

Contents

- Document Control Information 2
- Revision History..... 2
- About 2
- How it Works..... 3
 - A Note about Probe Data..... 3
- Overview 3
 - Viewing Tiles 3
 - Single Map Comparison..... 4
 - Dual Map Comparison 4
 - Generating Tiles..... 4
 - Background Information about Mercator Tiles 5
 - Calculating the “Median Distance” for a Generated Route 6
 - Abbreviated Terminology related to Medians..... 7
- Using the MapMetrics Interface 7
 - Primary Source 7
 - None 7
 - Single Map Comparison..... 8
 - Dual Map Comparison 9
 - Secondary Source (for Split Screen) 10
 - Metric 11
 - Download Dataset 11
 - Layers Panel..... 12
 - Map Source 12
 - Zoom Controls 12



Search Bar 12

Details Panel 13

Document Control Information

Document Name	MapMetrics World User Manual
Document Version	1.0
Author	TomTom
Date of Release	29-Oct-2021

Revision History

Version	Issue date	Reason for change	Description of change
1.0	29-Oct-2021	First Release	

About

[MapMetrics World](#) is a tool which allows anyone to analyze how drivable roads are and to easily correct routing and other map errors.

MapMetrics World is addressed as MapMetrics for the rest of this document. Do not confuse it with other variants of MapMetrics.



How it Works

Using billions of GPS probe traces, MapMetrics creates a metric for comparing the predictive routes in OSM to the routes described by the data. Areas can have bad routing for a variety of reasons: missing roads, wrong one-way streets, and roads that aren't connected correctly, to name a few. MapMetrics assesses how close or far drivers are from the route that the map suggests. It then identifies large deviations where drivers have strayed far from the suggested route and highlights those areas with a red-to-green color scale.

A Note about Probe Data

MapMetrics, while offering highly accurate predictive analysis of data, is subject to the accuracy of the GPS probe traces. While we have plenty GPS data reliably from vehicles, we also collect GPS data from activities that aren't good indicators of routes: for example, riding in trains, authorized traffic on airport runways and skiing at ski resorts. MapMetrics developers are working on ways to remove this data. In the case of airports, ski resorts, ports and other edge cases we're simply removing the affected tiles.

Generally speaking, where the route closely matches GPS traces, we assume the map data for routing is pretty accurate. Where the traces diverge from what a routing engine thinks a driver should do, the map quality will tend to be lower. MapMetrics red-to-green color scale highlights where potential work could improve the map. After that, it is up to the editor to navigate to the same location in ID Editor, look up imagery sources and other overlays, and make the judgement call.

Overview

Viewing Tiles

There are two ways to view MapMetrics-generated tiles in order to identify an area that needs improvement.



Single Map Comparison		Dual Map Comparison																			
<p>Comparing trace segments with the route generated using the selected map (For example, OSM202109 i.e. OSM September 2021)</p> <p>Tile Color Codes</p> <table border="1"> <thead> <tr> <th>Color</th> <th>Map with Probe data</th> </tr> </thead> <tbody> <tr> <td>Red</td> <td>Map routes are far from trace segments i.e. poor map quality</td> </tr> <tr> <td>Green</td> <td>Map routes are very close to the trace segments i.e. excellent map quality</td> </tr> <tr> <td>Other</td> <td>The closer a tile color is to green, closer the map routes are to the trace segments i.e. better the map. Similar logic applies to tiles with shades closer to red.</td> </tr> </tbody> </table>		Color	Map with Probe data	Red	Map routes are far from trace segments i.e. poor map quality	Green	Map routes are very close to the trace segments i.e. excellent map quality	Other	The closer a tile color is to green, closer the map routes are to the trace segments i.e. better the map. Similar logic applies to tiles with shades closer to red.	<p>Comparing OSM's routing quality across different time periods (For example, OSM202108-OSM202109 i.e. comparing OSM August 2021 with OSM September 2021)</p> <p>Tile Color Codes</p> <table border="1"> <thead> <tr> <th>Color</th> <th>Map 1 with Map 2</th> </tr> </thead> <tbody> <tr> <td>Yellow</td> <td>Map 1 has lower median count compared to Map 2. In other words, it is closer to the trace segments i.e. Map 1 has better quality</td> </tr> <tr> <td>Purple</td> <td>Map 2 has better quality</td> </tr> <tr> <td>Gray</td> <td>Both maps have a similar quality</td> </tr> <tr> <td>Other</td> <td>The closer a tile color is to yellow, better Map 1 is compared to Map 2. Similar logic applies to tiles with shades closer to purple.</td> </tr> </tbody> </table>		Color	Map 1 with Map 2	Yellow	Map 1 has lower median count compared to Map 2. In other words, it is closer to the trace segments i.e. Map 1 has better quality	Purple	Map 2 has better quality	Gray	Both maps have a similar quality	Other	The closer a tile color is to yellow, better Map 1 is compared to Map 2. Similar logic applies to tiles with shades closer to purple.
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Generating Tiles

