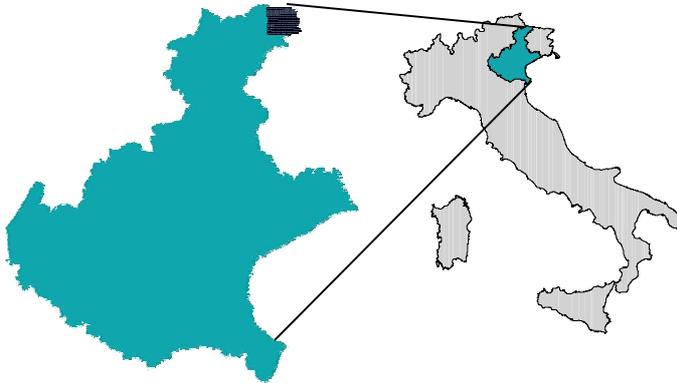


# VENETO REGION PILOT AREA

The pilot area is located in the north-east of Veneto region, located itself in the north-east of Italy. The area borders with Austria are in the northern part and run along high mountain peacks.



The pilot area has a square-shaped border in order to facilitate the description by 1 km<sup>2</sup> shaped pixels. It is 241 km<sup>2</sup> large (241 pixels). The altitude varies from 1000 m in the valleys to over 2600 m a.s.l. on the highest peaks.

The mean average temperature is around 0-3 °C at high altitudes, above the tree line (in the alpine belt,

1900-2000 m a.s.l.) and between 3 and 10 °C under the tree line, in the mountain belt. The total annual rainfall is about 900-1300 mm.

From a geological point of view the area shows two different environments: in the first one acid metamorphic rocks (phillite, schists) are very common, in the other one calcareous rocks are much more widespread (dolomite, marly limestone). Most of the area is covered by glacial deposits whose lithology depends on the material of the glacier's basin. The area is covered by natural vegetation, mostly by spruce (*Picea excelsa*) and silver fir (*Abies alba*) forests which are among the most productive of whole the region. Pasture is or has been also very widespread, particularly at high altitudes, above the tree line. Pasture has often influenced the development of soils which often appear with eroded surface horizons.

The main source of soil data of the area is the 1:250,000 scale soil map (fig.2).

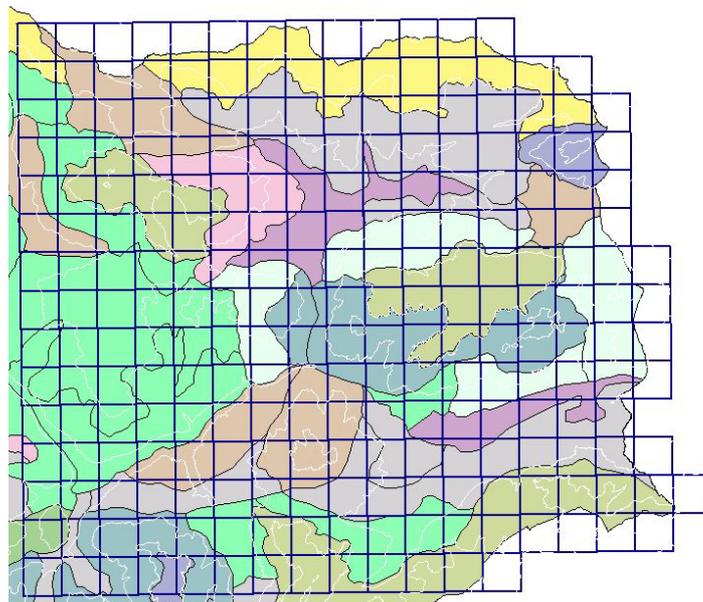


Fig.2: 1:250,000 soil map of Veneto Region (pilot area)

Metamorphic rocks are relatively weatherable so that soils which have been originated from acid metamorphic parent materials are moderately deep and also show some weak aluminium and iron sesquioxides traslocation. At higher altitudes, above the tree line, due to low temperatures and high precipitations, the most widespread soils are *Podzols*.

On dolomitic parent materials, soils are much shallower (*Leptosols*) since dolomite is a very hard rock which is difficult to weather. Soils are calcareous and have lots of rock fragments in the profile. Only on stable surfaces they can develop a *cambic* horizon (*Calcaric Cambisols*) or an *argic* one (*Luvisols*).

