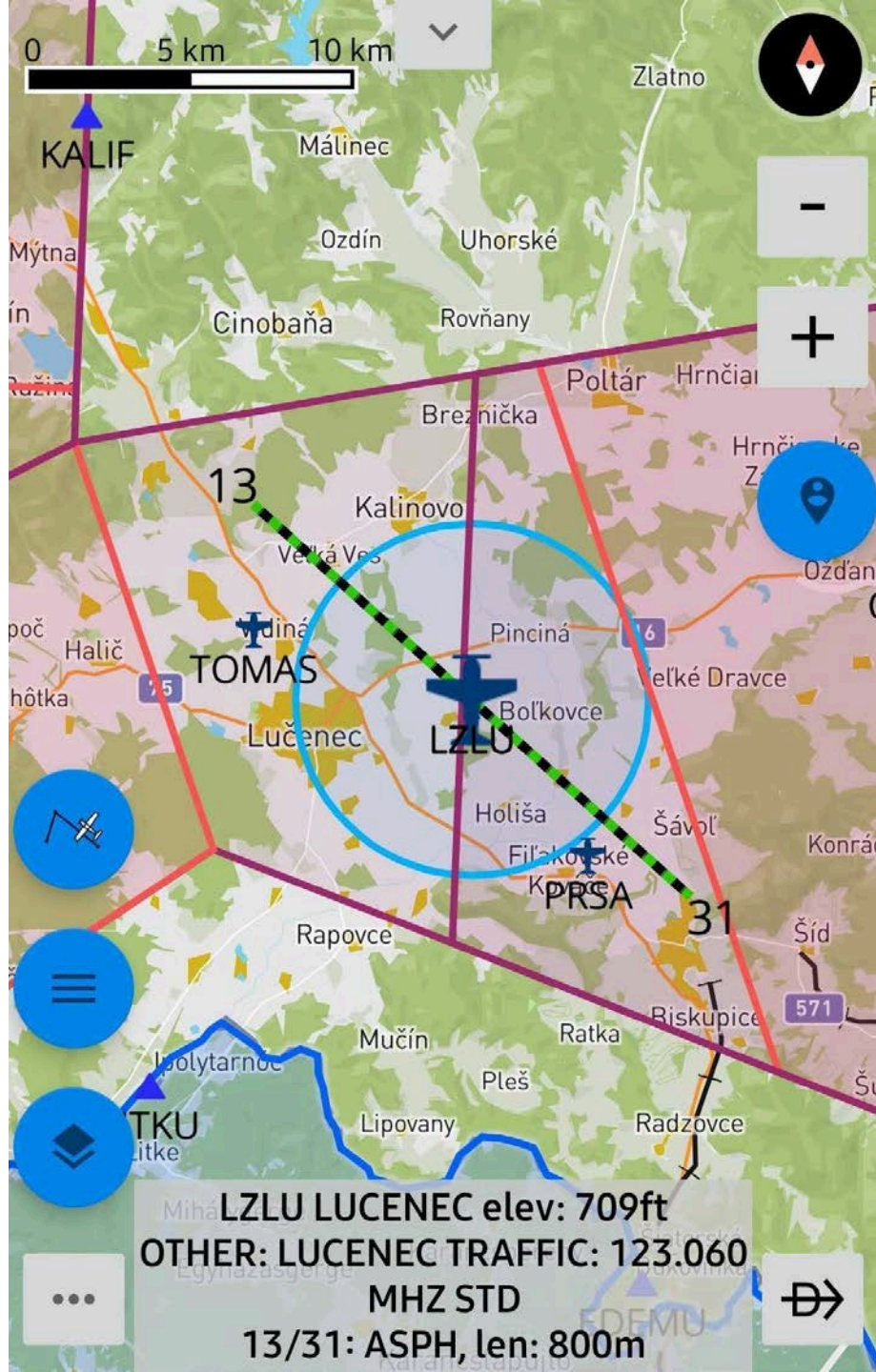
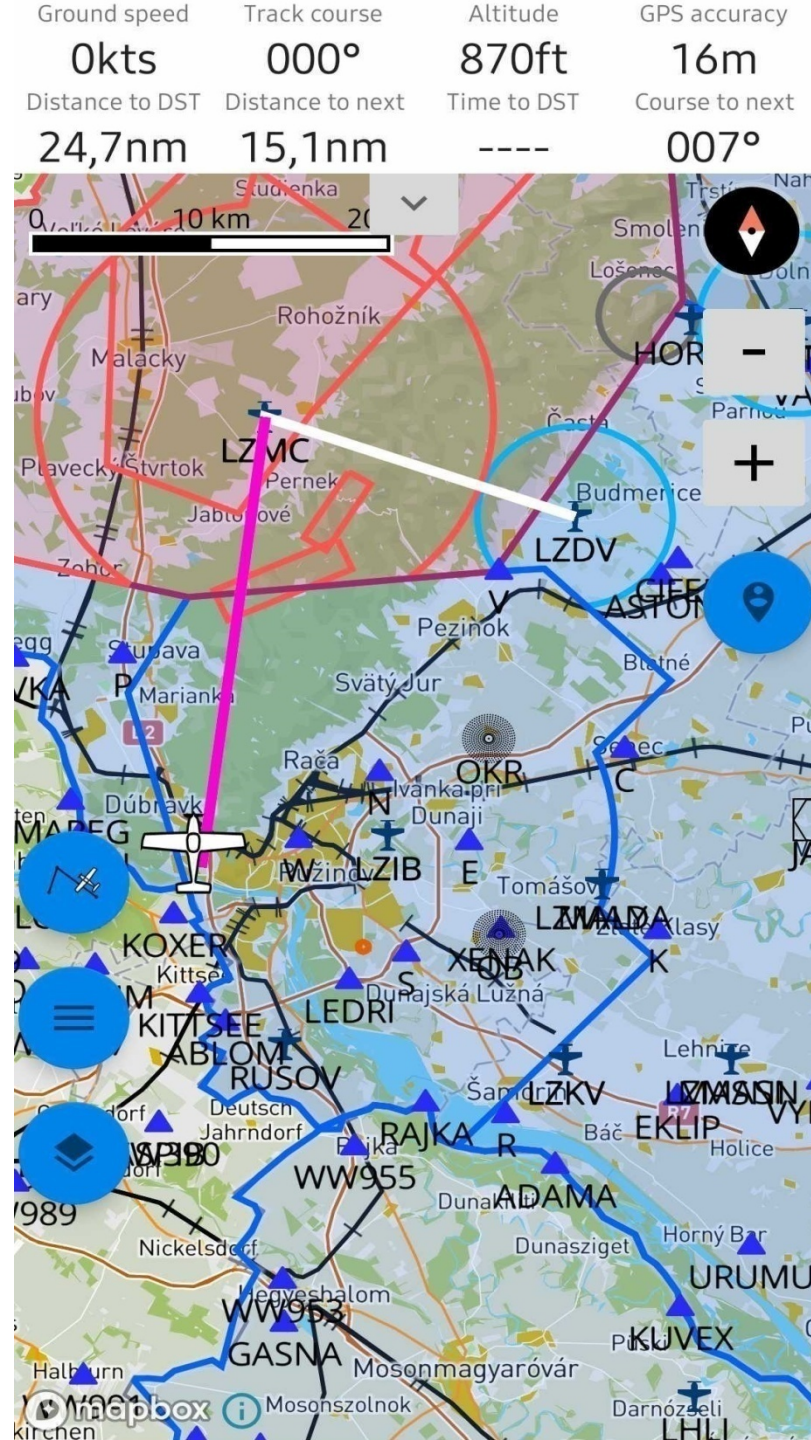
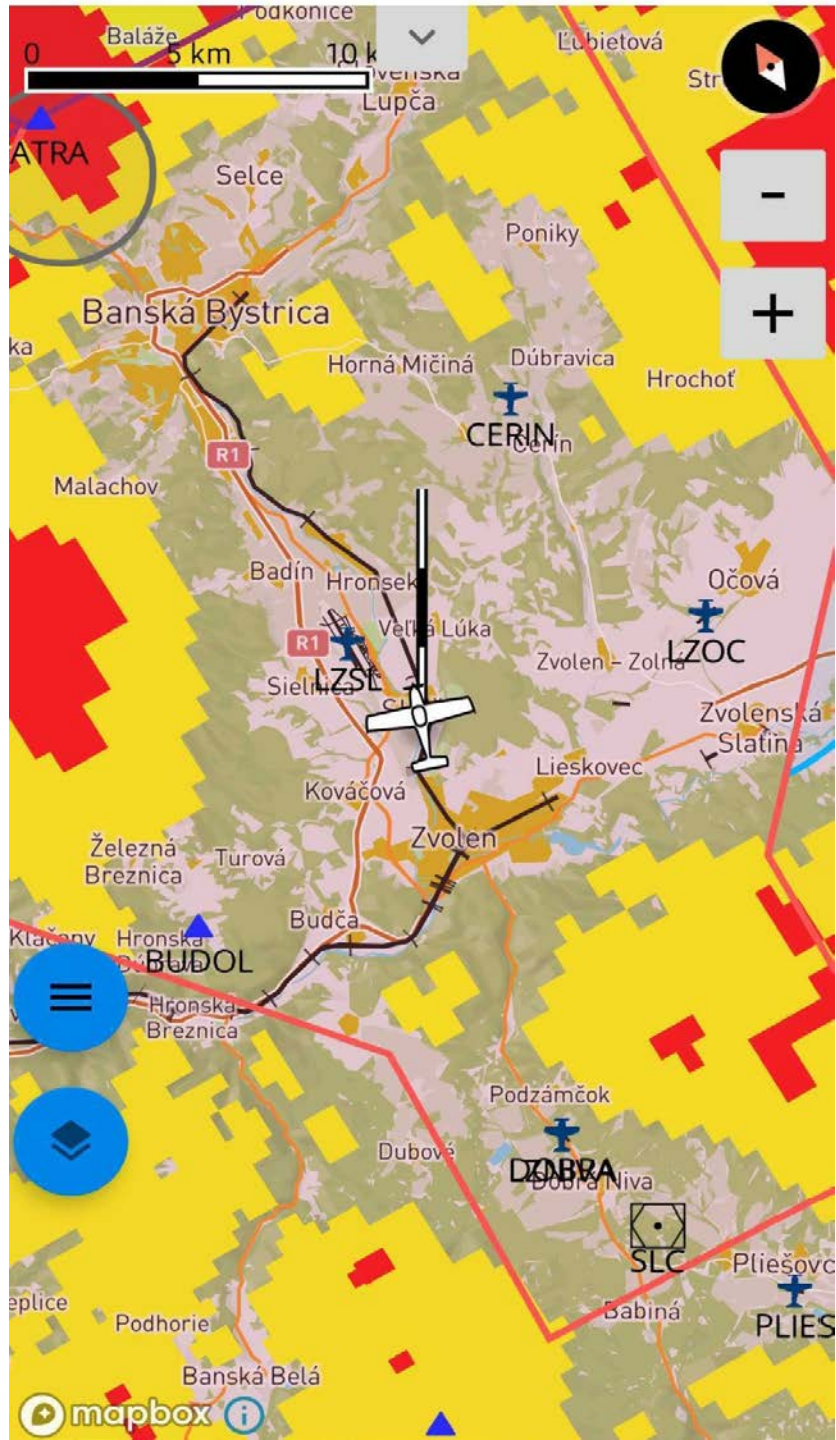


