

Practical teaching of GIS at University of Liège

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Lessons

- Pr. Jean-Paul Donnay:
 - For non-geographers (geologists, urban planners, engineers...)
 - ➔ GIS users
 - Master:
 - *Introduction to GIS* (15h theory + 15h practical)
 - For Geographers & Land Surveyors
 - ➔ GIS professionals
 - Bach. :
 - *Cartography & GIS* (30h th + 40h pr)
 - *Cartography complement – projections* (15h th + 20h pr)
 - *Spatial analysis & GIS* (30h th + 30h pr)
 - Master :
 - *Project management* (10h th + 10h pr)
 - *GIS* (30h th + 30h pr)
 - *Special questions of geomatics* (20h th + 30h pr)

GIS for users

Introduction to GIS (1)

- Data analysis (QGIS)
 - Data schema
 - Attribute table
 - SQL requests
- Vector data (QGIS, OpenJump)
 - Import / export
 - Topology decomposition
 - Software extensions
- Raster data (Idrisi)
 - Import / export
 - Metadata
 - Color palette
 - Image georeferencing
- Data exchange (QGIS)
 - De facto format standards
 - OpenLayers, Google
 - WMS client

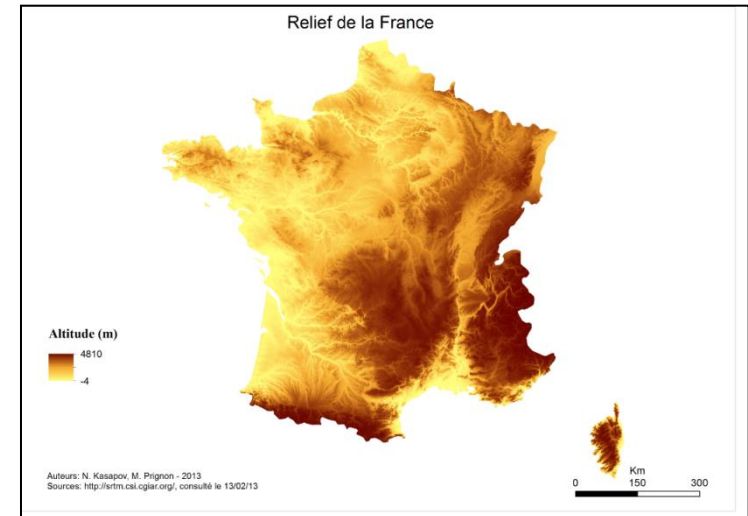
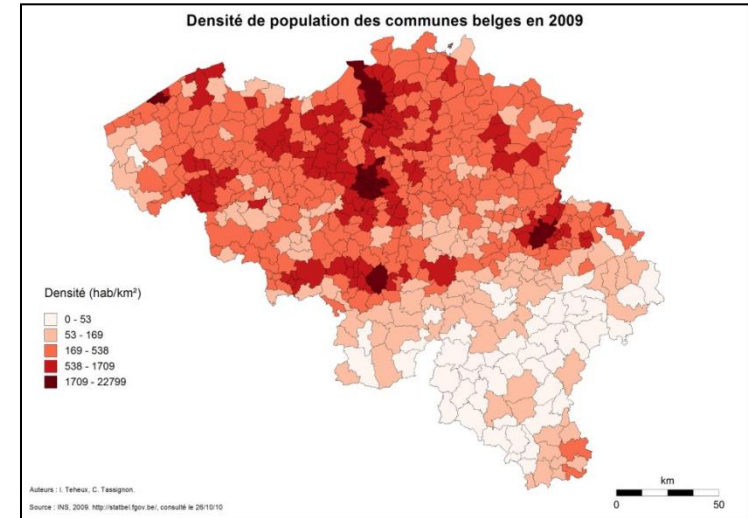
Introduction to GIS (2)

- Coordinate reference systems (QGIS, Google Earth/Maps)
 - SRID (EPSG)
 - « On the fly » transformations
 - WKT CRS definitions
- Spatial requests (QGIS, Open Jump)
 - Simple queries
 - Topologic queries
 - Spatial joints
 - Geometry edition
- DEM (Idrisi, Surfer)
 - Interpolation
 - Slopes, watershed, illumination
 - 3D display
- Raster decision support (Idrisi)
 - Map algebra
 - Multicriteria analysis