## GEOGRAPHICAL DATA CONVERSION

The ECALP PILOT AREA shapefile in ETRS\_LAEA grid has been converted into local geographical data. The projection file used is described below:

```
PROJCS["Monte_Mario_Rome_Italy_1",  
GEOGCS["GCS_Monte_Mario_Rome",DATUM["D_Monte_Mario",SPHEROID["International_1924",6378388.0,297.0]],  
PRIMEM["Rome",12.45233333333333],  
UNIT["Degree",0.0174532925199433]],  
PROJECTION["Transverse_Mercator"],  
PARAMETER["False_Easting",1500000.0],  
PARAMETER["False_Northing",0.0],  
PARAMETER["Central_Meridian",-3.452333333],  
PARAMETER["Scale_Factor",0.9996],  
PARAMETER["Latitude_Of_Origin",0.0],  
UNIT["Meter",1.0]]
```

Then an intersection of the 1 km grid (shp) and the mapping units of the 1:250,000 scale soil map of Veneto Region (shp) has been worked out. The result is the **UC\_retic shapefile**, the area of every pixel part.

## DOMINANT STU DESCRIPTION TABLE

(database table name: **ECALP\_DOMINANT\_STU**)

The table which contains data about which STU are present in the SMU and their percentage is **UC\_UTS**.

UC is the mapping unit (SMU), UTS is the Soil Typological Unit (STU).

The dominant STU in the pixel has been calculated by means of a series of 5 Access queries with the following steps:

- **Qpix1\_STU**: it calculates the percentage and the area of each STU of every SMU, in each part of pixel of the **shapefile UC\_retic**;
- **Qpix2\_stu\_aggr**: it calculates the total area of each STU in each pixel;
- **Qpix3\_maxsup**: it calculates total area of STUs in each pixel and chooses the maximum area of a STU in each pixel, but it doesn't specify which STU corresponds to that maximum area;
- **Qpix4\_STUmax**: it points out the STU which has the maximum area in the pixel;
- **Qpix5\_STUmax\_unique**: it calculates a unique result of dominant STU in the pixel taking the first STU when more than one have the same area in the pixel.

All attribute fields of the dominant STU description table have been filled up by means of updating queries, taking data from the Soil Typological Unit local database.

## PIXEL DESCRIPTION AND SOIL INDICATOR TABLE

(database table name: **ECAL\_PIXEL\_DESCRIPTION**)

All attributes linked to no soil have been filled up by means Corine Land Cover 2000 shapefile:

- SUR-BARE, (CLC codes 332, 335);

- SUR-URB, (CLC codes 1);
- W-BODY: (CLC codes 5).
- STU-TOT: it is calculated by summing up all STUs (from **Qpix3\_maxsup**) and subtracting all types of non-soil (SUR-BARE+ SUR-URB+ W-BODY) in each pixel. Only for border pixel STU-TOT+SUR-BARE+ SUR-URB+ W-BODY doesn't give 100%

## ORGANIC CARBON POOL

The table used to collect useful data to calculate OC content is the horizon table of the STU local database (UTS\_ORIZZONTI). It contains data about organic carbon contents (%), bulk density (g/cm<sup>3</sup>), rock fragments (% vol.) and horizon depths (cm) of all STUs.

The OC carbon pool (ton/ha) for different depths (30cm, 100cm and humus layers) has been calculated for every STU. The OC content in the pixel has been calculated as weighted average of every STU including non soil (OC = 0%) in the pixel.

A series of 4 Access queries and modules (*Primi30cm*, *Primi100cm*) has been set up for each depth:

- **Q1\_OC30\_hor:** it defines the horizons involved to get to the first 30 (or 100 cm, or holorganic layers), of every STU in every pixel. It calculates the amount of organic carbon for every horizon (ton/ha), up to 30 cm (or to 100 cm, or for holorganic layers) by multiplying [OC content]\*[bulk density], subtracting the volume occupied by rock fragments, in every horizon and converting the result into the right measure unit (ton/ha);
- **Q2\_OC30\_content:** it calculates the OC total content for the required depth (ton/ha).
- **Q3\_OC30\_STUpixel:** it calculates the OC content of every STU in the pixel, weighted by its extension in the pixel (ton/ha);
- **Q4\_OC30\_stupixelcontent:** it sums up the OC content of the STUs for the whole pixel;
- **Q5\_OC30\_pix:** it reduces OC content in the pixels in order to include non-soil areas, by weighting **Q4\_OC30(100, hum)** by STU-TOT (the actual coverage of STUs in the pixel).

