Back to QGis: Georeferencing

Summer School on Digital Humanities

Course material available at
https://github.com/AugustoCiuffoletti/DHSS_2025

Augusto Ciuffoletti

8 giugno 2025

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
- QGIS provides tools for this task

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  - Accuracy improves with the number of reference points
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  - Optimal reference points are distant and non-aligned
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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)
- Open the Georeferencer tool
- In the *Georeferencer* window

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  - Select File -> Open Raster...
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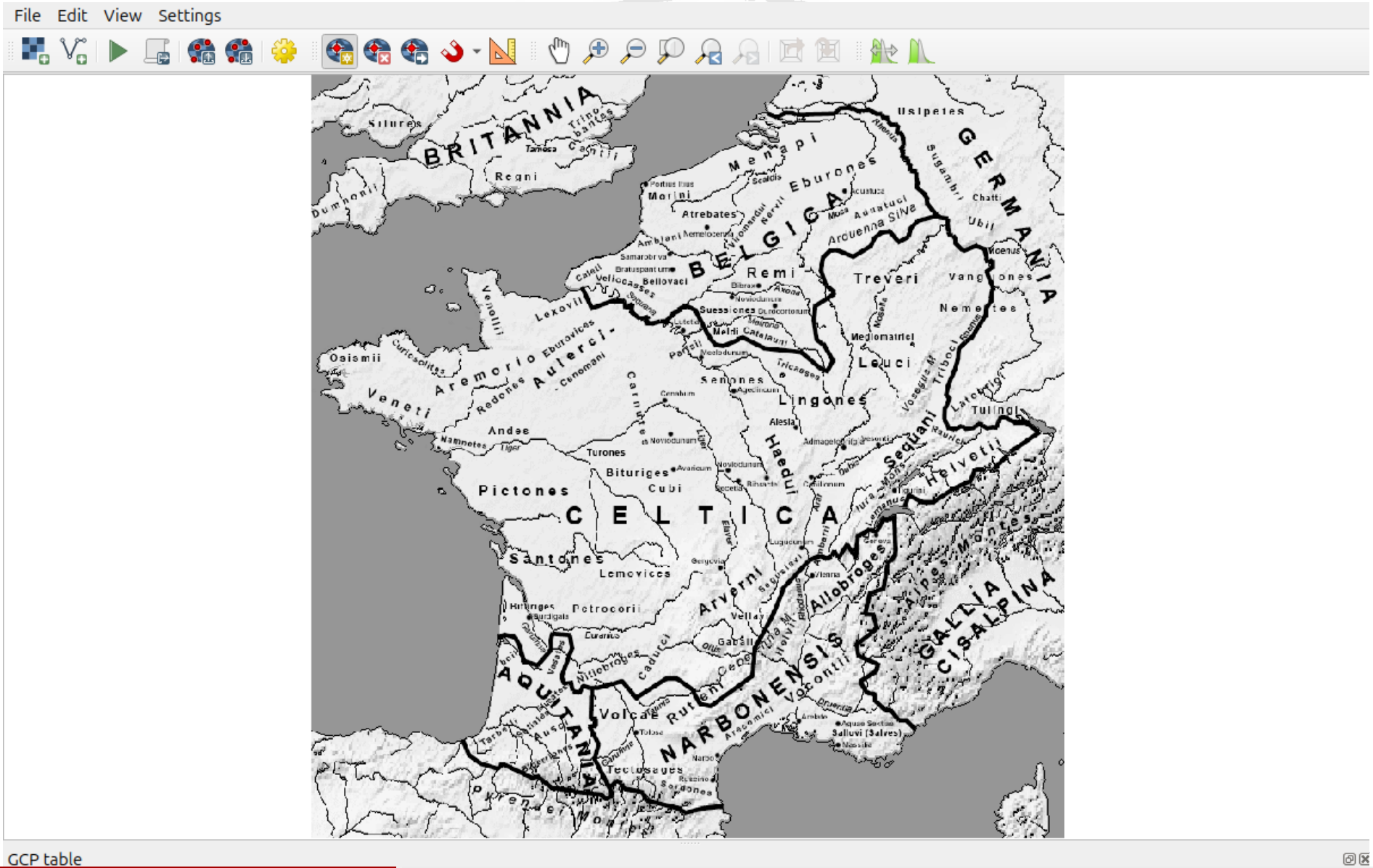
Unreferenced image loaded



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 transformation
  - Enable "Load in QGIS when done"
  - Click OK to apply the settings and return to the Georeferencer window

