

Back to QGIS: Georeferencing

Summer School on Digital Humanities

Course material available at

https://github.com/AugustoCiuffoletti/DHSS_2025

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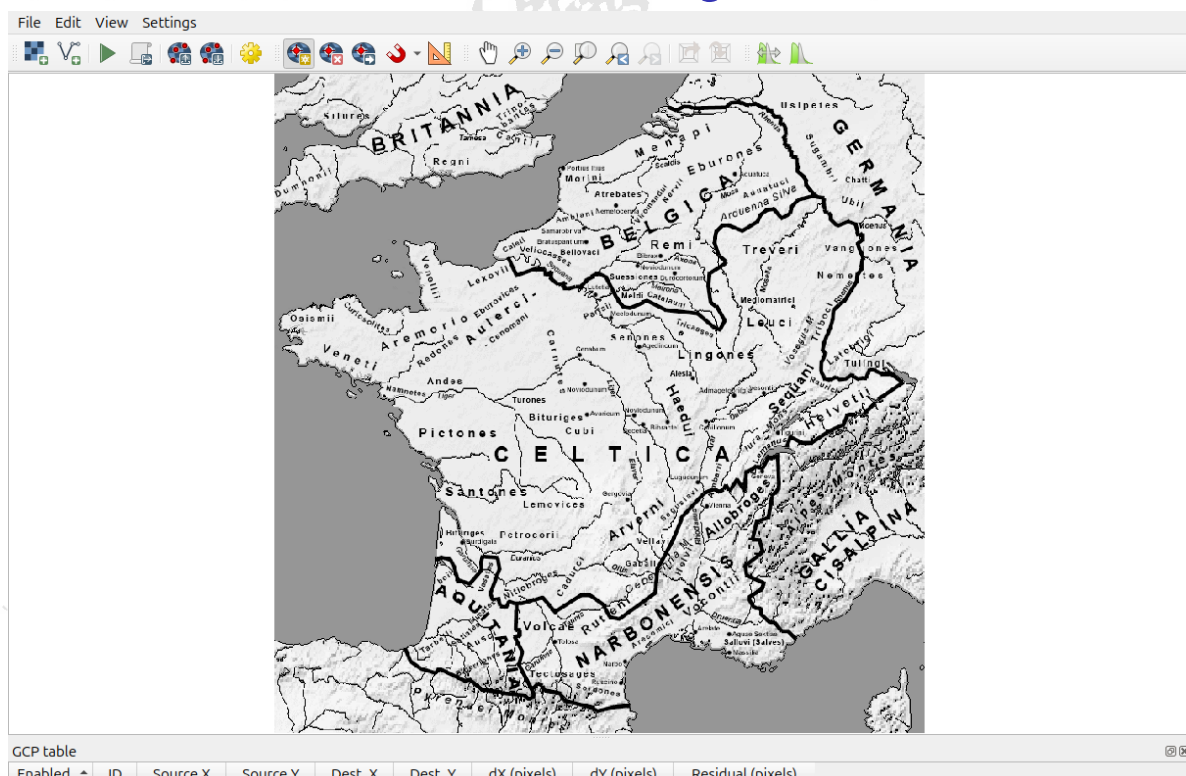
Back to QGIS: Georeferencing

- Georeferencing involves transforming an image into a map
 - assigning geographic coordinates to each pixel in the image
- To achieve this, match points on the image with corresponding locations on an accurate reference raster (e.g., OSM)
- A georeferencing tool then calculates the coordinates for all pixels
 - Accuracy improves with the number of reference points
 - The image may need morphing (non-linear transformation)
 - Optimal reference points are distant and non-aligned
- QGIS provides tools for this task

Georeferencing: Preparation

- Create a new project and load the reference raster (OSM)
- Adjust the scale to match the area covered in the map
- Observe the code in the bottom right corner: **EPSG:3857 (WGS84/Pseudo-Mercator)**
 - This is the usual projection for Web mapping
- Open the Georeferencer tool:
 - Select **Layer** -> **Georeferencer...** to open a new window
- In the *Georeferencer* window:
 - Select **File** -> **Open Raster**
 - Locate and open the image file you want to georeference

