



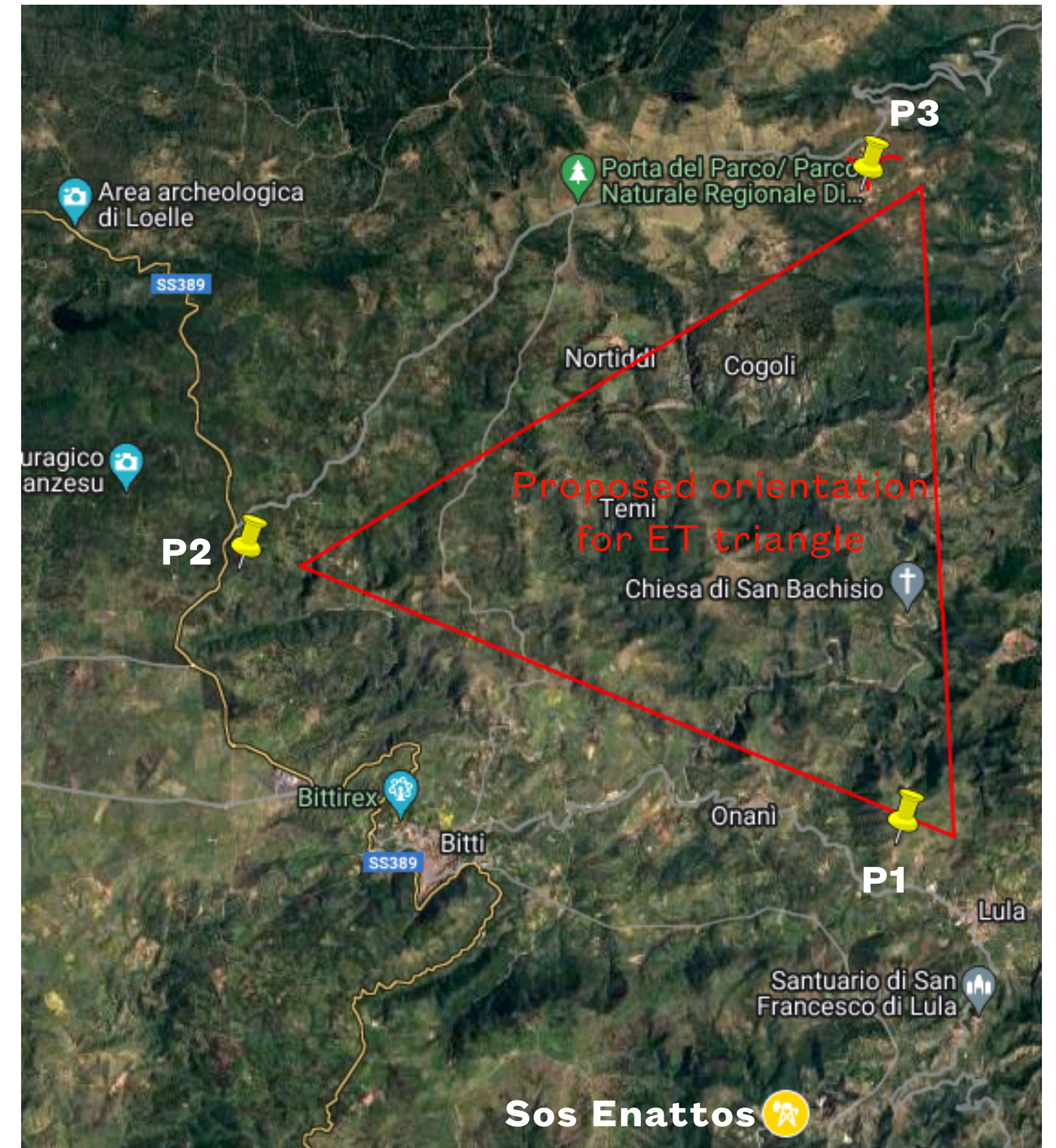
WP1.1 activities

Status of seismic noise characterization activities at the Sardinia site

MATTEO DI GIOVANNI - SPB WORKSHOP

Sardinia site

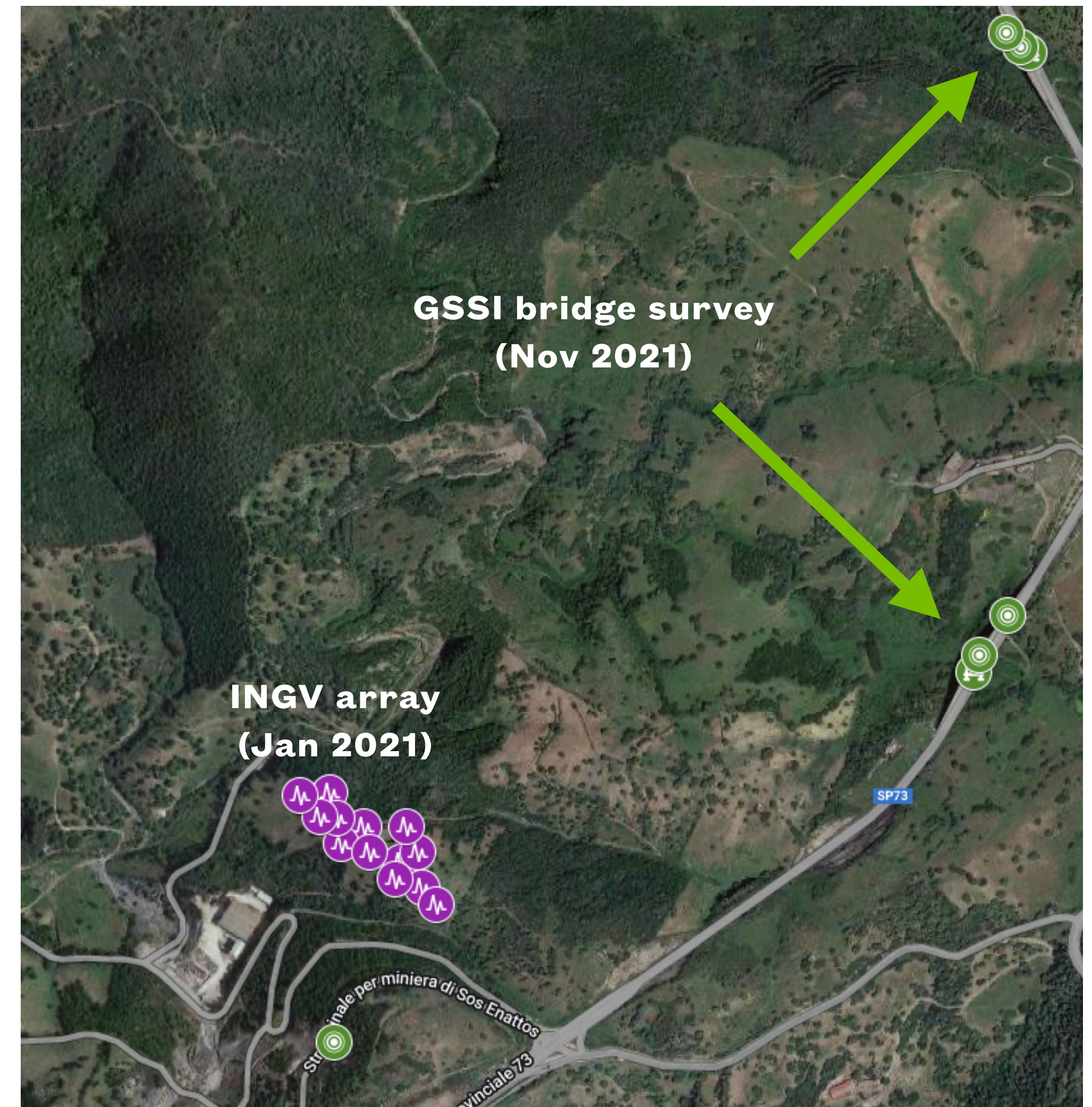
- Characterization activities are focusing on three different areas:
 - The Sos Enattos mine (since 2019);
 - The proposed vertexes P2 and P3 (since 2021);
 - In the near future, also P1 will join;
- Permanent and temporary seismic sensors have been installed to provide a thorough seismic characterization of the area;
- The time span of available data now allows for long-term analysis;
- The seismic network is complemented by other instruments (acoustic, magnetic, atmospheric... - WP1.3 and WP1.4).



