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Short report on dbMISS project status

towards attenuation tomography in NRW

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The DATA collection status (Seismic Networks)

Considering distribution of seismic stations and earthquake in NRW, To complete the available data set provided by GD and RN following tasks are needed:

1- For some events, catalogs provided by GD are missing P- and S-phase arrival times at certain stations, despite the waveforms being of good quality.

This issue is observed, for example, at stations within the BENS network (University of Cologne). Consequently, arrival times for these phases should either be picked manually or determined using an automatic algorithm.

2- For events that appear in two catalogs but are located differently, the location should be updated using all available waveforms.

To perform a homogeneous measurement of attenuation:

- We aim to deploy a temporary network of 10 seismic broadband stations in the northern part of NRW. This strategy is intended to decrease the distances between stations, in northern part enabling a more homogeneous measurement of attenuation, primarily utilizing seismic background noise data.
- The primary locations for the stations are selected based on the feasibility of deployment at each site, taking into account factors such as proximity to main highways, power availability, ownership, and other logistical considerations. The final layout of the stations will depend on these factors.
- Samples of noise recorded at various stations in the region are tested, and algorithms to process background noise data to retrieve surface waves are developed using the Noisepy package (Chengxin et al, 2020).

Jiang, Chengxin, and Marine A. Denolle. "NoisePy: A new high-performance python tool for ambient-noise seismology." Seismological Research Letters 91.3 (2020): 1853-1866.

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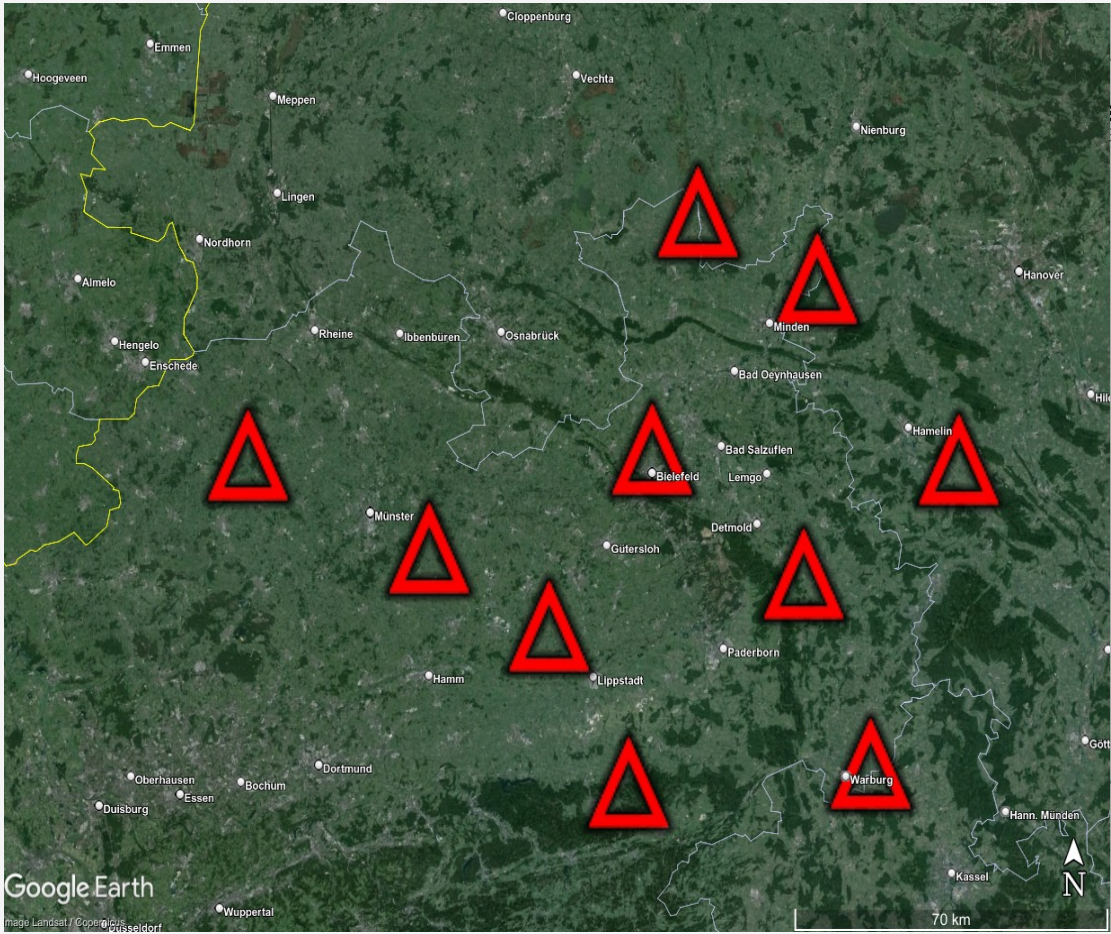
Layout of the temporary network

