MapMetrics World - User Manual

Contents

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Description

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.

Access

Access MapMetrics World using this URL.

Background

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.

Remark 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. Here is one such example:

Figure 1: A MapMetrics visualization in France that shows a trainline in July 2021 (left) and then removed in August (right)

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 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 the ID Editor, look up imagery sources and other overlays, and make the judgement call.

Details

How does MapMetrics Generate Tiles?

This section contains backend-related technical information and mathematical calculations. Scroll down to the section about viewing tiles if you are only interested in using MapMetrics to identify areas for improvement.

For a user-defined geographic area (max extent ≈ 1° x 1°), 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-17 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-17 Mercator tile – the "median distance" values of all trace segments in a level-17 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-17 Mercator tile (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-17 Mercator tiles (this is a measure of the quality of the routing experience when using the specified map);
    - 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); 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 ± 85.05° 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 17, the zoom level for which Map Metrics reports statistics

Calculating the "Median Distance" for a Generated Route

In this example, a trace segment in a level-17 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.

Map Metrics chooses a set of n points on the trace segment, and for each of those points calculates the distance, dn, 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.

How to View Tiles in MapMetrics?

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

Single Map Comparison

Comparing probe traces with the route generated using the selected map (For example, OSM202109 i.e. OSM September 2021)

Tile Color Codes

Color	Map with Probe data
Red	Map routes are far from probe traces i.e., poor map quality
Green	Map routes are very close to the probe traces i.e., excellent map quality

** Other tiles are of shades that range between red and green - closer a tile is*

Dual Map Comparison

Comparing OSM's routing quality across different time periods
(For example, OSM202108-OSM202109 i.e. comparing OSM August 2021 with OSM September 2021)

Tile Color Codes

Color	Map 1 with Map 2
Yellow	Map 1 has lower median count compared to Map 2. In other words, Map 1 is closer to the probe traces i.e., has better quality
Pink	Map 2 has better quality

** Other tiles are of shades that range between yellow and pink - closer a tile is*

to red, lower the map quality; closer a tile is to green, higher the map quality.	*to yellow, better the quality of Map 1; closer a tile is to pink, better the quality of Map 2.*

