



How to use OSM data in QGIS ?



Vector, raster, database, docker, Overpass, tiles and so on ...

Which one should I use ?

Etienne Trimaille





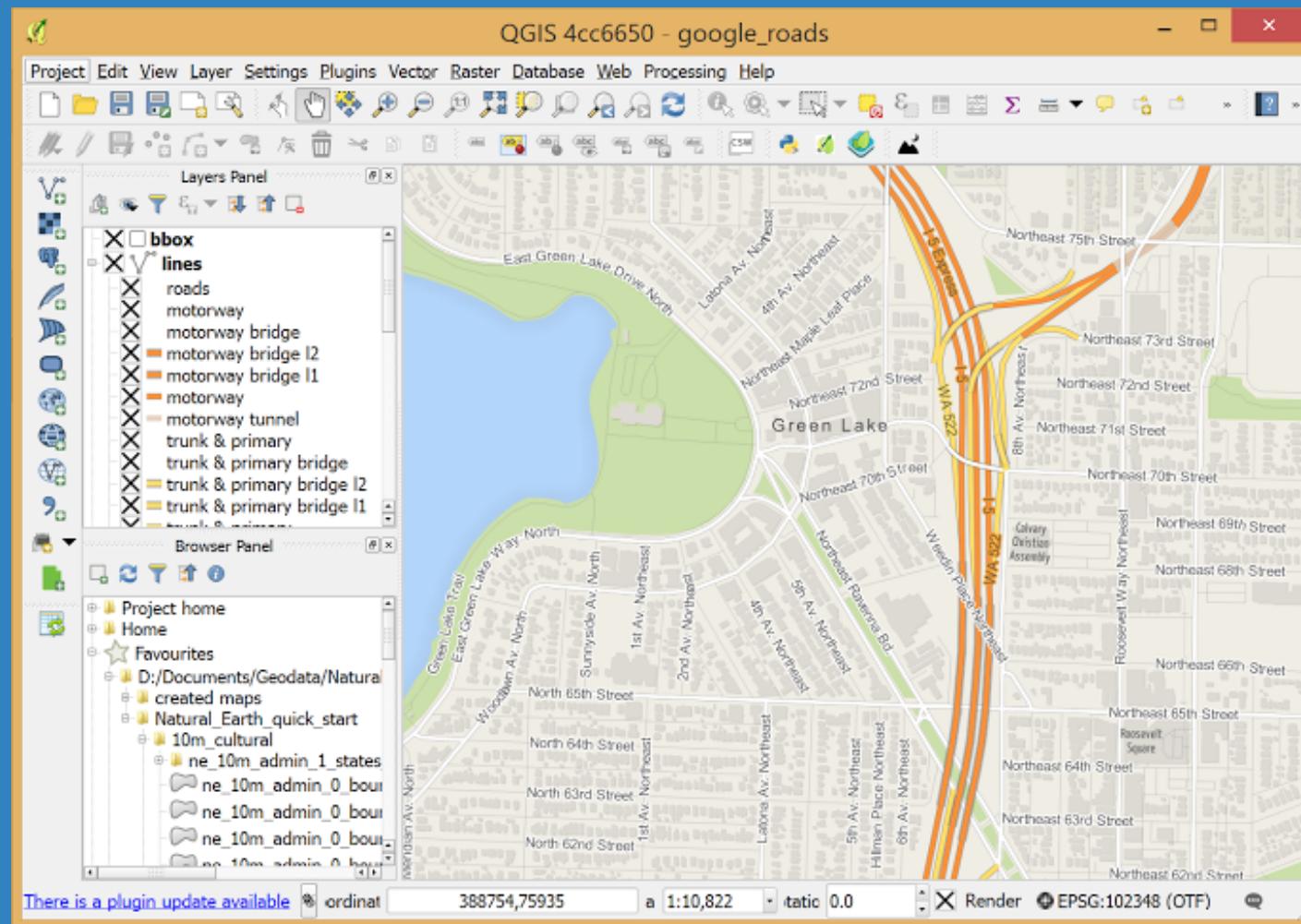
3Liz

- French company 
- **Open Source** forever
- Core contributors in QGIS, server side mainly
- ♥ QGIS Desktop ♥ QGIS Server ♥ PostGIS ♥
- Opensource solution for publishing QGIS Project on the web,
Lizmap Web Client ↗
- Development, server hosting, consulting, QGIS support, training





QGIS, the powerful desktop app



OSM vector data, styled like in Google Maps





OpenStreetMap

- Vector database
- Open Database License (ODBL)
- Worldwide coverage
- All kind of features from landuse, to opening hours and accessibility



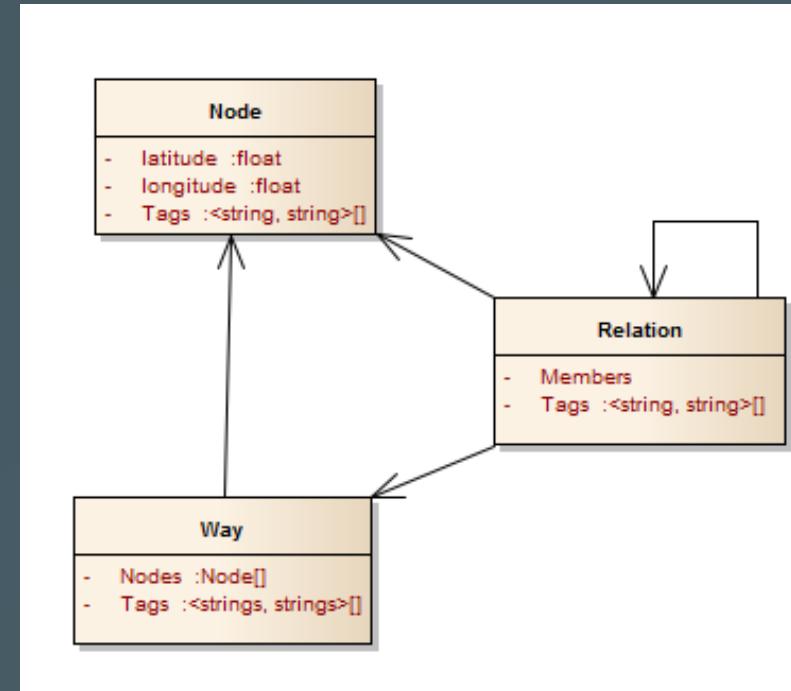


OSM data model

- Different primitive objects

OSM	GIS
Node	Point
Way	Line
Relation	Polygon

- A OSM way can either be a GIS line or GIS polygon according to its OSM tags (key/values)
- A OSM relation can be point, line, multilinestrings, multipolygons, mixed geometry ...