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  - Select Settings -> Transformation Settings
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  - Ensure the SRS is set to EPSG:3857 - WGS84/Pseudo-Mercator
  - Specify a target file for the resampled raster
  - Enable "Load the resulting layer"
  - Click OK to apply the settings and close the Georeferencer window

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  - Enable "Load result when done"
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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 the 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, input the coordinates
  - Click the "from Map Canvas" button
  - The map and dialog disappear, and the cursor turns 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

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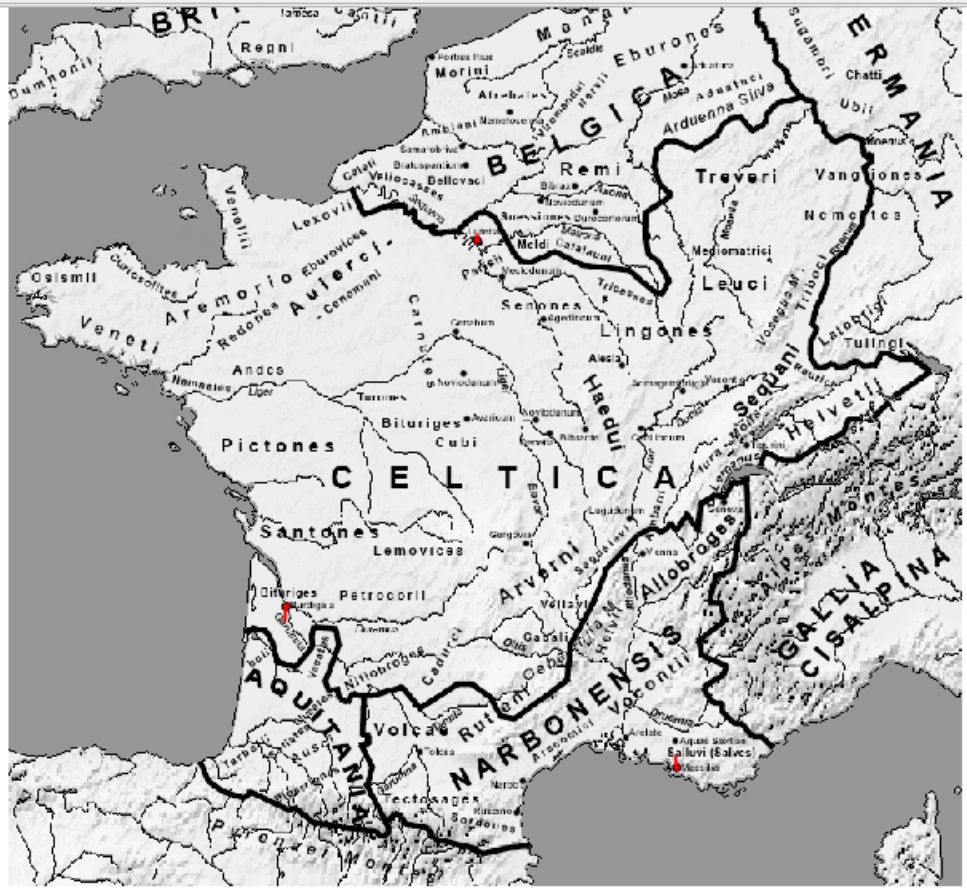
The map before georeferencing

File Edit View Settings



GCP table

Enabled	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual (pixels)
☑	0	385.542577	-265.631889	260543.31	6265191.65	0.860690	-3.587920	3.689709

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

Running the Georeferencer

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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 are Paris, Marseille, and Bordeaux
- Observe how the new raster aligns with OSM features
- If the result is unsatisfactory, delete the layer and repeat

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- Observe how the network of roads differs between the maps
- If the result is unsatisfactory