MapMetrics Interface

Primary Source

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

None

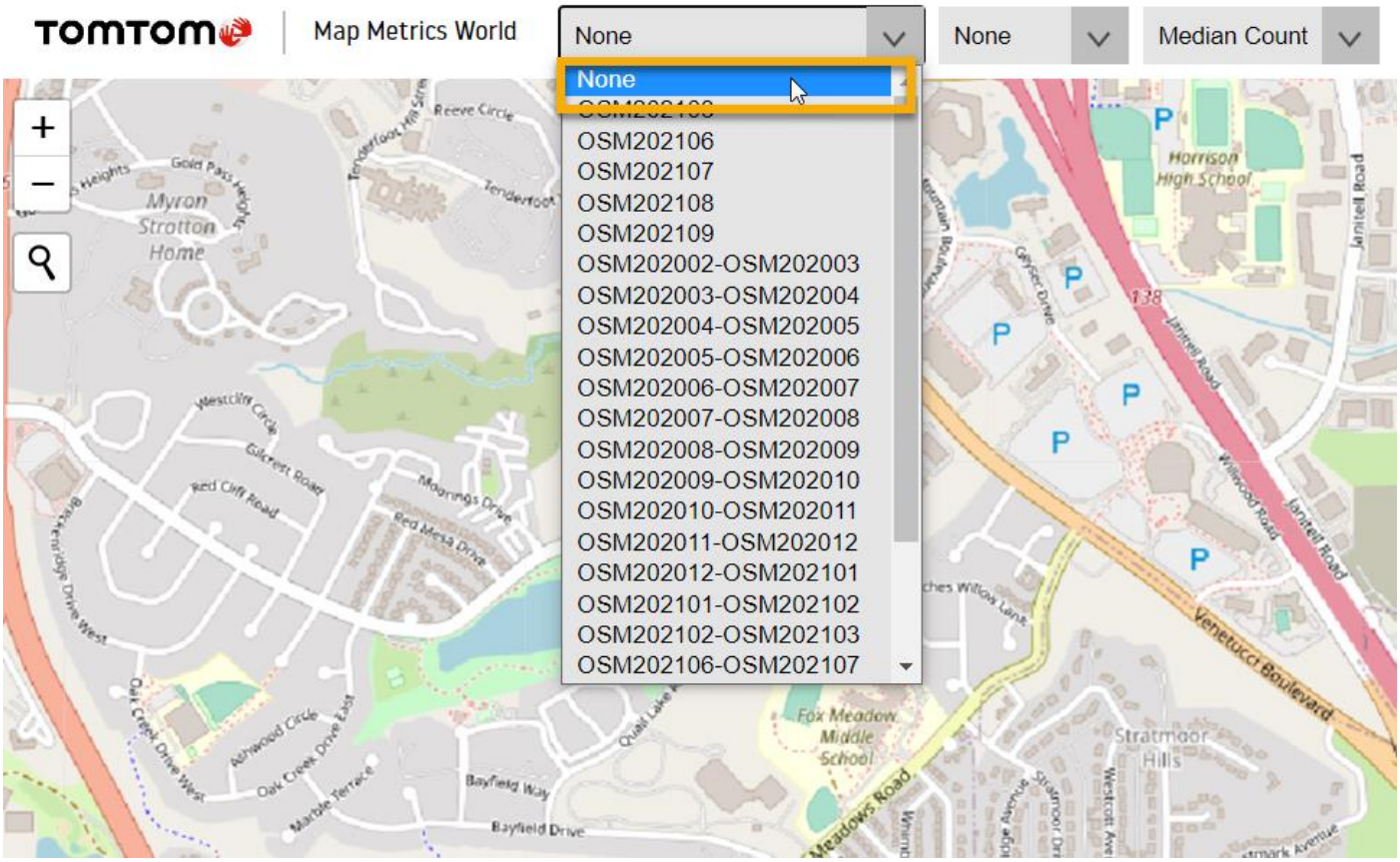


Figure 2: Shows no extra data on the map.

Single Map Comparison

Compares the map route data with GPS probe data and shows the resulting tiles (color codes). These tiles are superimposed over a map source.