OpenStreetMap, Mapbox, Elevation data

Marcel Palaj





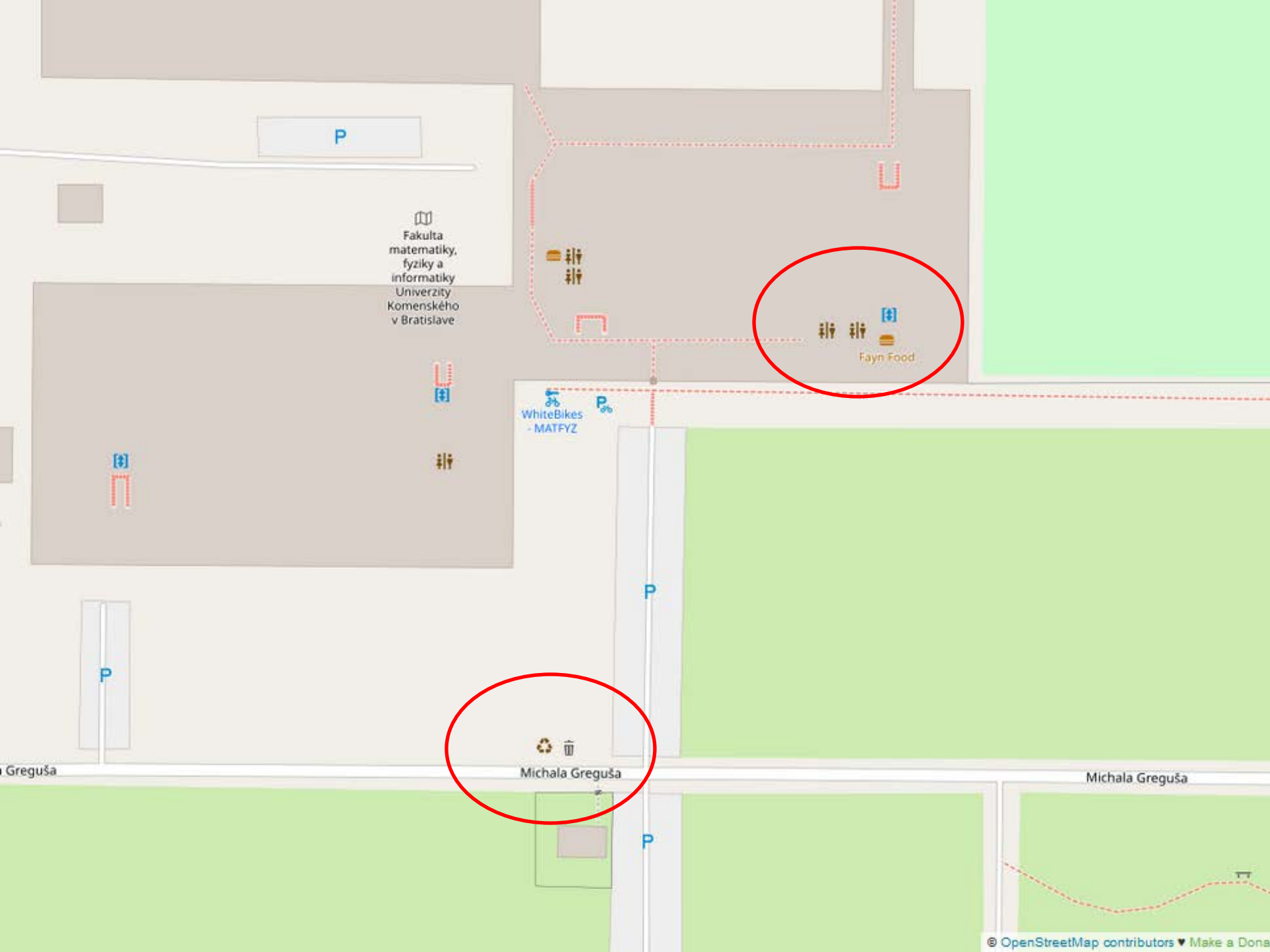
OpenStreetMap

- Open project
- Voľné geografické dáta
- Voľne prístupné na zdieľanie, úpravu, použitie
- Podobne ako wikipedia



OpenStreetMap - dáta

- Ľudia
 - Ručné zmeny
 - Záznamy z navigácií
- Satelitné snímky (yahoo, bing)
- Štátne organizácie (GKÚ, KÚ, NLC, ...)