GIS for professionals

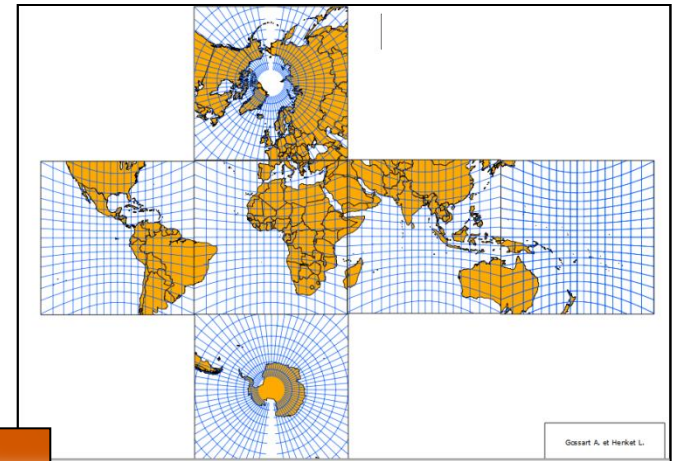
GIS prerequisite: cartography

- **Map production**
 - Geo-referencing
 - Computer graphics (vector & raster)
 - Data pre-treatments (generalization, classifications...)
 - Semiotics application (symbol edition, etc.)
 - Choropleth, flows, continuous maps...
 - Plan design for surveyors
- **Different GIS softwares**
 - ArcGIS, MapViewer, Idrisi, Q-GIS, Open Jump
 - AutoCad, Covadis



GIS prerequisite: mathematical cartography

- Projections and transformations between coordinate reference systems
 - PHP / SVG programming:
 - CRS transformation interface
 - Tissot Indicators (QGIS, OpenJump)
 - On the fly transformations (QGIS, ArcGIS)



Formulaire - Mozilla Firefox

Fichier Édition Affichage Historique Marque-pages Outils ?

Formulaire +

localhost/KASPRZYK/formulaire.html

Entrez le nom d'une ville

Entrez ses coordonnées WGS84

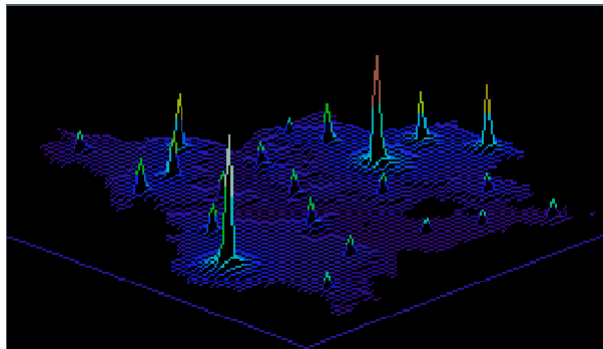
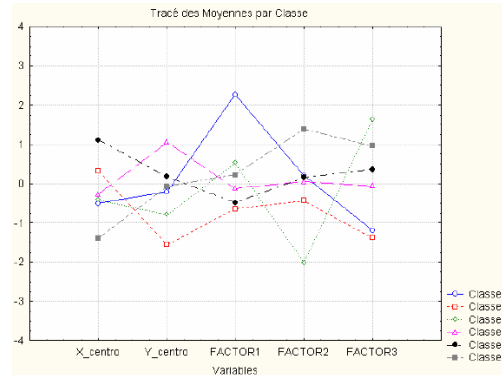
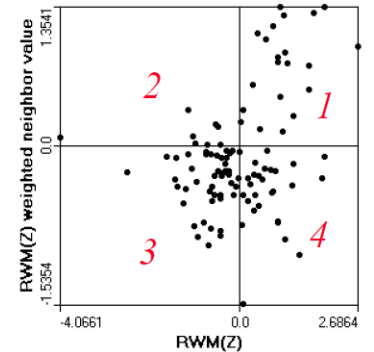
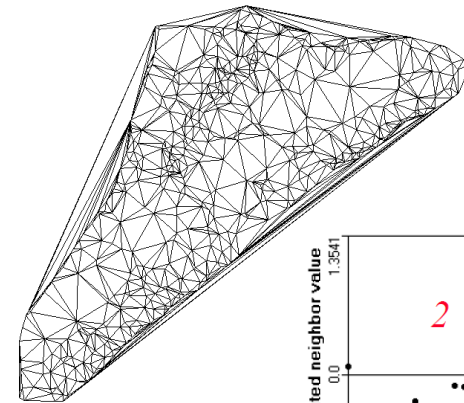
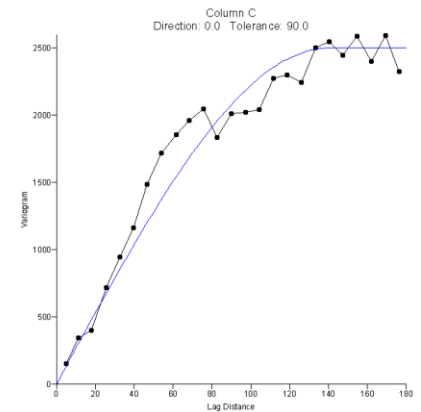
X Y Z

