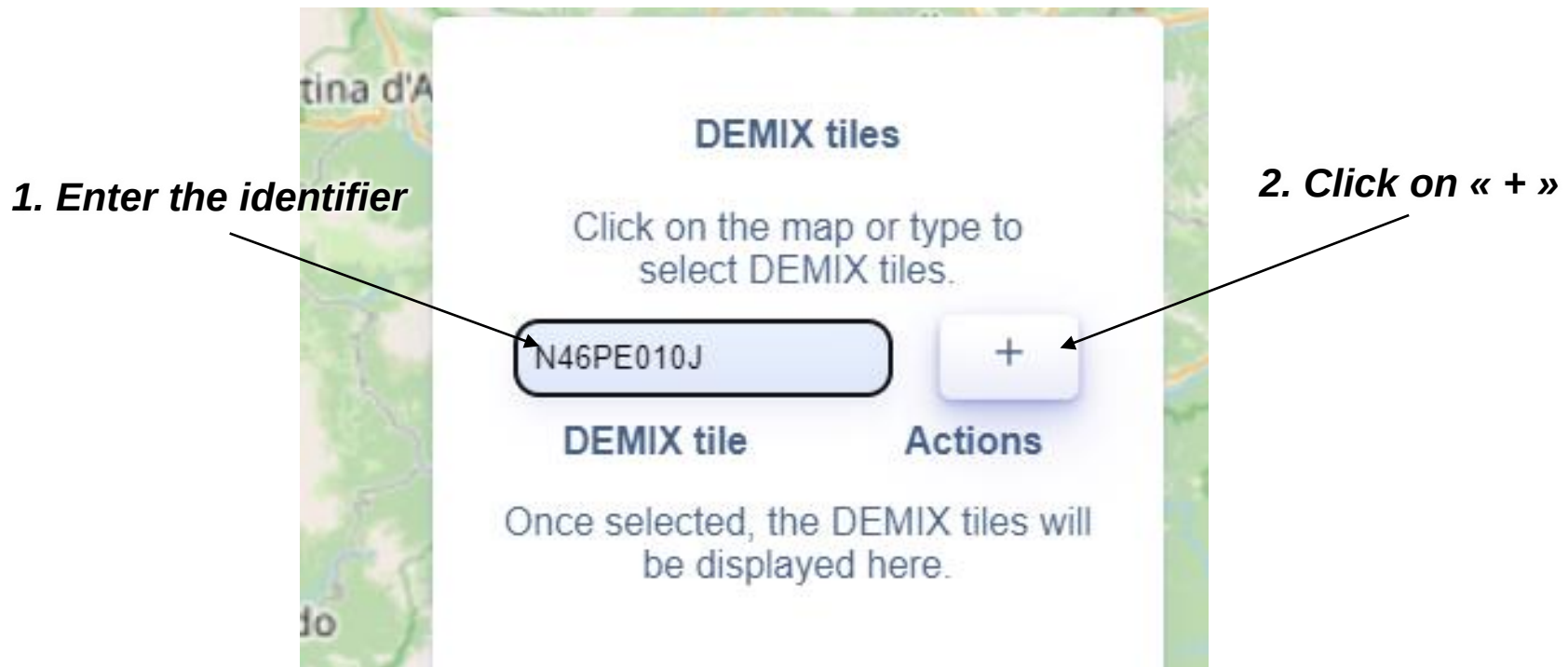
N31UW007H +

DEMIX tile	Actions
N31XW007K	
N31TW007D	
N31QW007D	
N31RW007H	
N31QW007L	
N31VW006B	
N31XW007D	
N31ZW007H	
N31UW007H	



QGIS installation and tile selection

- 1. Download and install QGIS (any version)
 - ❑ <https://www.qgis.org/en/site/forusers/download.html>
- 2. On the DEMIX Operations Platform, add the tile « N46PE010J » to the DEMIX tiles list





DEM selection and export

- 3. Select « Copernicus DEM GLO-30 » in the left panel and click on « Native »

1. Select the DEM

DEMIX tile(s) 1/30 tiles selected

DEM Copernicus DEM GLO-30

Version v2022-1

Native

- 4. Click on **Export**
- 5. Once downloaded, select « ALOS World 3D » and click on « Export »
- 6. Once downloaded, select « ITA-TRE_DSM_1-2 » and click on « Export »