OSM data model

Another difference → **attributes**

- In GIS, the **layer** has one or many **fields**, defining all features in this specific layer
- In OSM, the **layer** does **not** exist. Each feature is individual and has its own fields.





Therefore

OSM data in QGIS will be different from raw OSM data



Moreover, there are a few questions



Do you need ...

- to have up to date OSM data ?
- to work with small extent or a big extent ?
 - By the way, what small extent and big extent ? (for online API)
- to have OSM metadata such as contributor, changeset, timestamp ?
- data designed for display or analysis or routing or geocoding or ... ?
- all OSM keys and values ?





There isn't a single answer





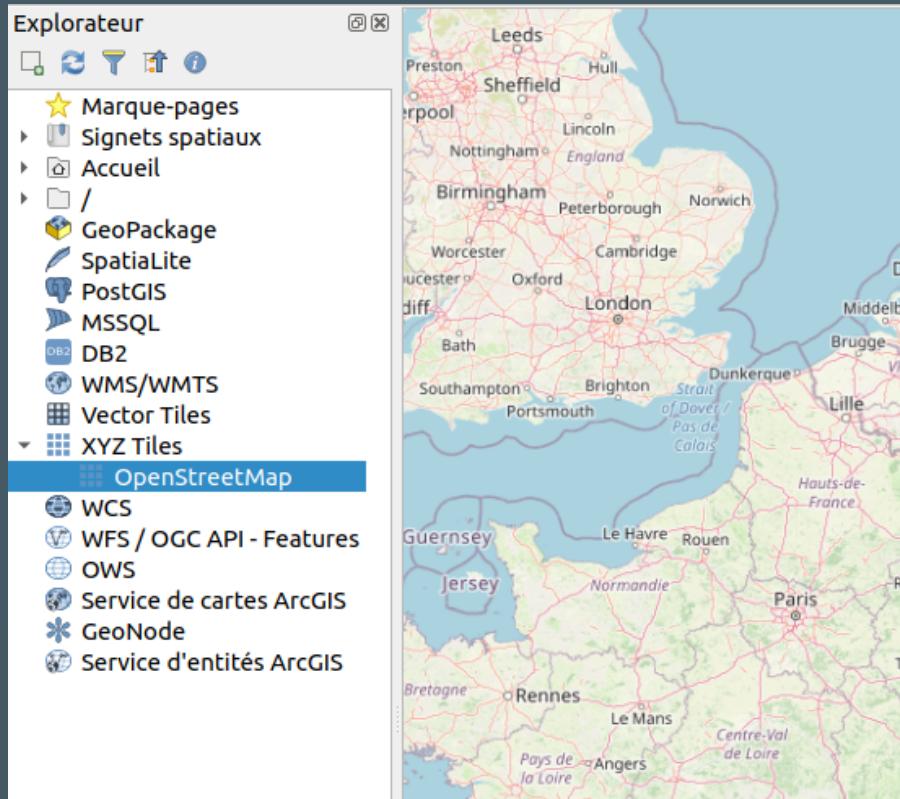
Let's see what is possible





With QGIS only

- Add the default mapnik style as a raster, from the *QGIS Browser*





With QGIS only

- Some online tools are already transforming the data into GIS formats (SHP, Geopackage, ...)
- <https://download.geofabrik.de/>
- <https://www.data.data-wax.com/> France and other countries, QGIS style, GitHub (→ this screenshot)
- ...





With QGIS only

- Load OSM XML or PBF files
 - Thanks to OGR in background
- Different websites to download these files:
 - [https://download.geofabrik.d
e/](https://download.geofabrik.de/)
 - [http://download.openstreetm
ap.fr/extracts/](http://download.openstreetm
ap.fr/extracts/)
 - ...

Browser

The screenshot shows the QGIS Browser window with a hierarchical file structure. The root folder is 'Home'. Inside 'Home' are '3d', 'anne', 'Desktop', 'dev', 'ansible', 'app', 'data', 'ifremer', 'miscellaneous', and 'osm'. The 'osm' folder is currently selected, highlighted with a blue border. Inside 'osm' are 'mayotte-latest.osm.pbf' and several subfolders: 'lines', 'multilinestrings', 'multipolygons', 'other_relations', 'points', 'qgis-mercicor-data', 'workshop', 'lzm_demo', 'screenshot.png', and 'docker'. The 'mayotte-latest.osm.pbf' file is also highlighted with a blue border.