Unreferenced image loaded



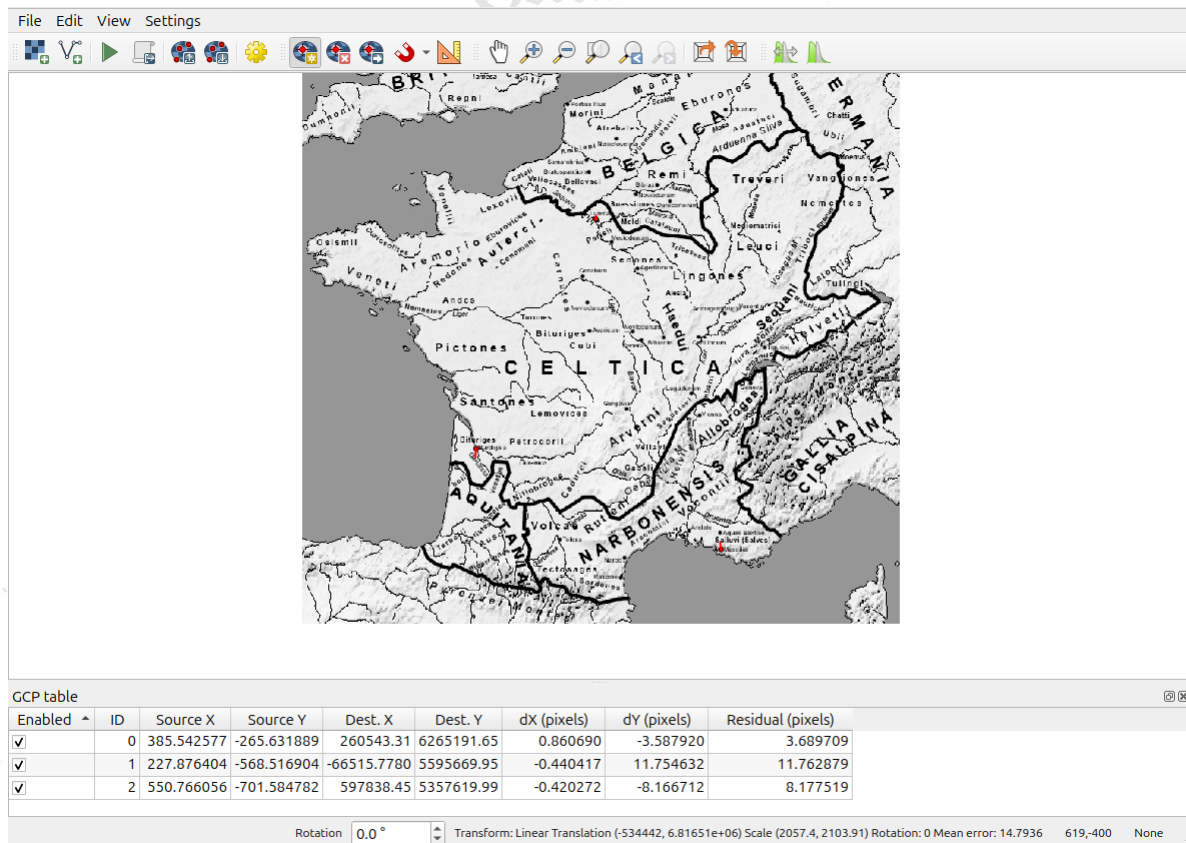
Setup the transformation type

- Configure transformation settings:
 - Select **Settings** -> **Transformation Settings**
 - Choose a transformation type (TPS is generally suitable)
 - Ensure the SRS is set to EPSG:3857 - WGS84/Pseudo-Mercator
 - Specify a target file for the result
 - Enable "Load in QGIS when done"
 - Click OK to apply the settings and return to the Georeferencer window