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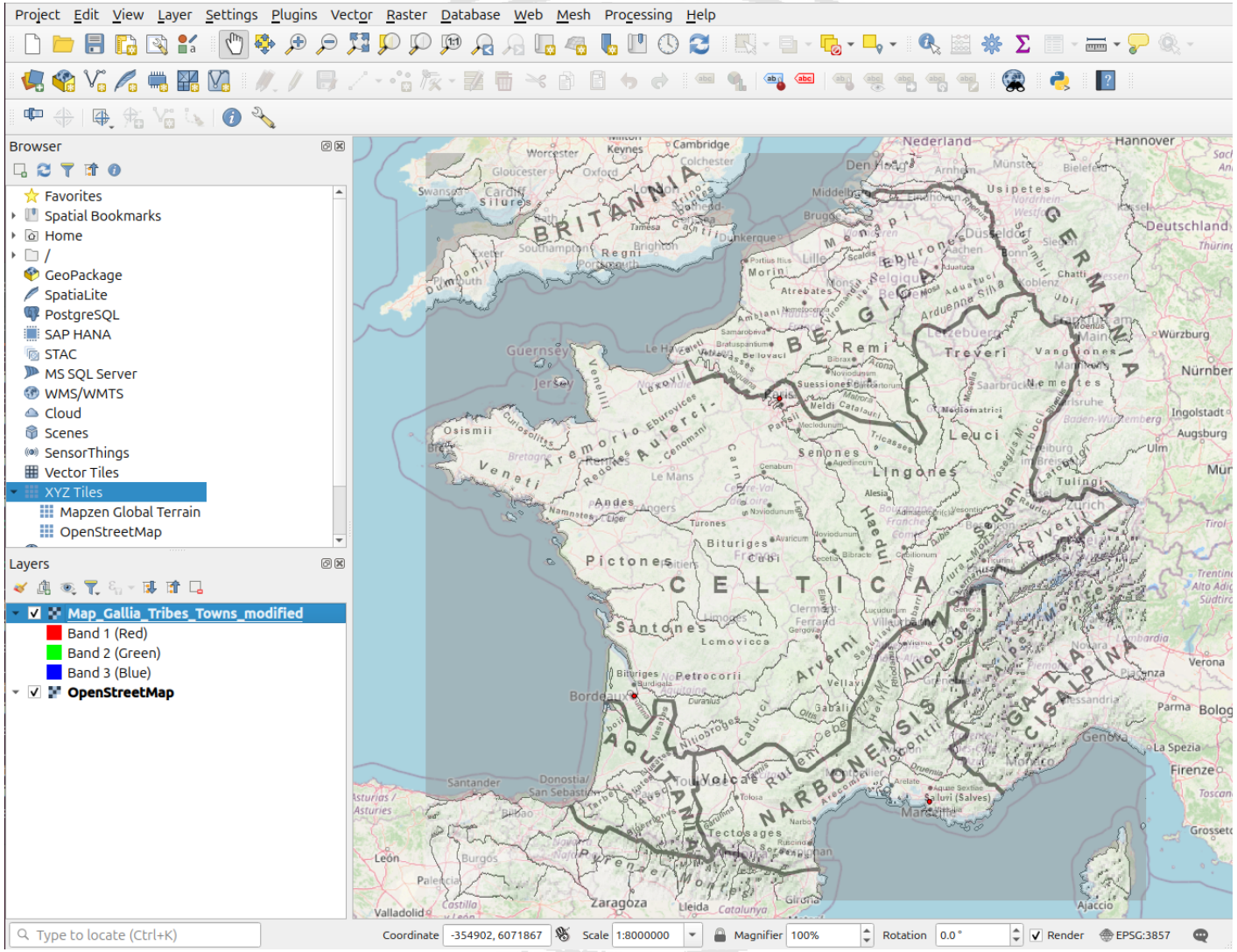
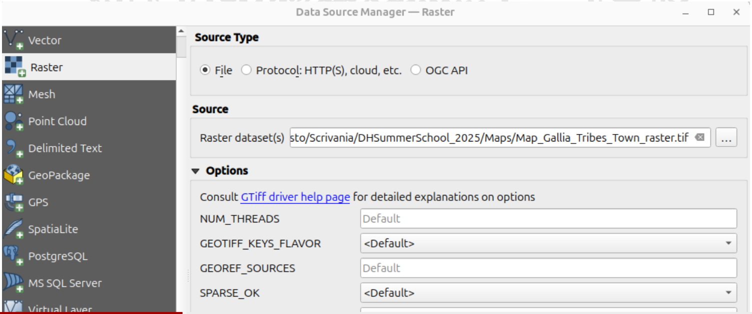
Referenced image generated