- ★ Favorites
- ▶ Spatial Bookmarks
- ▼ Home
 - ▶ 3d
 - ▶ anne
 - ▶ Desktop
 - ▼ dev
 - ▶ ansible
 - ▶ app
 - ▼ data
 - ▶ ifremer
 - ▶ miscellaneous
 - ▼ osm
 - ▼ mayotte-latest.osm.pbf
 - ✓ lines
 - ✓ multilinestrings
 - ✗ multipolygons
 - ✗ other_relations
 - ⋮ points
 - ▶ qgis-mercicor-data
 - ▶ workshop
 - ▶ lzm_demo
 - ▶ screenshot.png
 - ▶ docker





With QGIS only

- It starts to be an issue if you want some specific fields
- This is called an **HStore** field

points — Features Total: 99, Filtered: 99, Selected: 0

osm_id	name	barrier	highway	ref	address	is_in	place	man_made	other_tags
1	9110804195	NULL	NULL	NULL	NULL	NULL	NULL	communic...	"material"=>"metal", "tower:type"=>"co...
2	9110874825	Baobab	NULL	NULL	NULL	NULL	NULL	NULL	"denotation"=>"landmark", "genus"=>"...
3	9110887917	NULL	gate	NULL	NULL	NULL	NULL	NULL	"material"=>"metal"
4	9110917251	Baobab	NULL	NULL	NULL	NULL	NULL	NULL	"denotation"=>"landmark", "genus"=>"...
5	9110917252	Baobab	NULL	NULL	NULL	NULL	NULL	NULL	"denotation"=>"landmark", "genus"=>"...
6	9110917253	Baobab	NULL	NULL	NULL	NULL	NULL	NULL	"denotation"=>"landmark", "genus"=>"...
7	9110917254	Baobab	NULL	NULL	NULL	NULL	NULL	NULL	"denotation"=>"landmark", "genus"=>"...
8	9110917255								"denotation"=>"landmark", "genus"=>"Adansonia", "leaf_cycle"=>"deciduous", "leaf_type"=>"broadleaved", "natural"=>"tree", "species"=>"A. digitata", "genus"=>"...



Use Processing Explode HStore

Explode HStore Field

Parameters Log

Input layer: points [EPSG:4326]

Selected features only

HStore field: osm_id

Expected list of fields separated by a comma [optional]:

Exploded: Create temporary layer

Open output file after running algorithm

0%

Help Run as Batch Process... Close Run

This algorithm creates a copy of the input layer and adds a new field for every unique key in the HStore field.
The expected field list is an optional comma separated list. By default, all unique keys are added. If this list is specified, only these fields are added and the HStore field is updated.





Or use QGIS Expression

points — Select by Expression

Expression Function Editor

hstore_to_map("other_tags")['description']

= + - / * ^ || () '\n'

Feature

Preview: 'DEMBENI C'

Zoom to Features Select Features Close

hstore

function hstore_to_map

Creates a map from a hstore-formatted string.

Syntax

hstore_to_map(*string*)

Arguments

string the input string

Examples

- hstore_to_map('qgis=>rocks')
→ { 'qgis': 'rocks' }

hstore_to_map("other_tags")['description']

hstore_to_map

map_to_hstore

function hstore_to_map

Creates a map from a hstore-formatted string.

Syntax

hstore_to_map(*string*)

Arguments

string the input string

Examples

- hstore_to_map('qgis=>rocks')
→ { 'qgis': 'rocks' }

for selection, labelling ...



Using QGIS Plugins

A few plugins in the QGIS plugin manager among the 973 plugins available 😎

The screenshot shows the QGIS Plugin Manager interface. On the left, there's a sidebar with icons for All, Installed, Not installed, Upgradeable, Install from ZIP, and Settings. A search bar at the top right contains the text "openstreetmap". Below the sidebar is a list of plugins, with several checked: OSMInfo, osmpoly_export, Pelias Geocoding, QuickMapServices, QuickOSM (which is highlighted with a blue selection bar), SPARQLing Unicorn QGIS Plugin, and Valhalla.

QuickOSM

Download OSM data thanks to the Overpass API. You can also open local OSM or PBF files. A special parser, on top of OGR, is used to let you see all OSM keys available.

Execute customs Overpass queries in QGIS to get OSM data.

★★★★★ 227 rating vote(s), 775413 downloads

Tags osm, openstreetmap, overpass, download, osmdownload, josm, remote, pbf, processing, modeler

More Info homepage bug tracker code repository

Author Etienne Trimaille

Installed version MASTER

Available version (stable) 2.0.0 updated at jeu. juin 24 00:00:00 2021

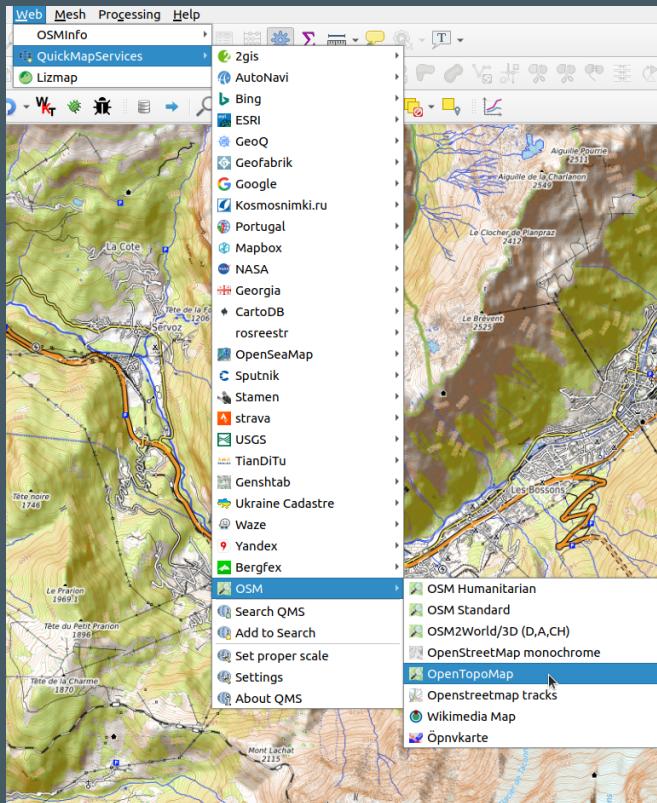
Changelog changelog

Buttons at the bottom include Upgrade All, Uninstall Plugin, Downgrade Plugin, and Close.