For a user-defined geographic area (max extent $\approx 1^\circ \times 1^\circ$), MapMetrics:



1. **fetches** a selection of clipped probe traces (max of 1000 per level-15 Mercator tile) for each road element that has the same vintage as the map (e.g. for a March 2021 map the probe traces are from March 1 - March 31, 2021);
2. **converts** those probe traces into trace segments by subdividing them where they cross the boundary of a level-16 Mercator tile (for more detail see [Background Information about Mercator Tiles](#));
3. **generates** – for the map(s) – a route between every trace segment’s start and end points using an appropriate routing engine (Grasshopper for OSM maps);
4. **compares** each trace segment (i.e. the route actually driven) with its corresponding generated route and calculates the “median distance” between the trace segment and the generated route (see [Calculating the “Median Distance” for a Generated Route](#));
5. **aggregates** – per map and level-16 Mercator tile – the “median distance” values of all trace segments in a level-16 Mercator tile and determines their median, the so-called “median of the medians”; and then
6. **calculates** (only in case of Dual Map Comparison):
 - for both maps, the “median of the medians” value for each level-16 Mercator tile in the user-defined area (this is a measure of the quality of the routing experience when using the specified map in that tile);
 - for both maps, the average of the “median of the medians” values of all the level-16 Mercator tiles in the user-defined area (this is a measure of the quality of the routing experience when using the specified map in the user-defined area);
 - the % difference between the two maps’ average “median of the medians” values (this is a measure of the difference in quality of the routing experience between the two maps in the user-defined area); and
 - other useful data
7. **displays** tiles:
 - in case of Single Map Comparison (using steps 1-5), color coded based on the “median distance” between the trace segments and the generated route
 - in case of Dual Map Comparison (using steps 1-6), color coded based on the % difference between the two maps’ average “median distance”

Background Information about Mercator Tiles

Mercator tiles:

- are the type of map tiles widely used to subdivide and display web maps
- use the Web Mercator projection (see its [Wiki page](#))



- completely cover the surface of the earth between the equator and $\pm 85.05^\circ$ latitude
- vary in number from a single tile at zoom level 0 to ≈ 69 billion tiles at zoom level 18
(the number of tiles at zoom level N is 2^{2N})
- quadruple in number at each successive zoom level, with each tile at zoom level N being divided into four similarly sized tiles at zoom level N + 1
- are differentiated from other tiles at the same zoom level N by a unique X and Y value, where X ranges from 0 at 180° W to $(2^N - 1)$ at 180° E, and Y ranges from 0 at 85.05° N to $(2^N - 1)$ at 85.05° S (i.e. X increases from west to east and Y increases from north to south)
- are nearly square at zoom level 16, the zoom level for which Map Metrics reports statistics (e.g. tile widths and heights at zoom level 16 are 387 m x 385 m in central Belgium, and 571 m x 567 m in the island of Réunion, off the coast of Madagascar)

Calculating the “Median Distance” for a Generated Route

In this example, a trace segment in a level-16 Mercator tile is being compared with the route generated between the trace segment’s start and end points by a routing engine that uses Map 1.



- Trace segment
- Generated route for Map 1
- Generated route for Map 2 that
- d_n Distance between trace segment and generated route for Map 1



Map Metrics chooses a set of n points on the trace segment, and for each of those points calculates the distance, d_n , between the point and the Map 1 route. It then calculates the median of these n distance values – i.e. the “median distance” – and stores it for later use in calculating the single “median of the medians” value that is used to summarize the quality of all the Map 1m routes in the tile.