Instruments

Sos Enattos

- Four permanent seismic stations at different depths (current installations):
 - SOE0 (0m): Trillium 240s;
 - SOE1 (-84m): Trillium 360s and Guralp 360s;
 - SOE2 (-111m): Trillium 360s;
 - SOE3 (-160m): Trillium 240s;
- In January 2021, a temporary array of 13 broadband seismometers was installed at Sos Enattos for 10 days;
- In november 2021, a set of 5 5Hz geophones was installed close to the mine for 5 days.

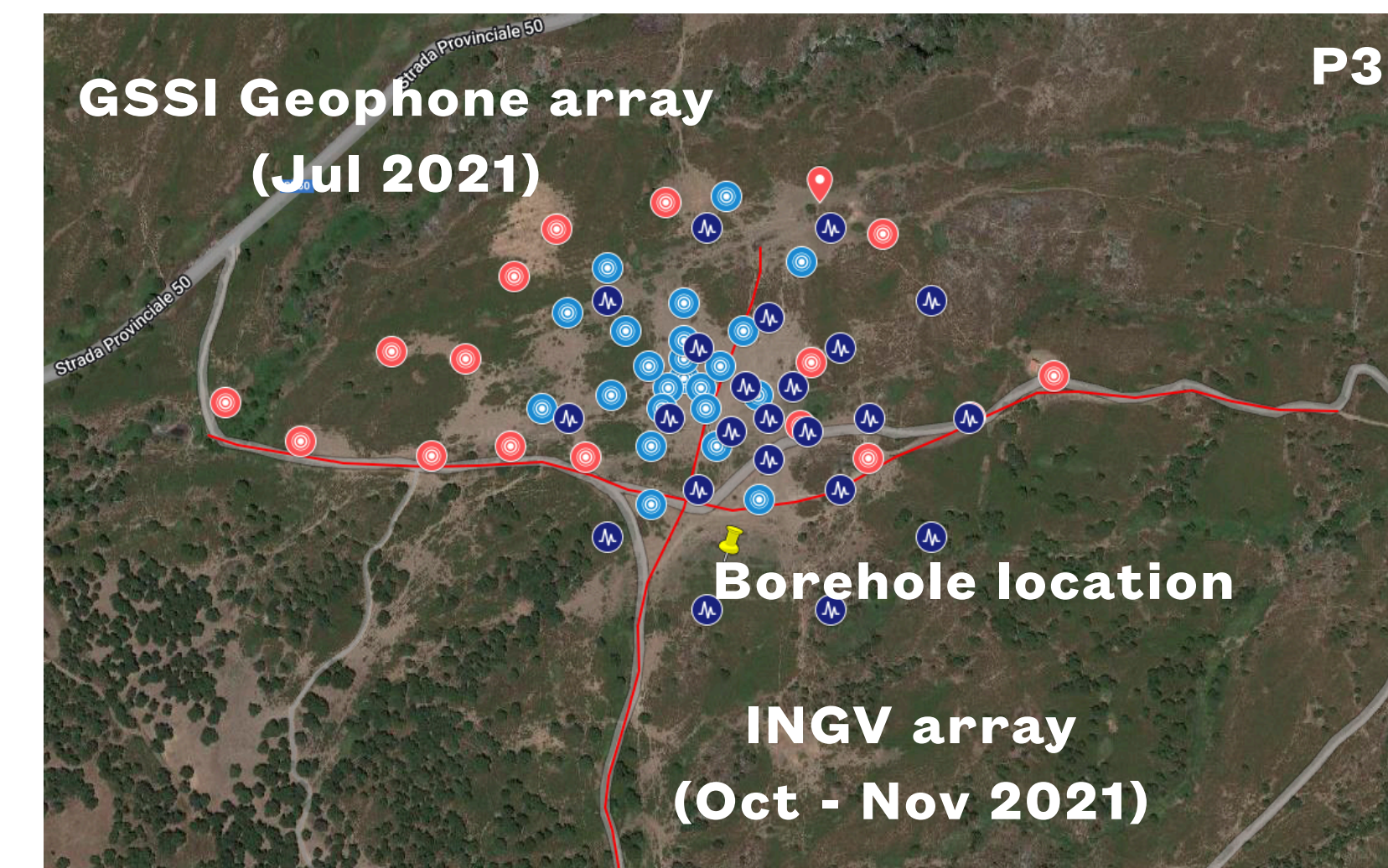
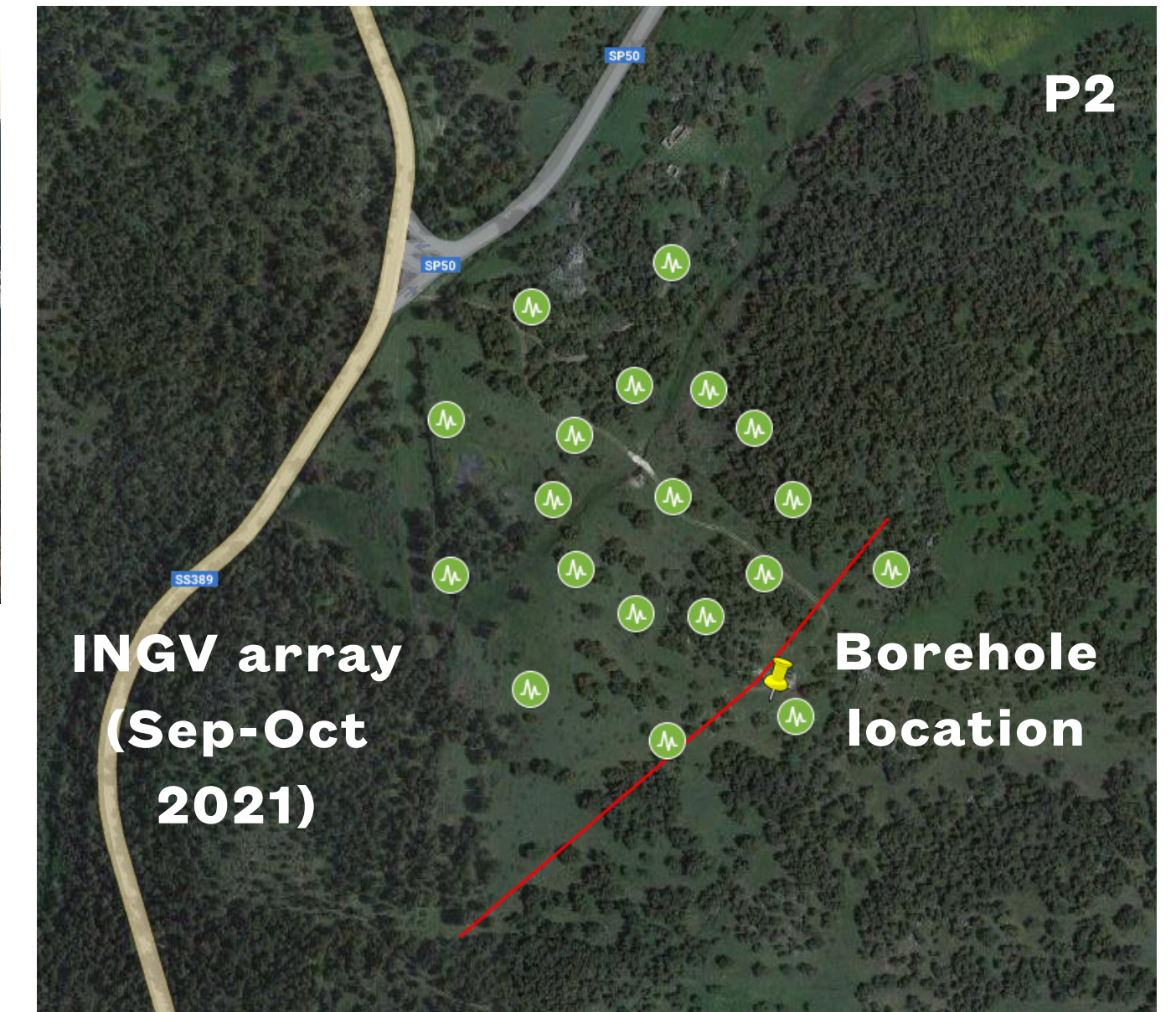


