

Polish activities at Sos Enattos: past and plans for the future

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**European
Funds**
Smart Growth



**Foundation for
Polish Science**

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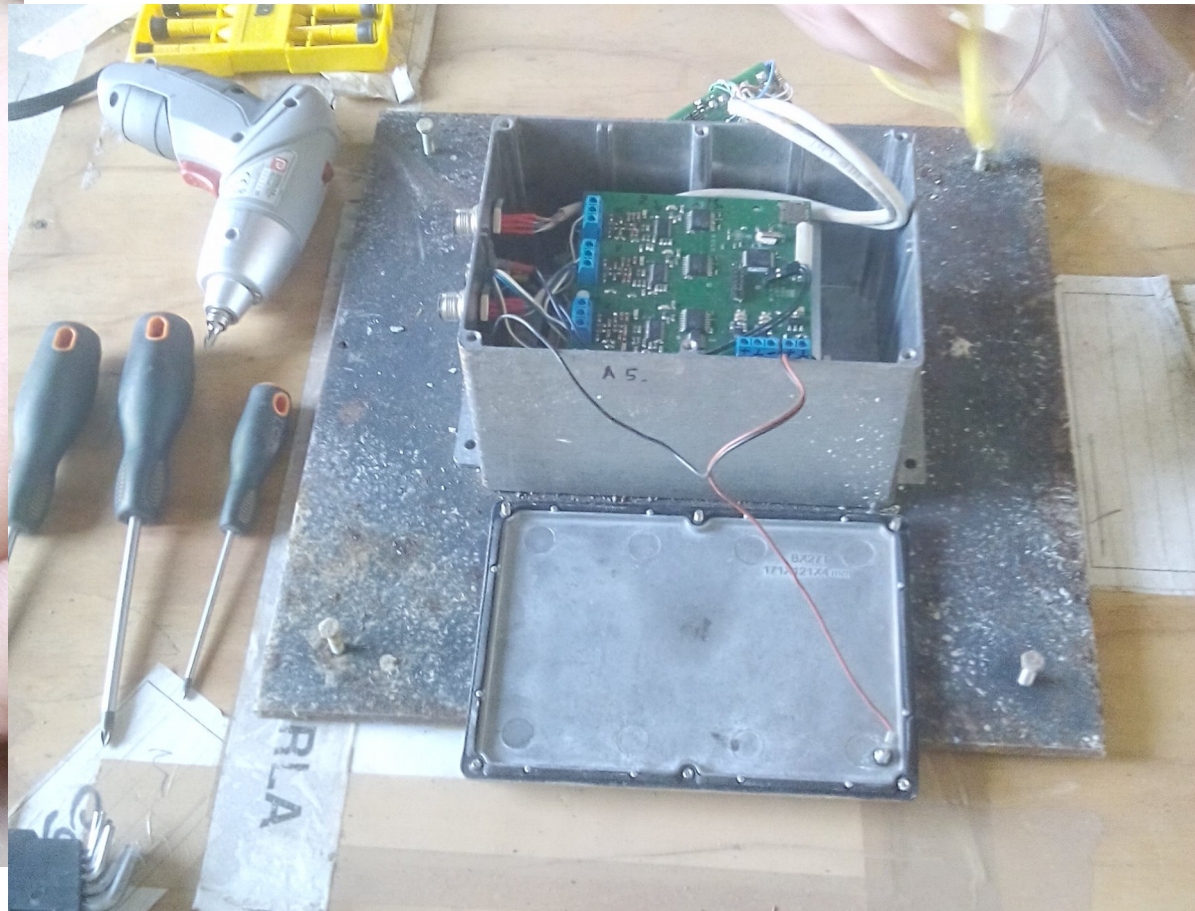
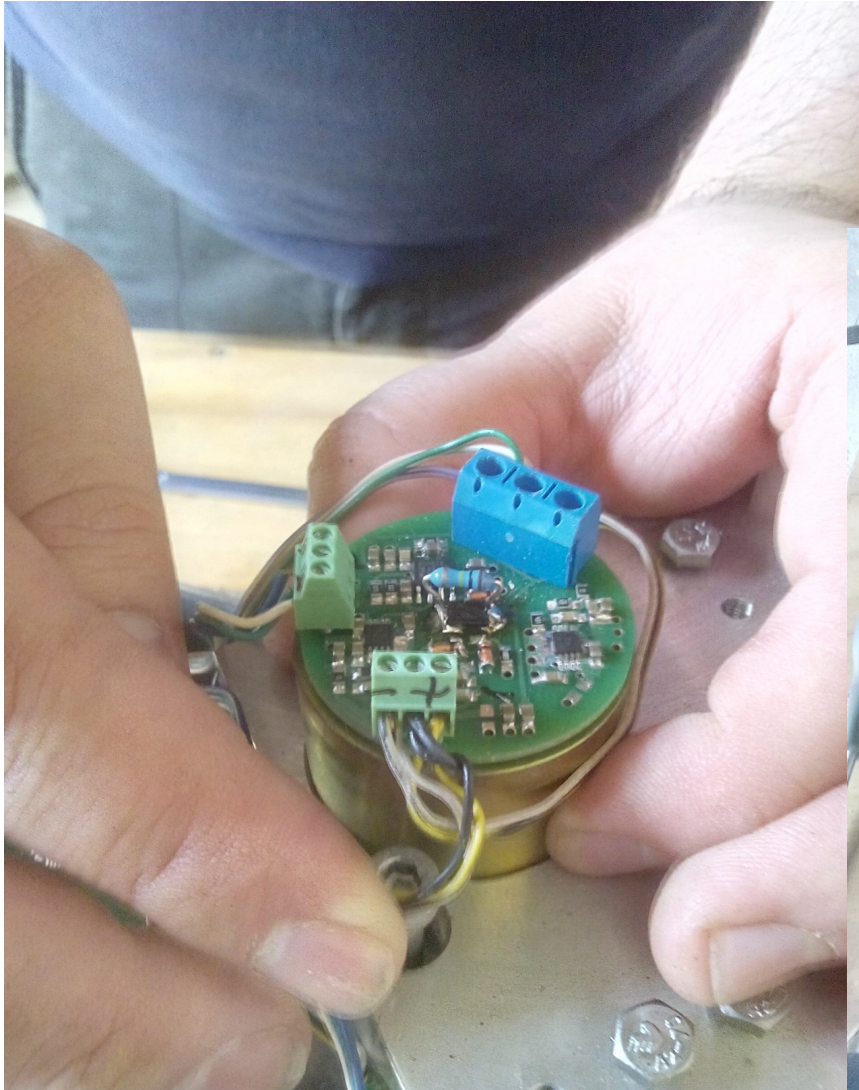
The idea