Choisissez une projection Sinusoïdale ▾

projeter

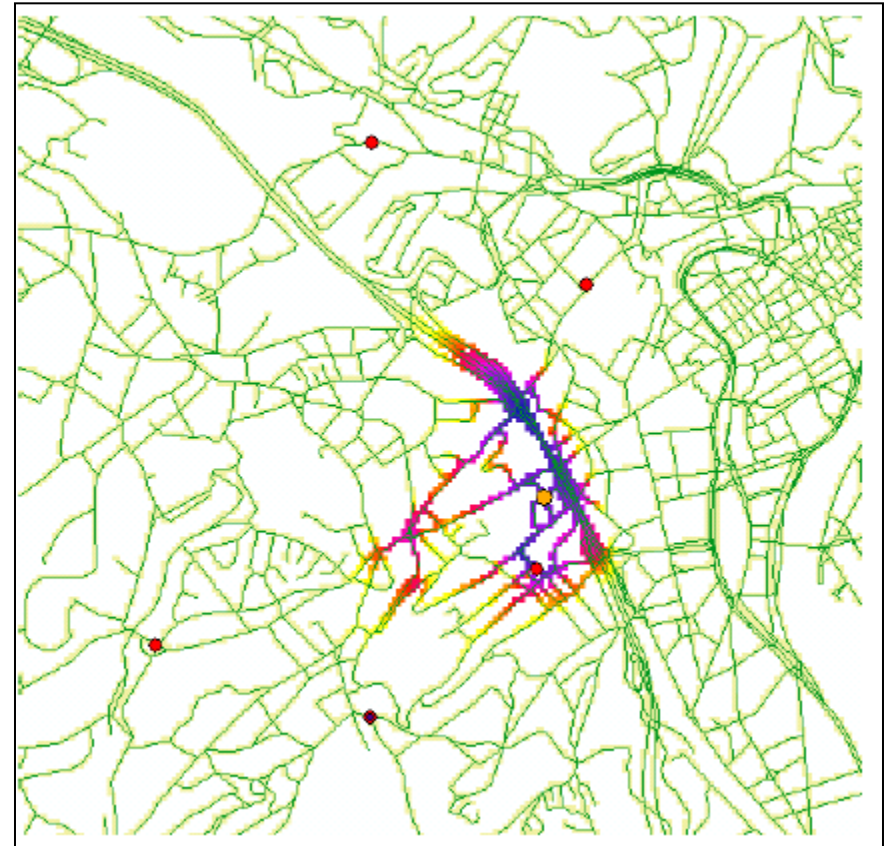
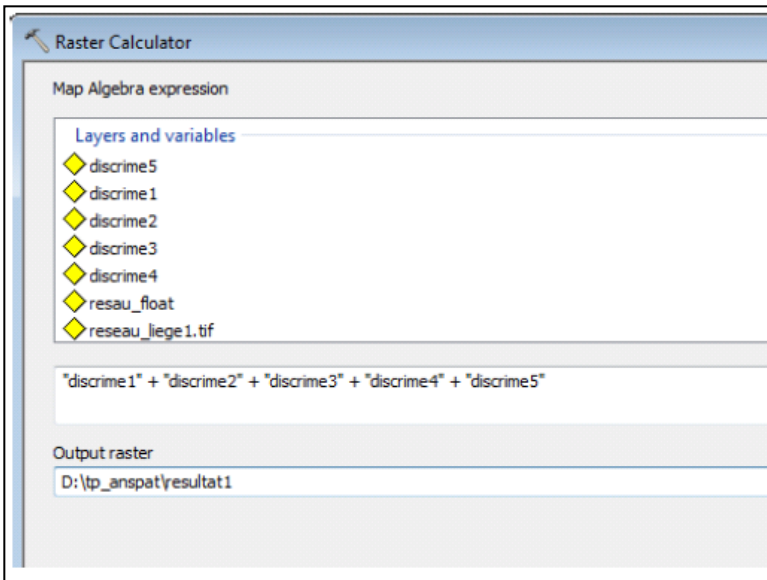
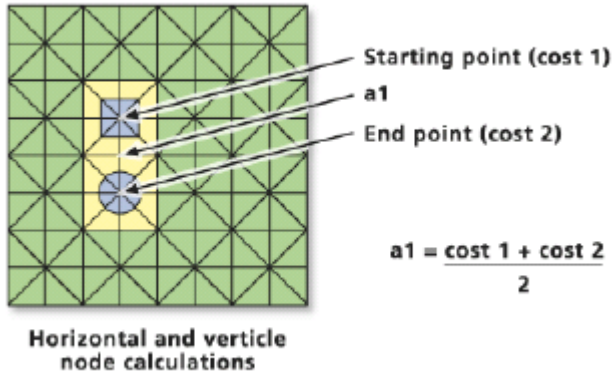
GIS prerequisite: spatial analysis

- **Spatial statistics**
 - Spatial distributions, spatial auto-correlation
- **Graph analysis**
 - Shortest path, flow analysis, propagation (raster)
- **Multivariate analysis**
 - PCA, classifications, regressions, regionalization
- **Geo-statistics & interpolations**
 - TIN, trend surfaces, Kriging, cost surfaces
- ArcGIS, Idrisi, Surfer, Statistica, MatLab, R, etc.