A second “median distance” value is also calculated for the route generated between the trace segment’s start and end points by a routing engine that uses Map 2. (Note: When two maps from different providers with the same vintage are being compared, the sets of trace segments used in the comparison are generally the same at this time.) This “median distance” value will similarly be used in the calculation of the summary “median of the medians” value for all the Map 2 routes in the tile.

Abbreviated Terminology related to Medians

In MapMetrics, the “median of the medians” is referred to as the median, while the average of the “median of the medians” is referred to as the average median. This abbreviated terminology will be used going forward.

Using the MapMetrics Interface

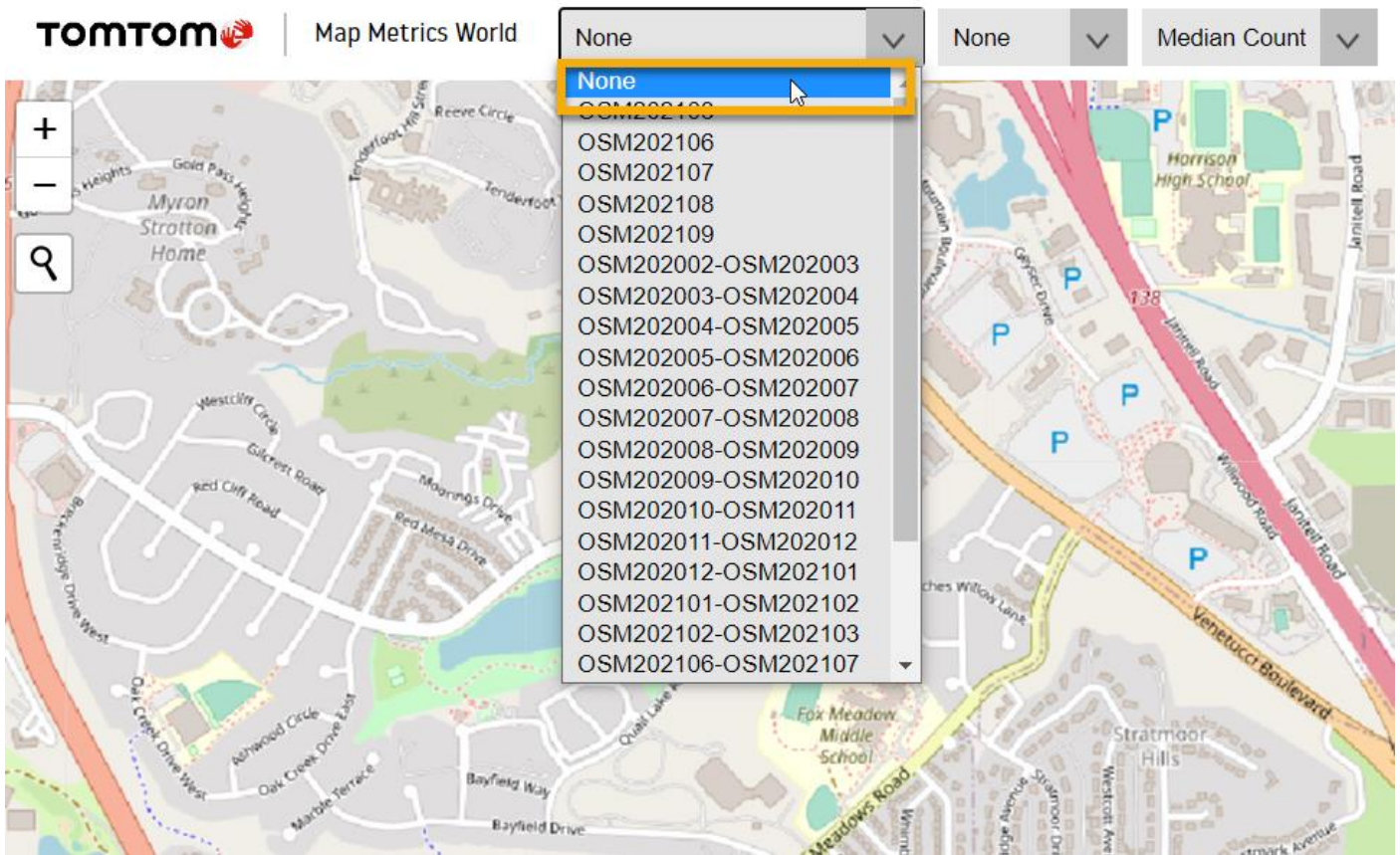
Primary Source

This drop-down menu selects the data source to display on the map:

None

Shows no extra data on the map.