Data Source Naming Convention

MAPYYYYMM: For example, **OSM202108**

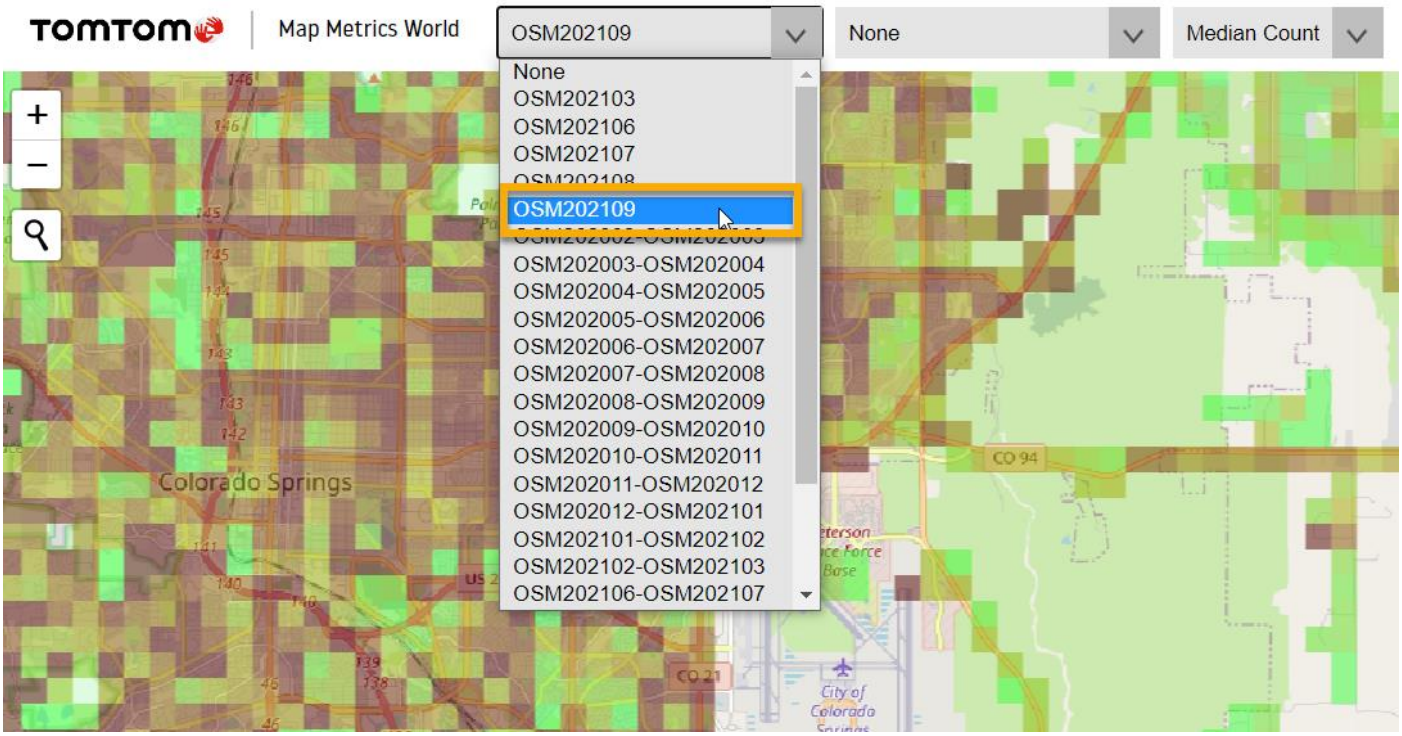


Figure 3: Comparing a map with probe traces

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

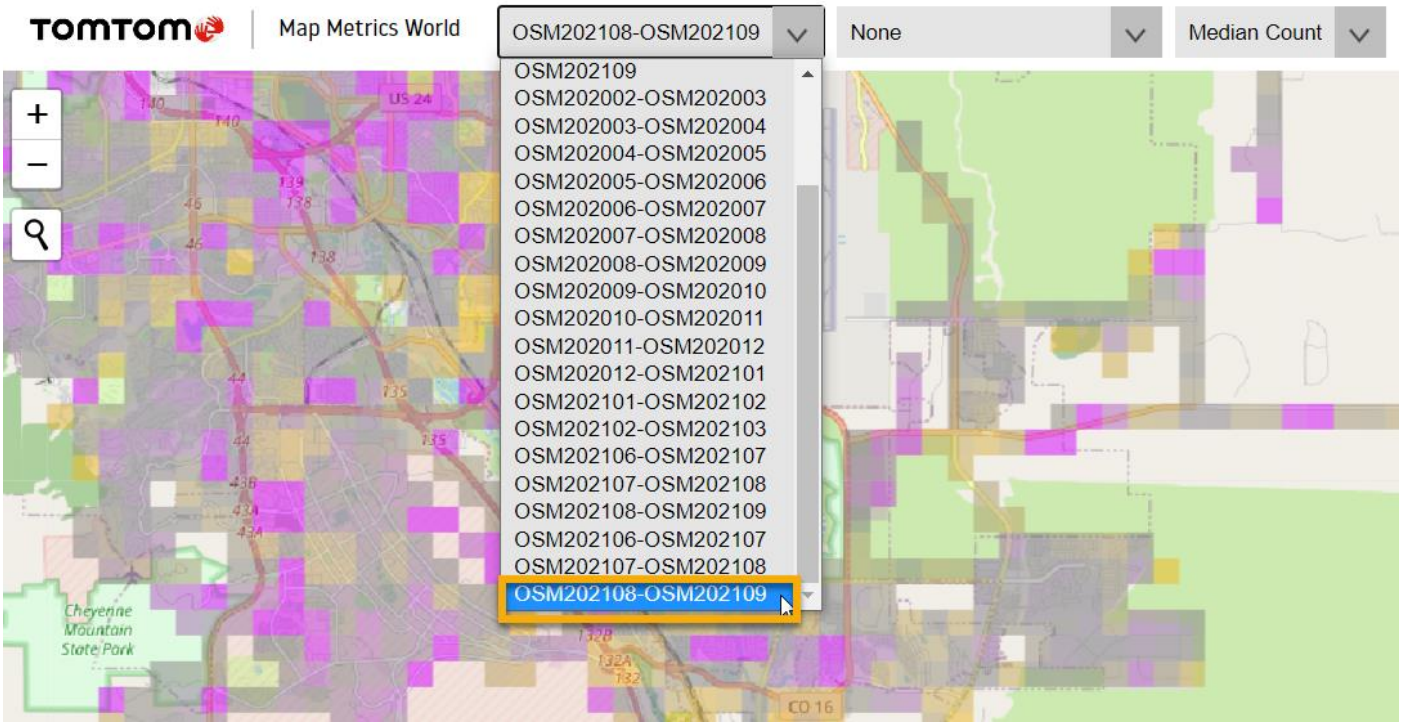


Figure 4: Comparing the quality of two maps

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.