- Design and build low cost seismic sensors
- Make them work with time synchronisation
- Deploy them at candidate sites
- Gather as much data as possible
- Characterize and compare sites

The sensor

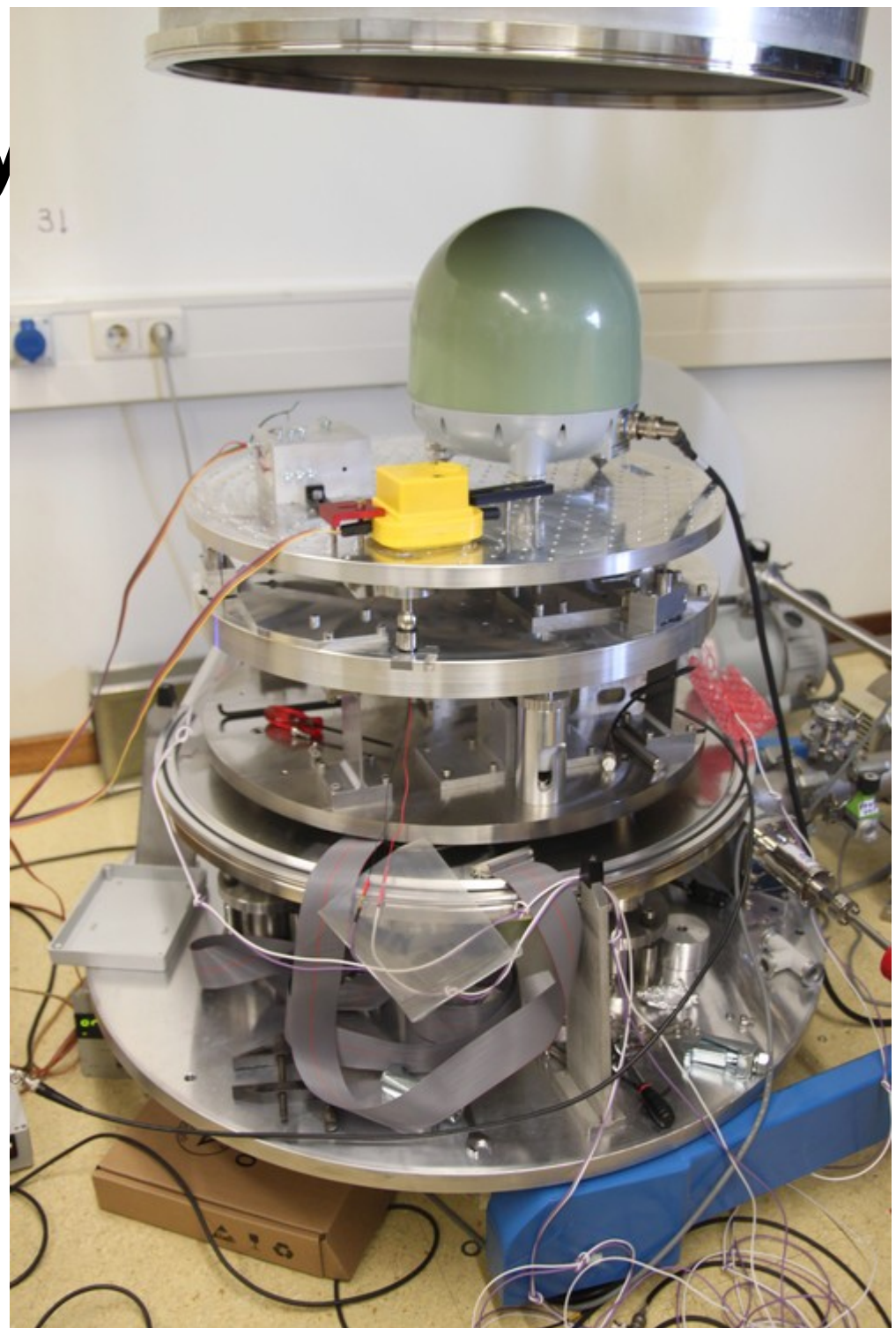
- Based on 2.5 Hz geophones
- Custom electronics
- Connected in series for data acquisition and time synchronisation
- Data gathered to a PC and also on SD cards in each sensor