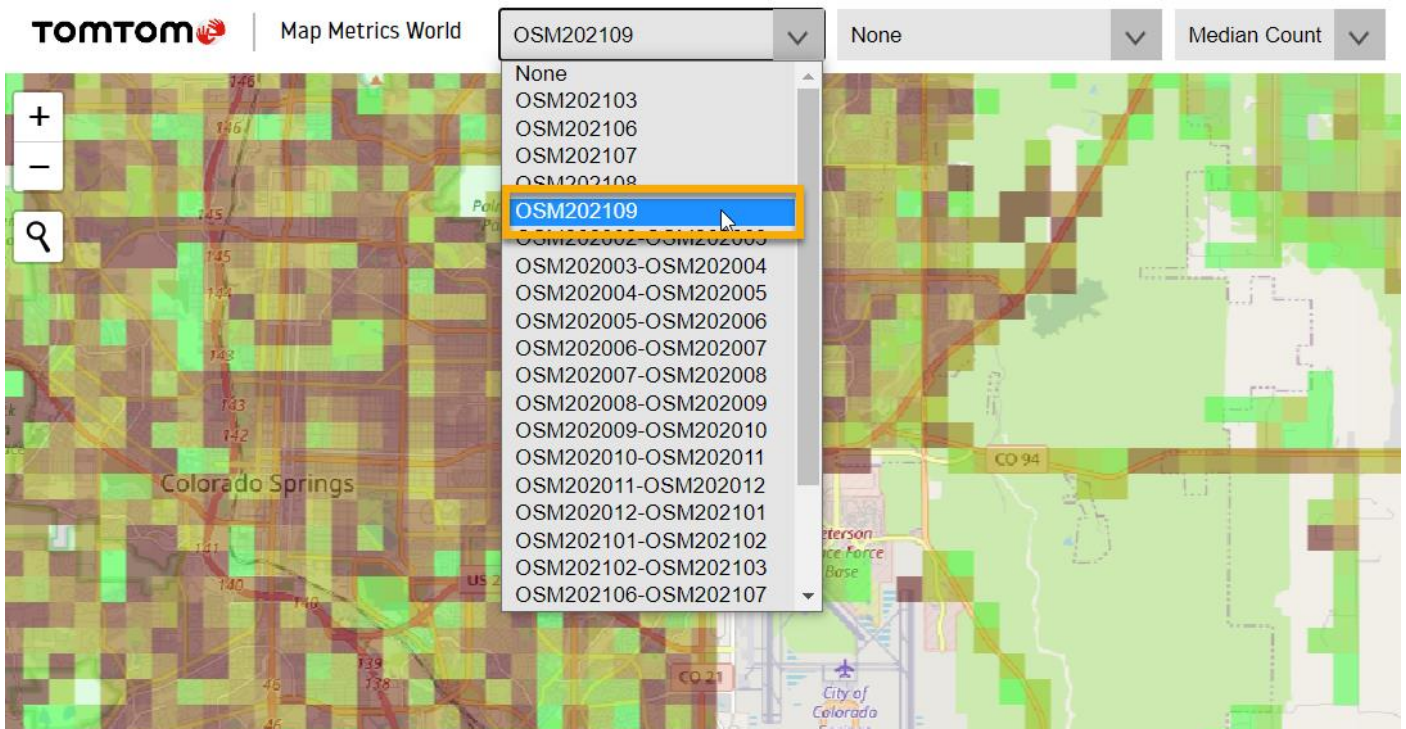
Single Map Comparison

Compares the map route data with GPS probe data and shows the resulting tiles ([color codes](#)). These tiles are superimposed over the OSM base map.