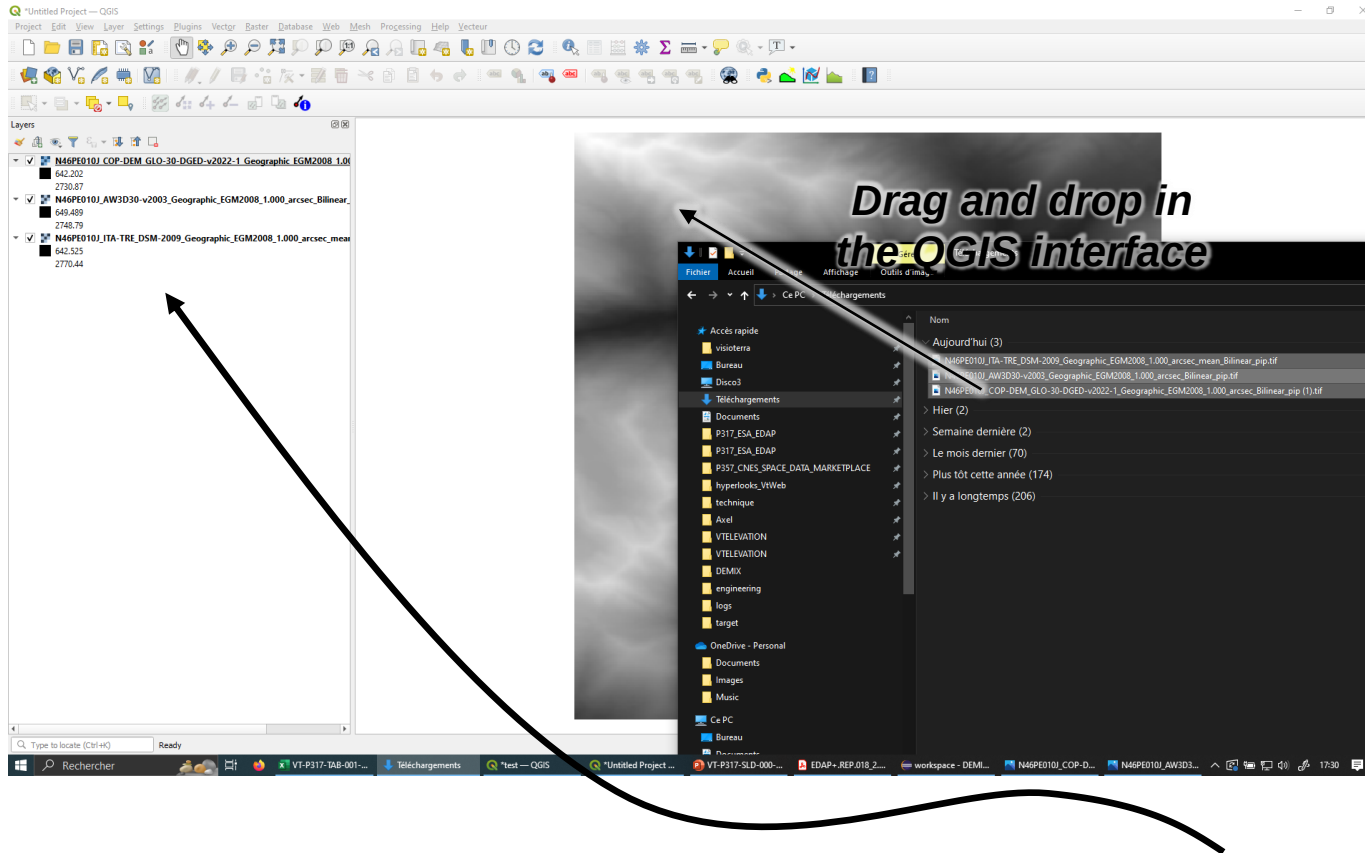
2. Click on « Native »

You should retrieve 3 GeoTIFF files, one for each of the DEMs.



Import DEMs in QGIS

- 7. Open QGIS and click on the « Project » tab, then « New ».
- 8. Add the three GeoTIFF DEMs by dropping them onto the interface.