Seismic sensors

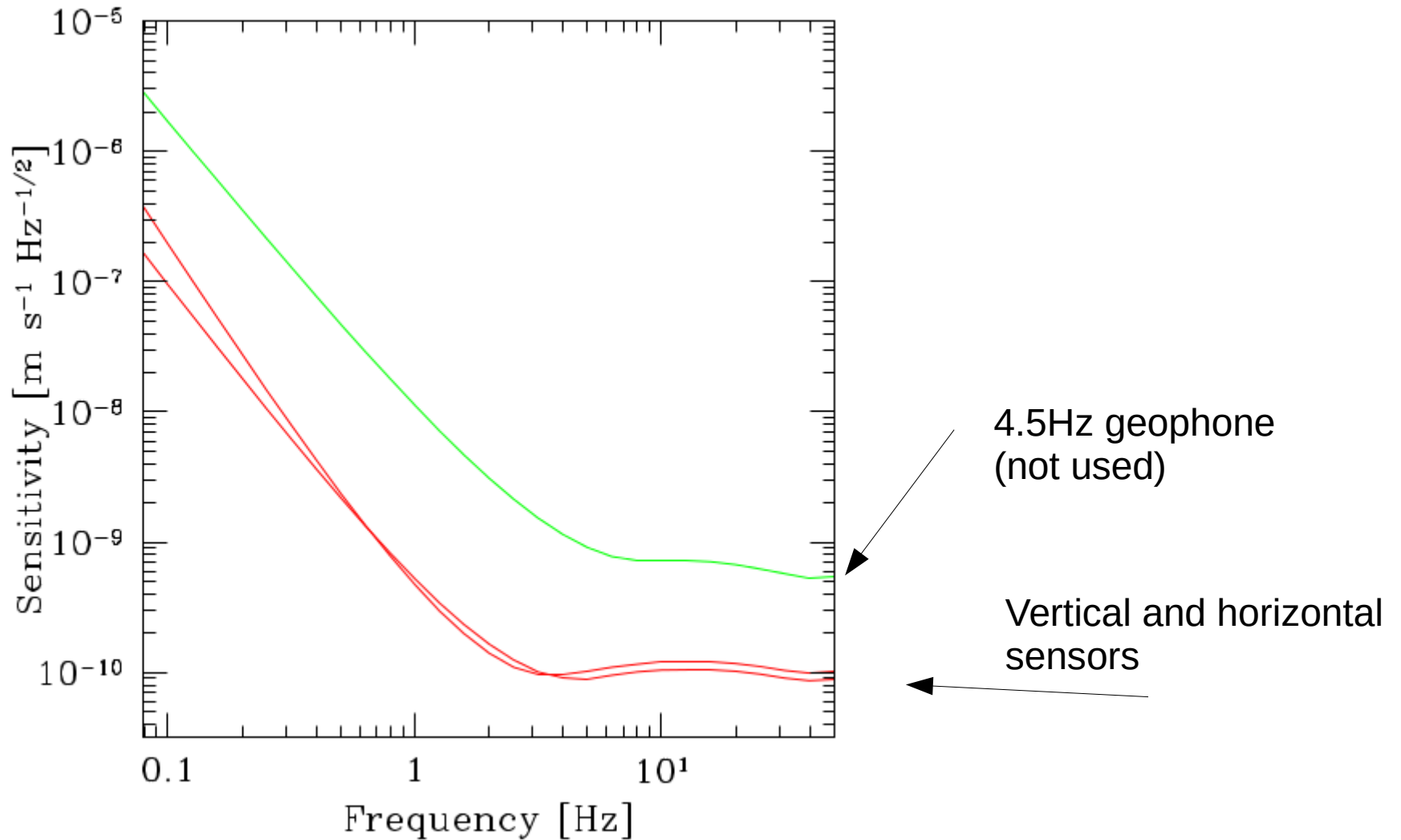


Sensitivity study

- Cross calibration with a Trillium detector at NIKHEF
- Noise measurement in a seismically isolated vacuum chamber at NIKHEF



Sensitivity estimate

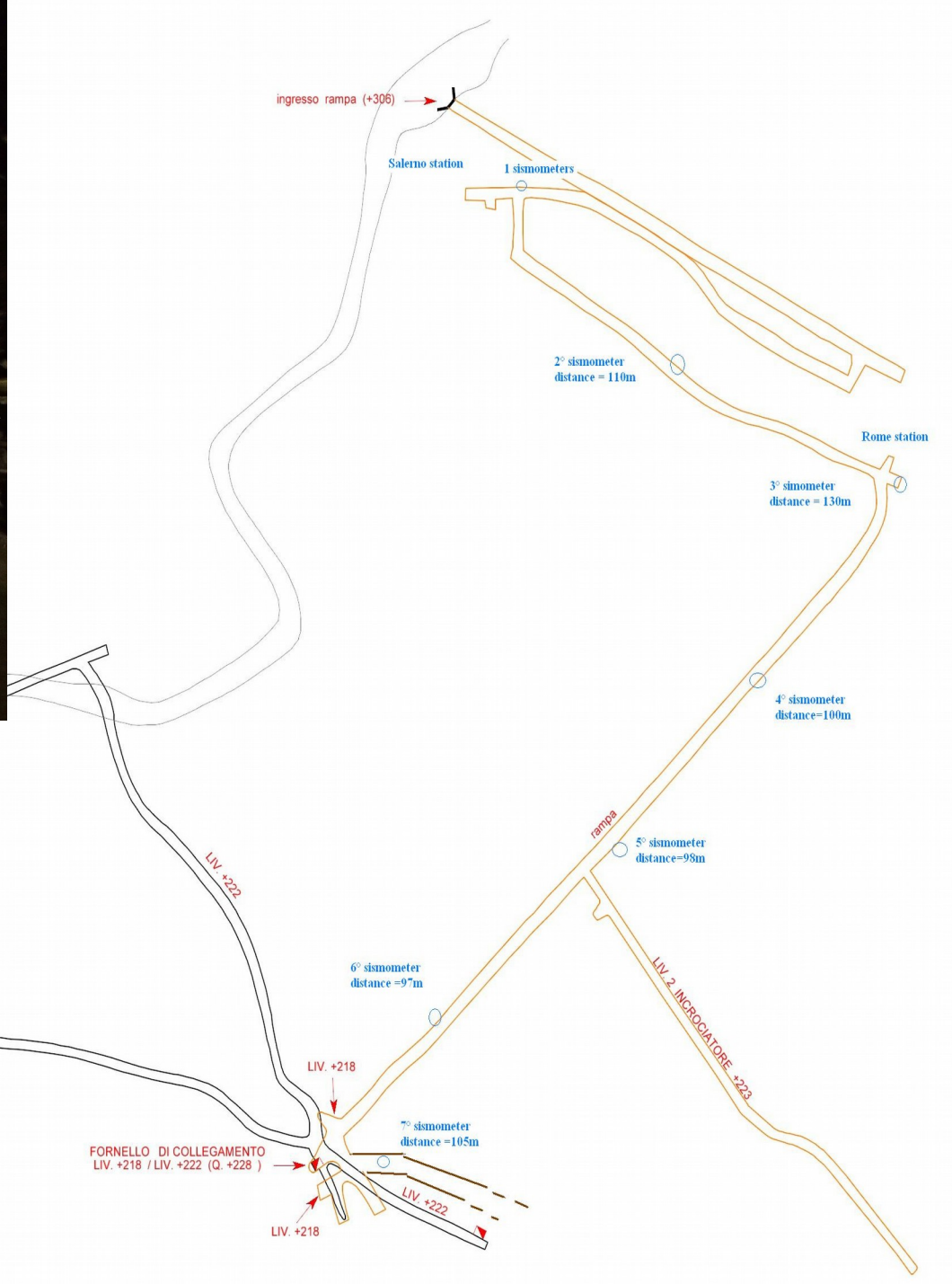


Locations

- Książ Castle – south-western Poland, testing facility
- Matra mine – Hungary
- Sos Enattos mine – Sardinia, Italy
- Canfranc Underground Laboratory, Spain

