Universität Münster

dbMISS project meeting:

Attenuation Study in NRW using local earthquake and quarry blasts/induced seismicity

03.07.2025

Die Landesregierung Nordrhein-Westfalen

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Update:

- Data related to a relocated catalog of QB are added to my datasets (University of Cologne, BNS Seismic station observatory)
- 1720 events are added and processed
- Temporary broadband network by university of Münster

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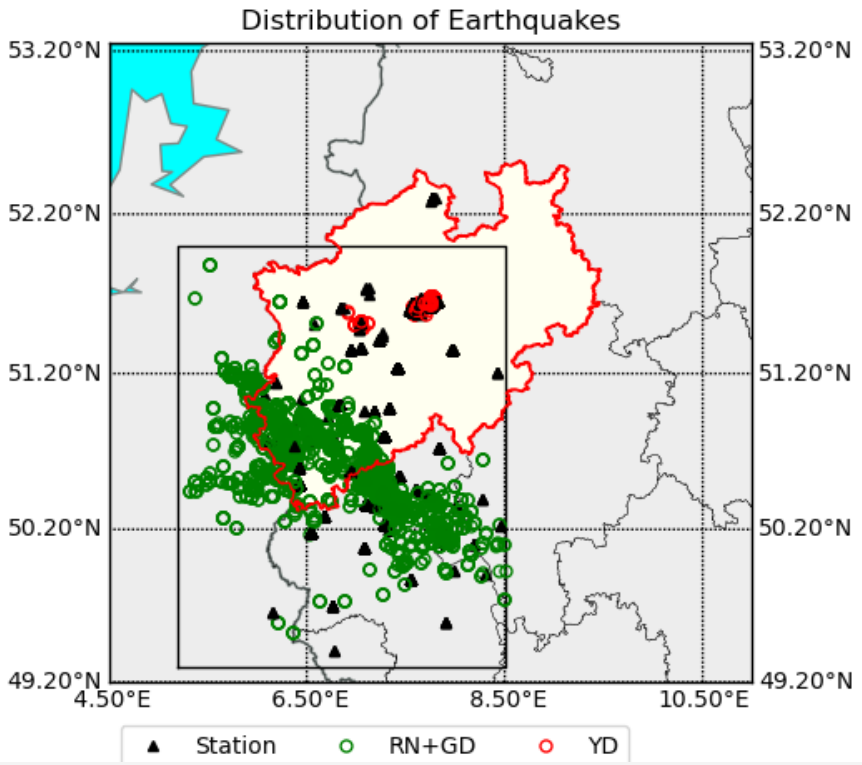
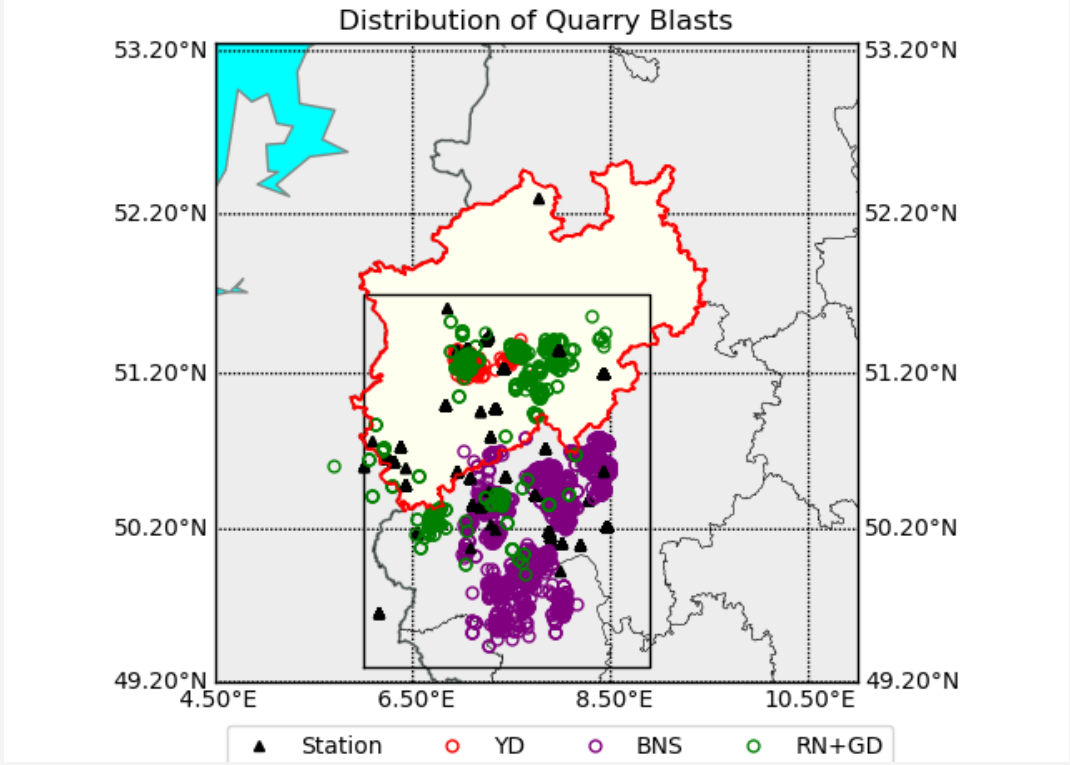
Earthquakes