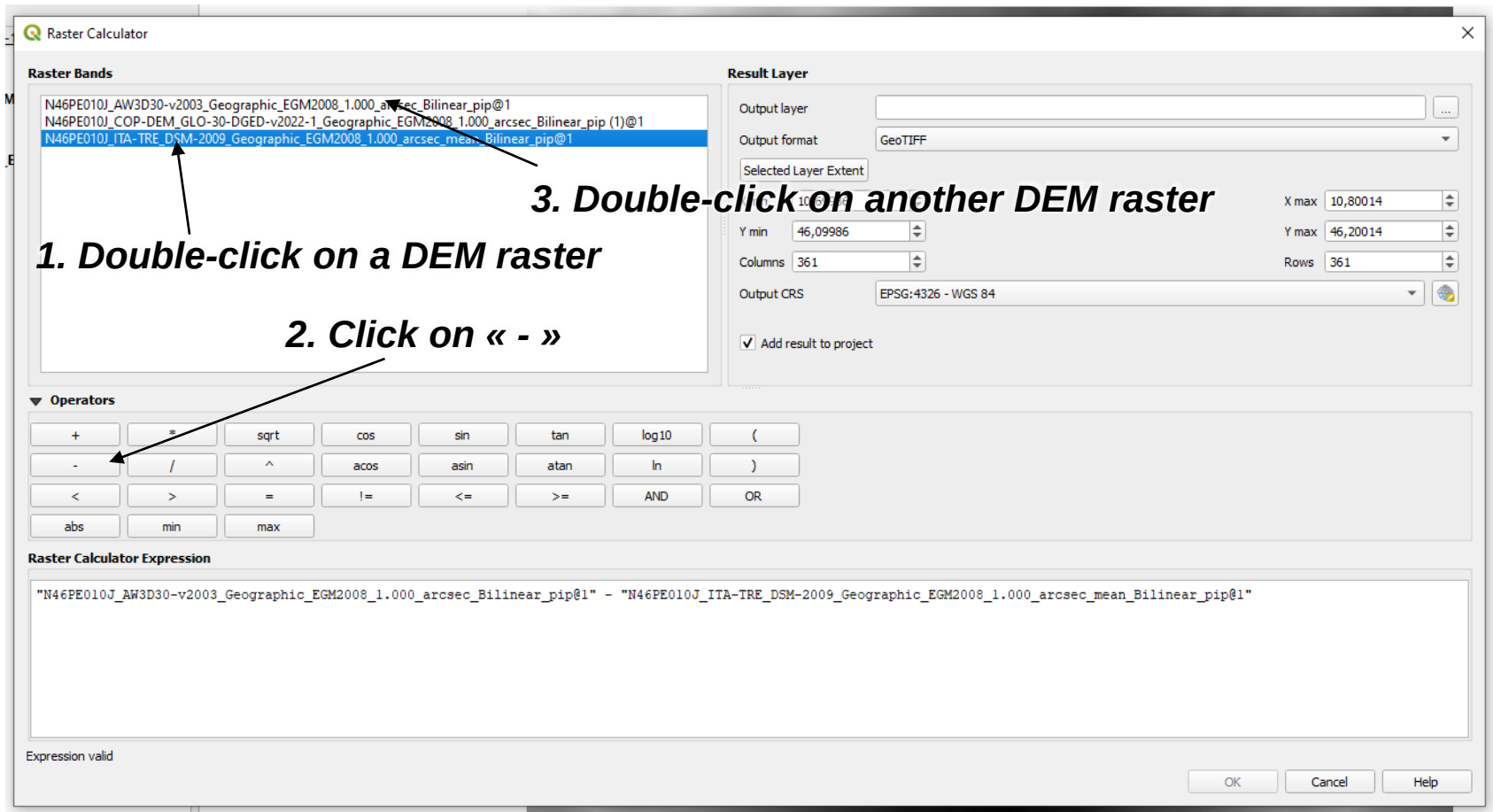


You should now be able to see the three DEMs in your QGIS layers



Set the difference operator in QGIS

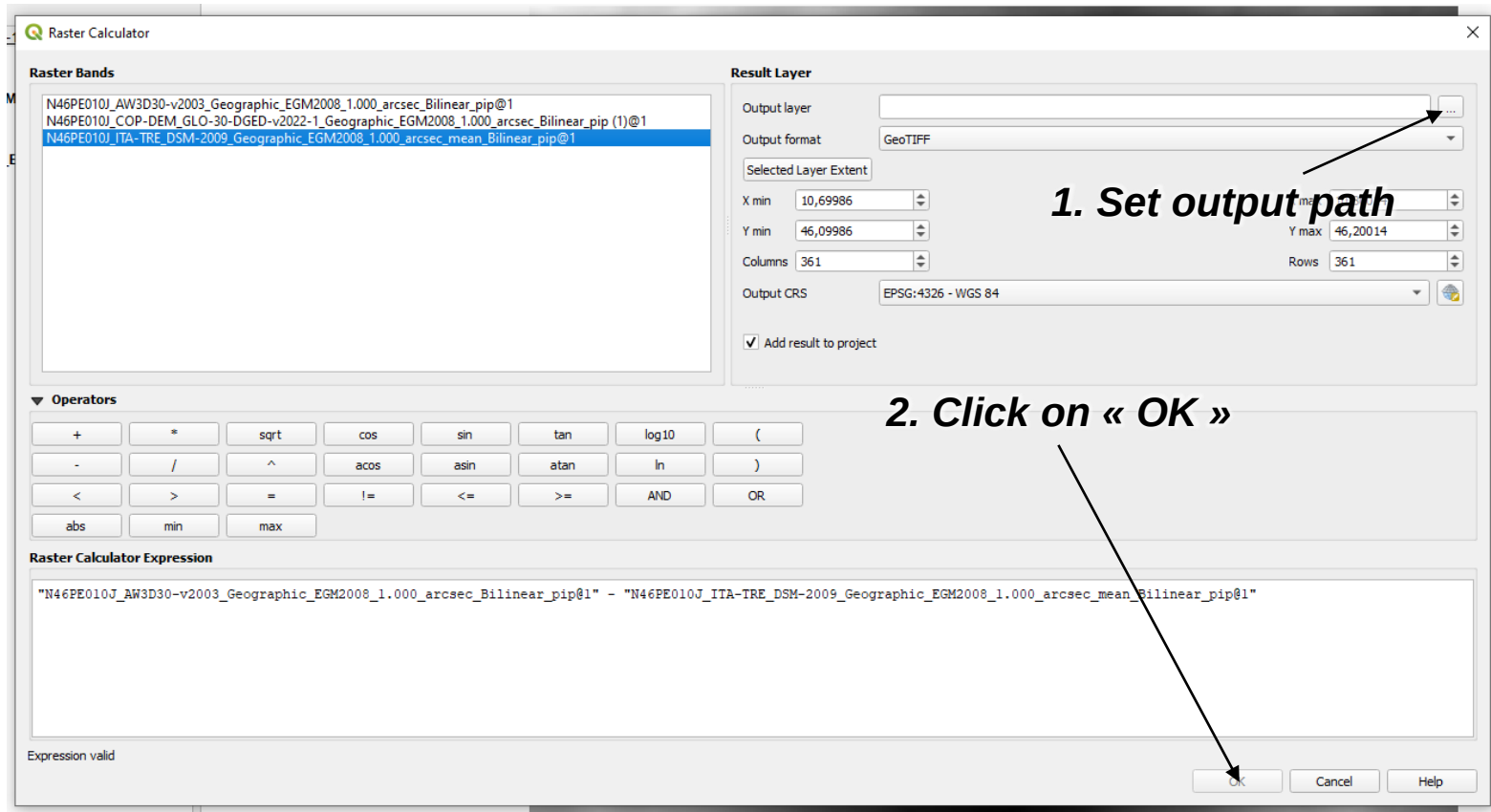
- 9. Click on the « Raster » tab, then « Raster Calculator ».
- 10. To perform a height difference, double-click on any DEM raster, then click on « - », then double-click on another DEM raster.