Son Enattos mine





Data acquisition

- Amount of data accumulated:
- Ksiaz – 4150 h
- Hungary – 20078 h and more
- Sardinia - 4358 h
- Spain – 4227 h and more

Available <http://foka.ise.pw.edu.pl/aspera/>

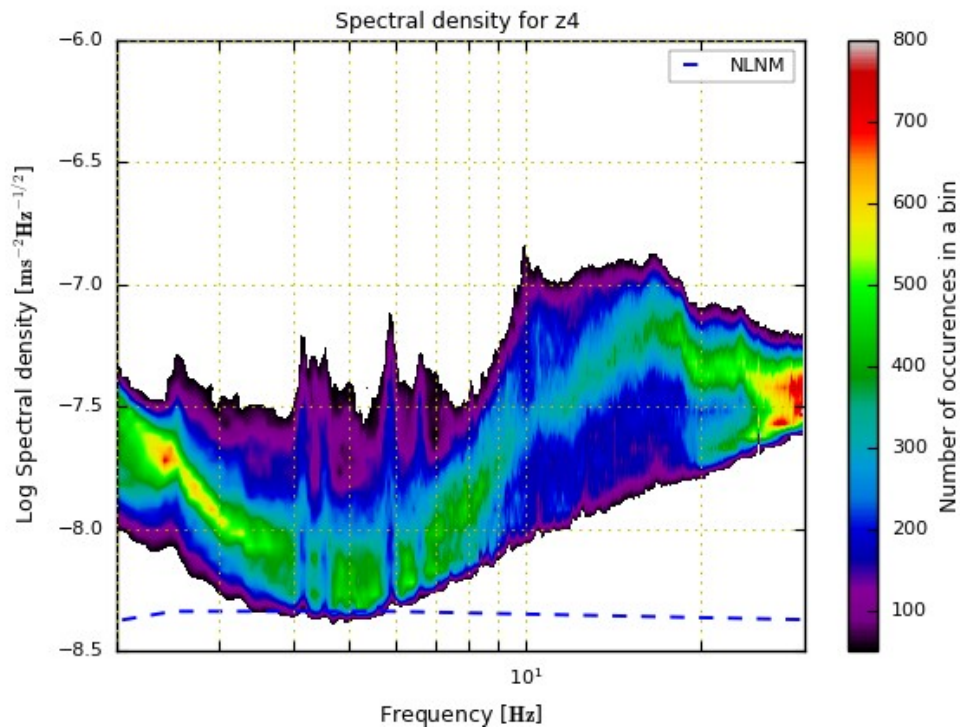