P

Fakulta
matematiky,
fyziky a
informatiky
Univerzity
Komenského
v Bratislave

Fayn Food

WhiteBikes
- MATFYZ

P

P

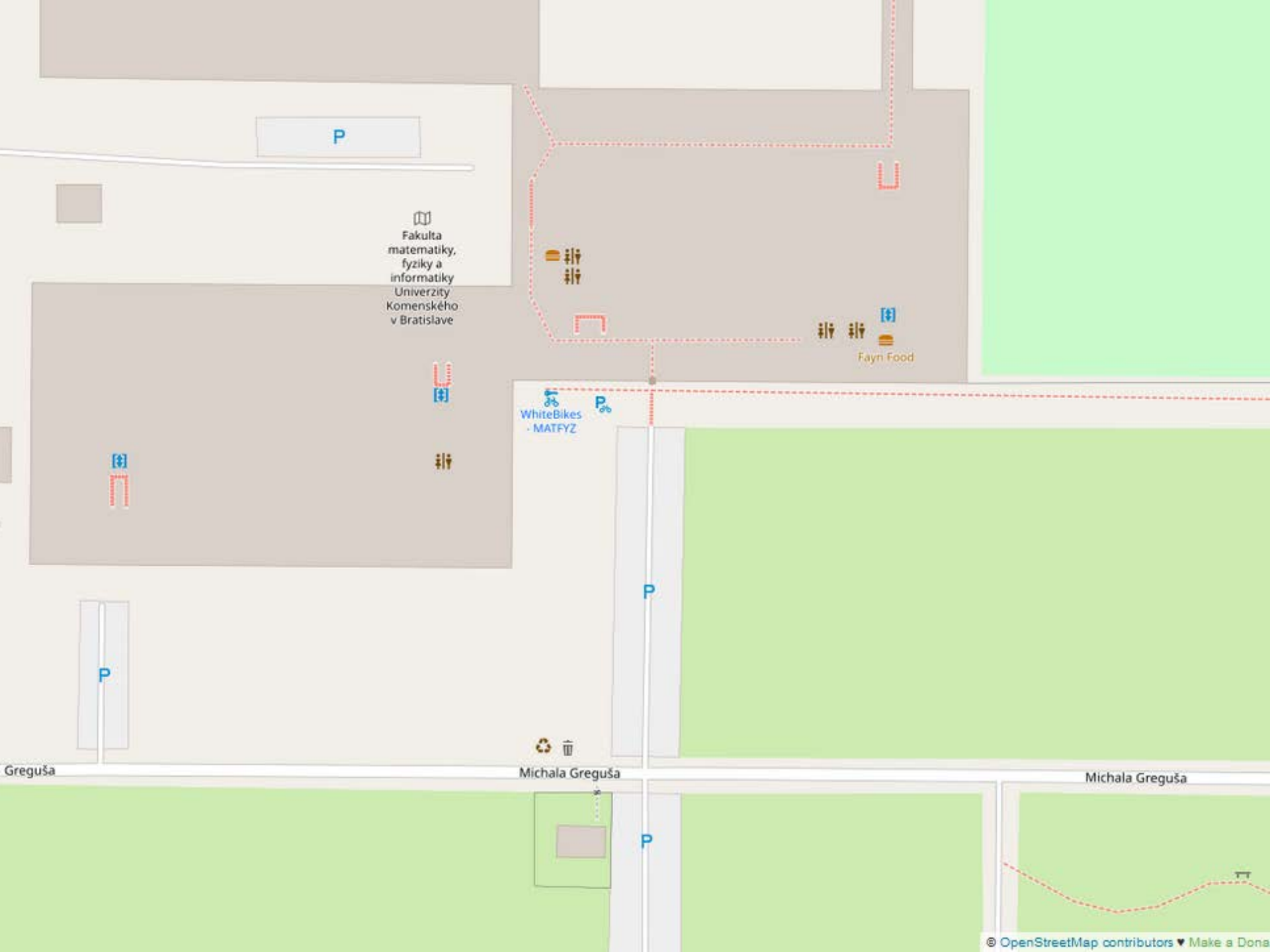
Greguša

Michala Greguša

Michala Greguša

OSM dáta

- Nekomprimovaná planéta = 1500GB
- Komprimovaná = 100GB



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[#]