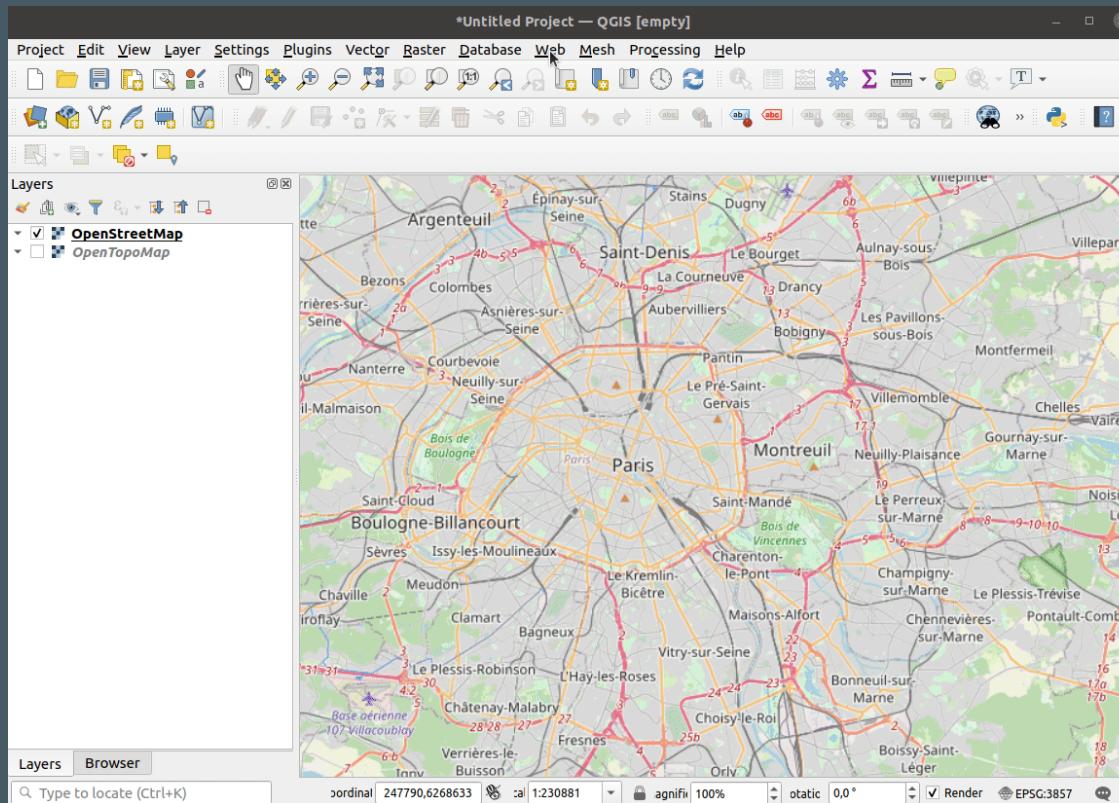
QuickMapServices plugin



OpenTopoMap in the background, based on OSM, designed for
hiking 🏔



QuickMapServices plugin



In *QuickMapServices*, go in *Settings* → *More services* → *Get contributed pack* to enable a **lot** of basemaps 🚀.



QuickOSM plugin

- Download the data on the fly
- Making requests to the Overpass API, similar to Overpass-Turbo
 - Server API to retrieve raw OSM data based on queries (OQL)
- QuickOSM 2.0.0 has been released
- Targeting both
 - **non OSM contributors**
 - and OSM OverpassAPI **experts**
- It's removing the HStore field `other_tags` by exploding it
- As it's an API, limited amount of data
- Let's make an overview of this new version



Quick Query

- Search in your native language
 - Bakery
 - Bäckerei
 - Boulangerie
 - → `shop=bakery` in OSM
- Multi key/value support with `AND`/`OR` operator

The screenshot shows the 'Quick Query' dialog in JOSM. At the top, there's a button 'Aide sur les clés/valeurs' and a 'Réinitialiser' button. Below that, a 'Pré-réglage' dropdown is set to 'Boulangerie'. The main area is a table with columns 'Clé' and 'Valeur'. A single row is present with 'shop' in the 'Clé' column and 'bakery' in the 'Valeur' column. There are 'Ajouter' and 'Supprimer' buttons at the bottom right of the table.

	Clé	Valeur	Ajouter	Supprimer
1	shop	bakery	+ (green)	- (red)

- *Thanks to the JOSM and Vespucci community to share these presets on GitHub*



Quick Query

French people love  and 

QuickOSM

Aide sur les clés/valeurs

Pré-réglage

	Clé	Valeur	Ajouter	Supprimer
1	Requête sur toutes les clés	Requête sur toutes les valeurs		

Dans

Lieu nommé requis quand la requête est "Dans".