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



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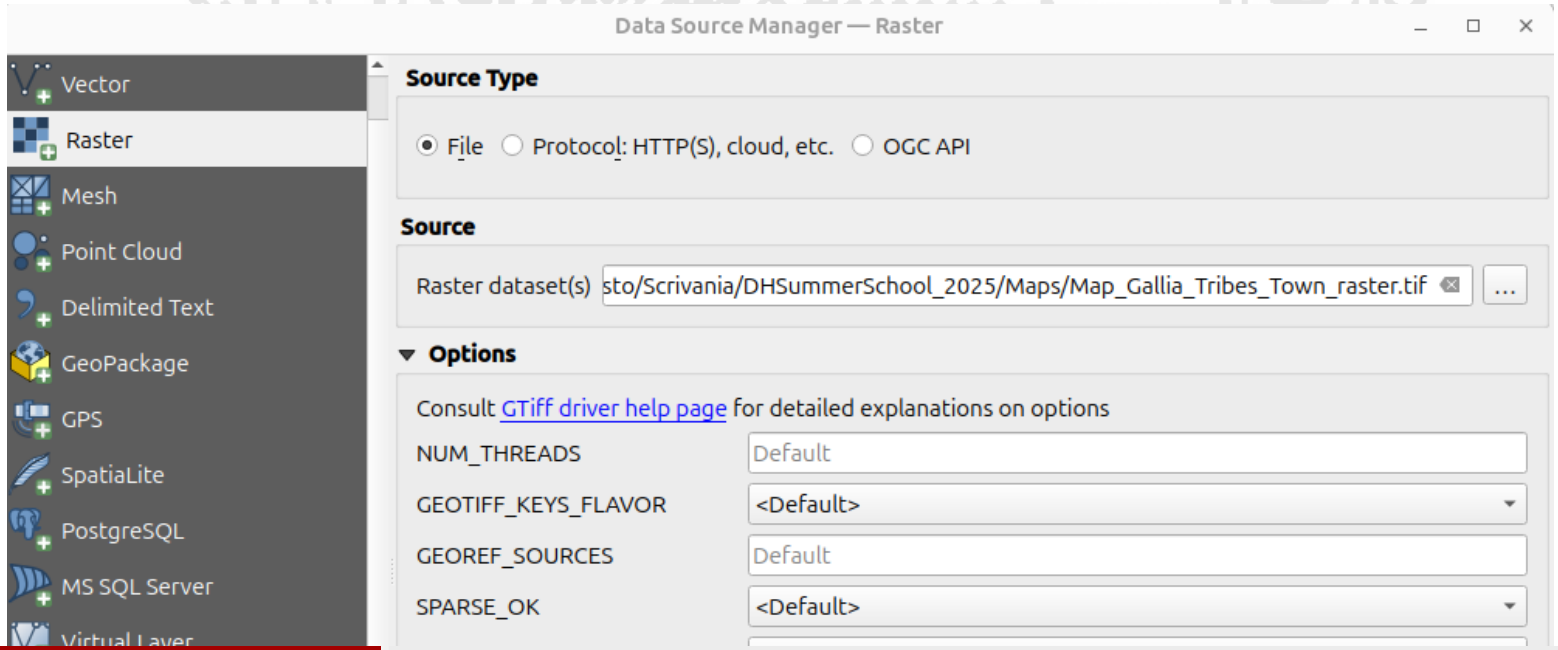