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Greguša

Michala Greguša

Michala Greguša

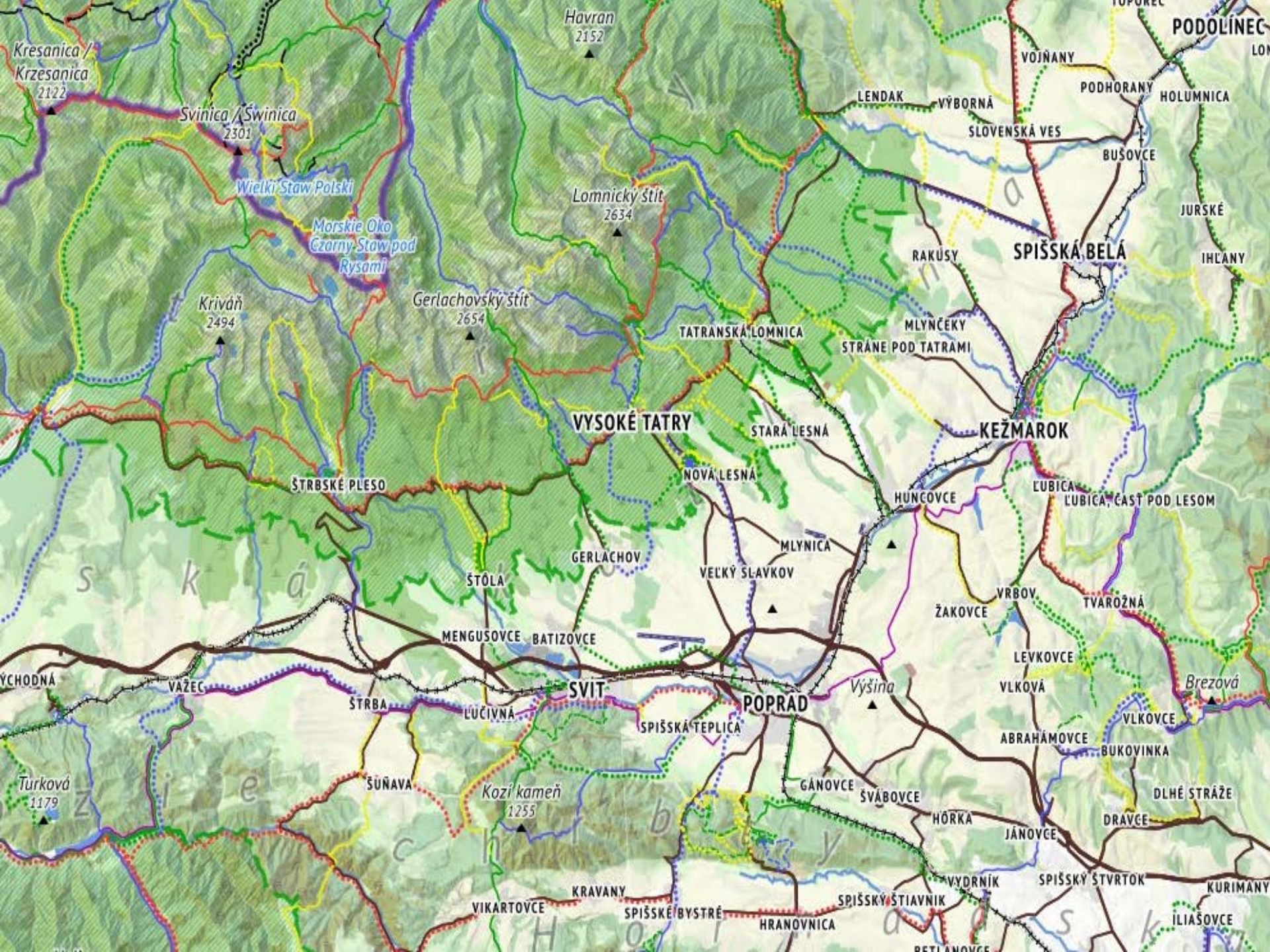
P

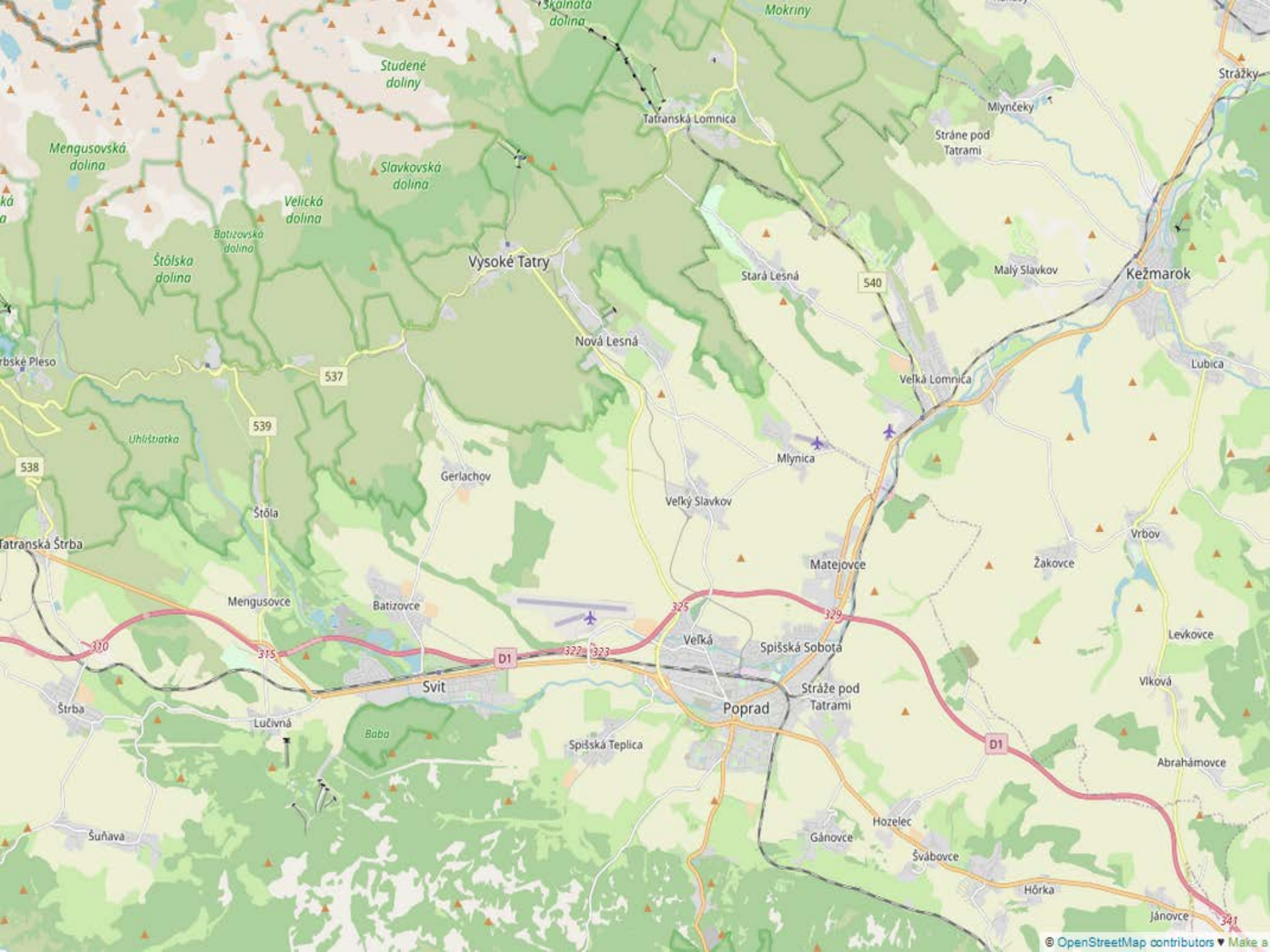

```
<node id="2706911627" visible="true" version="4"
changeset="63850654" timestamp="2018-10-
25T00:54:42Z" user="aceman444" uid="1617449"
lat="48.1513535" lon="17.0699010">
  <tag k="amenity" v="fast_food"/>
  <tag k="name" v="Fayn Coffee"/>
  <tag k="old_name" v="Fayn Food"/>
  <tag k="opening_hours" v="Mo-Fr 07:30-15:00"/>
  <tag k="operator" v="FunWeston"/>
  <tag k="website" v="http://www.freefood.sk"/>
  <tag k="wheelchair" v="limited"/>
</node>
```

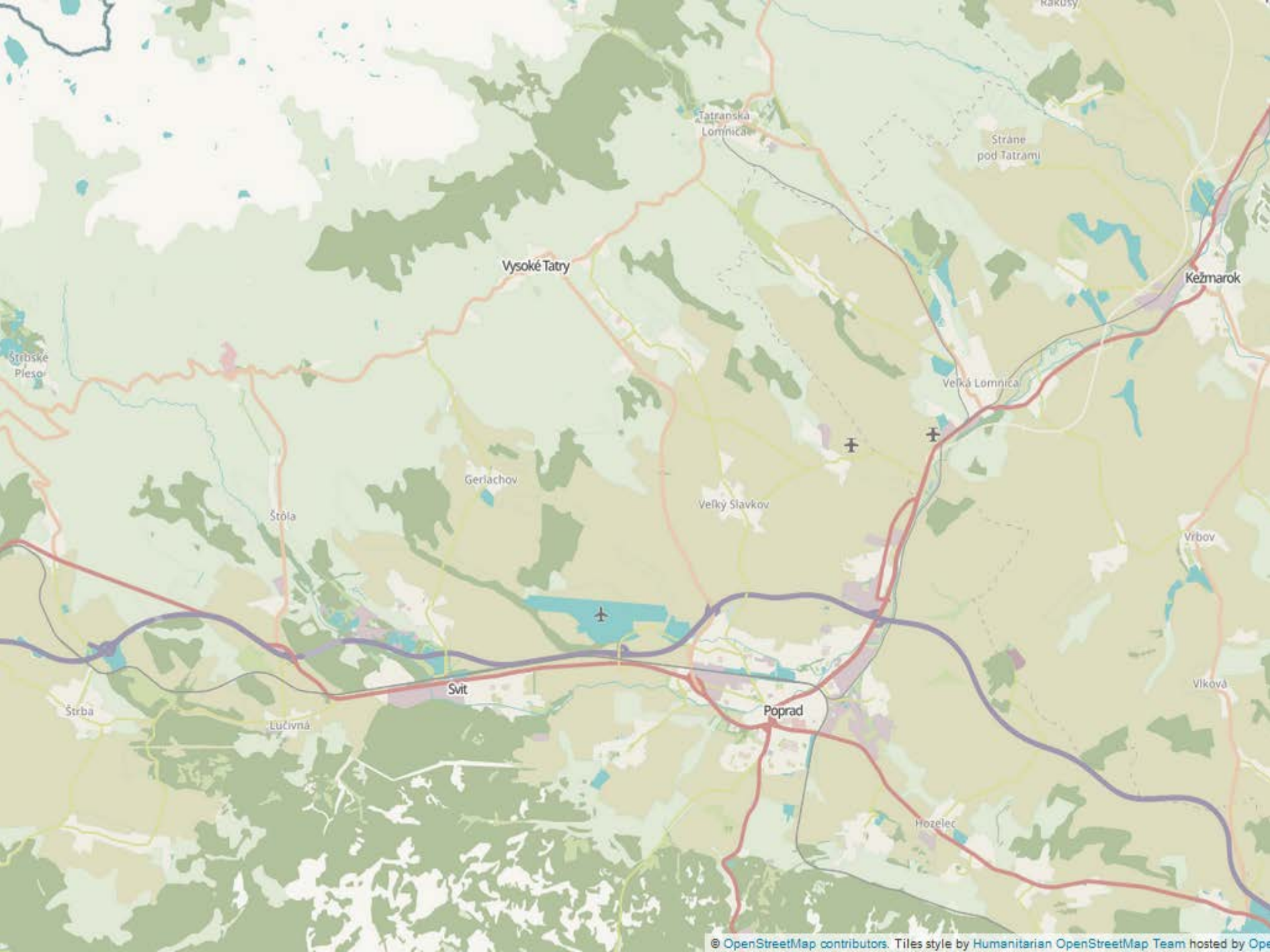
```
<node id="3400155077" visible="true" version="2"
changeset="35526876" timestamp="2015-11-
23T10:18:45Z" user="elbartto512" uid="97970"
lat="48.1513202" lon="17.0699464">
  <tag k="amenity" v="toilets"/>
  <tag k="source" v="survey"/>
  <tag k="wheelchair" v="no"/>
</node>
```