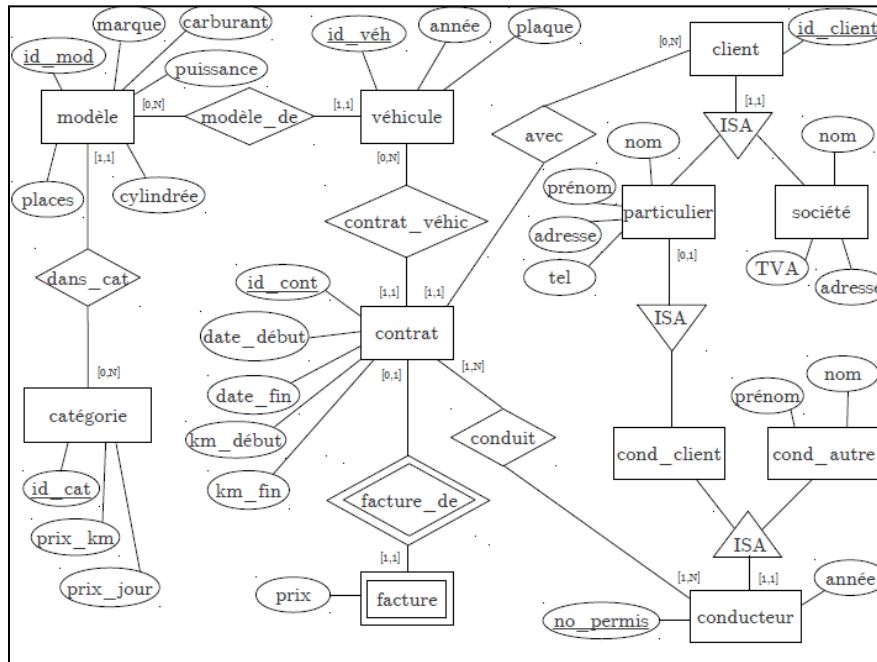
GIS prerequisite: spatial analysis: practical example

Practical teacher: Marie Trotta



GIS prerequisite: databases

- Theory: Pr. Pierre Wolper
- **Database conceptual / logical / physical modeling**
 - E/A formalism, SQL language
- Main work:
 - database building (MySQL)
 - PHP interface of the database