For 100 cm depth and for humus layers, the process is similar and the queries have matching names

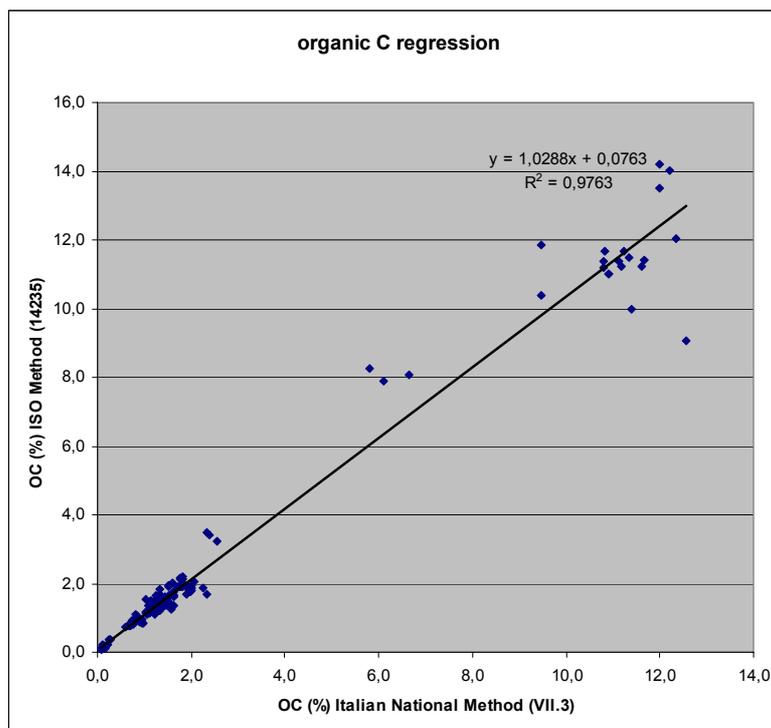
Organic Carbon values, obtained with the Italian National method (Walkley-Black, VII.3), have been converted into ISO method values (ISO-14235, Sprenger-Klee), through the following regression function.

$$y = 1.0288x + 0.0763, (R^2 = 0.9763)$$

where:

x= OC (%) Italian National method (VII.3)

y= OC (%) ISO method (ISO-14235)



## SOIL LOSS

Soil loss has been calculated using CORINE EROSION, a qualitative model. The parameters required are soil ERODIBILITY, climate EROSIVITY, LAND COVER and SLOPE.

Soil ERODIBILITY (**e\_erod\_cl**) has been calculated for every STU of the pixel by means of:

- **surface texture class (FIELD: e\_tex\_cl):** surface horizon clay and sand values have been converted into CORINE EROSION classes. Horizon texture classes with more than 5% Organic Carbon content have been lowered by one unit;
- **soil depth (FIELD: e\_depth\_cl);**
- **soil stoniness (FIELD: e\_stones\_cl):** calculated as rock fragment content of the surface horizons.

Climate EROSIVITY (**erosivity\_cl**) has been calculated for every pixel by intersecting two climate indexes:

- **Fournier index (FIELD: e\_mfi\_cl):** always class 3 in the area;
- **Bagnouls-Gausson Index (FIELD: e\_bgi\_cl):** always class 1 in the area.

LAND COVER (**e\_soilcover\_cl**): by means of a series of 3 queries which use Corine Land Cover 2000: each part of each pixel, obtained by crossing the 1km grid with the Corine Land Cover shapefile (CLC\_retic), has been given a CLC code. The pixel class has been calculated as weighted averages of all land covers and non-soil classes which occur in the pixel.

Class 1 never occurs because there are no agricultural soils. Most of the pixels have class 0.5 (well covered by permanent vegetation), class 0 is due to non soil areas.

SLOPE has been calculated as average slope of the pixel (by means of DEM with 10 m pixels).

CORINE EROSION class has been defined for every pixel, by means of a series of 4 Access queries:

- **QE1\_STU:** it defines the extension of every STU of every SMU in the pixel;
- **QE2\_STU\_aggr:** it calculates the total area of each STU in the pixel;
- **QE3\_ASER\_stu:** it calculates CORINE EROSION value (ASER) of each STU, converting the index into quantitative classes (ton/ha);
- **QE4\_stutonha** it calculates the erosion (ton/ha) for each STU in the pixel;
- **QE5\_tonsum:** it calculates the erosion (ton/ha) for each pixel, considering only soil coverage
- **QE6\_ton\_pix:** it reduces eroision values in the pixels in order to include non-soil areas, by weighting **QE5\_tonsum** by STU-TOT (the actual coverage of STUs in the pixel).

Erosion classes used are:

CORINE index		ton/ha
0	None or very low	0-2
1	Low	2-10
2	Moderate	10-40
3	High	>40

For the conversion from CORINE EROSION Index values (ASER) to ton/ha values the following function has been worked out:

$$y = 2.6667x^3 - 5x^2 + 4.3333x$$

where:

x= Corine Erosion ASER (Actual Erosion Risk) values

y= ton/ha