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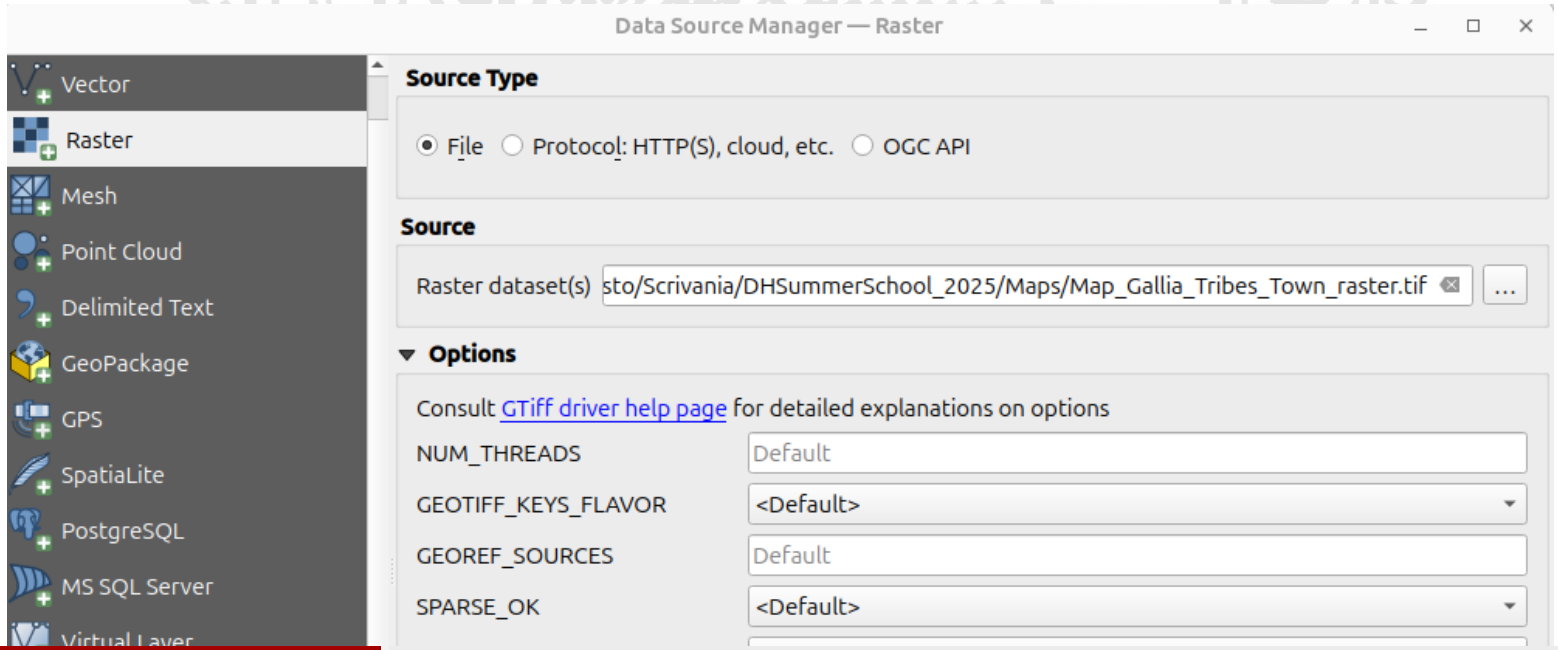

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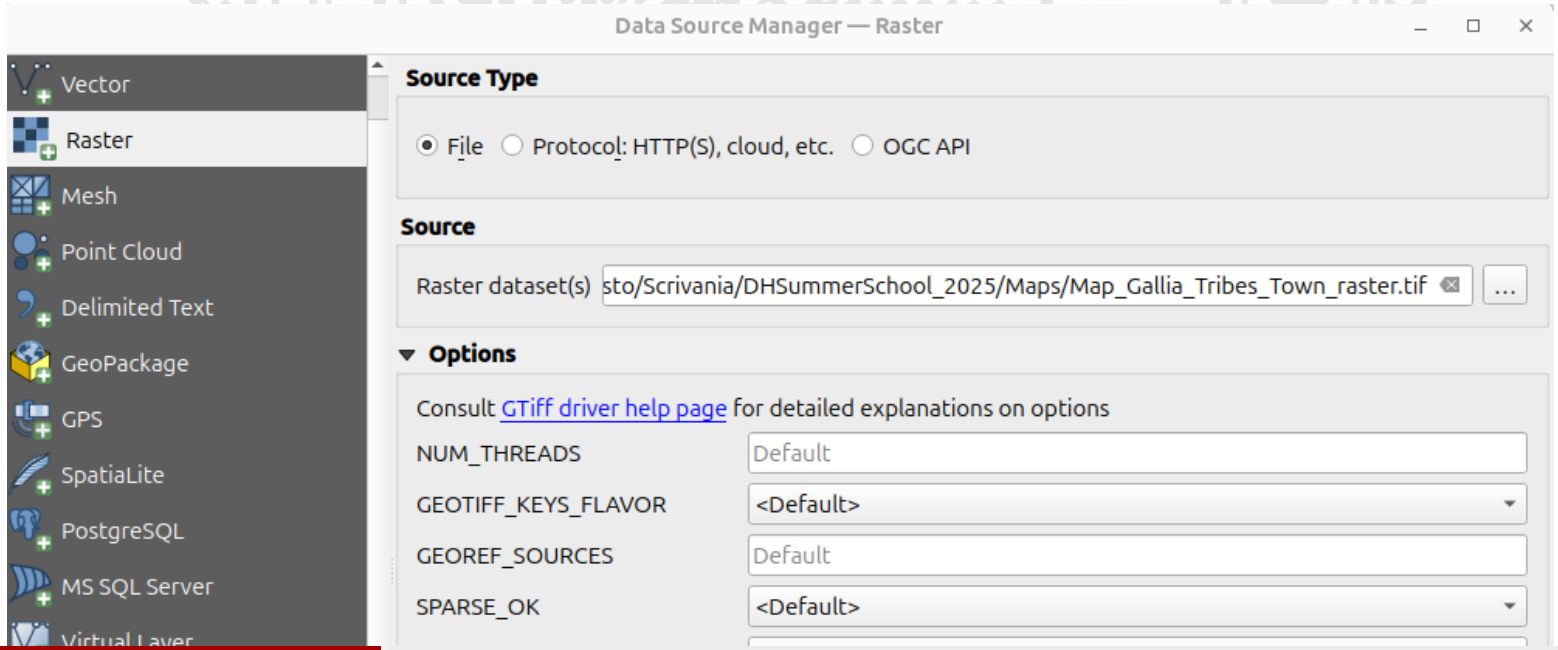