▼ Historique des requêtes

shop_bakery_baume les dames  

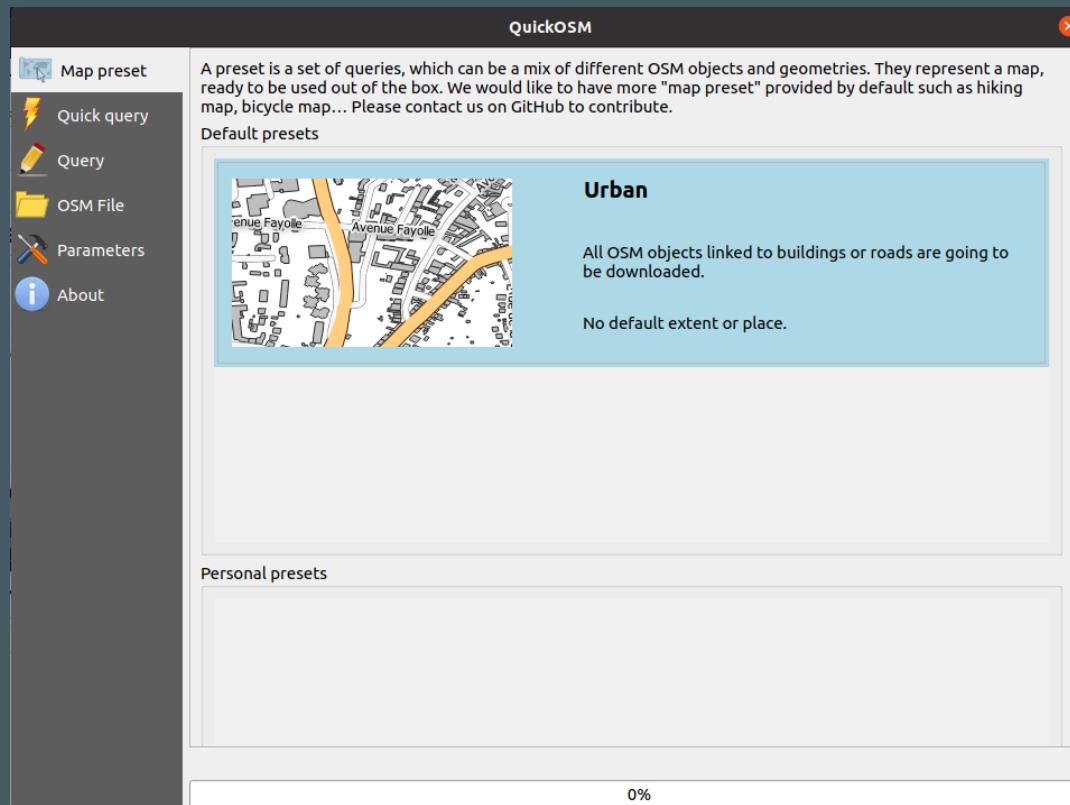
All OSM objects with the key 'shop'='bakery' in baume les dames are going to be downloaded.





Map presets

- Download many layers, many OSM objects, with a QGIS symbology at the **same** time with 2 clicks