Čo OSM ponúka

- Nekomprimovaná planéta = 1500GB
- Komprimovaná = 100GB
- (primárne) dáta, nie obrázky
- (áno, dajú sa stiahnuť aj obrázky)







Mapbox



- Mapové produkty
- Začali byť populárni po zmene google maps cenovej politiky
- Viac možností štylovania

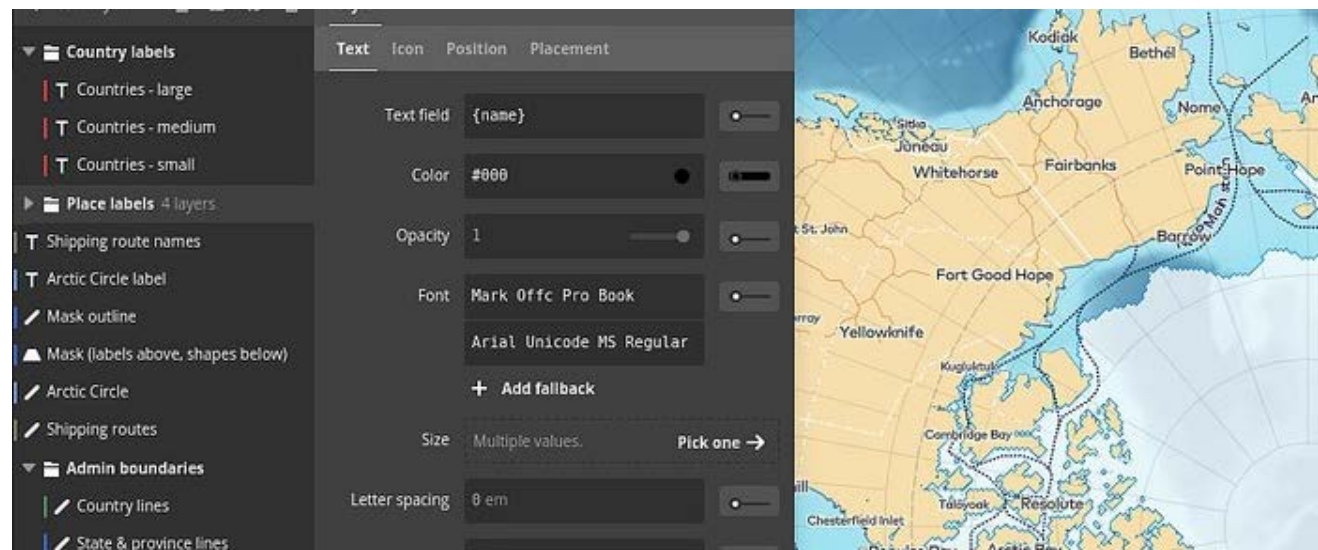
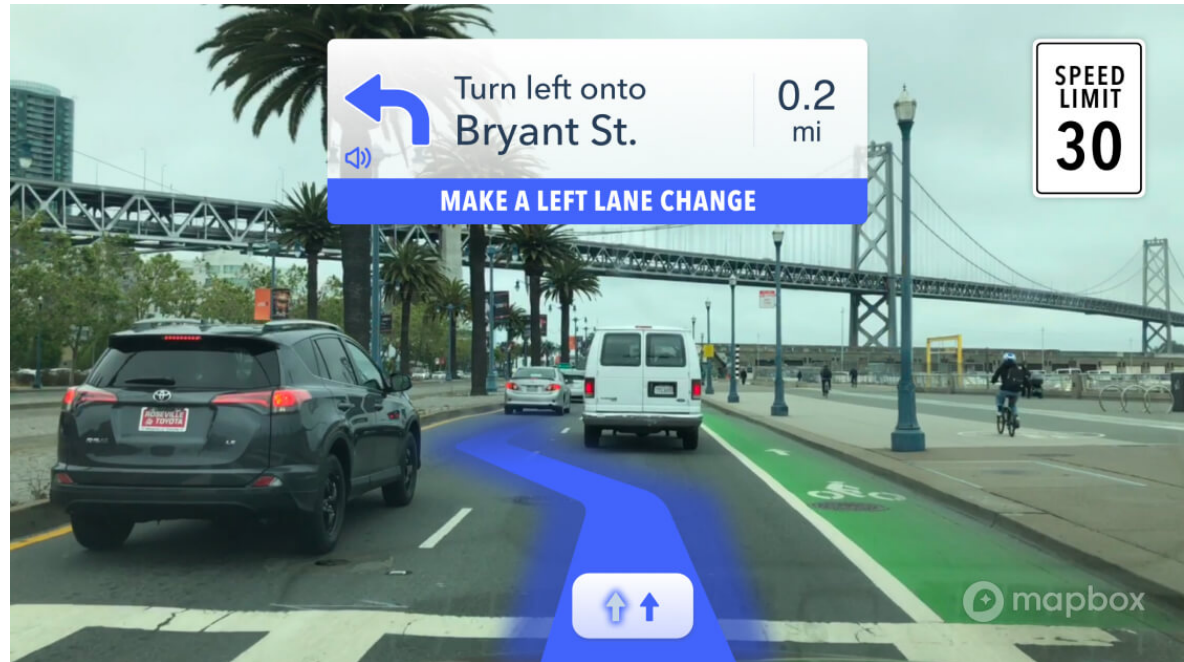


The New York Times

STRAVA

Mapbox

- Produkty:
 - html/js (web)
 - android SDK
 - iOS SDK
 - Mapbox studio
 - Navigation SDK
 - Search SDK
 - Vision SDK
 - ...



Cena / learning environment

- Spoplatnené
- pre malé aplikácie sú limity voľné (25k používateľov, ~1 milión mapových dlaždíc, ...)
- Environment
 - Na stránke je dosť príkladov (rôznorodých)
 - 4.11.2021 vyšiel mapbox v10
 - Stackoverflow ☹
 - <https://github.com/mapbox/mapbox-android-demo>

Dobrá rada na úvod:

The screenshot shows the OpenStreetMap interface. At the top, there's a navigation bar with 'OpenStreetMap', 'Edit', 'History', 'Export', 'More', 'Log In', and 'Sign Up'. Below this, a search bar contains the coordinates '48.1697 17.1737' with a 'Go' button. The search results are displayed on the left side, showing 'Search Results' from 'Internal', 'OpenStreetMap Nominatim', and 'GeoNames'. The 'Internal' result is highlighted with a red circle and a yellow background. The main map area shows a detailed view of Bratislava, Slovakia, with various landmarks and roads. A red pin is placed on the map at the coordinates 48.1697, 17.1737, which is located in the city center near the Danube River. The map includes labels for various locations like Malacky, Stupava, Bratislava, and Petržalka. The bottom of the page shows the URL 'https://www.openstreetmap.org/#map=10/48.1697/17.1737' and a copyright notice for OpenStreetMap contributors.