Matching Points

- Repeat the following steps for at least three (distant, non-aligned) points on your map image:
 - Identify a recognizable detail on the map image that also appears on the reference raster
 - e.g., in an ancient map of France, *Lutetia* corresponds to modern Paris
 - Use arrow keys to move and the mouse wheel to zoom, but clicking is disabled
 - Click when the crosshair is positioned over the reference detail (e.g., *Lutetia*)
 - A window appears to input the coordinates
 - Click the **From Map Canvas** button
 - The map and dialog disappear, and you return to the OSM raster with a crosshair pointer
 - Locate the corresponding point (e.g., *Paris*) on the raster and click
 - QGIS extracts the geographic coordinates from the raster
 - The map reappears with the coordinates filled in
 - Click OK and repeat for at least three points

The map before georeferencing



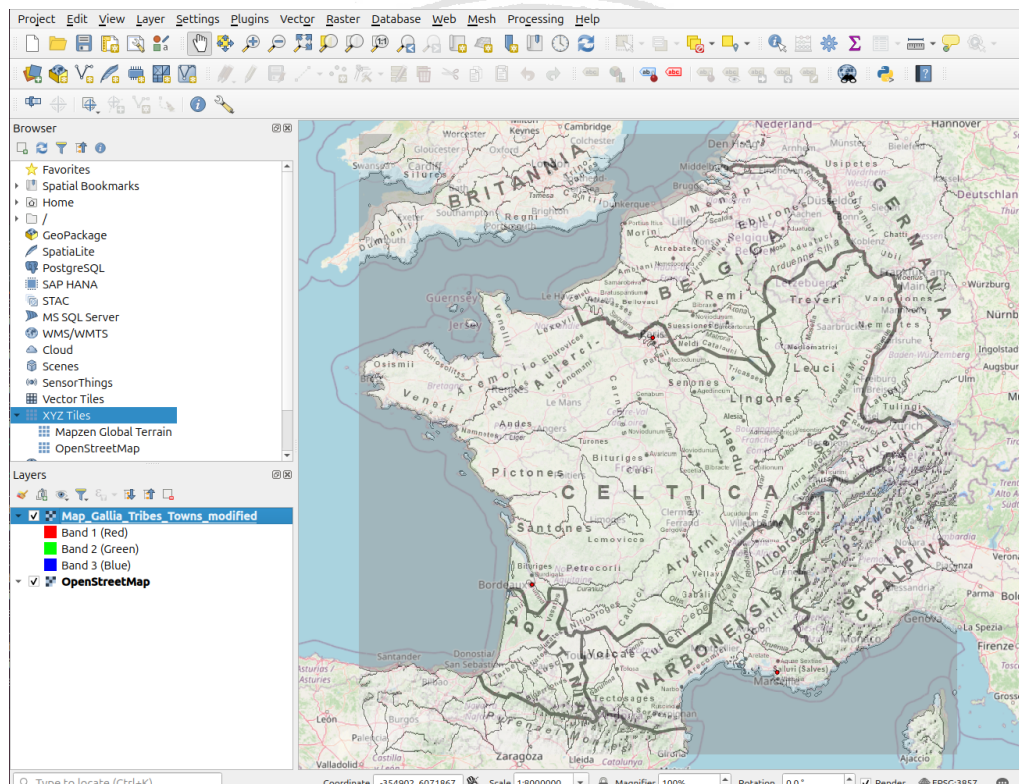
Running the Georeferencer

- Once all reference points are set, apply the georeferencing algorithm
- Click the green triangle in the *Georeferencer* toolbar to start the process
- A pop-up will confirm completion
- Keep the Georeferencer window open and switch to the main QGIS window to inspect the result