Map presets



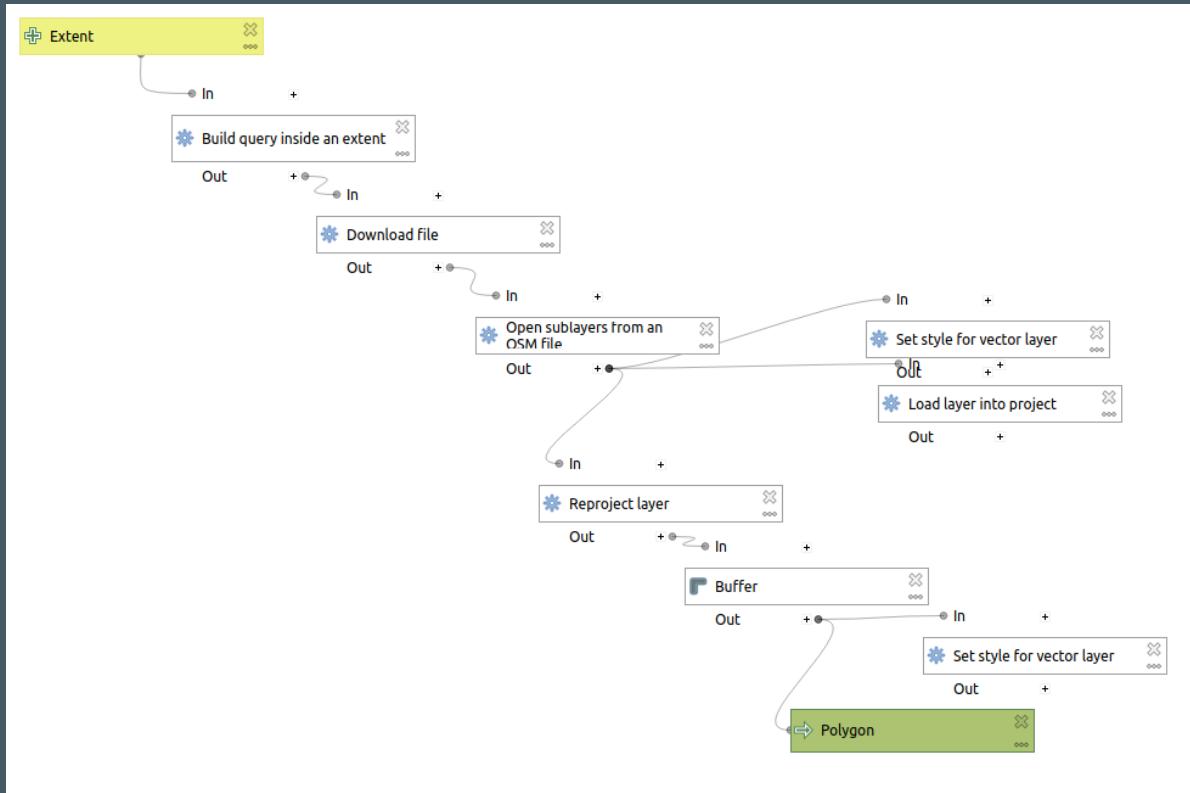
Bicycle map, landuse, ... map presets





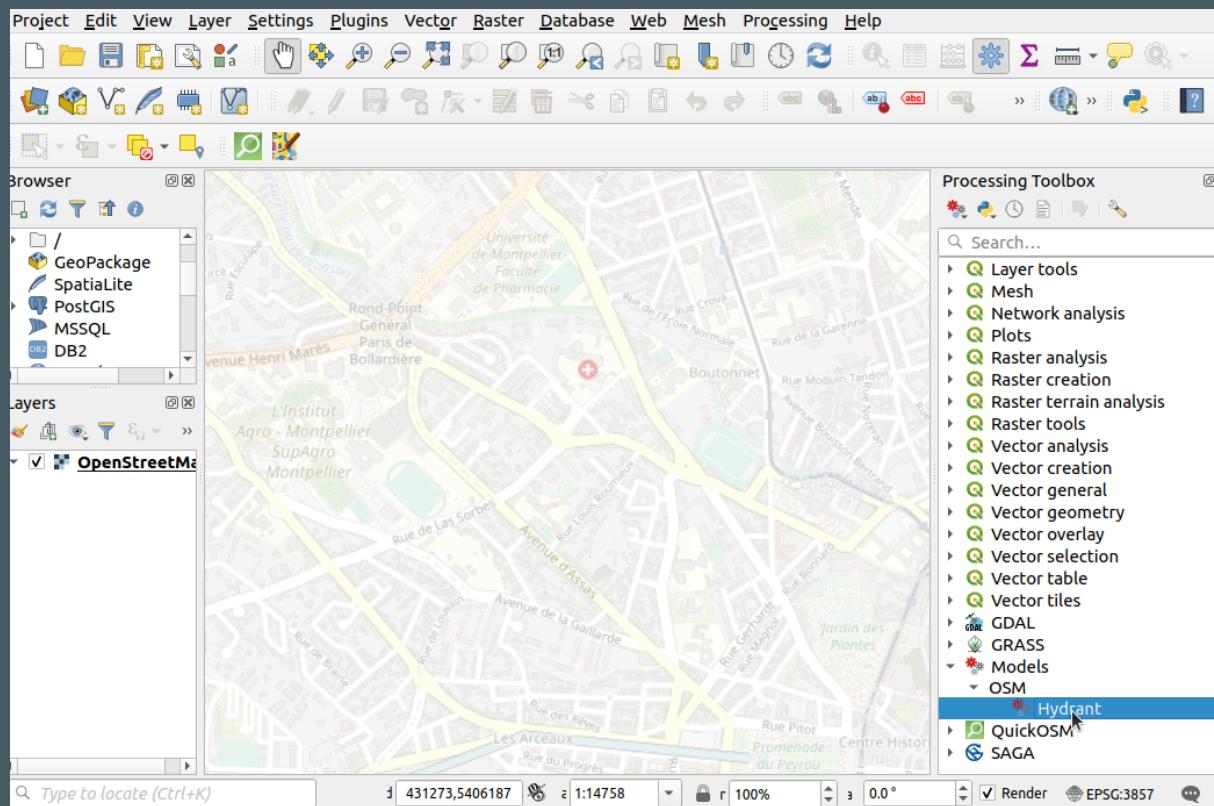
QuickOSM in Processing

- Available in Processing *Toolbox* and *Modeler*
- Example : downloading fire hydrants, reprojecting in meters projection, buffering and QGIS Style