Data Source Naming Convention

MAPYYMM: For example, **OSM202108**





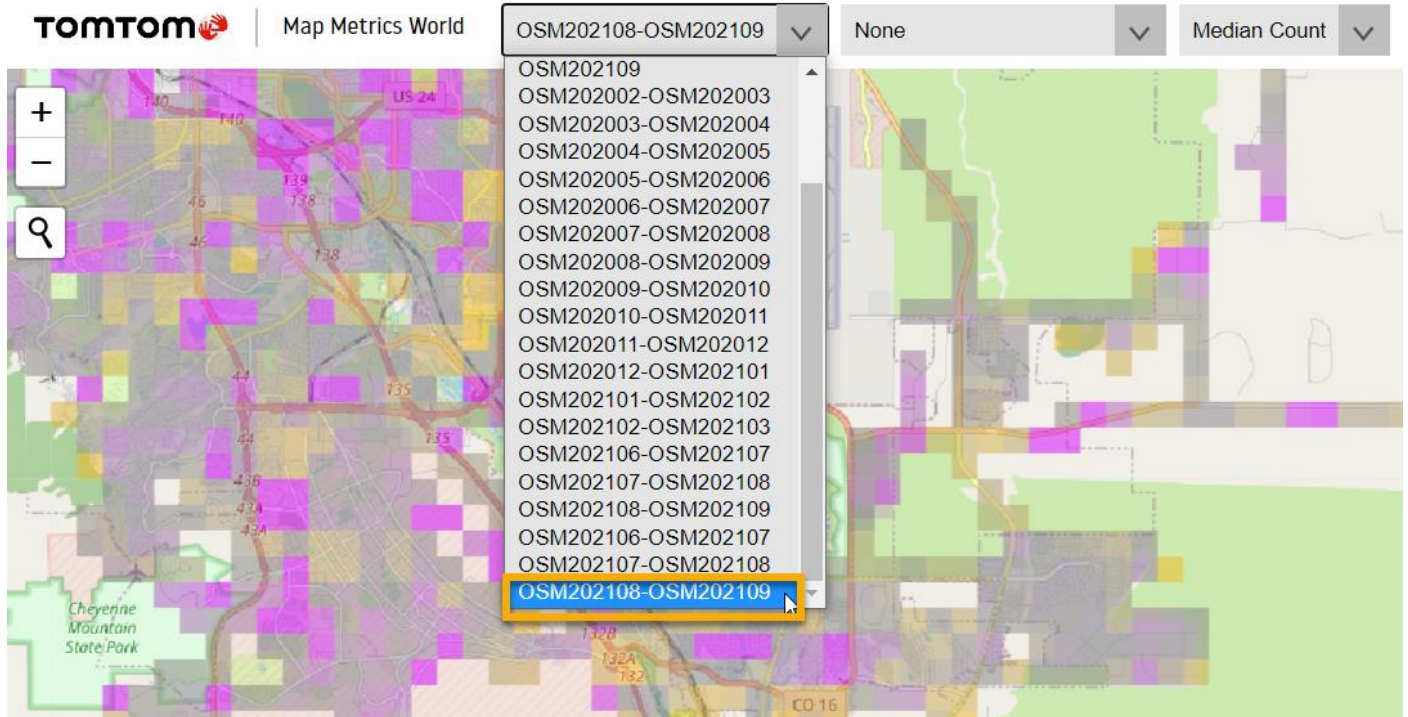
Dual Map Comparison

Compares the OSM map of two different time periods and shows the resulting tiles ([color codes](#)). These tiles are superimposed over the base map.