Data analysis

- Seismic spectra
 - Daily variability
 - Range
- Quake analysis

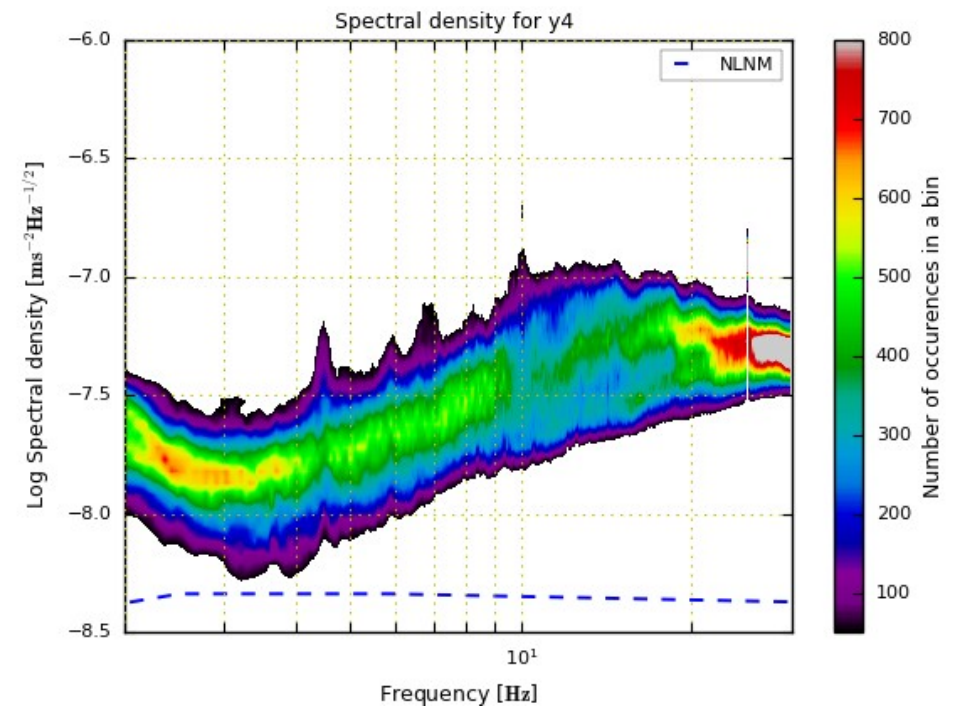
Sos Enattos - spectra

- 7 sensors, 3 axis each
- 1 sensor on the surface

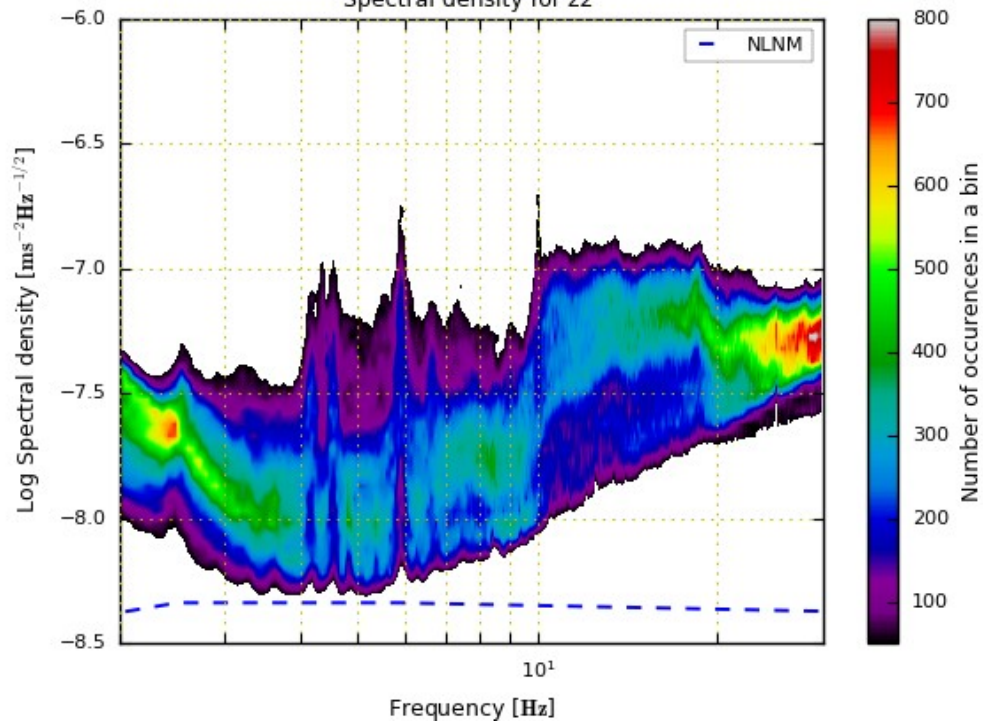