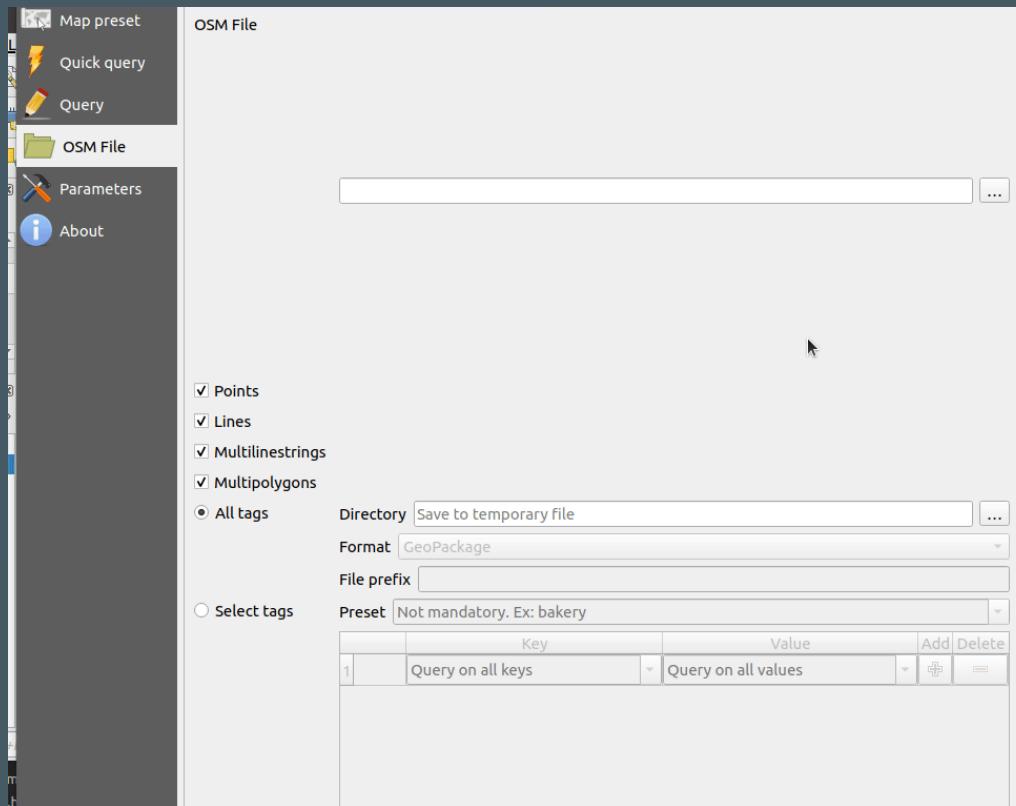
QuickOSM in Processing





Local OSM file

- Having a PBF/OSM file on your computer ?
- You can still filter it



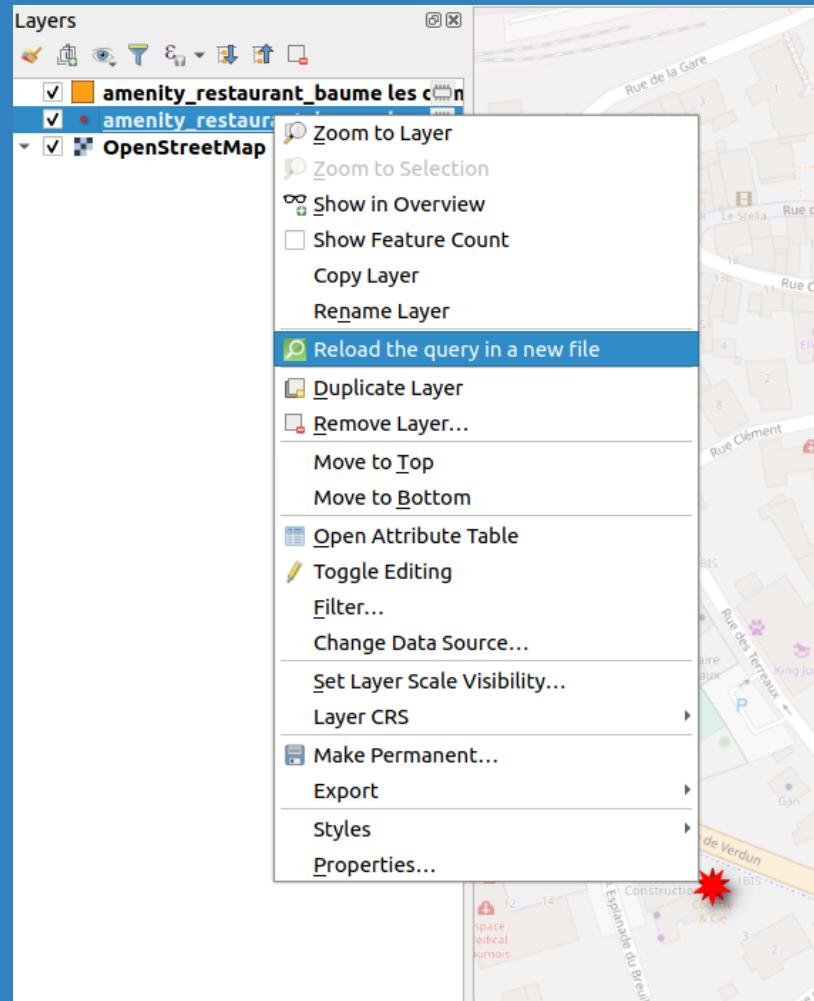


Some quick tips in QuickSOM





Reload the query to get latest update from OSM





Query many named places with ;

In montpellier ; paris

All OSM objects with the key 'amenity'='restaurant' in montpellier and paris are going to be downloaded.





Default QGIS Actions available

The screenshot shows a QGIS interface with a map of Guadeloupe. A context menu is open over a selected feature, listing various actions:

- Select All
- Copy Cell Content
- Zoom to Feature
- Pan to Feature
- Flash Feature
- Run Layer Action
- OpenStreetMap Browser
- JOSM
- User default editor
- mapillary
- website** (highlighted in blue)
- wikidata
- Open Form...

Below the map, a table displays data for three selected features:

	full_id	osm_id	osm_type	map			
1	n28894627...	2889462701	node	c5O6C-			
2	n29517567...	2951756716	node	qJEaMHve...	NULL	NULL	NULL
3	n29517567...	2951756717	node	Zj2geSuCL...	NULL	NULL	NULL



QuickOSM 2.0.0

Full changelog

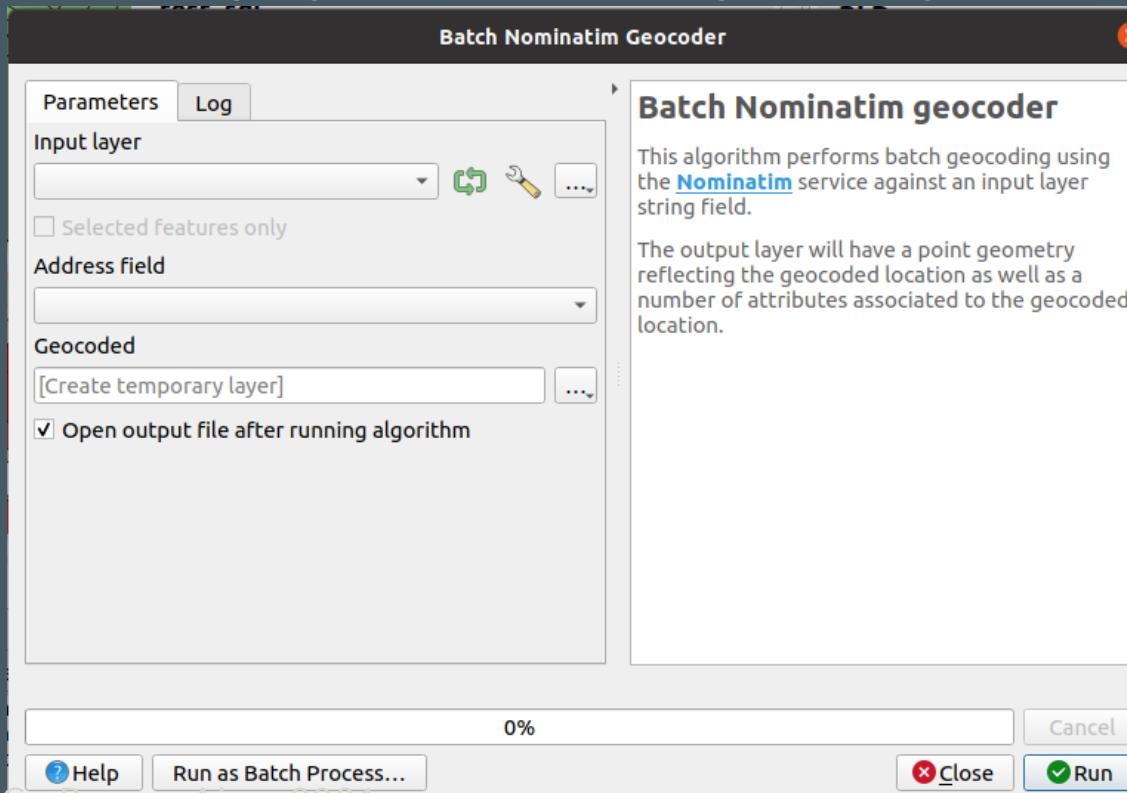
<https://github.com/3liz/QuickOSM/releases/tag/2.0.0>

- *Add history of queries*
- *Add option to get the metadata of OSM data such as author, timestamp etc*
- *Boost of performance using HStore processing algorithm to parse the downloaded OSM file, which is coded in C++*
- ...