Data Source Naming Convention

MAPYYYYM1-MAPYYYYM2: For example, OSM202108-OSM202109

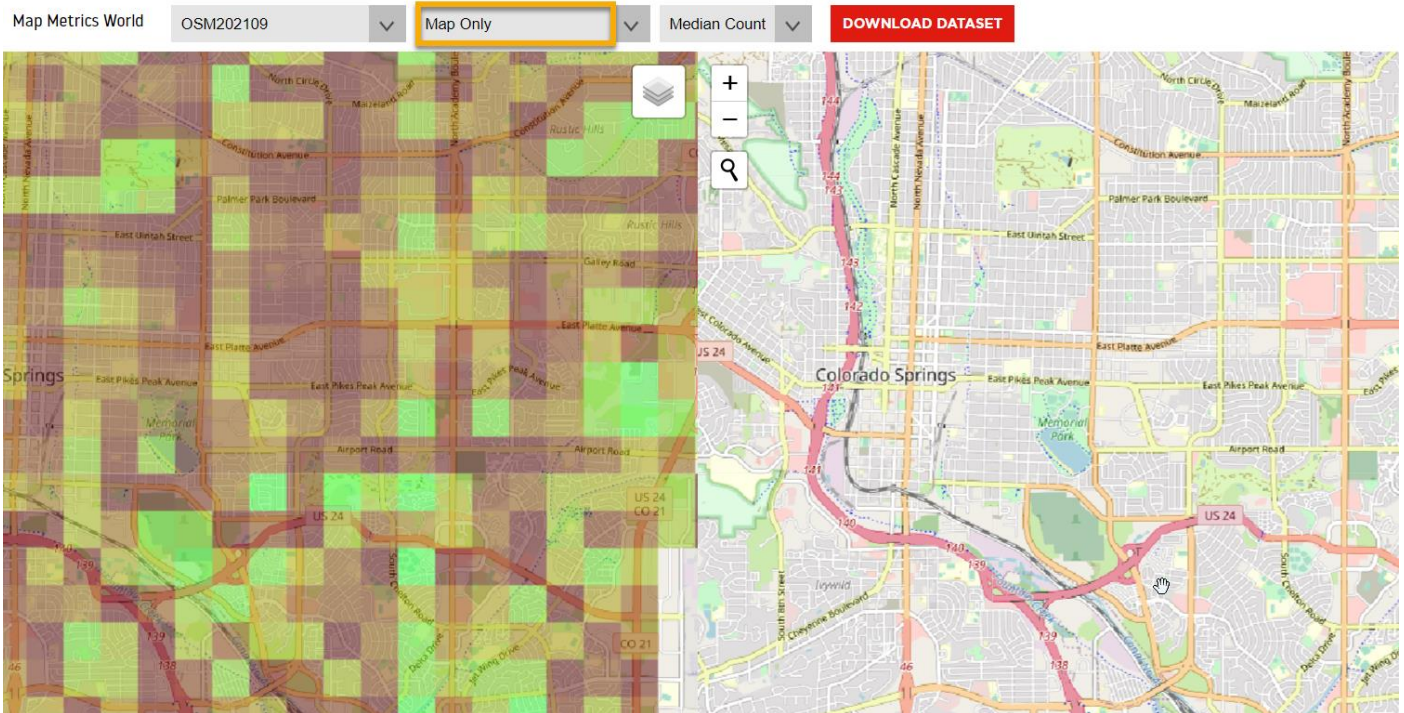


Secondary Source (for Split Screen)

Selecting a data source from this dropdown will split the screen in half and display a second map on the right that auto-pans.

Selecting **None** will hide the second map.





Metric

Selects the metric to display for both primary and secondary data sources. Available options are:

- Median Count
- Median
- Average

Note: Median Count is the most frequently used metric in MapMetrics.

During [single map comparison](#), a tile with a value of '50,000 or more' is colored red while a tile with a value of '1,000 or less' is colored green. Tiles with intermediate values display shades based on how close they are to these two ends of the spectrum.

Download Dataset

Get a global dump of tiles processed for the selected dataset in the form of a zip file. The resulting excel sheet includes coordinates, median, average, and median count for each tile.