Make the “difference” layer in QGIS

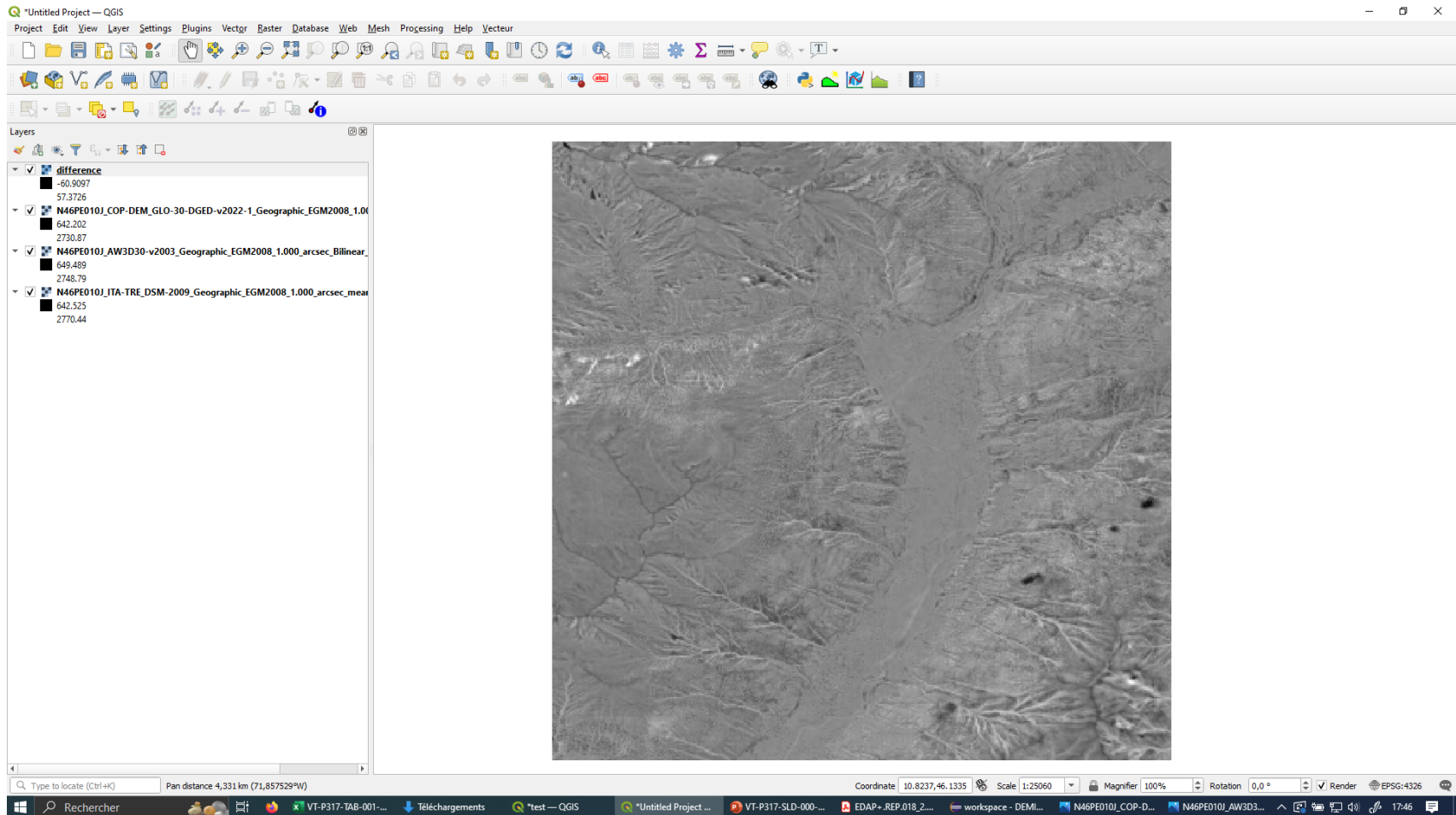
- 11. Click on « ... » to set the output path of your difference raster
- 12. Click on « OK »





Display the DEM difference in QGIS (grayscale)

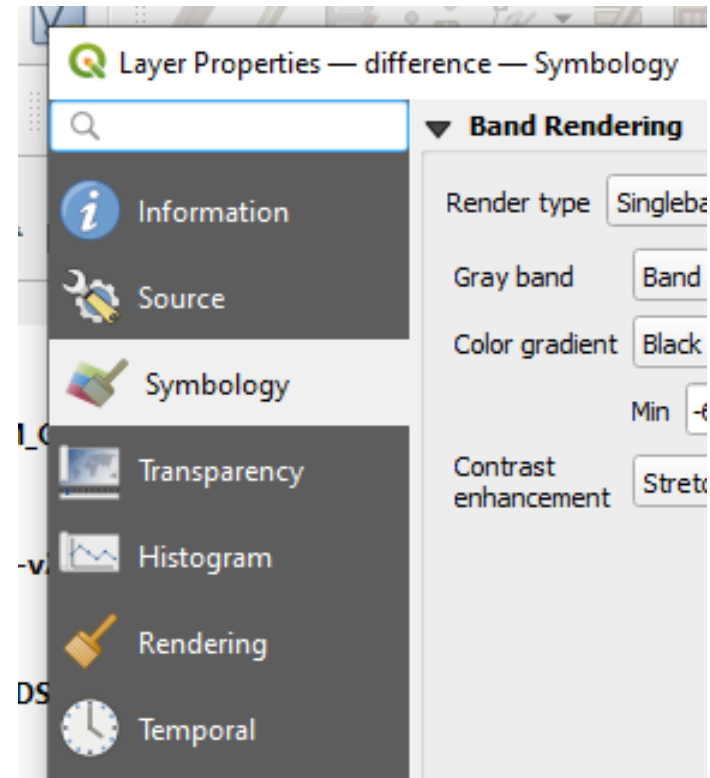
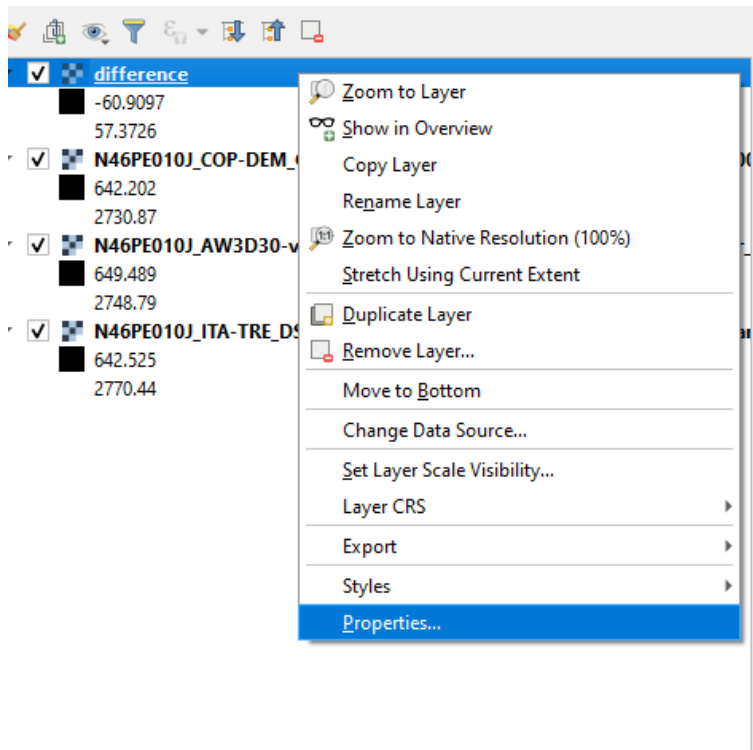
If everything went correctly, you should now see your difference raster directly into QGIS !