Preliminarily selected sites for temporary seismic network installation for noise measurements,10 broadband sensors, including 4 Trillimum compact, and 6 Trillium compact 120 s sensors are planned for installation.

The locations are at least 10 km far from the main highways and railways and 5 km from other main roads.

The network inter-station distances are between 30 to 150 km.

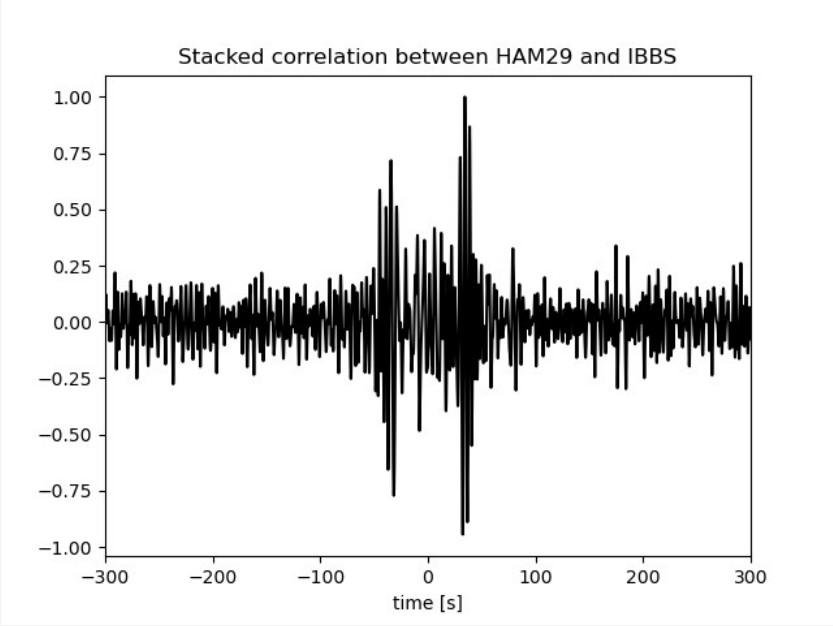
The network will operate for at least 6 months, from about June.



Seismic attenuation tomography from ambient seismic noise analysis

Example of background noise cross-correlation
East-West components of stations IBBS (RN) and HAM29 (YD) (0.2-0.5 Hz bandpass)
stations distance: 69.7 km
Measurement time: 10 days (from 2023-01-01)

Although the duration of processed data in this example is short, but surface waves traveling between two stations are clearly visible in this frequency range.



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Proceed with the implementation of the project:

- The temporary seismic network will be deployed, and the quality of the data will be monitored and assessed. To avoid data gaps for unknown reasons, we will likely read the data at short intervals of 6 weeks.

- Within two months, all available data necessary for conducting attenuation tomography, which utilizes both earthquake and explosion data, could be finalized. Additionally, other input parameters required for using the MuRAT and Q-open packages will be prepared.