OpenStreetMap

Edit History Export

More Log In Sign Up

48.1697 17.1737 Go

Search Results

Results from Internal

48.1697, 17.1737

17.1737, 48.1697

Results from OpenStreetMap Nominatim

Bratislava, Region of Bratislava, Slovakia

Results from GeoNames

No results found

10 km 5 mi

© OpenStreetMap contributors Make a Donation Website and API terms

Dobrá rada na úvod:

OpenStreetMap

Edit History Export

48.1697 17.1737 Go

Search Results

Results from Internal

48.1697, 17.1737

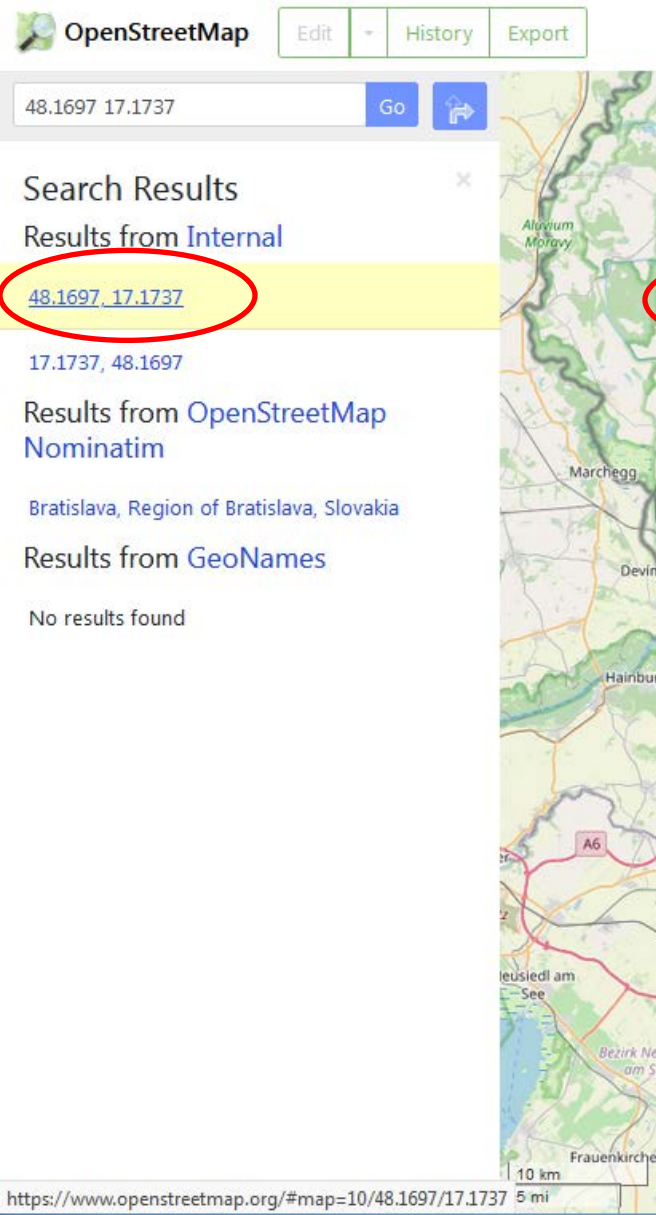
17.1737, 48.1697

Results from OpenStreetMap Nominatim

Bratislava, Region of Bratislava, Slovakia

Results from GeoNames

No results found



OpenStreetMap

Edit History Export

17.1737 48.1697 Go

Search Results

Results from Internal

17.1737, 48.1697

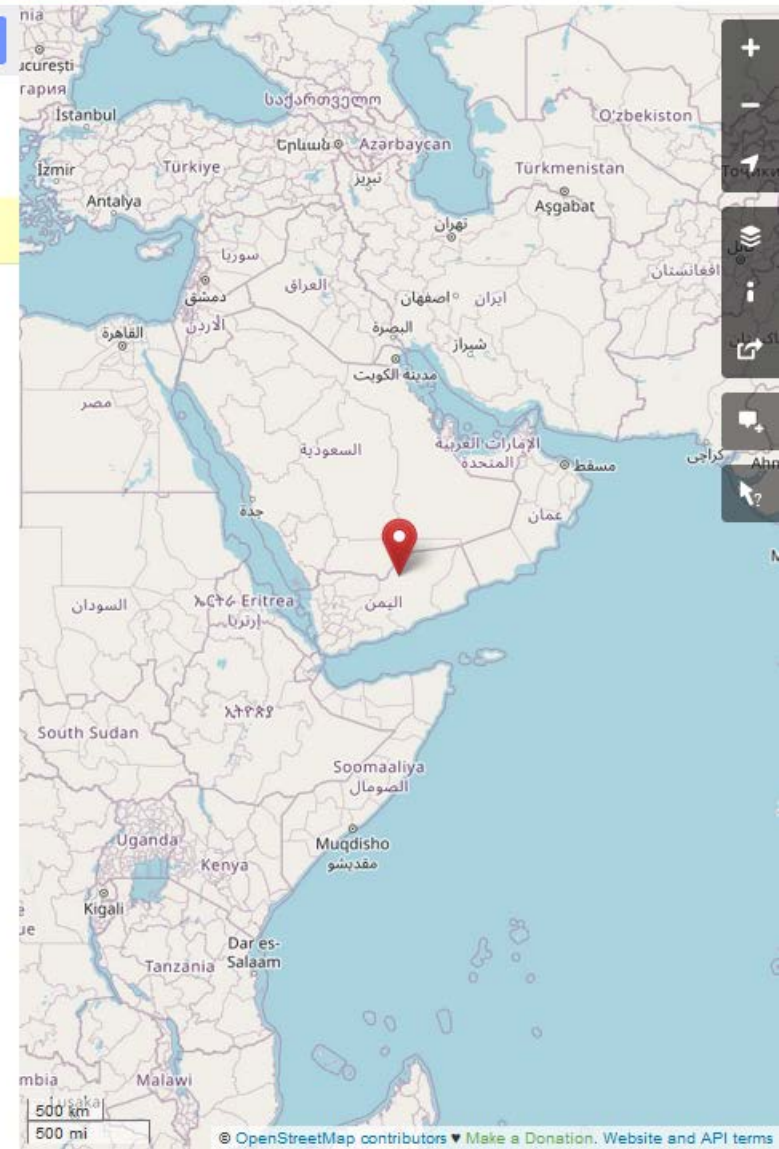
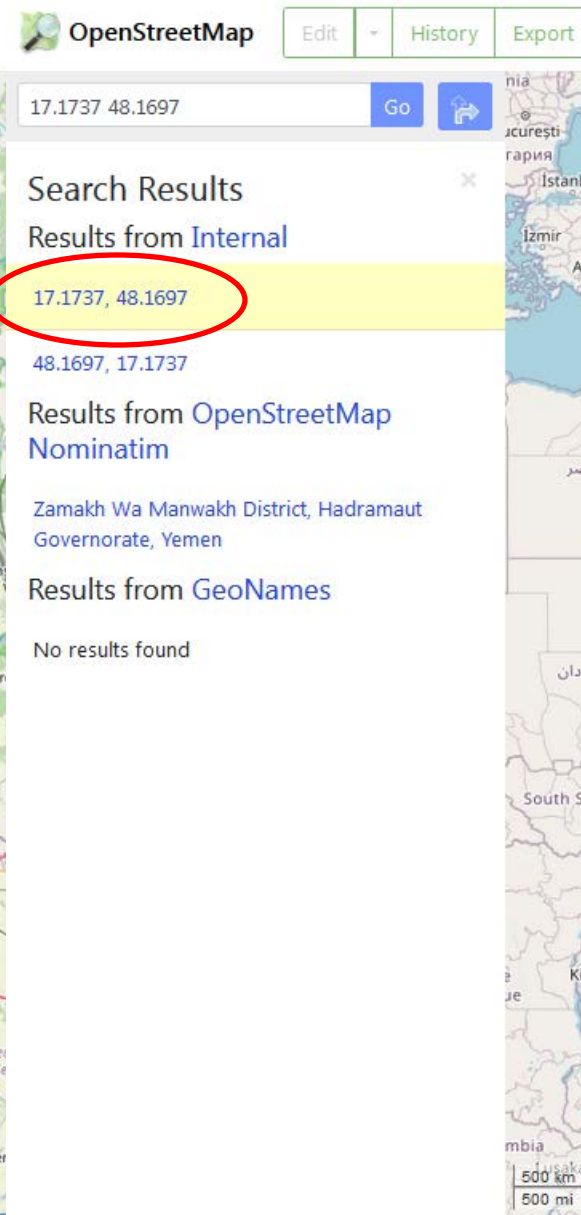
48.1697, 17.1737

Results from OpenStreetMap Nominatim

Zamakh Wa Manwakh District, Hadramaut Governorate, Yemen

Results from GeoNames

No results found



Mapbox API key

Access tokens

You need an API access token to configure [Mapbox GL JS](#), [Mobile](#), and [Mapbox web services](#) like routing and geocoding. Read more about [API access tokens](#) in our documentation.