Set a colour map to highlight the negative / positive differences

- 13. To add a color map to the raster, right click on the difference layer (left panel) and click on « Properties », then get to the « Symbology » tab.





Set colour map parameters

- 14. Select the render type « Singleband pseudocolor », then select the colour ramp of your choice
- 15. Enter the min and max values of the color bands (here, -20 to +20)

erence — Symbology

1. Select « singleband pseudocolor »

Render type: Singleband pseudocolor

Band: Band 1 (Gray)

Min: -20 Max: 20

3. Enter min and max values

Interpolation: Linear

Color ramp: [Blue to Red gradient]

Label unit suffix:

Label precision: 4

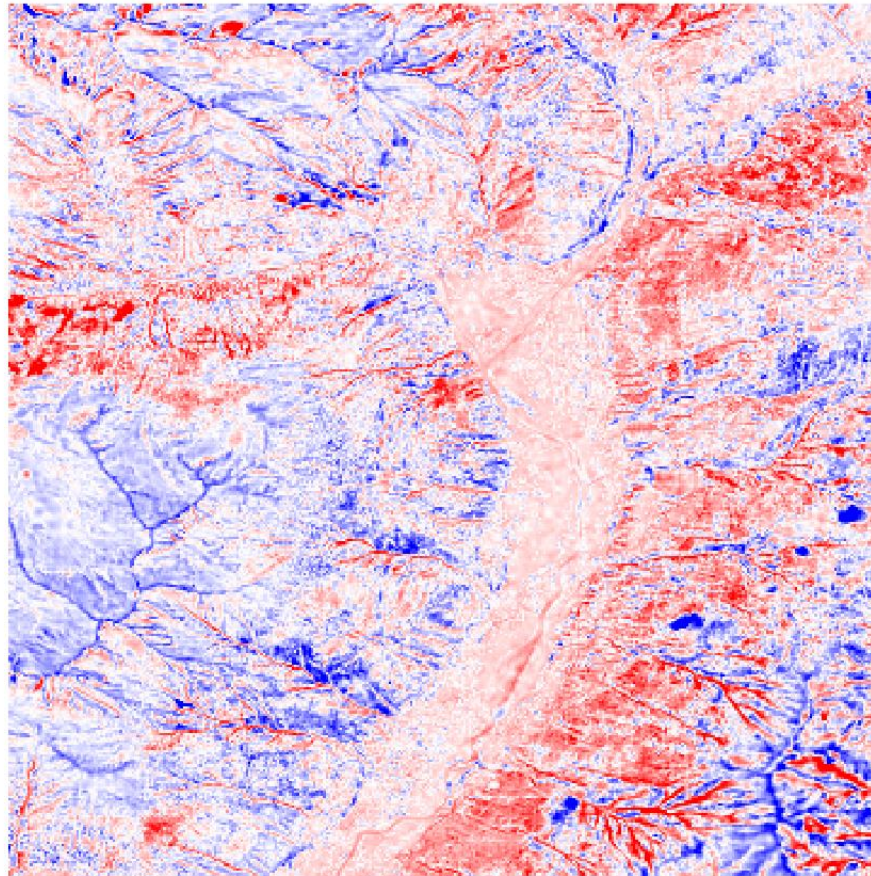
2. Select a colour ramp

Value	Color	Label
-20	[Blue]	-20,0000
-19,921722	[Blue]	-19,9217
-19,8434444	[Blue]	-19,8434

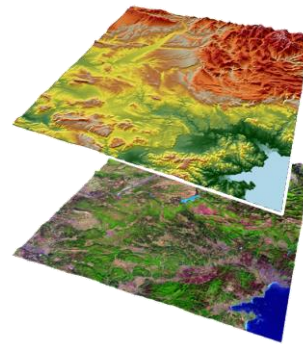


Display the DEM difference in QGIS (colourmap)

Your differences should now be coloured accordingly !



Thank you for your attention !



DEM4S2

DEM4S2

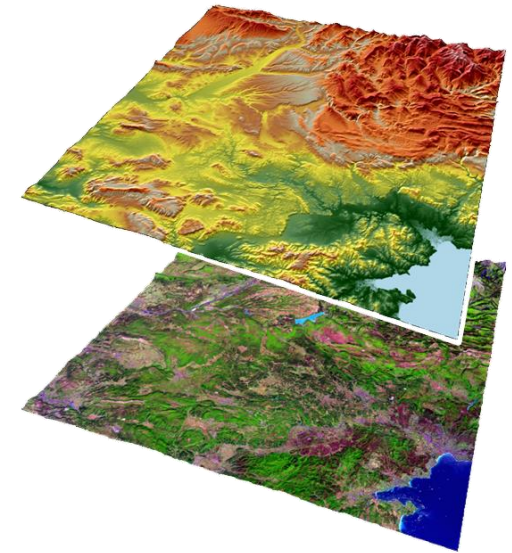
Production of DEM used to
orthorectify a Sentinel-2 tile



General presentation

➤ Digital Elevation Model for Sentinel-2

- ❑ Open - <https://visioterra.org/DEM4S2/>
- ❑ Current version – v1.2 ([changelog](#))
- ❑ Works with Sentinel-2 or [MGRS](#) tile identifier
- ❑ Allows to display and download 3 DEMs
 - Copernicus DEM GLO-30 (latest version – currently v2022_1)
 - Copernicus DEM GLO-90 (latest version – currently v2022_1)
 - NASADEM (v001)



DEM4S2



Digital Elevation Model for Sentinel-2

Sentinel-2 or MGRS tile identifier

S2B_MSIL1C... or 33TUG

Select a DEM

--

Sentinel-2 quicklook

DEM quicklook

DEM statistics

Mean

Std. dev.