Vertical acceleration spectrum



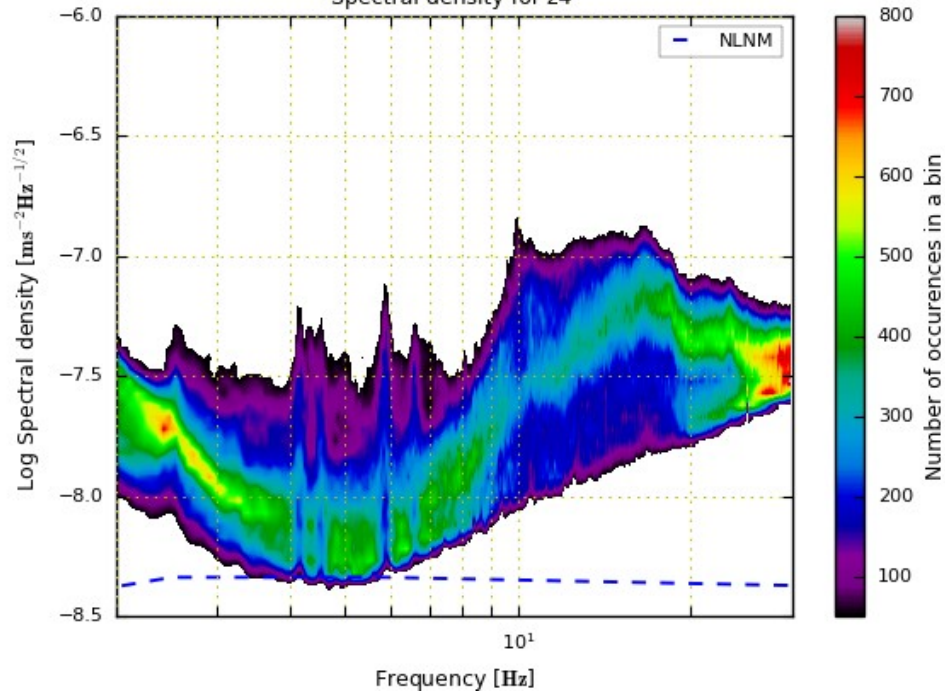
Horizontal acceleration spectrum



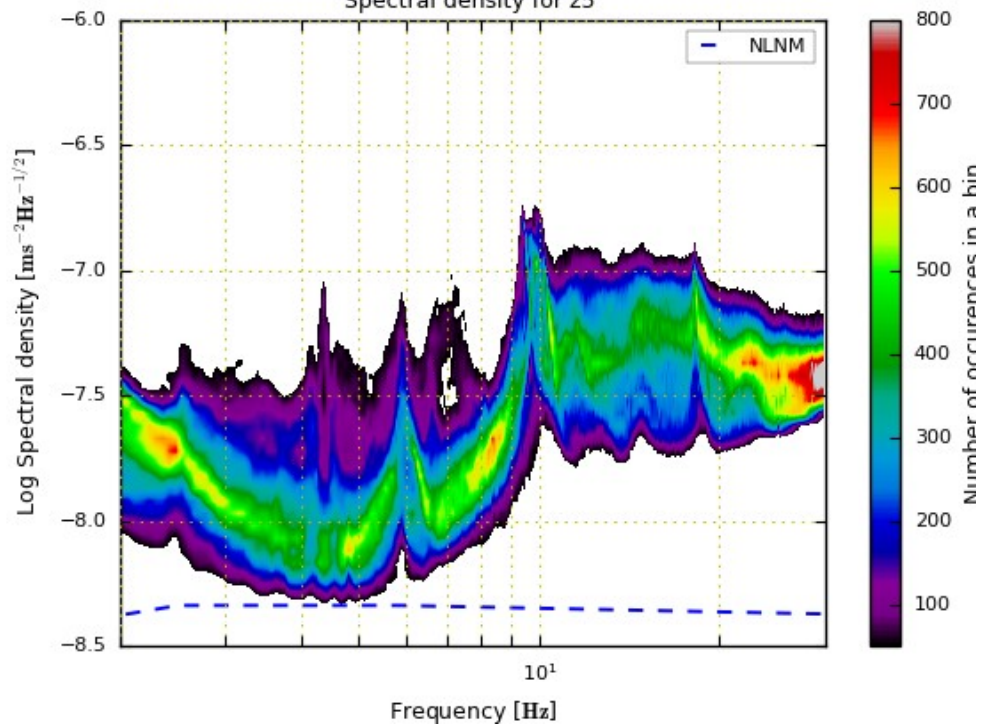
Spectral density for z2



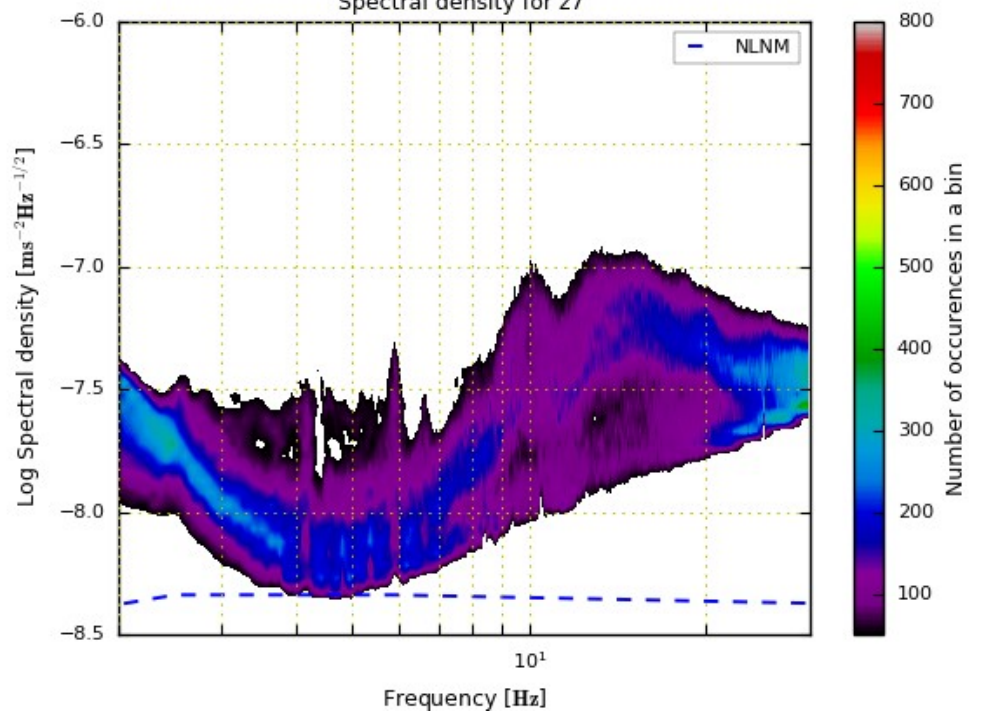
