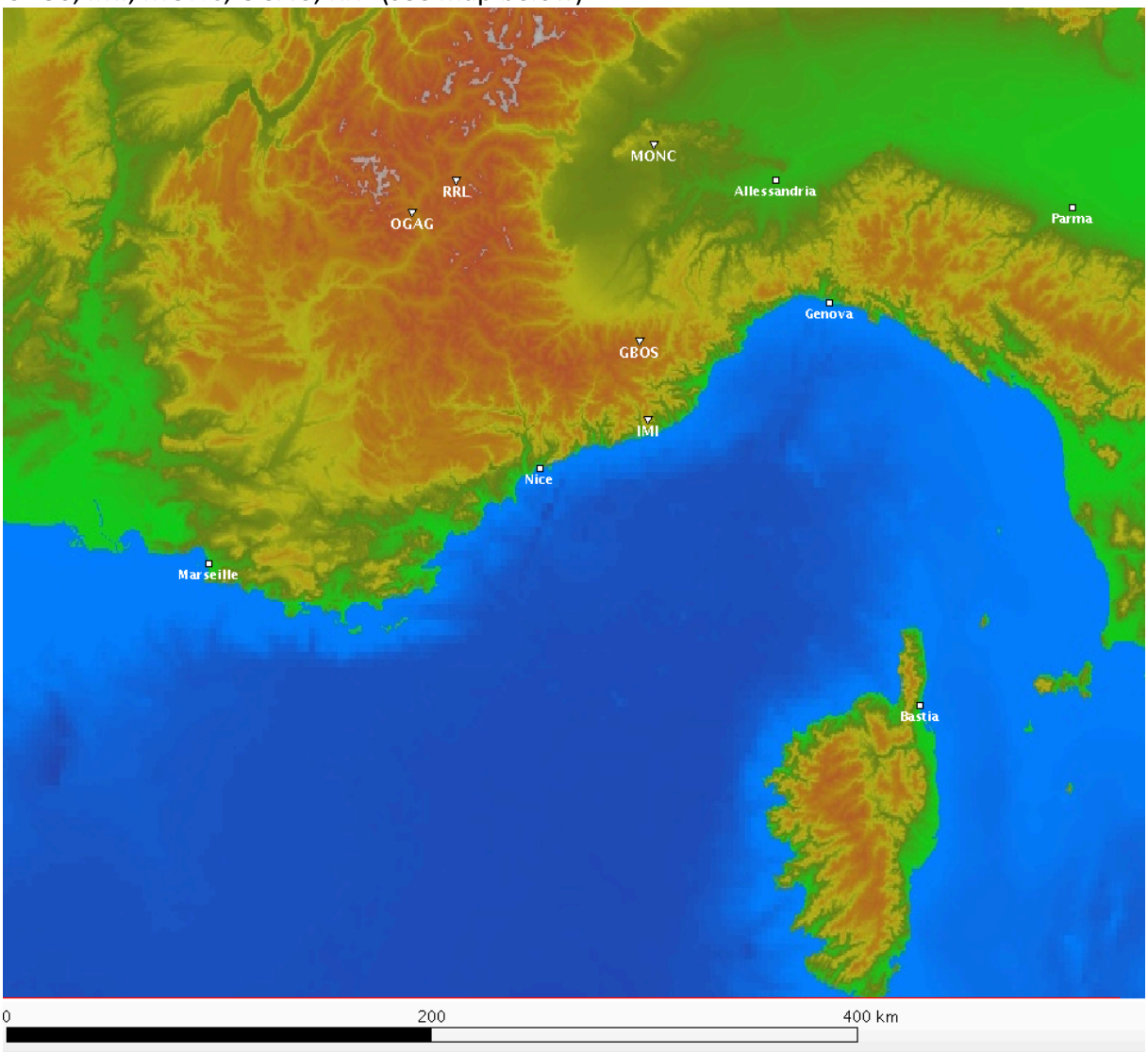
**Part 1 : Tracking the seismic source !**

An earthquake occured in North Italy (close to Torino) in 2018, March 27th
We have some records (seismograms) from local seismic stations:
GBOS, IMI, MONC, OGAG, RRL (see map below)



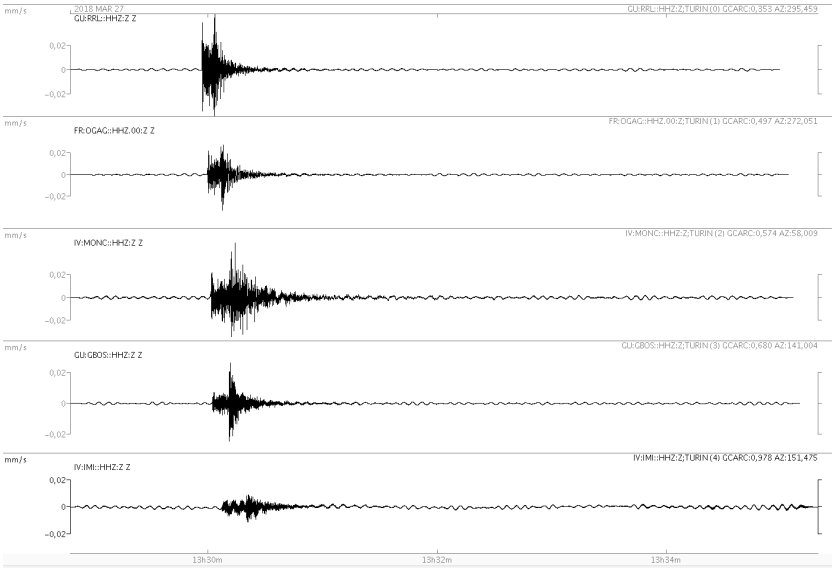

How can we localize the earth quake epicentre using these seismic data ?