Min.

Max.

Export DEM

Export as WMTS

Display in 3D

v1.2 / info@visioterra.fr



Digital Elevation Model for Sentinel-2

Changelog

Version	Date	Changes
1.2	13/07/2023	- General - add the present changelog. 3D display - control panel is now collapsible. 3D display - add text box displaying the value of terrain exaggeration. 3D display - add switch to enable or disable the water mask.
1.1	28/06/2023	Support MGRS tile identifier in input.
1.0	12/06/2023	First version of the DEM4S2 platform.

v1.2 / info@visioterra.fr

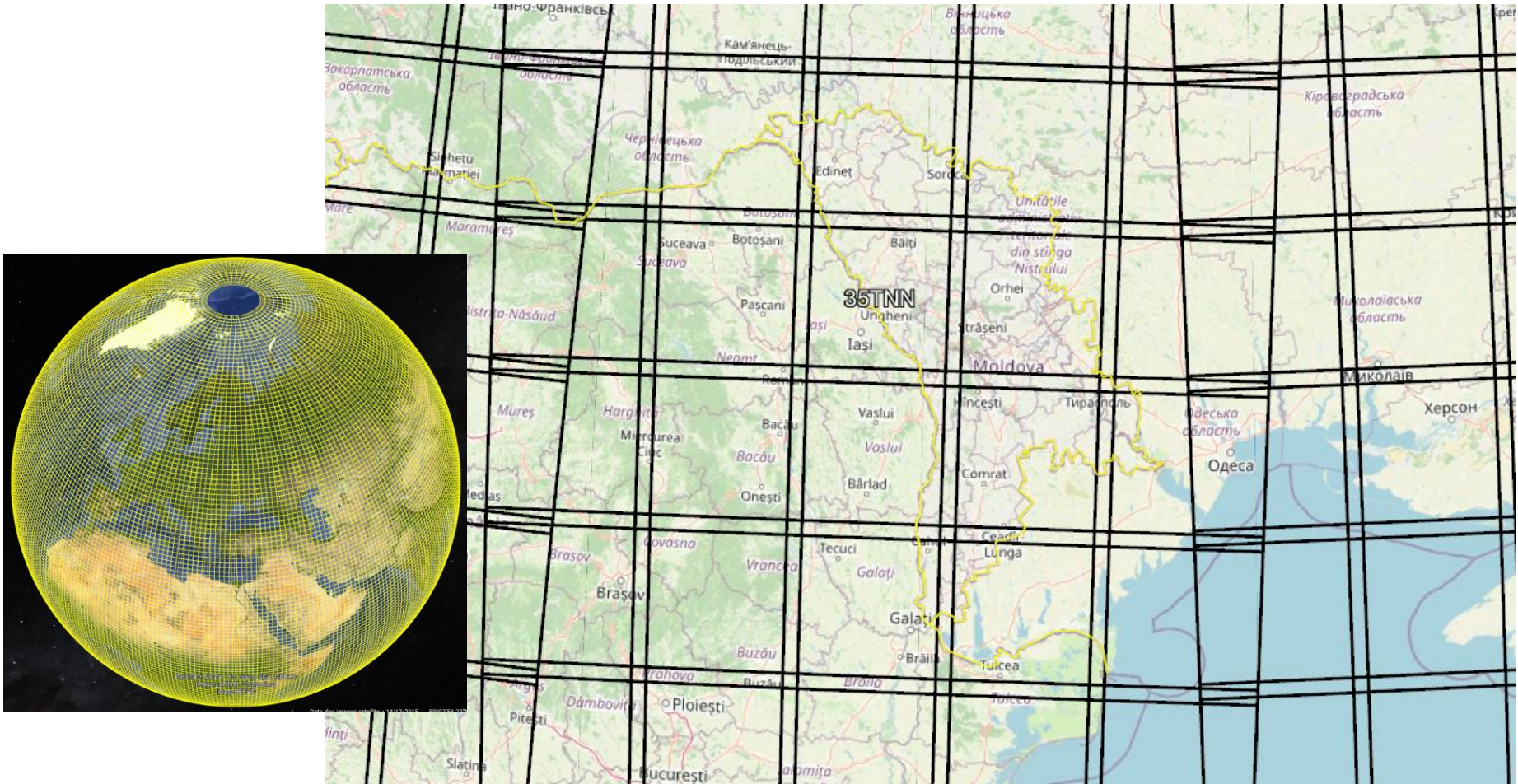




Sentinel-2 MGRS (Military Grid Reference System)

➤ KML file available at

https://sentinel.esa.int/documents/247904/1955685/S2A_OPER_GIP_TILPAR_MPC_20151209T095117_V20150622T000000_21000101T000000_B00.kml/ec05e22c-a2bc-4a13-9e84-02d5257b09a8





Sentinel-2 product identifier

- Search Sentinel-2 product
- Open Access Hub

4

2

3

1

5

S2B_MSIL2A_20230709T090559_N0509_R050_T35TNN_20230709T104657

Request Done: (footprint:"Intersects(POLYGON((27.531757022366556 47.13034440928513,27.645533832036815 47.13034440928513,27.645533832036815 47.200873733110114,27.531757022366556 47.200873733110114,27.531757022366556 47.13034440928513,27.645533832036815 47.13034440928513)))")