Spectral density for z4



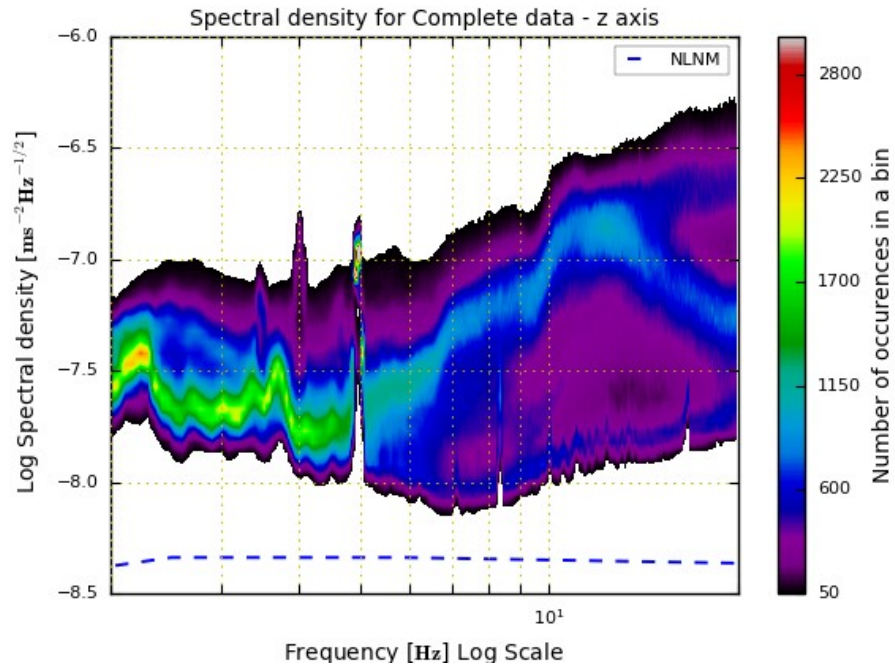
Spectral density for z5



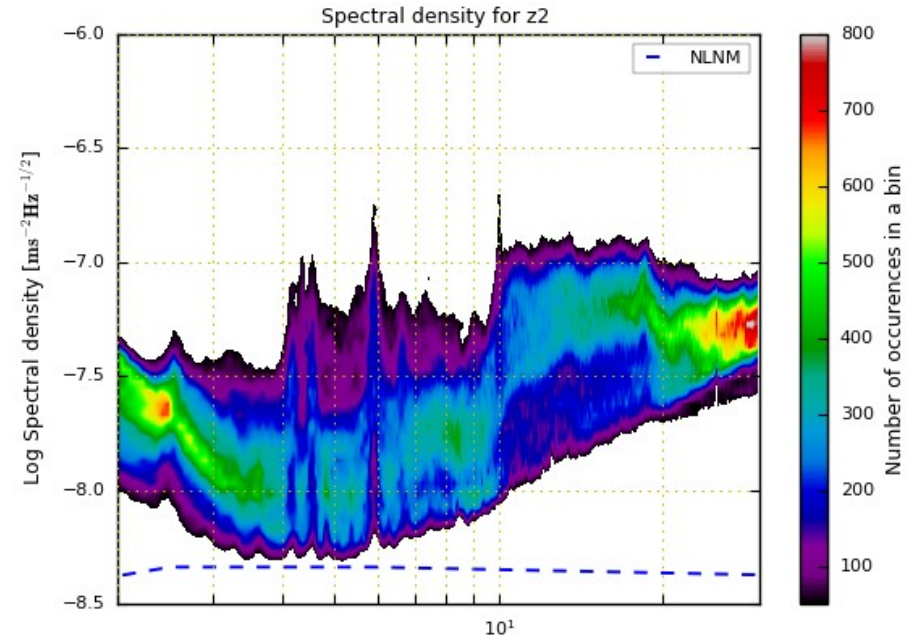
Spectral density for z7



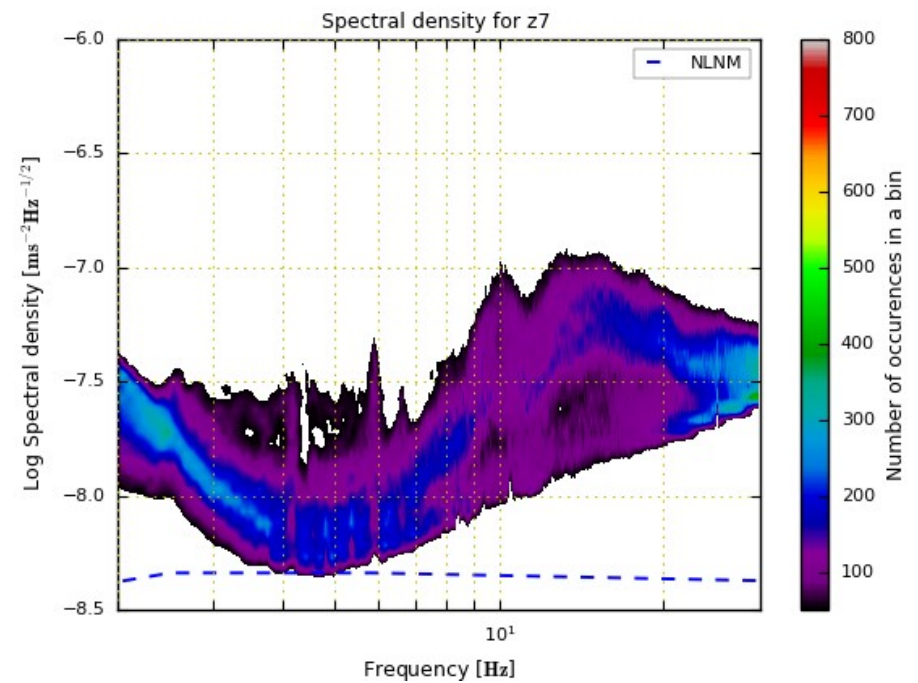
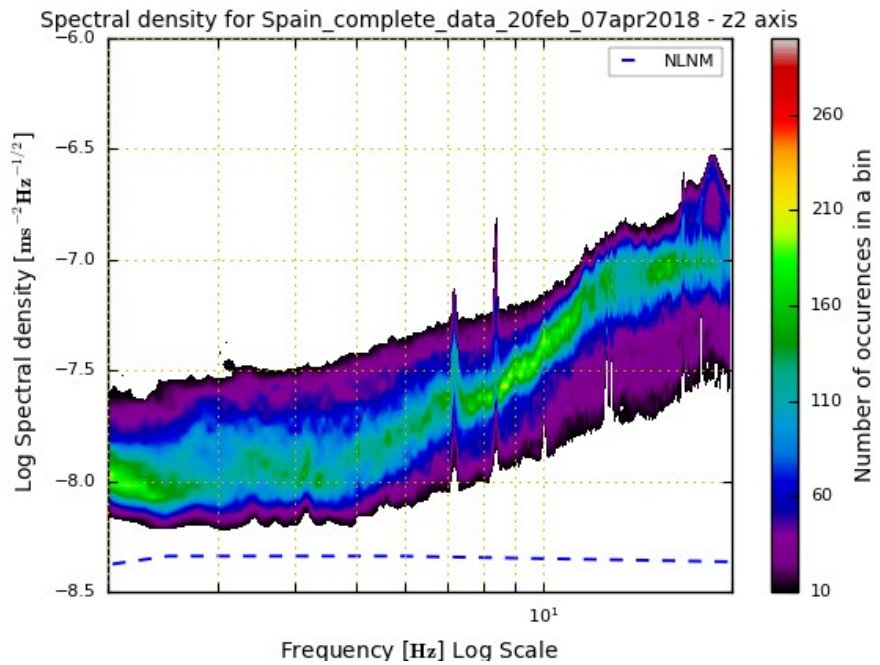
Matra