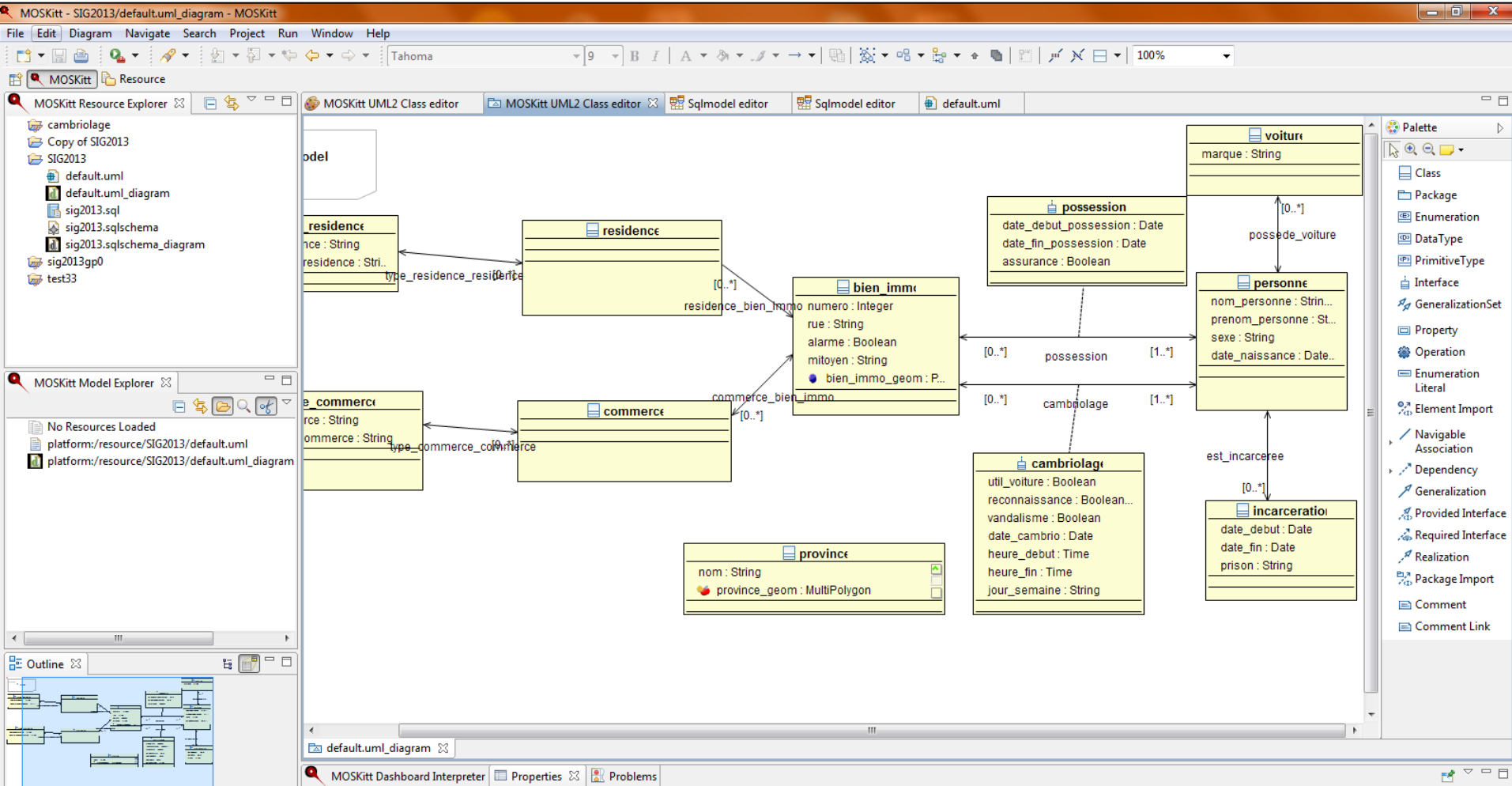
The screenshot shows a web browser window at `http://localhost/login.php` with the title "Université de Liège - portail interne". The page content includes:

- A dropdown menu for "Choisissez une table" with "categorie" selected and a "détails" button.
- A heading "Vérifier la disponibilité d'un véhicule."
- A "Sélectionnez une catégorie" dropdown menu.
- Form fields for "Date début:" with "Année 2010", "Mois janvier", and "Jour 1" selected.
- Form fields for "Date fin:" with "Année 2010", "Mois janvier", and "Jour 1" selected.
- A "vérifier" button.
- A heading "Etablir un nouveau contrat".
- A "Type de client" dropdown menu with "societe" selected.
- A heading "Période de contrat".
- Form fields for "Date début:" with "Année 2010", "Mois janvier", and "Jour 1" selected.
- Form fields for "Date fin:" with "Année 2010", "Mois janvier", and "Jour 1" selected.
- An "envoyer" button.

