INFO-H-415 - Advanced Databases

Session 11 - Geographical Databases (2/3)

1 References

- PostgreSQL: `http://www.postgresql.org/docs/9.2/interactive/index.html`
- PostGIS: `http://postgis.org/documentation/manual-2.0/`
- QuantumGIS: `http://www.qgis.org/`
- PostGIS Raster: `http://trac.osgeo.org/postgis/wiki/WKTRasterTutorial01`

2 Visualizing Raster data

QGIS can display raster data from several formats:

- load the "bel_regn" shapefile from last session to use as a reference.
- press the Add Raster Layer button and open the BEL_alt.vrt file provided in the `bel_alt` directory.

The result probably doesn't look very interesting but try clicking at different points on the raster with the Identify Features tool, checking out the altitude at different locations in Belgium and around.

To help visualizing the results, right click on the Layer and click "Properties". You can define how the value of the raster is represented at each point. By default qgis indicate the regions with a lower altitudes darker than the regions with a higher altitude. Choose Custom values with min=0 and max=800. See the results. Try out different settings in the Properties dialog box until the visualization works for you. Try to find the spots with negative altitudes by selecting appropiate values for the min and max options. You can for instance impose that all other spots with an altitide greater than zero should be white.

Now get the altitude dataset from worldclim.org at `http://biogeo.ucdavis.edu/data/climate/worldclim/1_4/grid/cur/alt_10m_bil.zip`. Load the alt.bil file into QGIS and observe the differences.

Use the Raster / Raster Calculator dialog to generate the difference between those two layers. Study the result with the visualization tools.

3 Raster importing in PostGIS

```
$ initdb                                        # necessary depending on your installation
$ pg_ctl start
$ createdb tp11                                 # Create the database
$ psql tp11 -c "CREATE EXTENTION postgis;"      # make it postgis
$ psql tp11 -f generate.sql                     # populate it with the data

$ cd bel_alt/                                   # move to bel_alt directory
$ raster2pgsql BEL_alt.vrt > insert_bel_alt.sql # export raster to sql in a new sql file
$ psql tp11 -f insert_bel_alt.sql               # execute the insertion file

$ cd ../alt_10m_bil/                            # move to alt_10m_bil directory
$ raster2pgsql alt.bil > insert_alt.sql         # export raster to sql in a new sql file
$ psql tp11 -f insert_alt.sql                   # execute the insertion file
$ cd ..                                         # return to home directory
```

4 Spatial Queries

To perform the exercices, you will need to update the SRID of the raster tables:

```
SELECT UpdateRasterSRID('alt', 'rast', 4326);
SELECT UpdateRasterSRID('bel_alt', 'rast', 4326);
```

You can check that the change has been applied:

```
SELECT ST_SRID(rast) FROM alt;
SELECT ST_SRID(rast) FROM bel_alt;
```

Search in the documentation for the following functions:

- ST_Clip
- ST_DumpPoints
- ST_Intersects
- ST_MapAlgebra
- ST_Resample
- ST_Segmentize
- ST_SummaryStats
- ST_UNION
- ST_Value

Write down and execute the following queries:

1. Compute the difference between the two altitude datasets.
   Try to perform this exercice first without using ST_Resample. Export the result and visualize it in QGIS:

   ```
   $ gdal_translate -of GTiff PG:"dbname=tp11 schema=public table=sol1" sol1.tiff
   ```

   (This commend should be runned directly in the terminal and not in psql)
2. Compute the maximum altitude in Belgium.
3. Get the altitudes of all cities in Belgium.
4. Compute the maximum and minimum altitudes for each province.

5. Create a new raster table restraining the alt_16 raster to Belgium. (Hint: use ST_Intersection.)
6. Compute the altitude along each river.