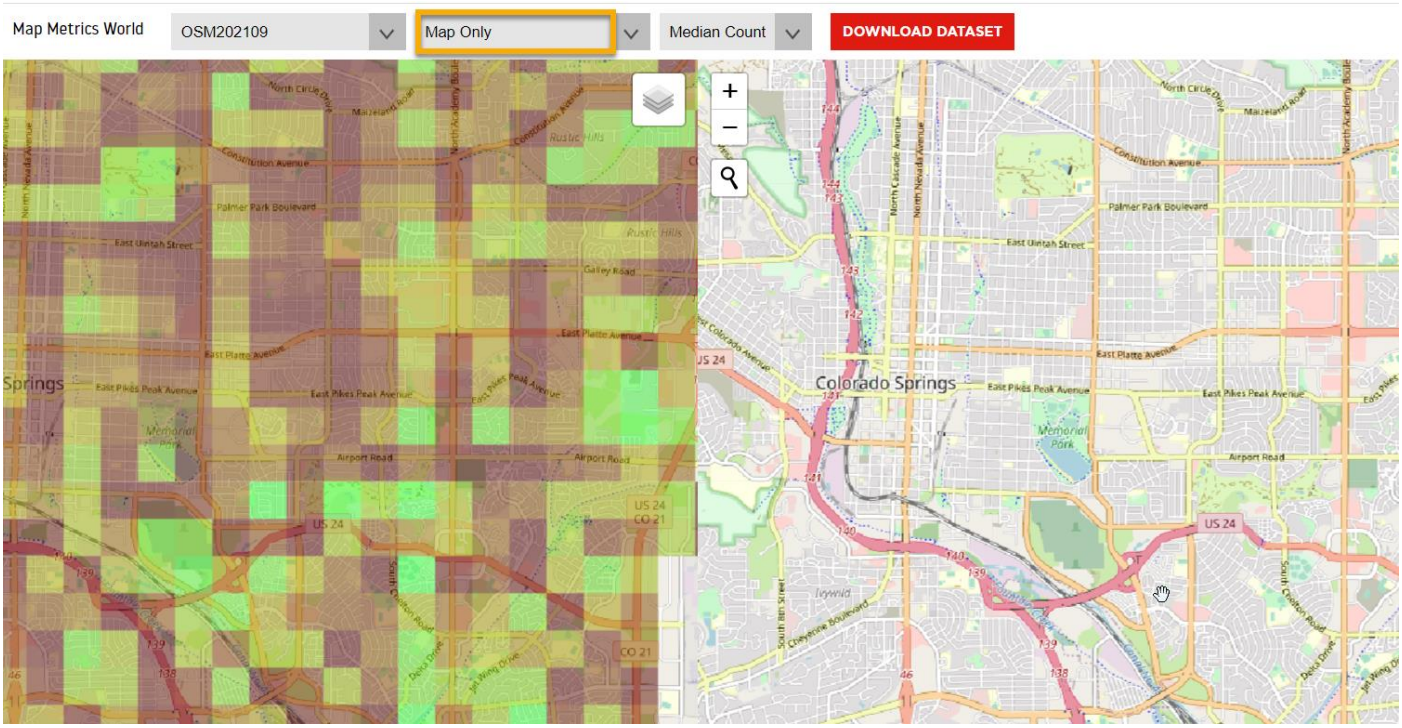


Figure 5: Viewing the same region, with MapMetrics tiles on the left and the map on the right.

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

Metric

Selects from the following metric options for generating the tiles:

- Median Count
- Median
- Average

Median Count is the most frequently used metric in MapMetrics. During single map comparison i.e., when comparing a map with probe traces (real traffic), a tile with a median count of '50,000 or more' is colored red while a tile with a median count 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 the coordinates and metrics for each tile.

Layers Panel

Map Source

Allows you to select a background layer for the map:

- OSM
- Satellite
- Bright mode
- Dark mode

Figure 6: Click the icon at the top-right corner to select one of the background layers.

Zoom Controls

These are standard zoom controls.