Instruments

P2/P3



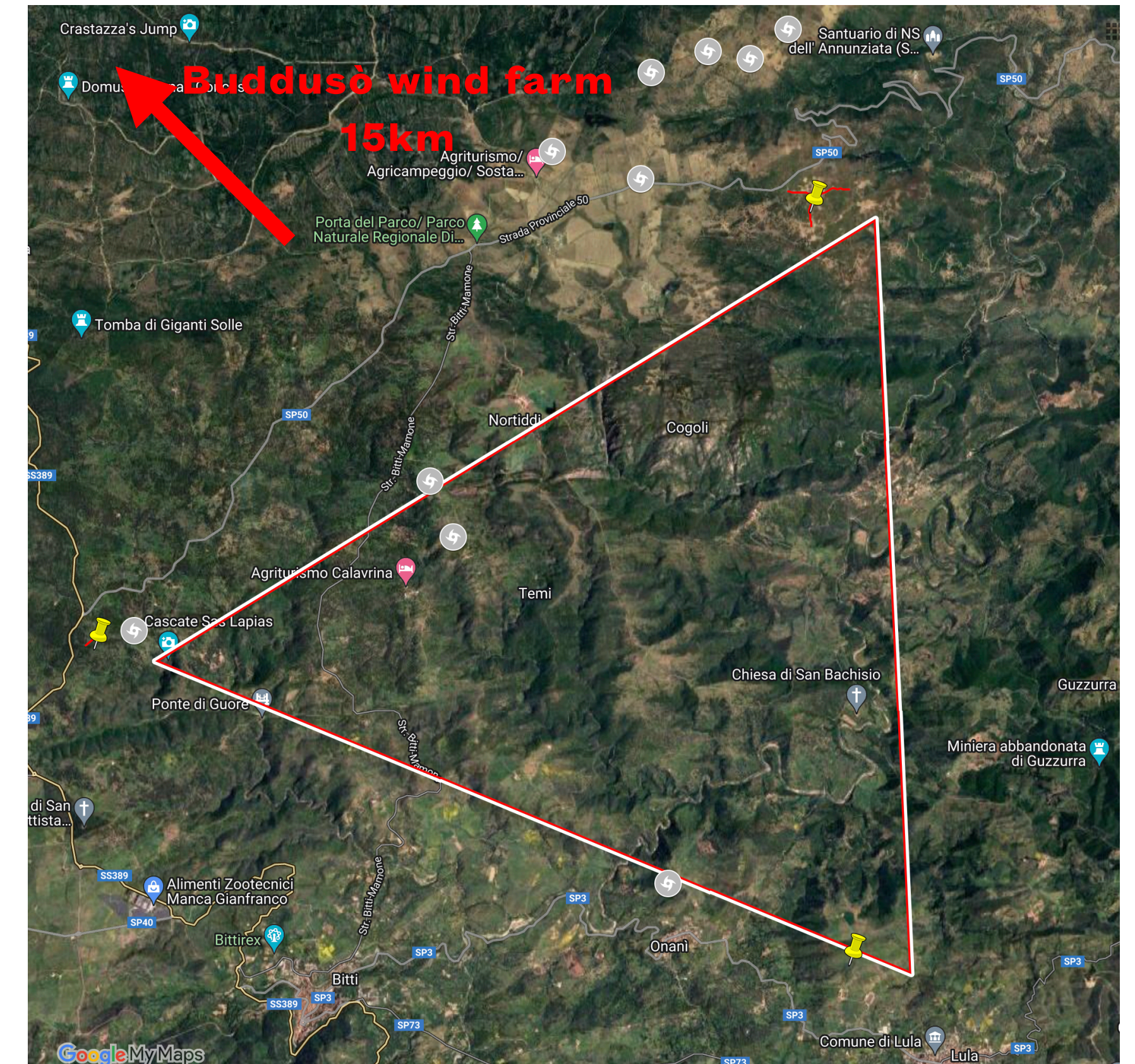
- Two permanent stations at each vertex:
 - Surface: Trillium 120H;
 - Borehole (-250m): Trillium 120Q
- Between summer and fall of 2021, temporary seismic arrays were deployed at both locations by INGV, GSSI and KIT;
- Active seismic survey at P2 in July 2021 to infer high resolution seismic profiles;
- Borehole/surface installations greatly improved during 2022;



Future plans

P2/P3

- Planning in progress of a measurement campaign to assess the contribution to background seismic noise of the wind turbines in the area;
- Contact was made with the company running the Buddusò wind park to get data about the wind turbines and to access the area to deploy instruments;
- Local land owners may also provide access to their own wind turbines;
- A collaboration with other WPs would be useful to make joint measurements using microphones;
- Understand the nature of EM interferences on seismic data.