S2B MSI S2B_MSIL2A_20230709T090559_N0509_R050_T35TNN_20230709T104657

Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('ef2265f6-c8e6-4869-8278-d9e0615efb3a'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('ef2265f6-c8e6-4869-8278-d9e0615efb3a')/$value)

Mission: Sentinel-2 Instrument: MSI Sensing Date: 2023-07-09T09:05:59.024Z Size: 1.01 GB

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Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('c0ff7c7c-b590-427a-b020-0badea970e2'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('c0ff7c7c-b590-427a-b020-0badea970e2')/$value)

Mission: Sentinel-2 Instrument: MSI Sensing Date: 2023-07-09T09:05:59.024Z Size: 756.91 MB

S2A MSI S2A_MSIL2A_20230704T090601_N0509_R050_T35TNN_20230704T140455

Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('e5022ecb-0920-4742-91ce-cf5e1cd63b'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('e5022ecb-0920-4742-91ce-cf5e1cd63b')/$value)

Mission: Sentinel-2 Instrument: MSI Sensing Date: 2023-07-04T09:06:01.024Z Size: 1.10 GB

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Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('bec6e776-cad5-4c93-8afa-b5a23cdad8'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('bec6e776-cad5-4c93-8afa-b5a23cdad8')/$value)

Mission: Sentinel-2 Instrument: MSI Sensing Date: 2023-07-04T09:06:01.024Z Size: 809.27 MB

S2B MSI S2B_MSIL1C_20230629T090559_N0509_R050_T35TNN_20230629T111418

Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('43a7a2d1-abd9-4fc9-8a3-7798050cd25a'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('43a7a2d1-abd9-4fc9-8a3-7798050cd25a')/$value)

Mission: Sentinel-2 Instrument: MSI Sensing Date: 2023-06-29T09:05:59.024Z Size: 685.11 MB

S2B MSI S2B_MSIL2A_20230629T090559_N0509_R050_T35TNN_20230629T122252

Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('4678066c-d5f1-4b83-b17c-a8a0dbc69f11'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('4678066c-d5f1-4b83-b17c-a8a0dbc69f11')/$value)

Mission: Sentinel-2 Instrument: MSI Sensing Date: 2023-06-29T09:05:59.024Z Size: 881.24 MB

S2B MSI S2B_MSIL2A_20230709T090559_N0509_R050_T35TNN_20230709T104657

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Footprint

Quicklook

Attributes

Inspector

Summary

Date: 2023-07-09T09:05:59.024Z

Filename: S2B_MSIL2A_20230709T090559_N0509_R050_T35TNN_20230709T104657 SAFE

Identifier: S2B_MSIL2A_20230709T090559_N0509_R050_T35TNN_20230709T104657

Instrument: MSI

AUX_DATA

DATASTRIP

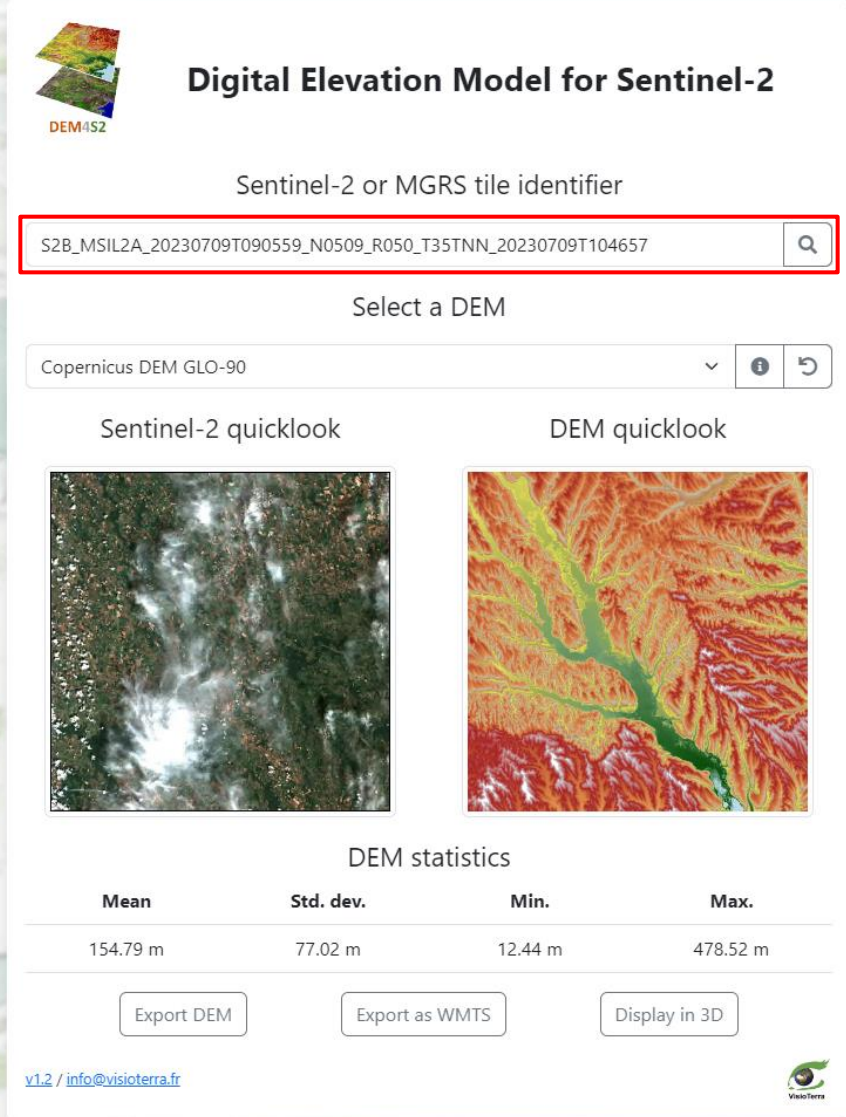
GRANULE



GeoTIFF export / WMTS export

- Set identifier in DEM4S2
(https://visioterra.org/DEM4S2/?s2Id=S2B_MSIL2A_20230709T090559_N0509_R050_T35TNN_20230709T104657)