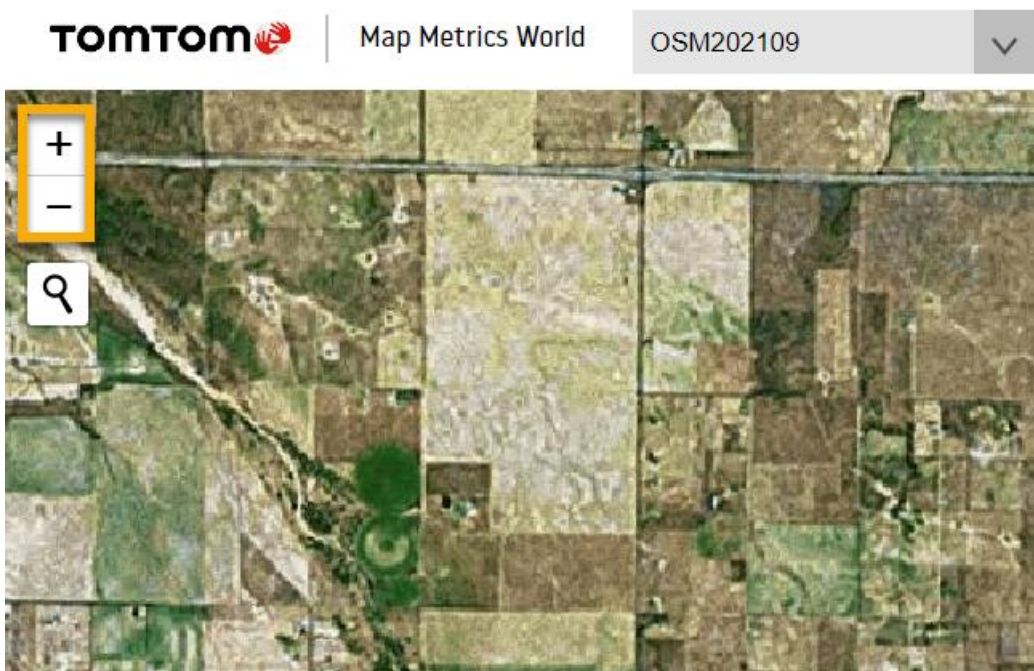


Layers Panel

Map Source

Allows you to choose the background layer for the map viz. OSM, Satellite, bright mode and dark mode.

Zoom Controls



These are standard zoom controls.

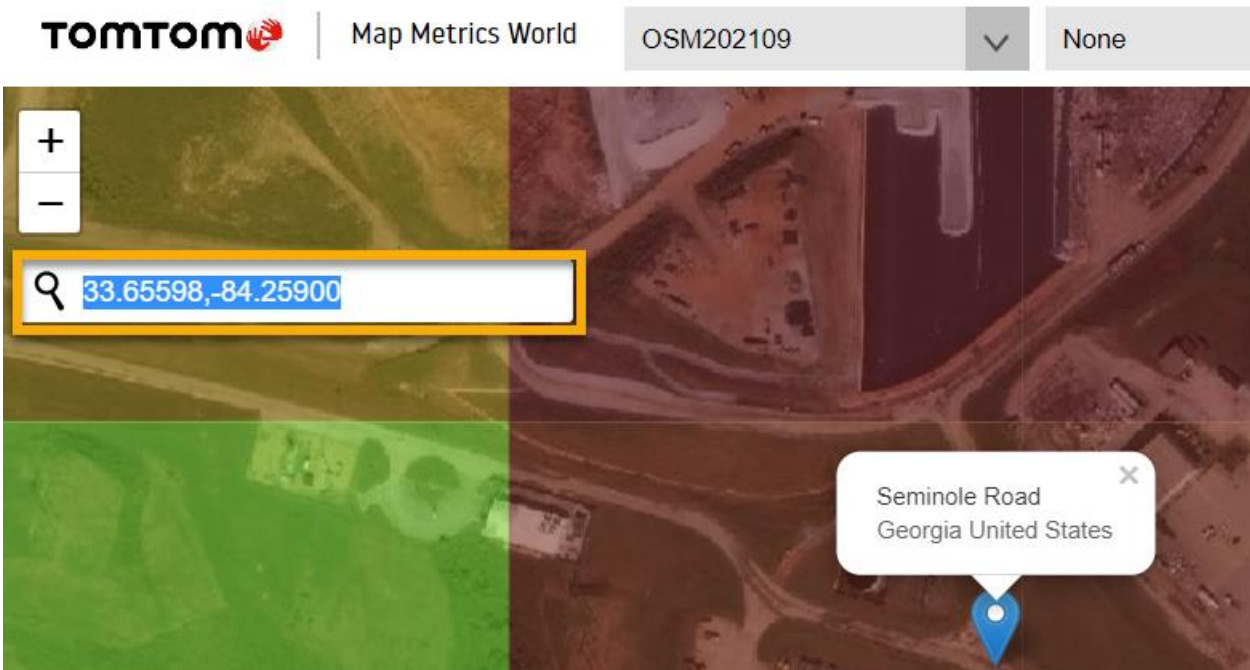
- + zooms in
- - zooms out

You can also zoom by scrolling up and down.

Search Bar

Allows you to search for a location (country, city, address, etc) by name. You can also search using coordinates, as demonstrated in the image below:





Details Panel

The Details Panel pops up when you click on the map with a data source selected. It contains information about the Mercator tile coordinates and the values for all the metrics on that (zoom 16) tile if available.

It also contains a link to iD Editor so that you can edit and improve the OSM map in that area.