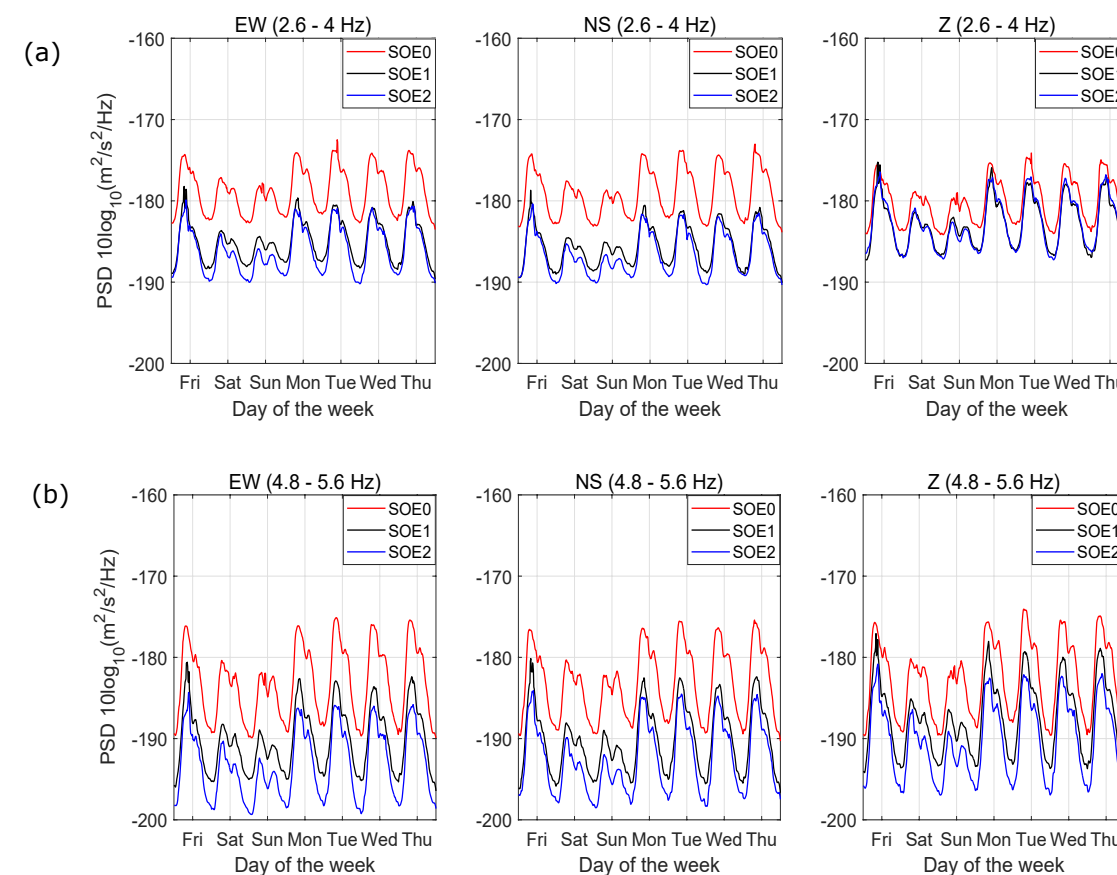
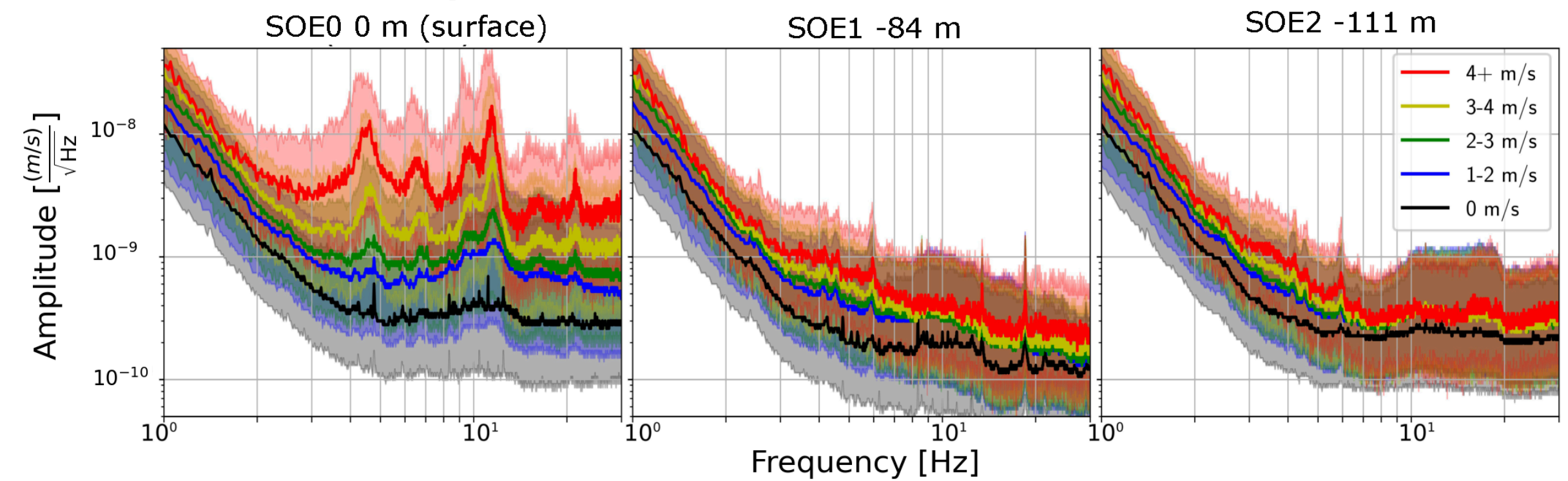
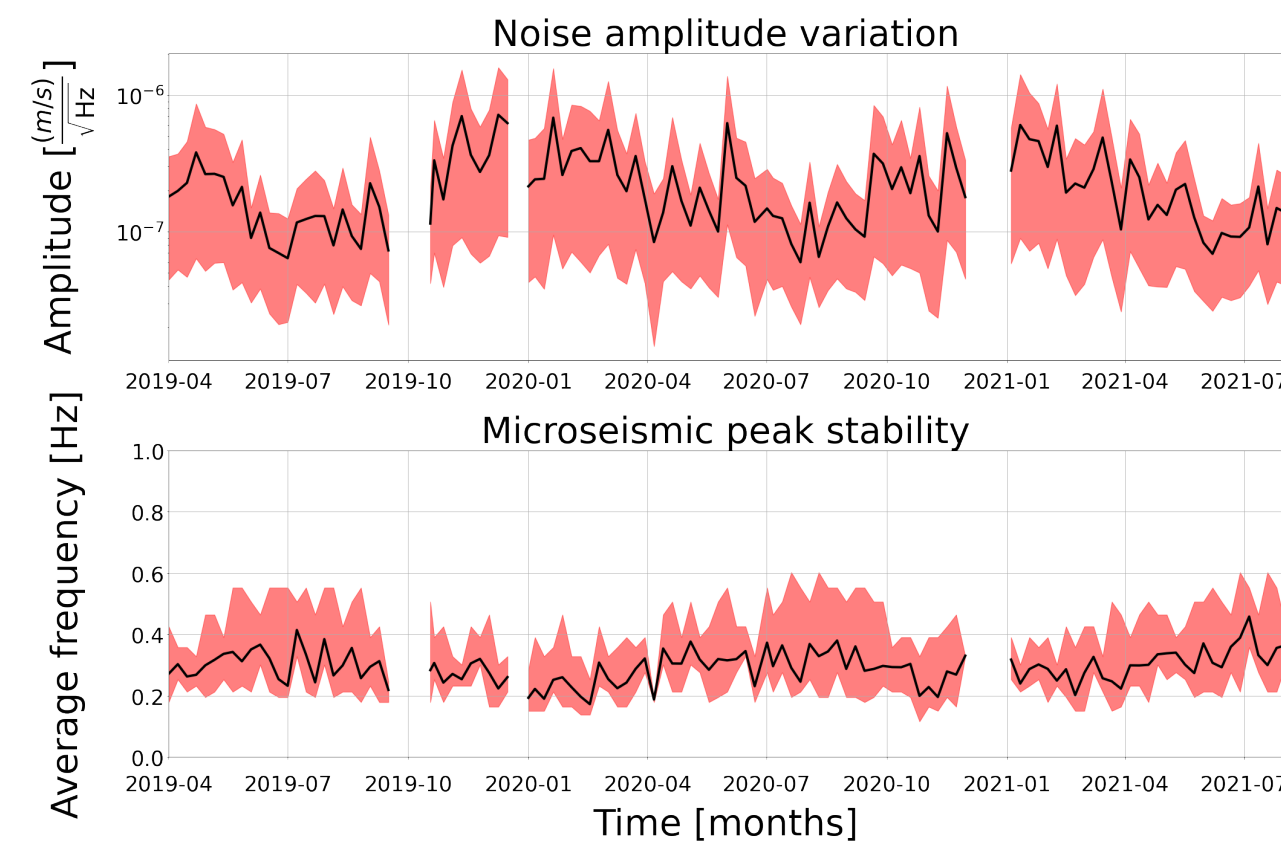
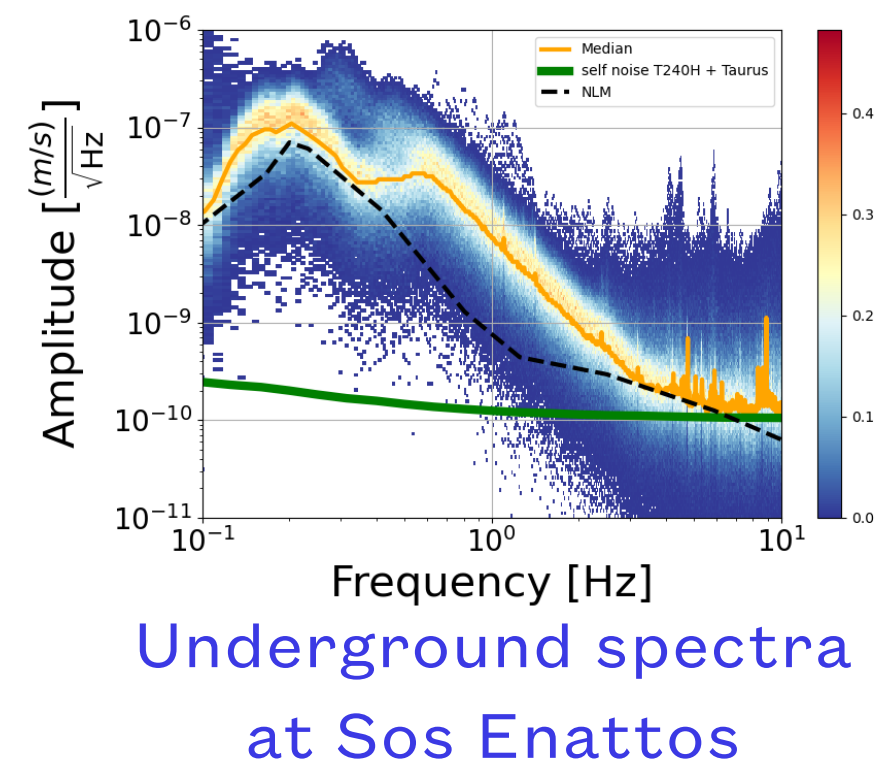
BACK UP