- **+** zooms in
- - zooms out

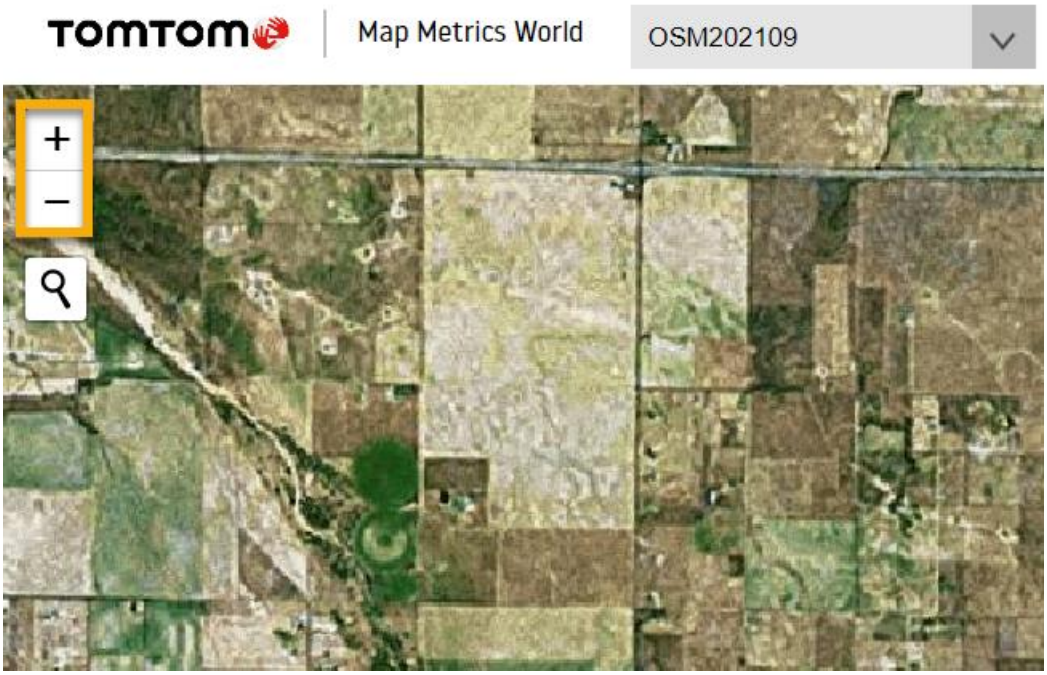
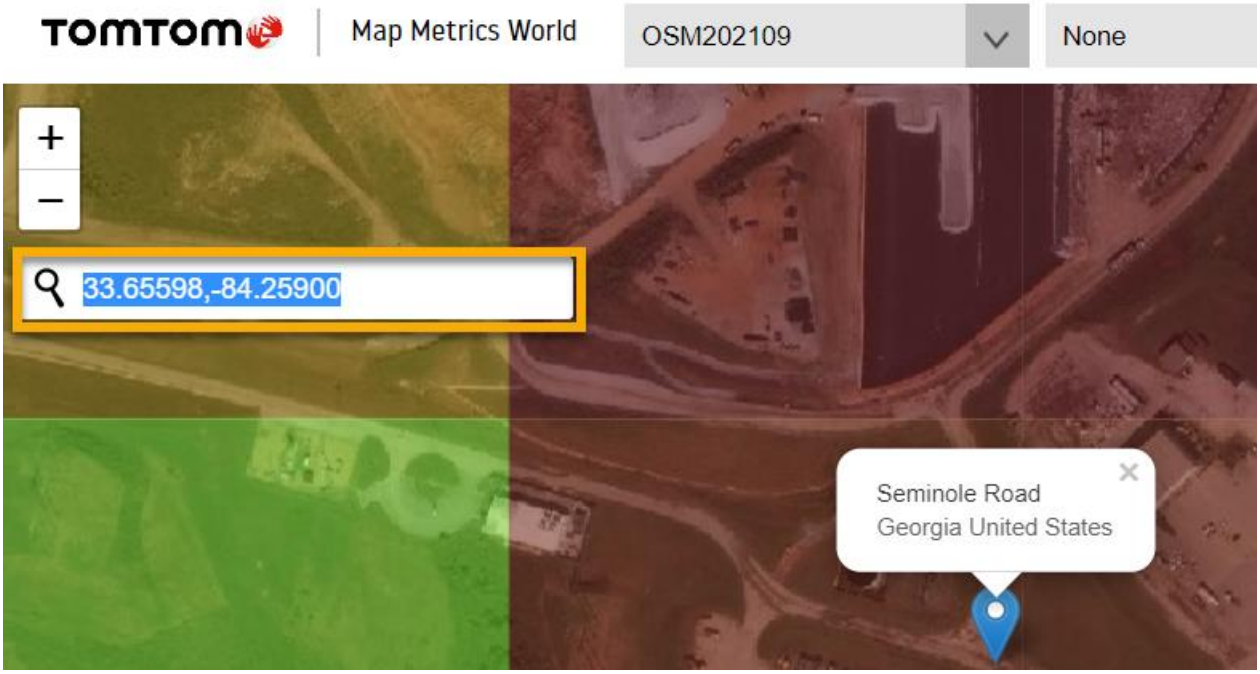


Figure 7: Another way to zoom into a tile – Double-click

You can also zoom in and out by scrolling the mouse roller up and down respectively.

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 the coordinates and all the metric values on that zoom-17 tile, if available. It also contains a link to iD Editor so that you can edit and improve the OSM map in that area.