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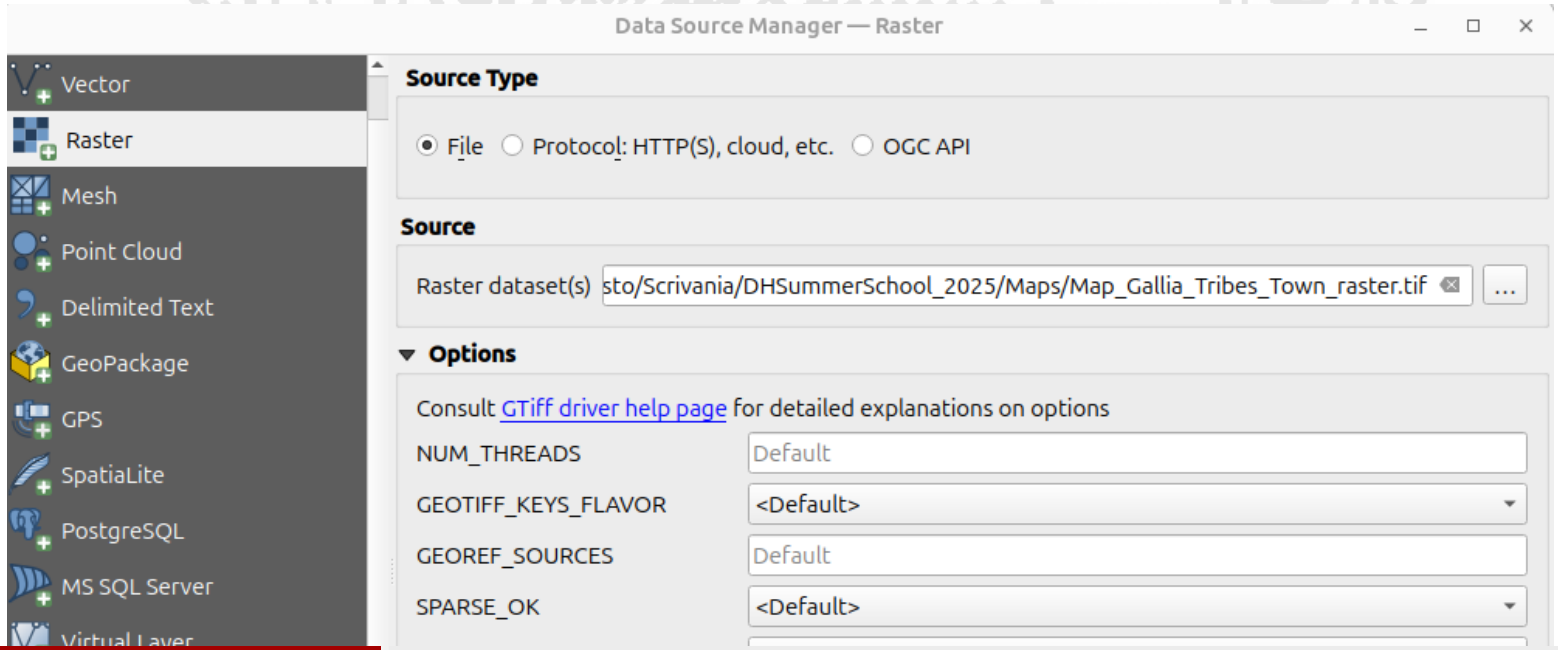

More Resources

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- Access geographic data (such as OpenStreetMap) from regional and global sources:
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  - http://www.diva-gis.org/gdata (Click on a country for downloading administrative boundaries)
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