Goals

- Collect and process seismic data from each candidate site;
 - Identify the properties of the seismic fields at the candidate sites connected both to anthropogenic and natural phenomena;
 - Identify and characterize specific sources of seismic noise;
 - Determine whether specific sources of seismic noise may have an impact on ET or not;
 - Provide useful information for the design of the detector's seismic isolation and control systems.
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Results as of 2022

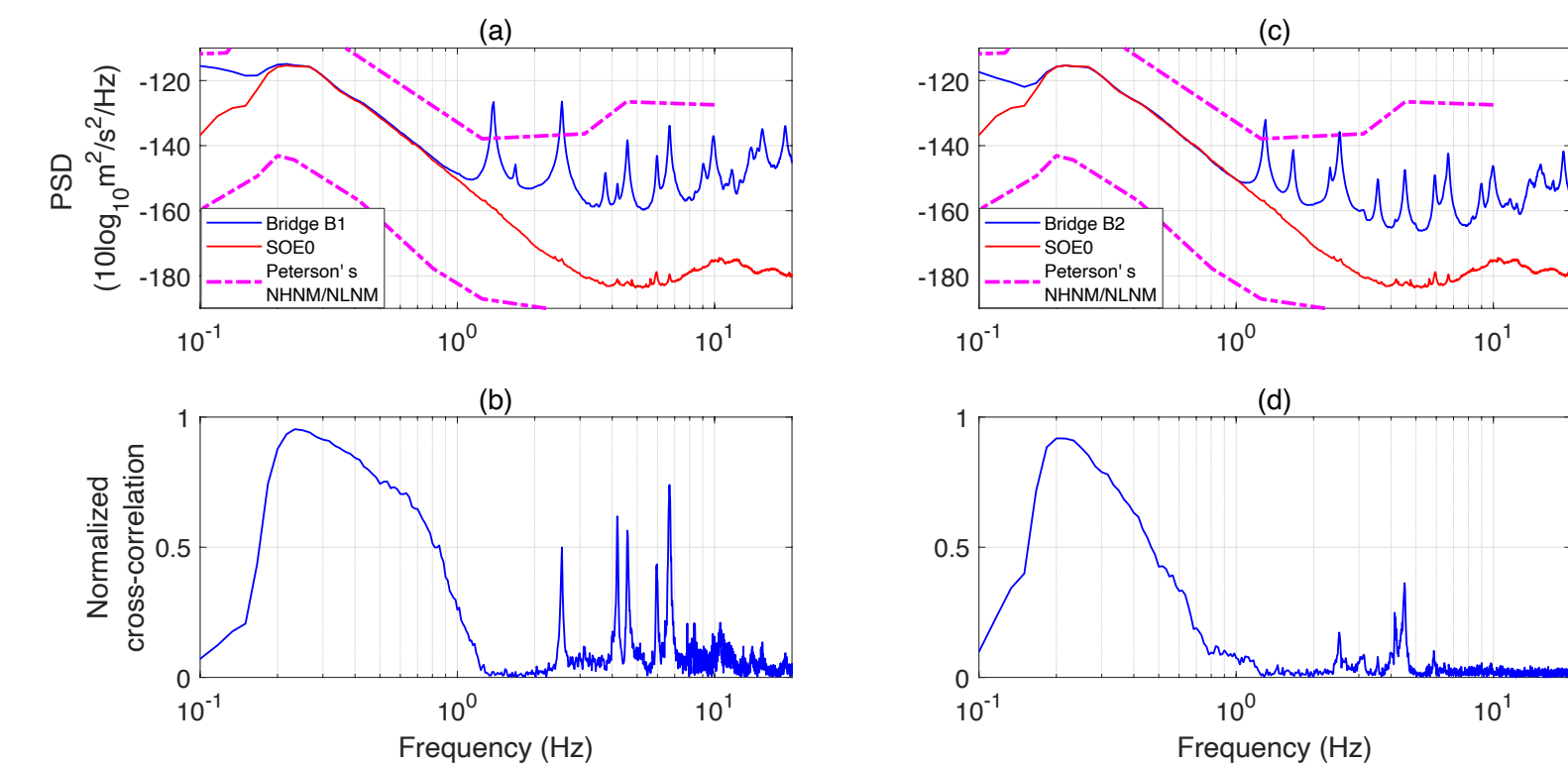
- First results about Sardinia in two papers: Di Giovanni et al. 2021 and Di Giovanni et al. 2022 (we are still waiting for the reviewers' comments for the latter)