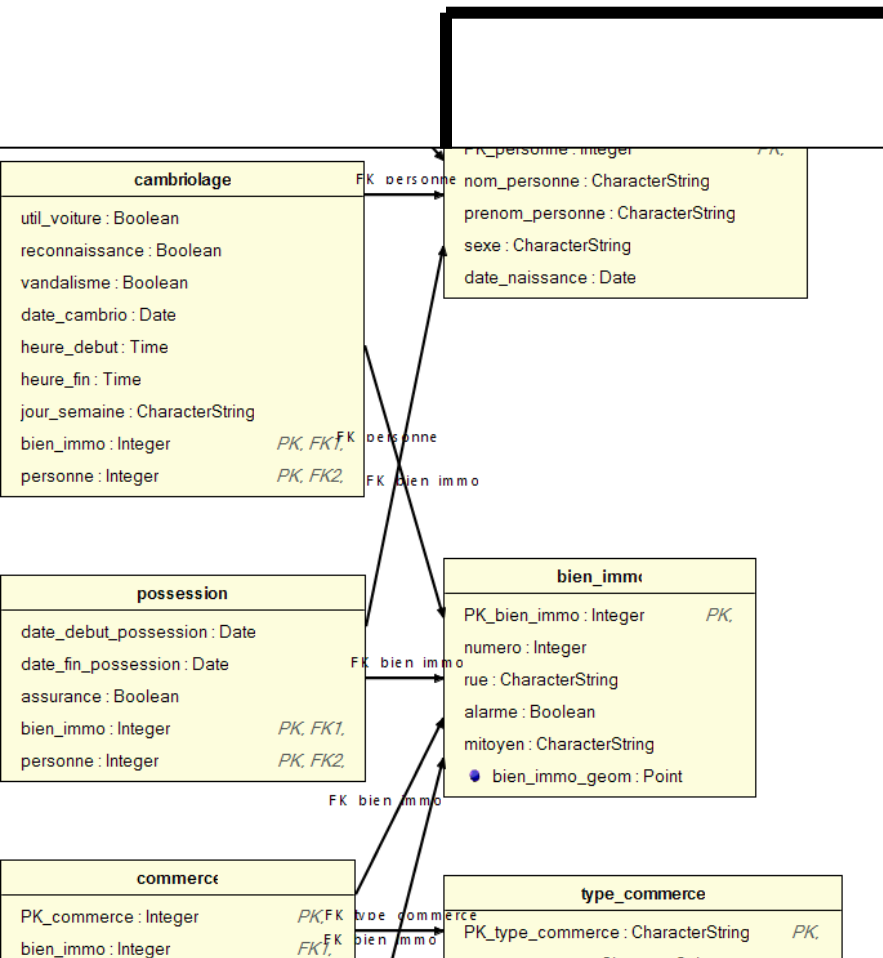
GIS

- **Main work (15h):**
 - **Conceptual modeling** of a spatial database
 - Extended UML language
 - **Implementation** of the GIS
 - CASE tools
 - **Data integration**
 - Data conversion, loading, metadata...
 - **GIS interface**
 - OS software (**MosKitt, PostGIS, GeoNetwork, Q-GIS...**)
 - Report (1 / pair of students)
- **Other works (15h):**
 - Spatial database applications: spatial index, requests, connectivity, etc.
 - Map algebra: formalism & macro modeler, decision wizard, multicriteria modeling

GIS main work: UML modeling (MosKitt)



GIS main work: SQL modeling (MosKitt)



```

/* Code generated for Postgre_8_2_4 with PostGis extension */

CREATE TABLE bien_immo(
  PK_bien_immo integer
  ,
  numero integer
  ,
  rue char
  ,
  alarme boolean
  ,
  mitoyen char
);

ALTER TABLE bien_immo
ADD CONSTRAINT PK_bien_immo PRIMARY KEY (PK_bien_immo);

CREATE TABLE commerce(
  PK_commerce integer
  ,
  bien_immo integer
  ,
  type_commerce varchar
);

ALTER TABLE commerce
ADD CONSTRAINT PK_commerce PRIMARY KEY (PK_commerce);
    
```

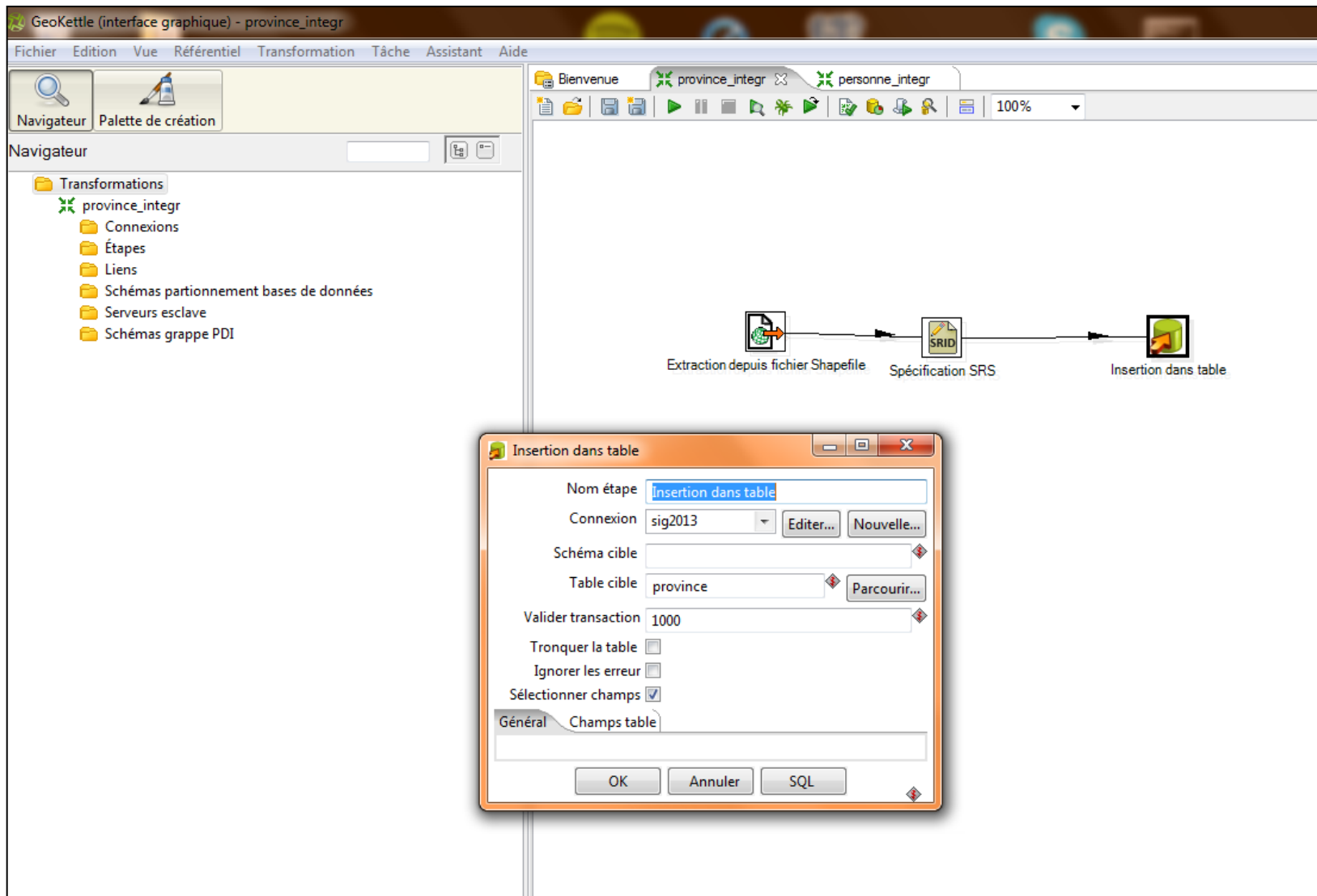
GIS main work: Database implementation and management (PostGIS)