On USB device > SESSION 4
Open file *SeisGram2K80.jar* > then choose the language (*Outils > langue Italien*), then open seismograms to study (*File > selezzione file*) … choose the seismograms found in the folder 'RESEARCH SENSORS', select only Z component data files (vertical ground motion) for the seismic stations GBOS, IMI, RRL, OGAG, MONC

Begin study by :
Synchronize records : *Visualizza > Alinea con… sincronizza*
Block alignement : > *verrouiller alignement*,
Filter data to keep only body seismic waves : *Filtri data (min:1Hz – max:5 Hz)*
Amplitude scale to fix at 0,02 mm/s for example

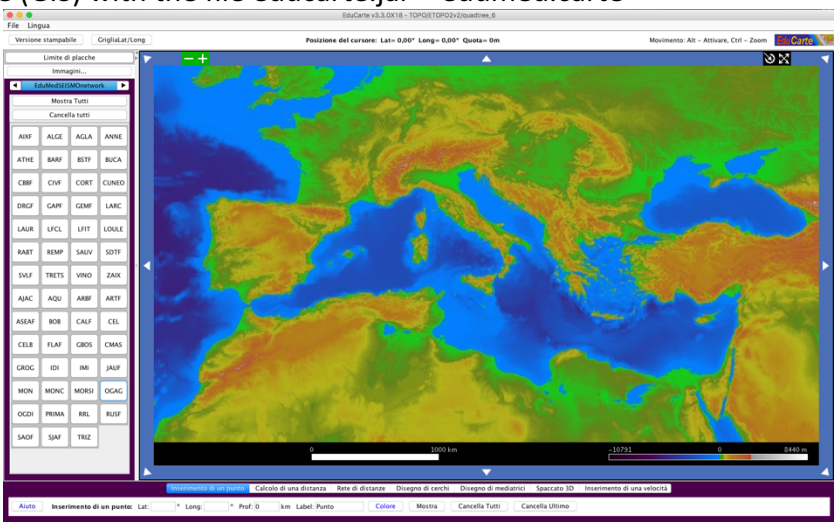
First analyse: arrival time, amplitude …..

Ranking stations according the distance station to earthquake : *Ordina par … GCARG*




We need now a map to plot seismic stations and to find epicentre

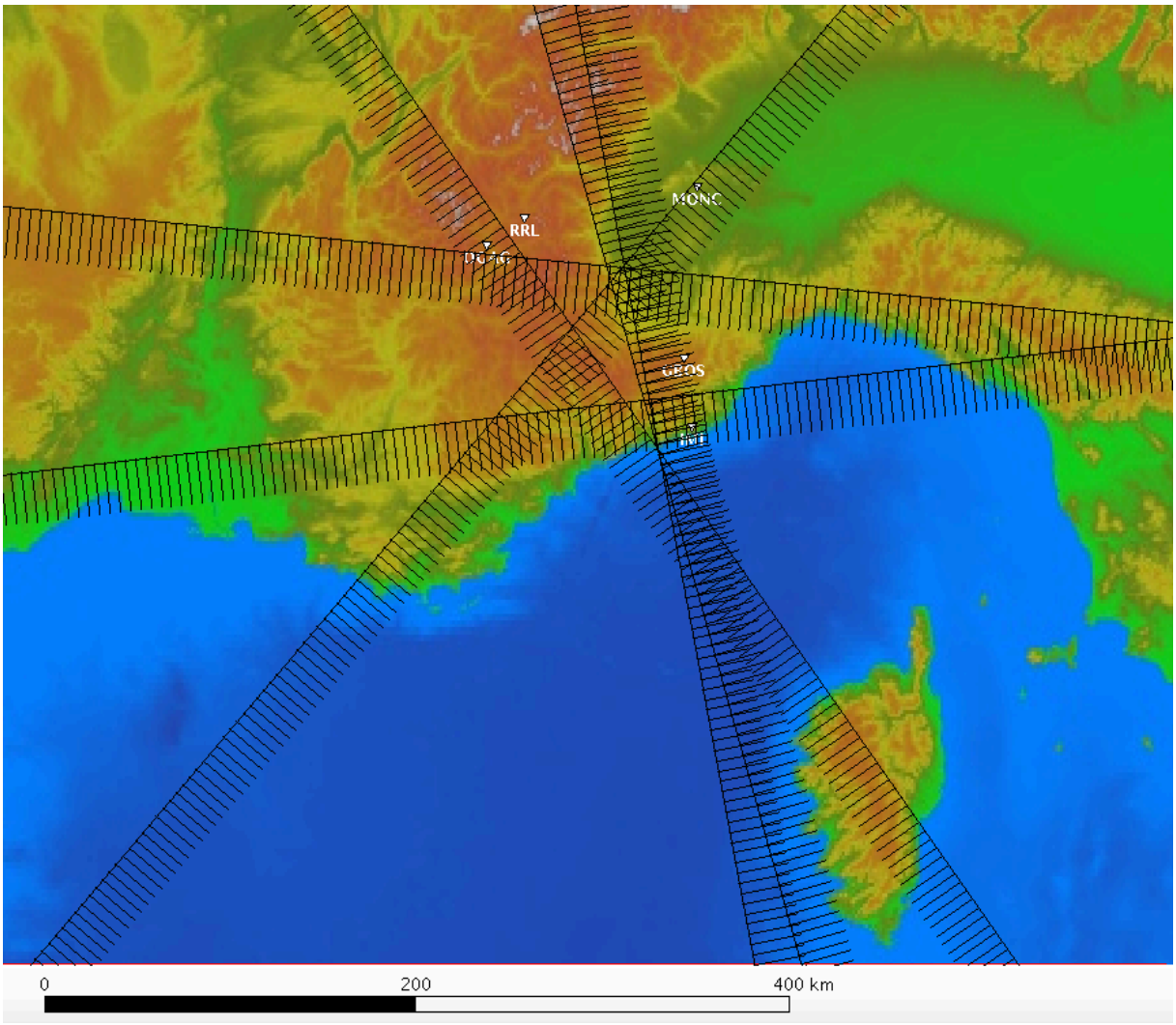
On USB key > SESSION 4
Open EduCarte (GIS) with the file educarte.jar > edumed.carte