Seasonal variation of microseismic noise at Sos Enattos

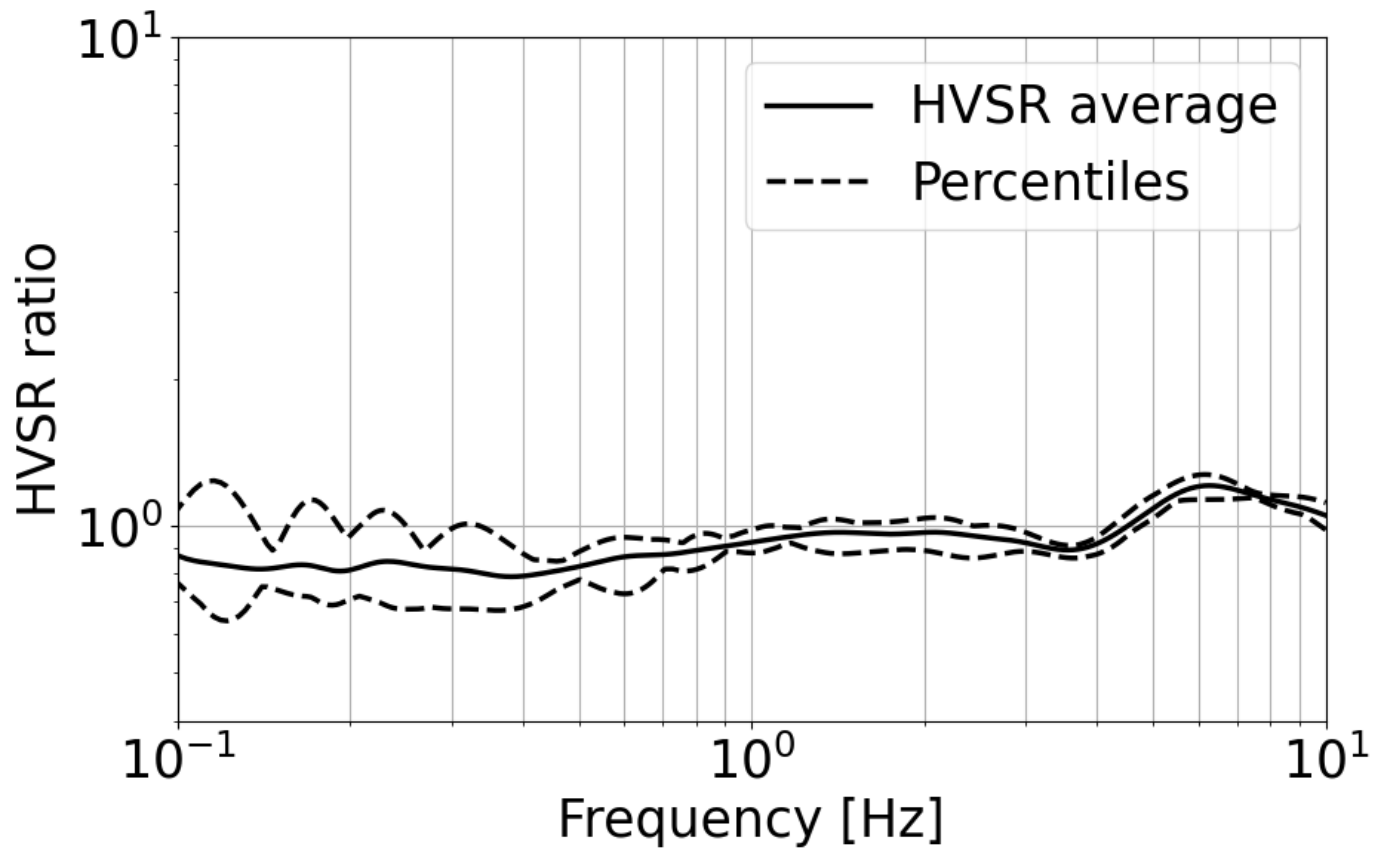
Anthropogenic noise temporal variations

Evidence of noise contribution from two nearby road bridges in Sos Enattos