The screenshot shows the QGIS Object Navigator window. On the left, a tree view displays the database structure under 'PostgreSQL 9.2 (localhost:5433)'. The 'Tables (12)' folder is expanded, showing a list of tables including 'bien_immo', 'cambriolage', 'commerce', 'incarceration', 'personne', 'possession', 'province', 'residence', 'spatial_ref_sys', 'type_commerce', 'type_residence', and 'voiture'. The 'bien_immo' table is selected. On the right, the 'Propriétés' tab is active, displaying a list of properties and their values for the selected table. Below this, the 'Panneau SQL' window shows the SQL code for creating the 'bien_immo' table.

Propriété	Valeur
Nom	bien_immo
OID	17785
Propriétaire	postgres
Tablespace	pg_default
ACL	
De type	
Clé primaire	pk_bien_immo
Lignes estimées	54
Facteur remplissage	
Lignes comptées	54
Hérite de tables	Non
Nombre de tables héritées	0
Non enregistré dans les journaux?	Non
Avec OID ?	Non
Table système ?	Non
Commentaires	

```
1  -- Table: bien_immo
2
3  -- DROP TABLE bien_immo;
4
5  CREATE TABLE bien_immo
6  (
7     pk_bien_immo integer NOT NULL,
8     numero integer,
9     rue character varying(100),
10    alarme boolean,
11    mitoyen character varying(100),
12    bien_immo_geom geometry(Point,31300),
13    CONSTRAINT pk_bien_immo PRIMARY KEY (pk_bien_immo)
14 )
15 WITH (
16     OIDS=FALSE
17 );
18 ALTER TABLE bien_immo
19     OWNER TO postgres;
```

GIS main work: data integration (GeoKettle)