In the centre, the map where selected data will appear, on the left database available, below various tools to analyse data.

On the left list, select seismic stations (EduMedSEISMOnetwork)
Make a zoom on the study area
As we know the relative distance between stations and epicentre, we can use the tool '*disegno di mediatrici*' to determine the epicentre area.

First result :




As we can see, epicentre area is not precise enough. We need more data !
In this area, a school (licea scientifico Cuneo) has a seismometer, and the seismic event was recorded …

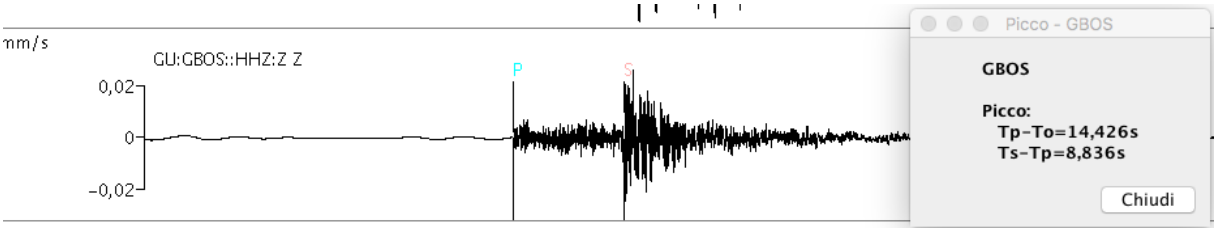
Back to SeisGram2K80 > open seismogram for CUNEO station (in EDUCATION-SENSORS) folder. CUNEO is between RRL and OGAG … we can add more bisectors. On our map !

Earthquake was localised by the researchers' community with the following references :
2018 March 27th, Longitude : 44.7 ,Latitude : 7.24 ,Depth : 11 kms

Plot this point on the map : '*inserimento di un punto*' …… the epicentre seems OK for you ??

**Part 2 : The race of the seismic waves !**

Back to the seismograms.
Pick the arrival time of the body waves at GBOS station : 'Picco' … the delay between P and S waves is about 8-9 seconds




If we have a good waves speed model for geological area, we can convert P-S delay in a distance. Try to determine epicentral distance for GBOS using only P-S delay : 'hodochrone'

Discussion :

For each seismogram, you can also get the right epicentral distance using 'info sismogramma ' … so we can evaluate the P waves propagation speed in the Earth.

Complete the table with seismogram information (on SeisGran2K)

| Station | Ts-Tp | Distance (km) | Tp-To (s) | V P (km/s) |
|---|---|---|---|---|
| RRL | | | | |
| OGAG | | | | |
| MONC | | | | |
| GBOS | | | | |
| IMI | | | | |
| MORSI | | | | |

Analyse, hypothesis, interpretation

It is time to propose a hands-on activity to understand the various P waves speeds !

Experiment : Modelling seismic waves propagation in various material.

Material : EXAO-EduMed-kit-sensors and software (on USB key)

Experiment :
Install the experiment with sensors connected to a computer. Install sensors drivers on the computer.

Schema of the experiment:

| |
|---|
| |

Results:

| Material | Distance between sensors | Delay between sensors | Waves speed | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

**Find this resource on EduMed web site :**
**http://edumed.unice.fr/fr/contents/files/teachers-room/ecole-terrain/school-Insegnaci-etna-2018.html**