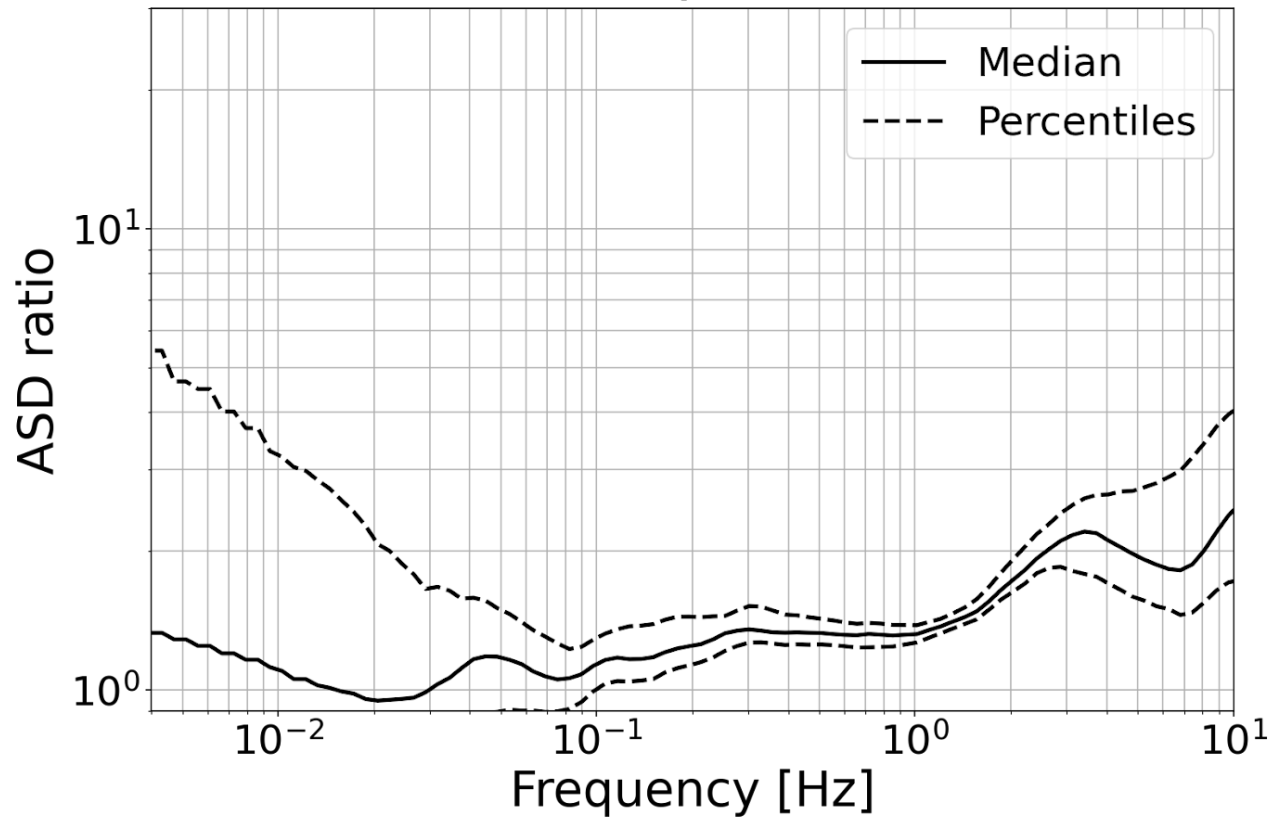
Results as of 2022

- Data from vertex surveys are still being processed.

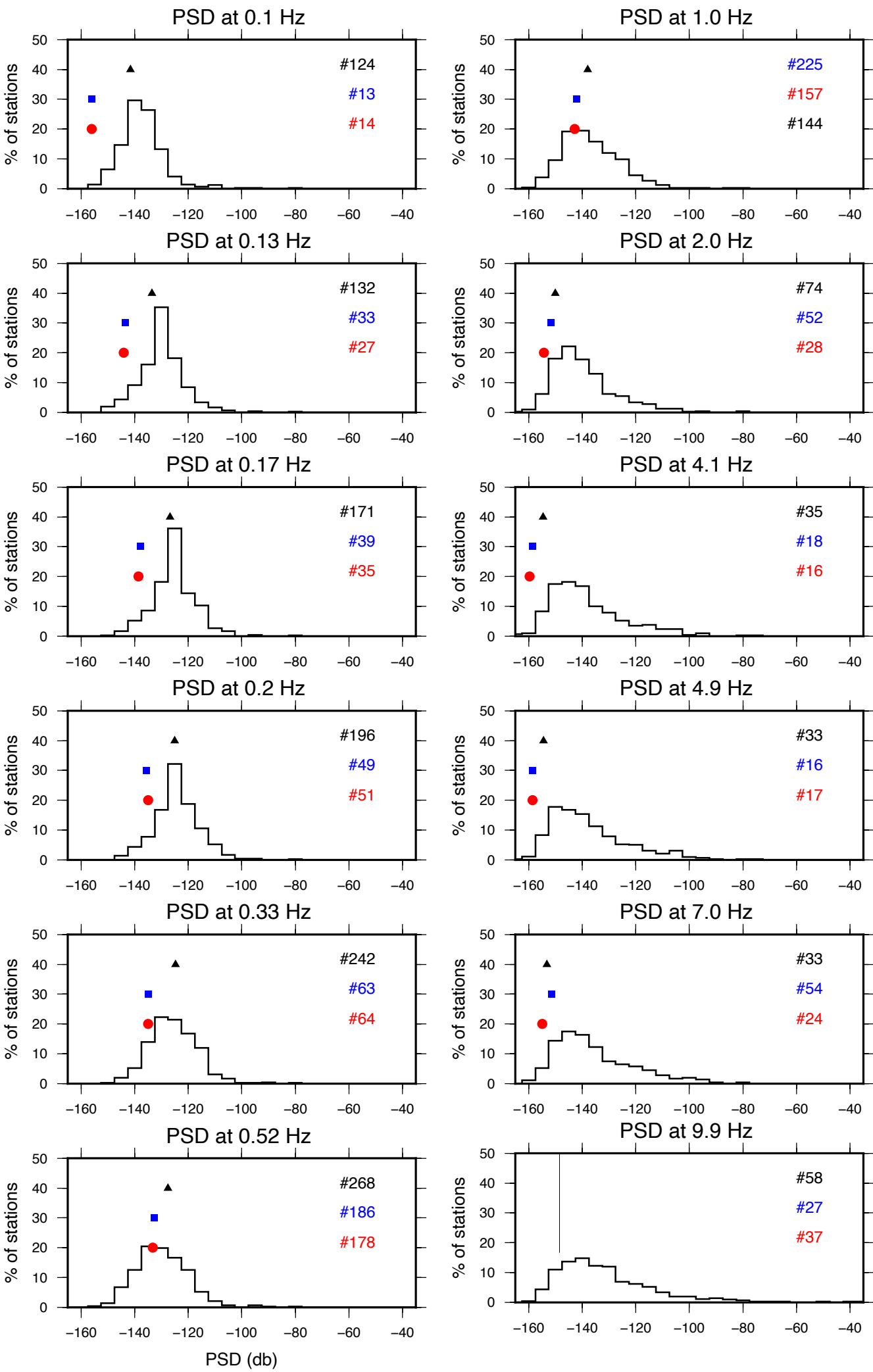
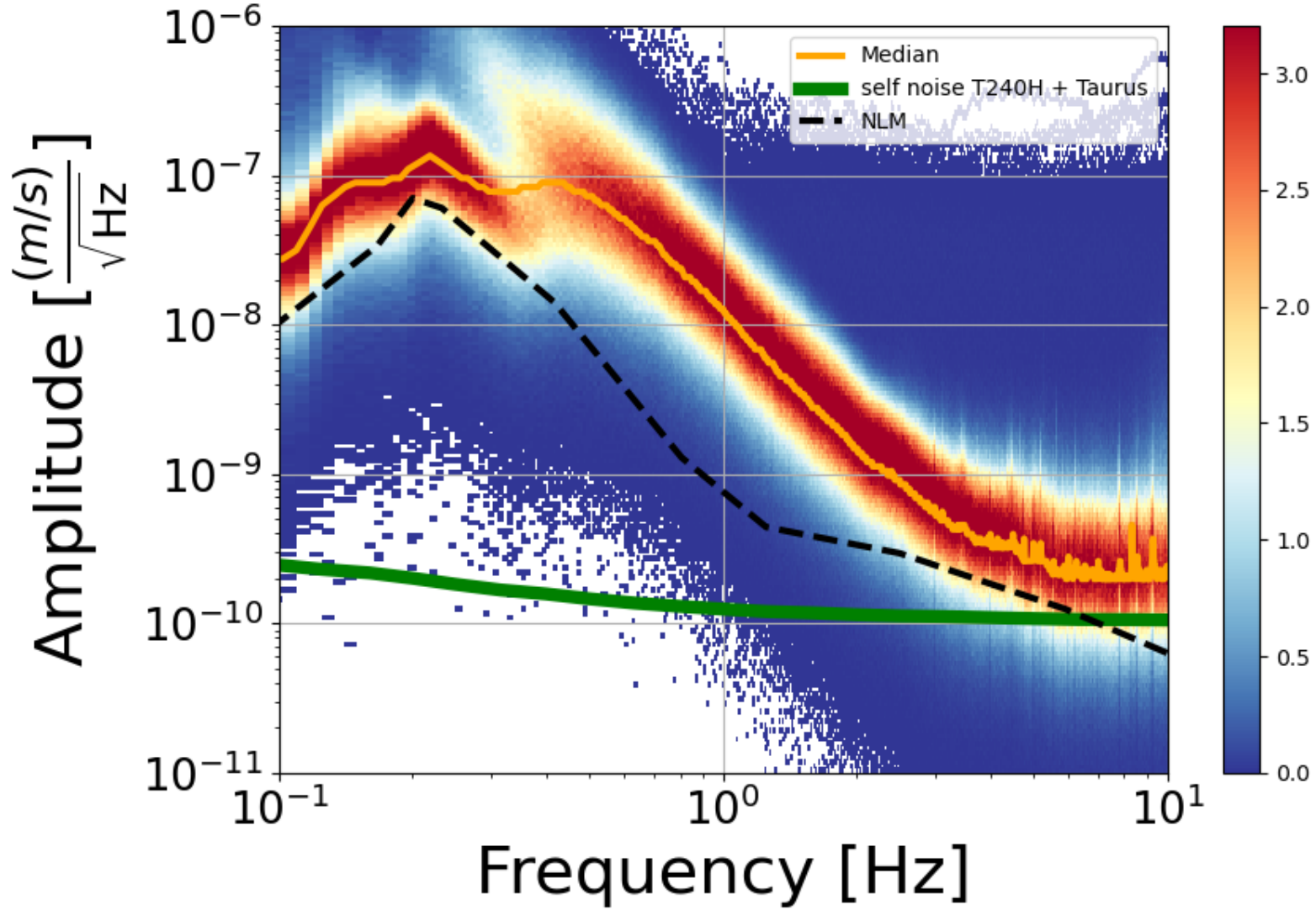