- Validate with
 - ☐ Default is retrieved from the processing baseline
 - ☐ Quicklook is loaded
 - ☐ Basic statistics are computed
- Export DEM
 - ☐ Download the DEM with the same CRS/GSD than the S2
- Export as WMTS
 - ☐ Create a WMTS stream compatible with GIS like QGIS
- Display in 3D
 - ☐ Display in a 3D globe directly in the web page



Digital Elevation Model for Sentinel-2

DEM4S2

Sentinel-2 or MGRS tile identifier

S2B_MSIL2A_20230709T090559_N0509_R050_T35TNN_20230709T104657

Select a DEM

Copernicus DEM GLO-90

Sentinel-2 quicklook

DEM quicklook

DEM statistics

Mean	Std. dev.	Min.	Max.
154.79 m	77.02 m	12.44 m	478.52 m

Export DEM Export as WMTS Display in 3D

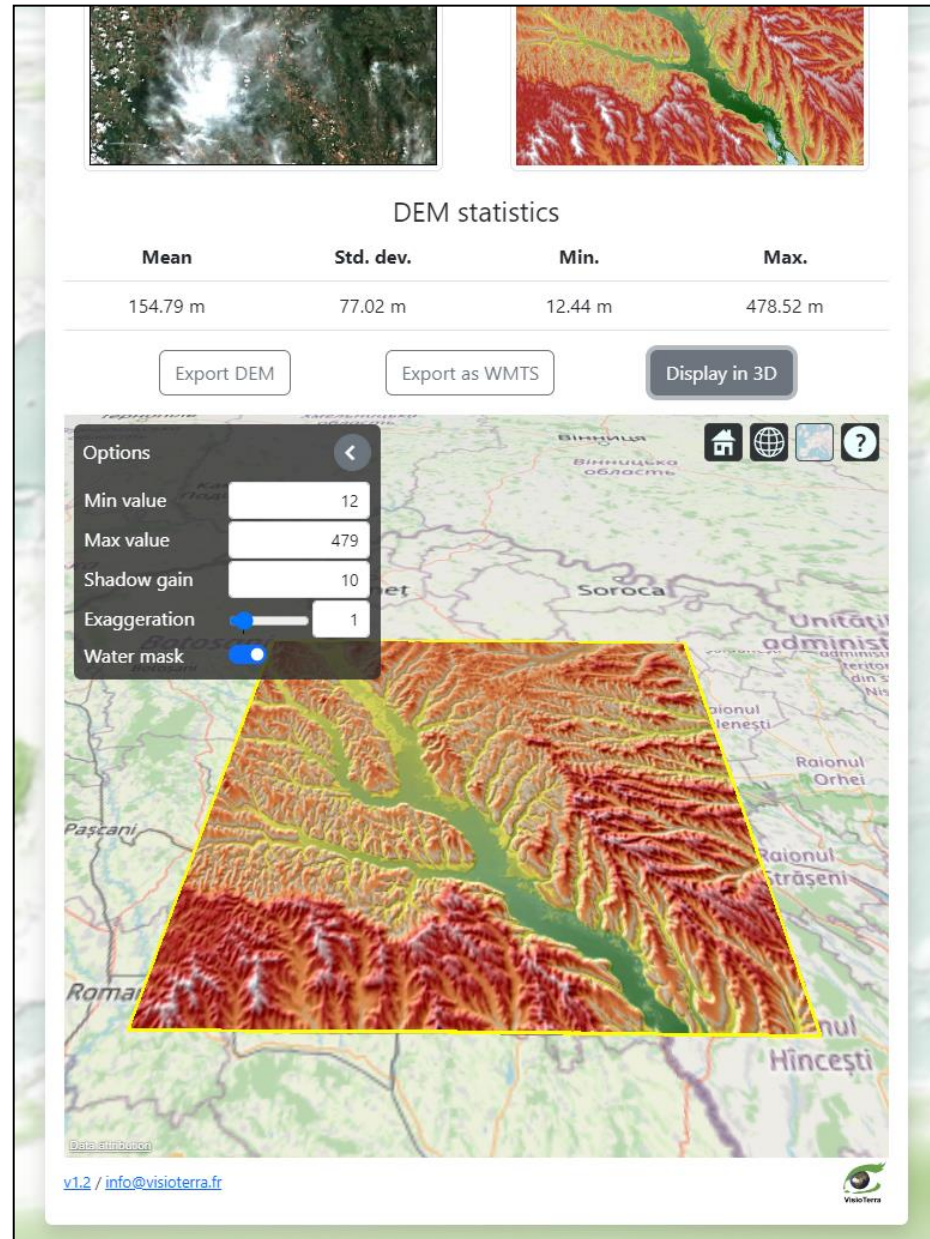
v1.2 / info@visioterra.fr

VisioTerra



Display in 3D

- **Min value**
 - ☐ Define the minimum value to be rendered, lower value will be saturated
- **Max value**
 - ☐ Define the maximum value to be rendered, greater value will be saturated
- **Shadow gain**
 - ☐ Define the gain applies to the shadowing, greater gain strengthen the shadowing
- **Exaggeration**
 - ☐ Define the vertical exaggeration of the 3D elevation, between 0 and 10
- **Water mask**
 - ☐ Enable or disable the water mask (based on Copernicus DEM GLO-30)





Merci de votre attention
Thank you for your attention

Questions ?



VisioTerra

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