+ Create a token

Default public token

 Refresh

pk.eyJ1IjoibWYyY2VsMzAzMiIsImEiOiJja2tjbWp4NWUwMXg
xMndtaws4aTI3amFmIn0.mVs3nkz_p1lg -If01VI5Q



Last modified: 10 months ago
URLs: N/A

map_tutorial_secret



 SECRET TOKEN

Last modified: 10 months ago
URLs: 0

map_tutorial



pk.eyJ1IjoibWYyY2VsMzAzMiIsImEiOiJja2tjbWp4NWUwMXg
wluMnd4YpMm9xdjJF4In0.LNdcRC0gyy_P_d4dp05LIg



Last modified: 10 months ago
URLs: 0

Edit your access token

Access token

🔒 SECRET TOKEN

Token name

Choose a name to help associate it with a project.

Name

map_tutorial_secret

19 / 128

Token scopes

All tokens, regardless of the scopes included, are able to view styles, tilesets, and geocode locations for the token's owner. [Learn more.](#)

Public scopes

☒ STYLES:TILES

☒ STYLES:READ

☒ FONTS:READ

☒ DATASETS:READ

☒ VISION:READ

Secret scopes

☐ SCOPES:LIST

☐ MAP:READ

☐ MAP:WRITE

☐ USER:READ

☐ USER:WRITE

☐ UPLOADS:READ

☐ UPLOADS:LIST

☐ UPLOADS:WRITE

☐ FONTS:LIST

☐ FONTS:WRITE

☐ STYLES:WRITE

☐ STYLES:LIST

☐ STYLES:DOWNLOAD

☐ STYLES:PROTECT

☐ TOKENS:READ

☐ TOKENS:WRITE

☐ DATASETS:LIST

☐ DATASETS:WRITE

☐ TILESETS:LIST

☐ TILESETS:READ

☐ TILESETS:WRITE

☒ DOWNLOADS:READ

☐ VISION:DOWNLOAD

☐ NAVIGATION:DOWNLOAD

☐ OFFLINE:READ

☐ OFFLINE:WRITE

Edit your access token

Access token

pk.eyJ1IjoibWFyzAVsMY2zMlIsImEiOiIja2tjbXN3dDpMmz1YwM9xdWluMnd4YjF4In0.gYycRC0LNd_P_d4dp05LIg



Token name

Choose a name to help associate it with a project.

Name

map_tutorial

12 / 128

Token scopes

All tokens, regardless of the scopes included, are able to view styles, tilesets, and geocode locations for the token's owner. [Learn more](#).

Public scopes

☒ STYLES:TILES

☒ STYLES:READ

☒ FONTS:READ

☒ DATASETS:READ

☒ VISION:READ

Basic Map setup

build.gradle:

implementation 'com.mapbox.maps:android:10.9.1'

strings.xml:

<string name="mapbox_access_token">your public
key</string>

Gradle.properties:

MAPBOX_DOWNLOADS_TOKEN=your secret key

settings.gradle:

```
repositories {  
    ....  
    maven {  
        url  
        'https://api.mapbox.com/downloads/v2/releases/maven'  
        authentication {  
            basic(BasicAuthentication)  
        }  
        credentials {  
            username = 'mapbox'  
            password = MAPBOX_DOWNLOADS_TOKEN  
        }  
    }  
}
```


MapView

activity_main.xml

```
<com.mapbox.maps.MapView
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    xmlns:mapbox="http://schemas.android.com/apk/res-auto"
    android:id="@+id/mapView"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    mapbox:mapbox_cameraTargetLat="48.1692"
    mapbox:mapbox_cameraTargetLng="17.1760"
    mapbox:mapbox_cameraZoom="9.0"
/>
```

MapStyles

MainActivity.kt

```
mapView = findViewById(R.id.mapView)  
mapboxMap = mapView.getMapboxMap()  
  
mapboxMap.loadStyleUri(Style.MAPBOX_STREETS)
```

Annotations

MainActivity.kt

```
annotationPlugin = mapView.annotations
```

```
pointManager =  
    annotationPlugin.createPointAnnotationManager(mapView)
```

```
icon = (resources.getDrawable(R.drawable.red_marker) as  
        BitmapDrawable).bitmap
```

```
val pointOptions = PointAnnotationOptions()  
    .withPoint(Point.fromLngLat(17.1722, 48.1682))  
    .withIconImage(icon)
```

```
pointManager.create(pointOptions)
```

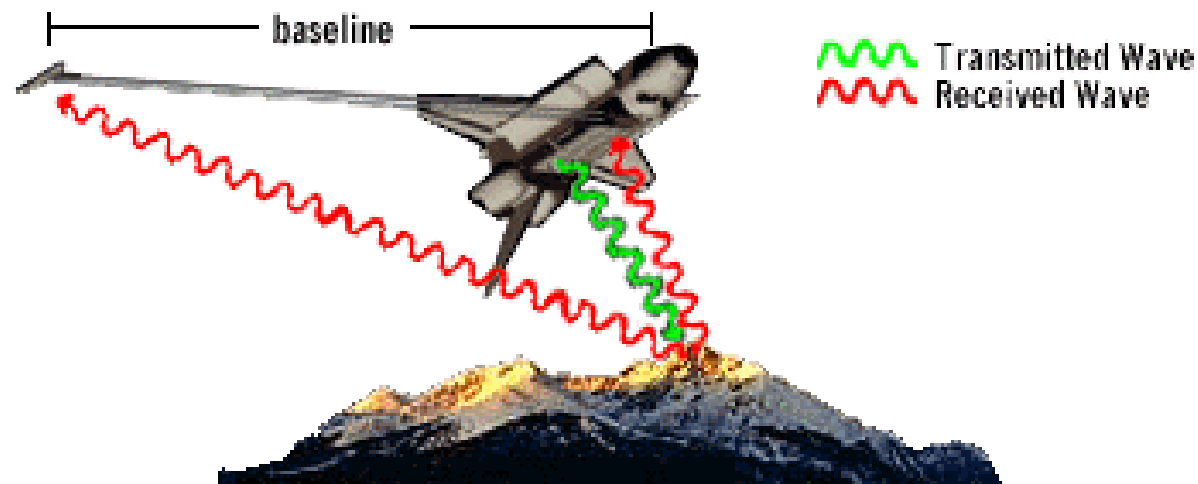
MapClick

MainActivity.kt

```
mapboxMap.addOnMapClickListener{p ->
    Toast.makeText(this, "${p.longitude()} ${p.latitude()}",
                  Toast.LENGTH_SHORT).show()
    val clickedPointOptions = PointAnnotationOptions()
        .withPoint(Point.fromLngLat(p.longitude(), p.latitude()))
        .withIconImage(icon)
    pointManager.create(clickedPointOptions)
    true
}
```

Elevation data

- OSM nemajú výškové dáta (väčšinou)
- Existujú na to API (Google Elevation API, Mapbox Elevation API, ...)
- Shuttle Radar Topography Mission