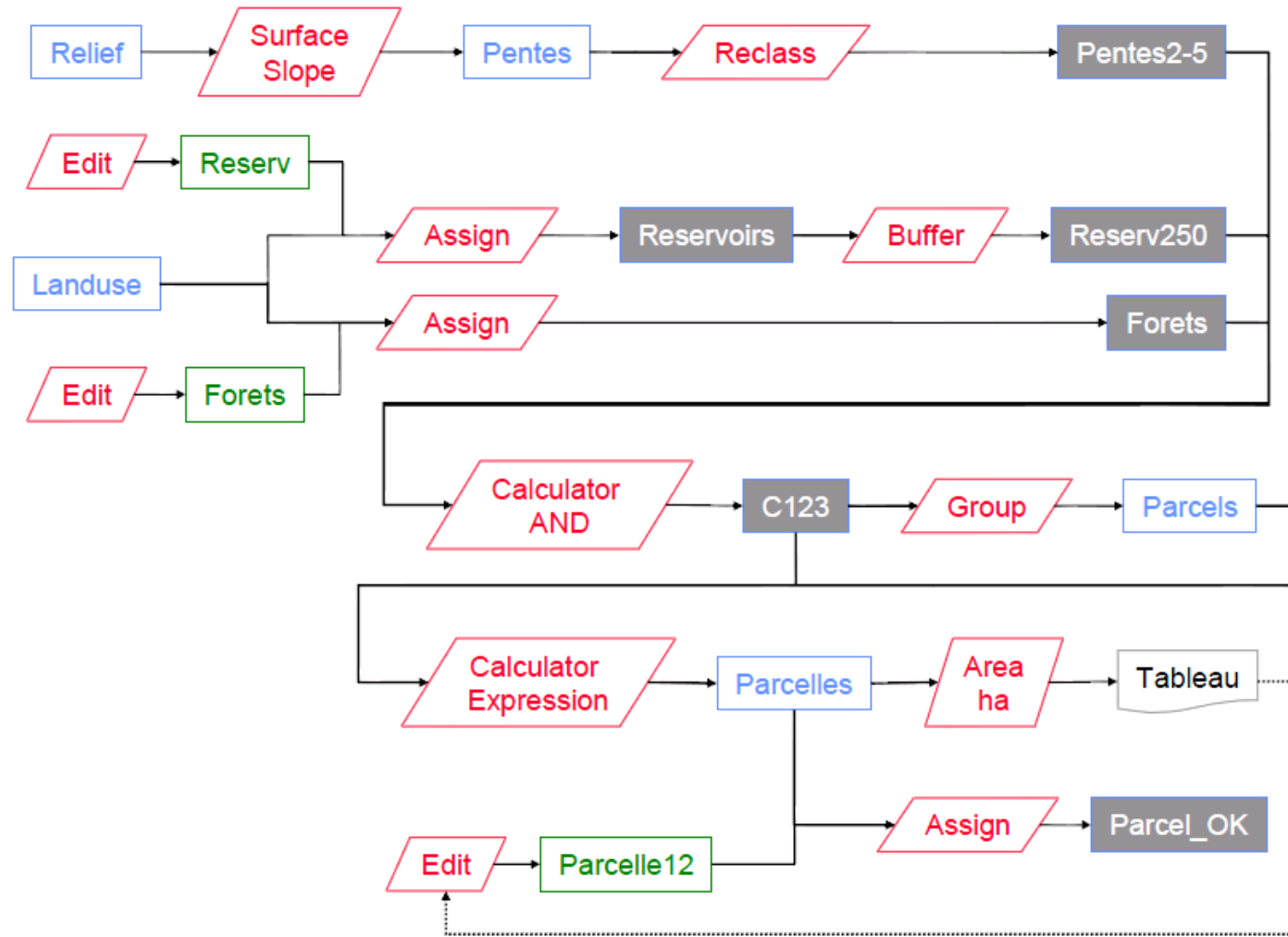
GIS main work: exploitation (OpenJump, PGAdmin)

The image shows two overlapping windows. The foreground window is PGAdmin, titled 'Query - cambriolage sur postgres@localhost : 5432 *'. It displays an SQL query in the 'Éditeur SQL' pane and its results in the 'Sortie de données' pane. The query counts the number of properties in each province of Belgium. The results table is as follows:

	polygone_nm character varying(80)	count bigint
1	LUXEMBOURG	1
2	HAINAUT	3
3	LI+GE	10
4	NAMUR	6

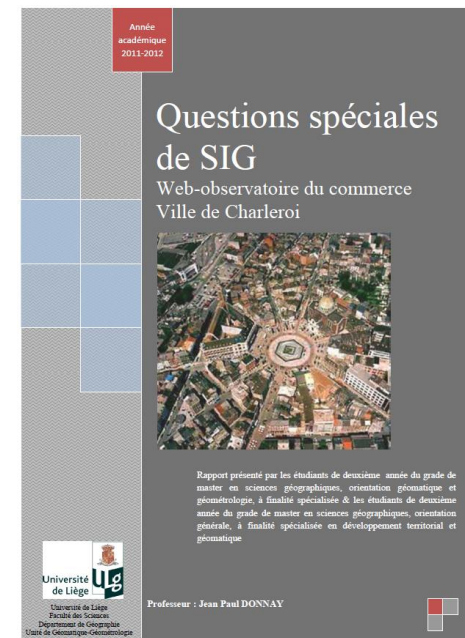
The background window is OpenJUMP, titled 'Projet 1'. It shows a map of Belgium with green polygons representing the provinces and red points representing the properties. The map interface includes a toolbar with various GIS tools and a legend on the left side.

GIS other works: raster decision support (Idrisi)



Special questions of GIS

- **Distributed GIS** : 3-tiers GIS architecture, GML (XML), Web services.
- **Project driven exercise:**
 - Prototype solution to meet an external demand (SPI, Charleroi, SEGEFA...)
 - All students participate in the solution, in total autonomy.
 - Project planning (PERT) and distribution of tasks (Gantt) under the responsibility of a team (pair) of project managers (*cf. Project management course*).
 - Still incorporates the implementation of a data server, a Web server, an application server; and building Web services and customized interfaces.
- PostGIS, Apache, MapServer, Q-GIS, Python, PHP (or other OS software)
- Oral presentation + report for the customer



Thank you for listening!

Questions?