Sos Enattos



Canfranc

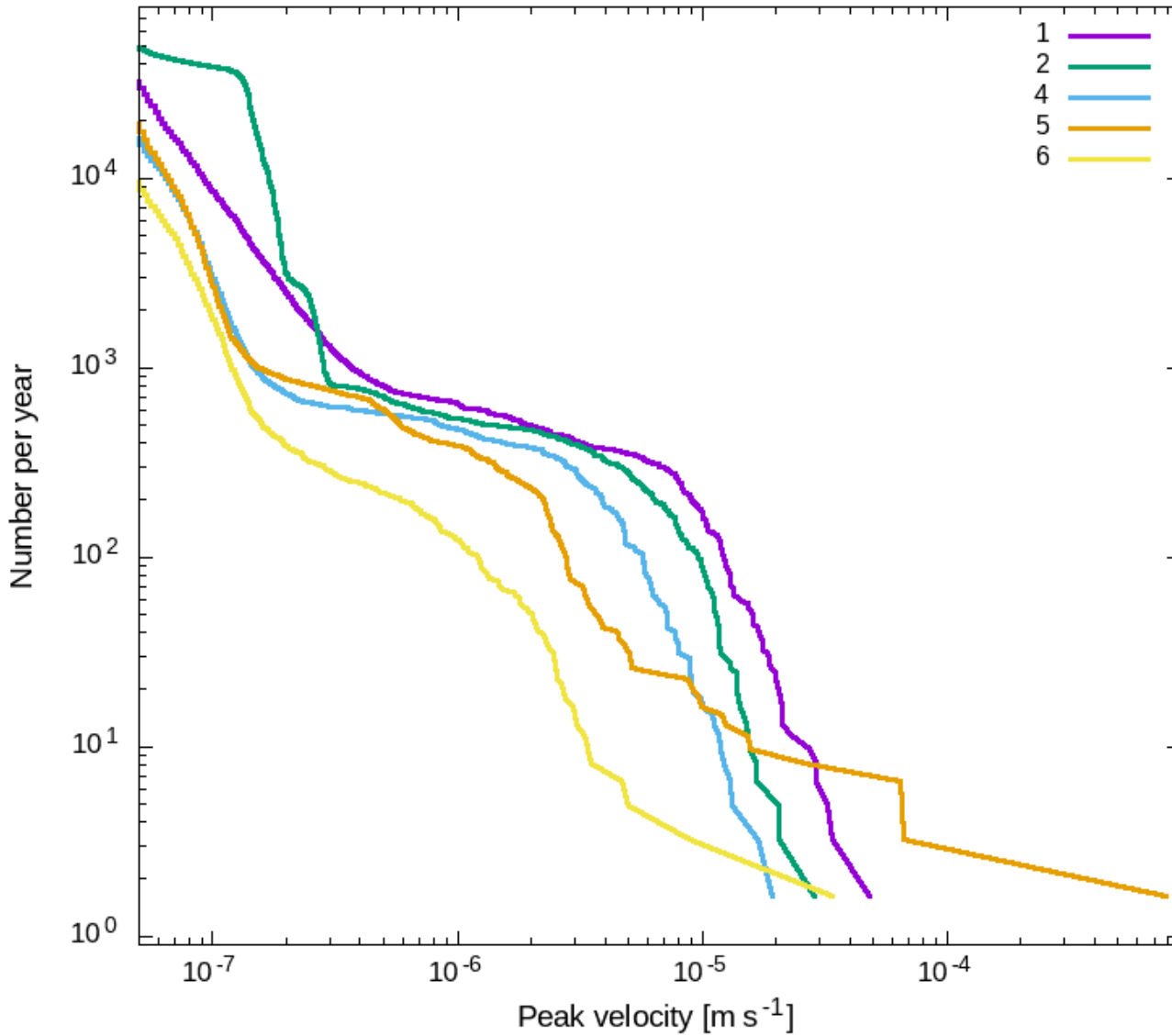


Earthquake analysis

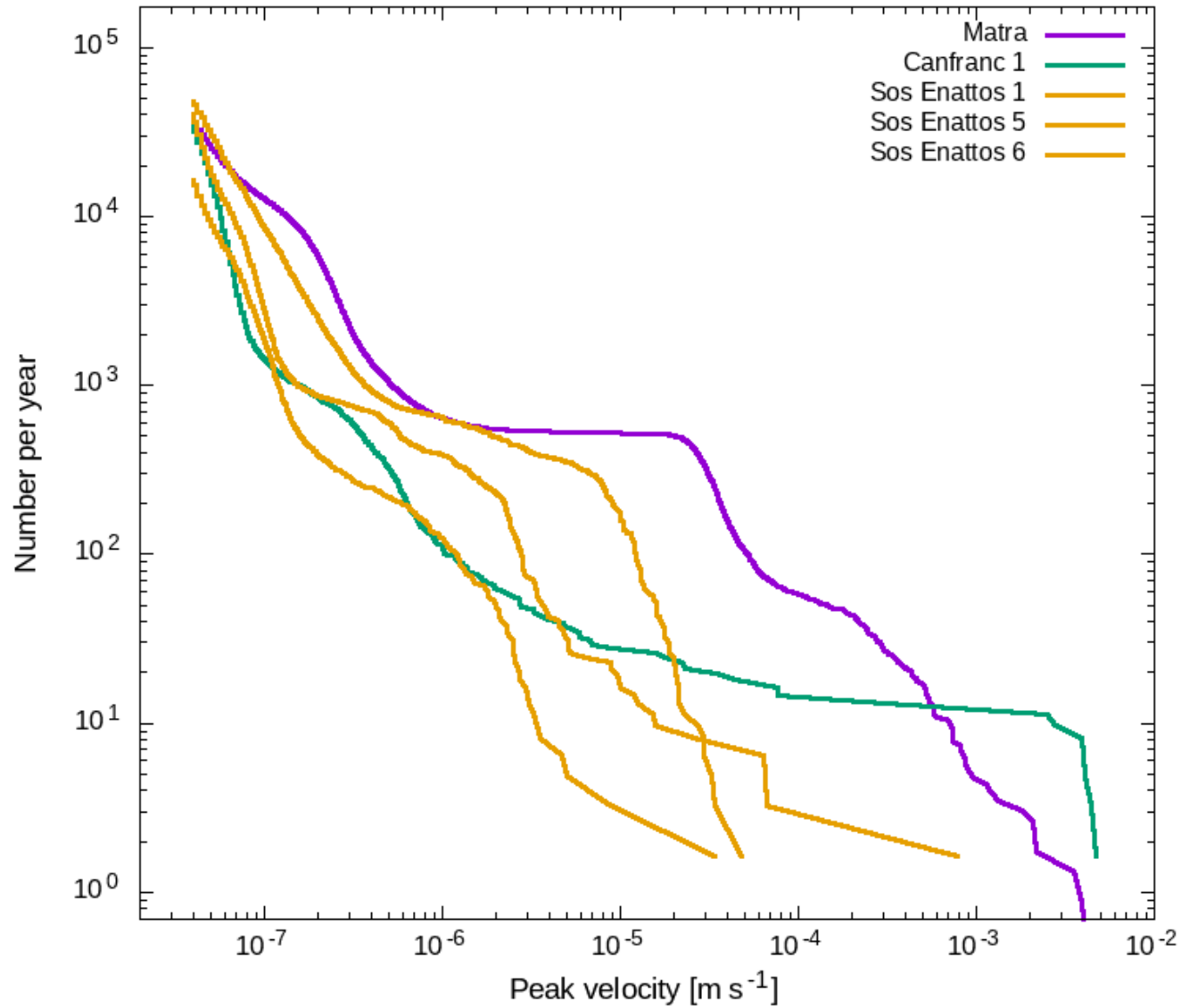
- Analyze 1 sec pieces of data
- Look for maxima in 3d velocity in each segment
- Define earthquake as segment with maximum above 0.5 micrometer/s
- Define earthquake as a set of such segments followed by at least one minute quiet time
- Find list of events for each site

Sos Enattos

Sos Enattos earthquakes



Site comparison



Other considerations

- Environment:
 - Underground humidity
humidity, chemistry
 - Forms of life: rodents



What next?

- Seismic studies:
 - Small dense array underground
 - Characterization on the surface with networks of sensors
- Infrasound monitoring
 - Underground, microphone network
 - On the ground studies?

Conclusion

- We are happy to continue our studies and contribute
- Apart from seismic studies we offer infrasound monitoring
- Wpuld be happy to get involved with additional activities.