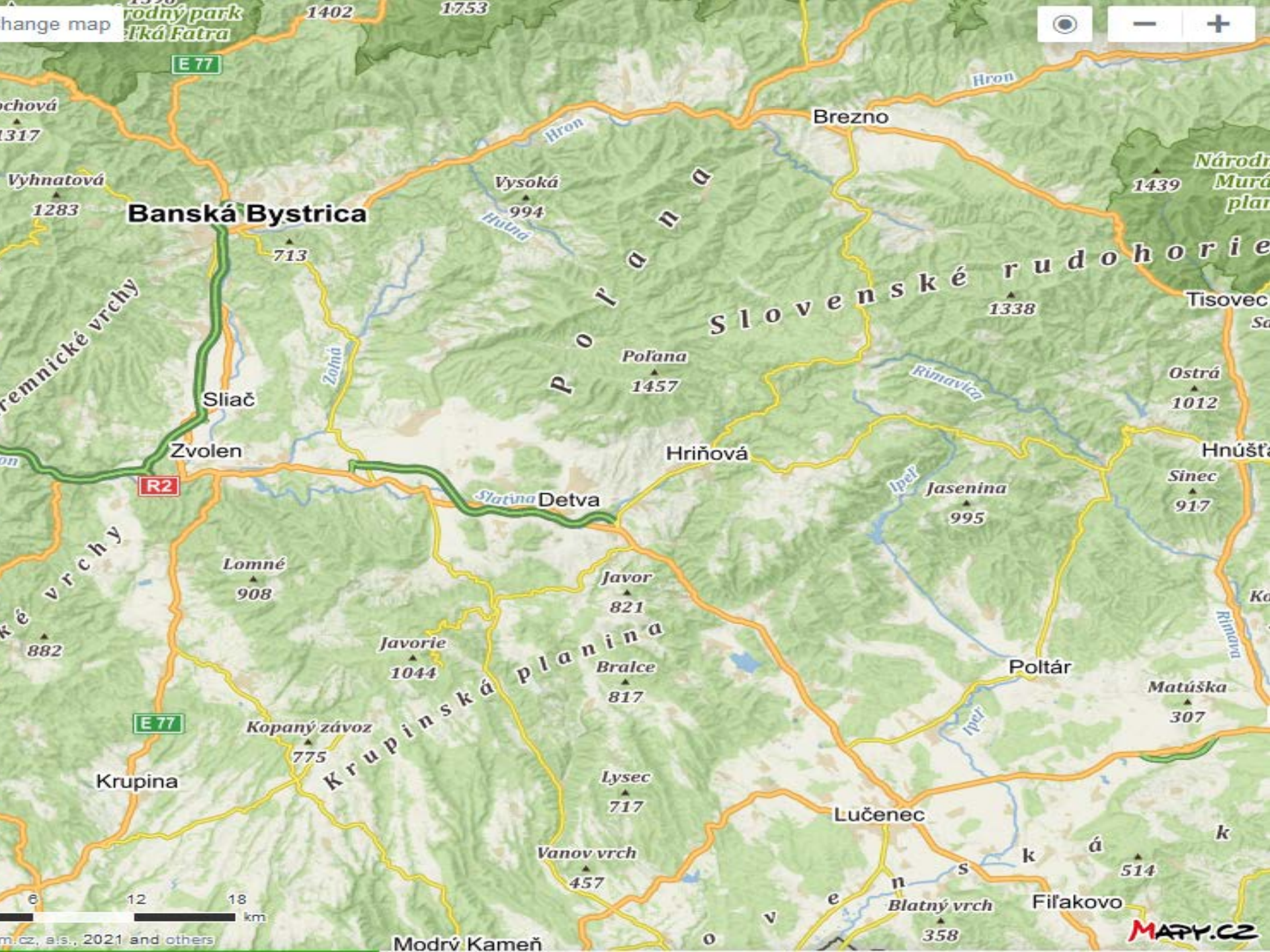
Radar signals being transmitted and recieved in the SRTM mission (image not to scale).

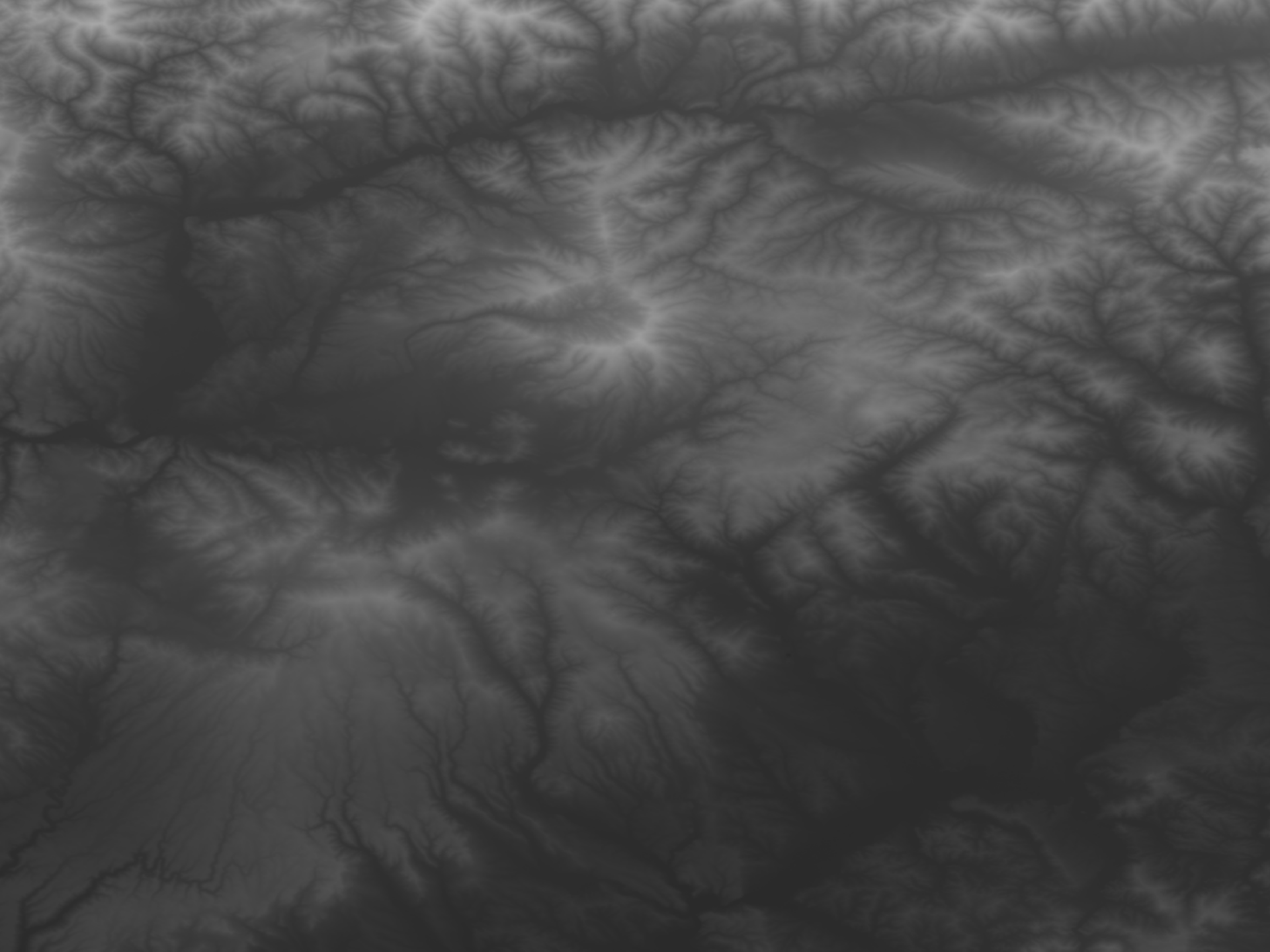

```
<node id="2706911627" visible="true" version="4"
changeset="63850654" timestamp="2018-10-
25T00:54:42Z" user="aceman444" uid="1617449"
lat="48.1513535" lon="17.0699010">
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```
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23T10:18:45Z" user="elbartto512" uid="97970"
lat="48.1513202" lon="17.0699464">
  <tag k="amenity" v="toilets"/>
  <tag k="source" v="survey"/>
  <tag k="wheelchair" v="no"/>
</node>
```

SRTM

- Rozlíšenie 30x30m
- Dáta sú free na stránkach NASA/USGS
- GeoTIFF





SRTM

- Ako s tým pracovať?
- Najjednoduchšie asi Python
- *elevation* (sťahovanie SRTM dát)
- *rasterio* (práca s GeoTIFF)

JSON?

```
{18.0: {48.2997: 238,  
  48.2994: 237, 48.2991: 235,  
  48.2988: 234, 48.2986: 232,  
  48.2983: 231, 48.2980: 231,  
  48.2977: 228, 48.2975: 226,  
  ...
```