Horizontal to Vertical Spectral Ratio at P2

P2.00.HHZ/P2.01.HHZ



Surface/Underground spectral ratio at P2



Introduction

- Seismic noise has an impact on GW detectors in many ways (unwanted motion of the test masses, stray light scattered by seismically excited surfaces, ecc...).
- The extension of ET towards lower frequencies with respect to current detectors makes a careful assessment of seismic noise at the candidate sites necessary;

Natural sources

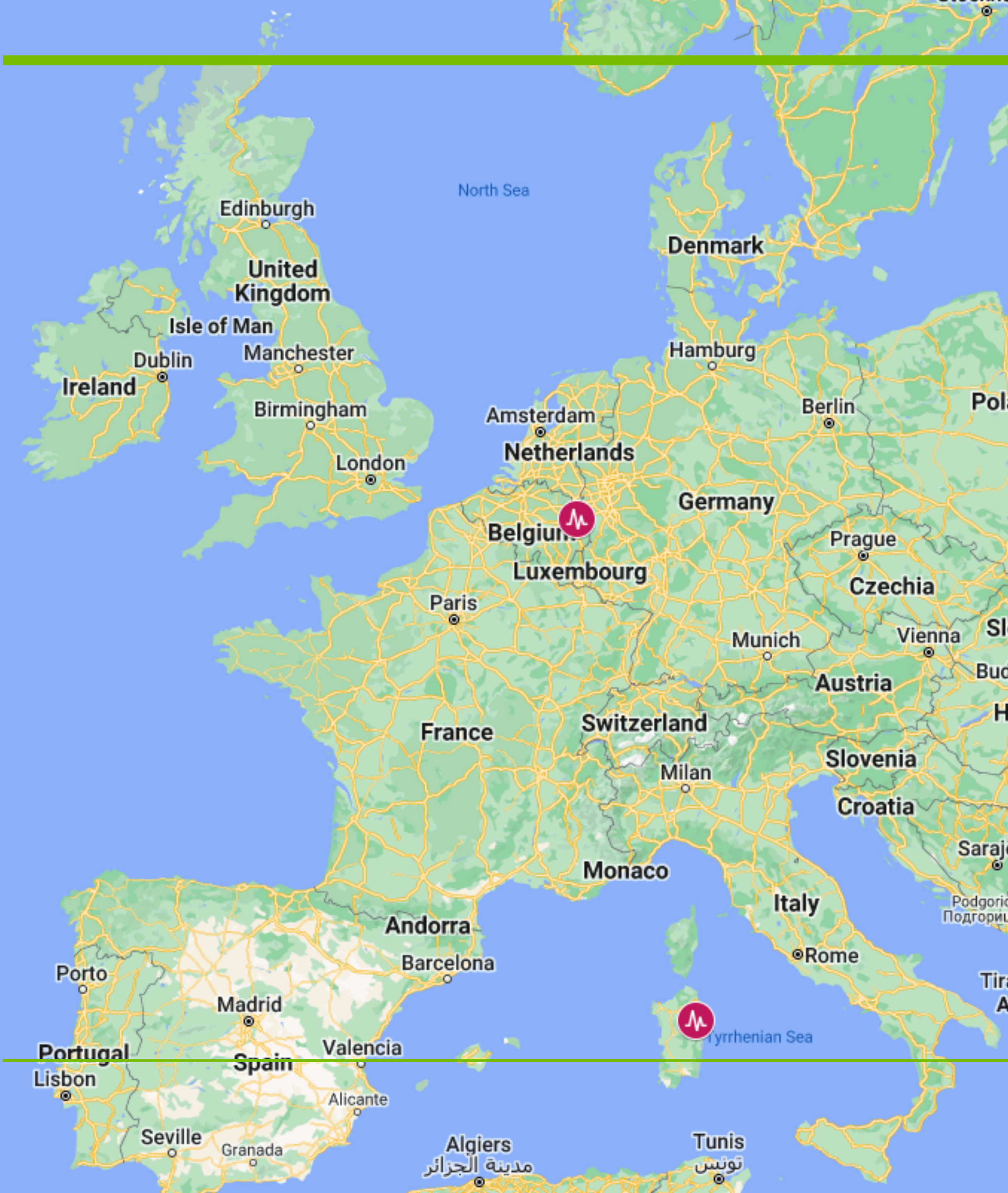
- broad frequency of interest (0.01 Hz to 50 Hz);
- below 1Hz main contribution from pressure variations and microseismic noise from sea waves;
- up to 50 Hz mainly caused by wind and other atmospheric phenomena;
- below 1 Hz, characterization necessary for Newtonian Noise studies.

Anthropogenic sources

- manifest at frequencies higher than 1 Hz;
 - direct consequence of human activities and/or artifacts;
 - change between day and night;
 - also important for Newtonian Noise studies.
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ET candidate sites

- Two candidate sites
 - Area surrounding the Sos Enattos mine in Sardinia (I);
 - Euroregion Meuse-Rhine on the NL-B-D border;
- A third site in Saxony (D) is entering the competition.



Sardinia site

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