Inspecting the Result

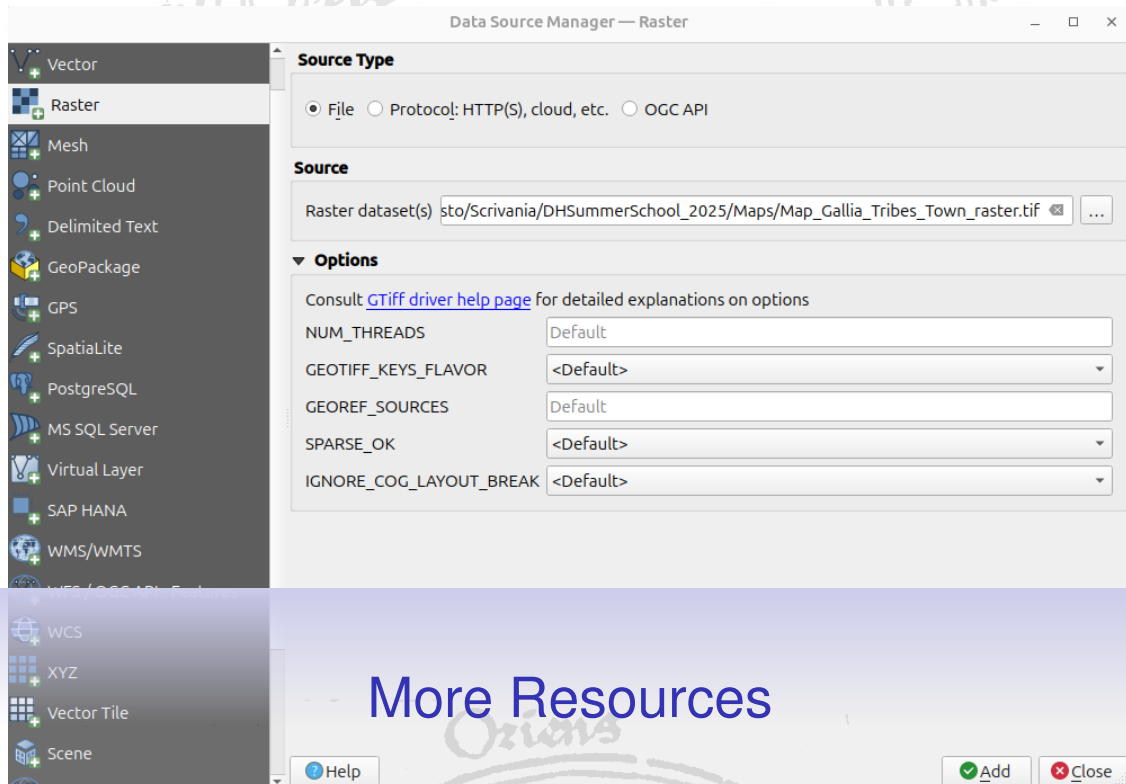
- The image appears as a new raster layer in the main QGIS window
- To assess the georeferencing accuracy, adjust transparency:
 - Right-click the new layer in the **Layers** panel and select **Properties** -> **Transparency**
 - Set **Global Opacity** to approximately 50
- The next slide illustrates an OSM raster of France with a georeferenced historical map of ancient tribes
- The three reference points used: Paris, Marseille, and Bordeaux
- Observe how the northern coastline differs between the maps
- If the result is unsatisfactory:
 - Remove the layer
 - Return to the *Georeferencer* window to add more points
 - Repeat the georeferencing process

Referenced image generated



Use Your New Raster in QGIS

- During the georeferencing process, you specified a location to save the new raster
- To load it in QGIS, open a new project and access the **Data Source Manager**
 - Select **Raster** as the data source type
 - Click **File** to choose the raster format
 - Browse your filesystem and set the **Source** field to the path of your new raster



More Resources

- Find in-depth QGIS tutorials at <https://www.qgistutorials.com/en/>
- Access geographic data (such as OpenStreetMap) from regional and global sources:
 - <https://earthexplorer.usgs.gov/> (Explore available *datasets*)
 - <http://wms.pcn.minambiente.it/mattm/servizi-di-scaricamento/> for downloading *WFS* resources to import into QGIS
- Try an engaging tutorial: https://www.qgistutorials.com/en/docs/3/working_with_terrain.html
 - Learn to add contour lines to QGIS maps