Geocoding

- New in QGIS 3.20 
- No more plugin required
- <https://nominatim.qgis.org>
- Processing algorithm for batch geocoding





Geocoding

- New in QGIS 3.20
- No more plugin required
- <https://nominatim.qgis.org>
- Integrated in the locator bar (without plugin)

The screenshot shows a QGIS interface with a map of Europe. The map displays country boundaries and major cities, with place names labeled in various languages. Some labels are in English (United Kingdom, France, Spain, Portugal), while others are in German (Deutschland), Polish (Polska), Czech (Česko), Hungarian (Magyarország), Italian (Italia), and many others. The QGIS toolbar at the bottom includes icons for Browser, Layers, and a search bar with the placeholder "Type to locate (Ctrl+K)".





Routing

- ORS Tools
- API based on OpenStreetMap data
- isochrones and matrix calculations

The screenshot shows the ORS Tools application interface. On the left is a map of Europe with a red line representing a route from Copenhagen to Prague, passing through several German cities like Hamburg, Berlin, and Dresden. The right side is the application window with the following details:

- Resources:** Sign Up, Dashboard, Forum
- Provider:** openrouteservice
- Advanced Directions:** Go with: driving-car, fastest
- Waypoints:** A list of 10 coordinates:
 - Point 0: 13.389705, 52.537907
 - Point 1: 11.585935, 50.909092
 - Point 2: 10.018172, 53.551318
 - Point 3: 14.451738, 50.083400
 - Point 4: 8.669559, 50.105029
 - Point 5: 12.159096, 49.022635
 - Point 6: 11.602793, 48.130398
 - Point 7: 6.983792, 50.930347
 - Point 8: 16.322939, 48.209098
 - Point 9: 8.838136, 53.077982
- Advanced Configuration:**
 - Traveling Salesman:** All other configuration will be omitted
 - Other Options:** None (radio button selected), Optimize Start, Optimize End
 - Avoid Options:** Avoid tags, Avoid countries
- Log:** Help, About, Close, Apply



Importing OSM in a database ?

[https://wiki.openstreetmap.org/wiki/Databases and data access APIs#Database Schemas](https://wiki.openstreetmap.org/wiki/Databases_and_data_access_APIs#Database_Schemas)

Schema name	Created with	Used by	Primary use case	Updatable	Geometries (PostGIS)	Lossless	hstore columns	Database
osm2pgsql	osm2pgsql	Mapnik, Kothic JS	Rendering	yes	yes	no	optional	PostgreSQL
apidb	osmosis	API	Mirroring	yes	no	yes	no	PostgreSQL, MySQL
pgsnapshot	osmosis	jXAPI	Analysis	yes	optional	yes	yes	PostgreSQL
imposm	Imposm		Rendering	no	yes	no	Imposm2: no, Imposm3: yes	PostgreSQL
nominatim	osm2pgsql	Nominatim	Search, Geocoding	yes	yes	yes	?	PostgreSQL
ogr2ogr	ogr2ogr		Analysis	no	yes	no	optional	various
osmsharp	OsmSharp		Routing	yes	no	?	?	Oracle
overpass	Overpass API		Analysis	yes	?	yes	?	custom
mongosm	MongOSM [®]		Analysis	maybe	?	?	?	MongoDB
node-mongosm	Mongoosejs [®]		Analysis	yes	yes	yes	NA	MongoDB
osmium	Osmium		Analysis	no	yes	no	yes	PostgreSQL

- Mainly **osm2pgsql**, used for rendering, very old project and used
- **Imposm**, version **3** is updatable. Each layer has a **mapping configuration**



Database with docker

- 🐘 and 🐳
- <https://github.com/kartoza/docker-osm>
- Docker-compose project :
 - PostgreSQL container
 - Imposm container
 - OSMUpdate container : to download OSM diff files
- Workflow
 - Drop a PBF file in the folder
 - Drop the area of interest for clipping (recommended) in the folder
 - Copy `.example.env` to `.env` for local settings
 - `make run`





et voila !

Possible to customize the configuration :

- Different **mapping**
- Generalization for different scales
- Updated every two minutes by default
- SQL Triggers, views
- Styles included in the QGIS `layer_styles` table

Tables (25)	
>	layer_styles
>	osm_admin
>	osm_aeroways
>	osm_amenities
>	osm_barrierpoints
>	osm_barrierways
>	osm_buildings
>	osm_housenumbers
>	osm_housenumbers_interpolated
>	osm_landusages
>	osm_landusages_gen0
>	osm_landusages_gen1
>	osm_places
>	osm_roads
>	osm_roads_gen0
>	osm_roads_gen1
>	osm_transport_areas
>	osm_transport_points
>	osm_waterareas
>	osm_waterareas_gen0
>	osm_waterareas_gen1
>	osm_waterways
>	osm_waterways_gen0
>	osm_waterways_gen1
>	spatial_ref_sys
>	Trigger Functions
>	Types
>	Views





Vector tiles

- Vector tile support, new in QGIS 3.14 ⭐
- MapTiler / OpenMapTiles <https://openmaptiles.org/>
- Presentation from Adam Laza in a few minutes





Questions

This was just a *subset* of capabilities.
There are still other plugins, other ways etc.

Etienne
 @etrimaille