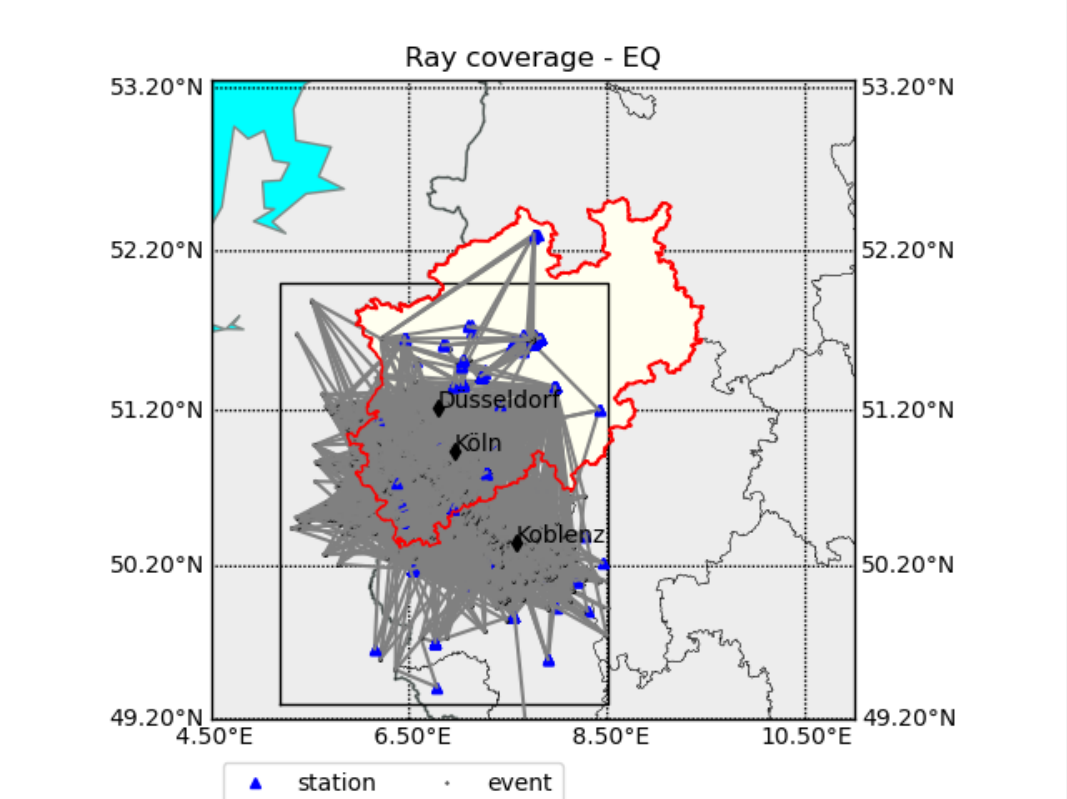


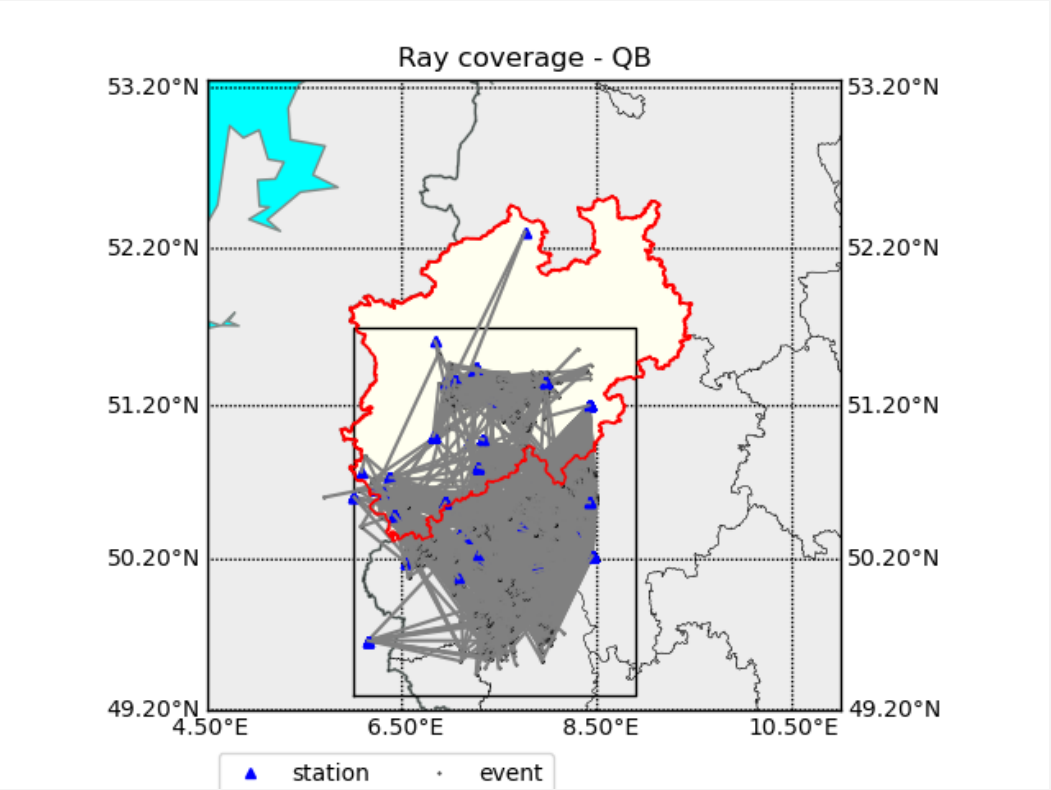
# Events	Network	#Stations
2489	All	101
1011	YD	
1478	RN+GD	

Quarry Blasts/Induced-Triggered Events



# Events	Network	#Stations
2271	All	45
212	YD	12
339	RN+GD	21
1720	BNS	26

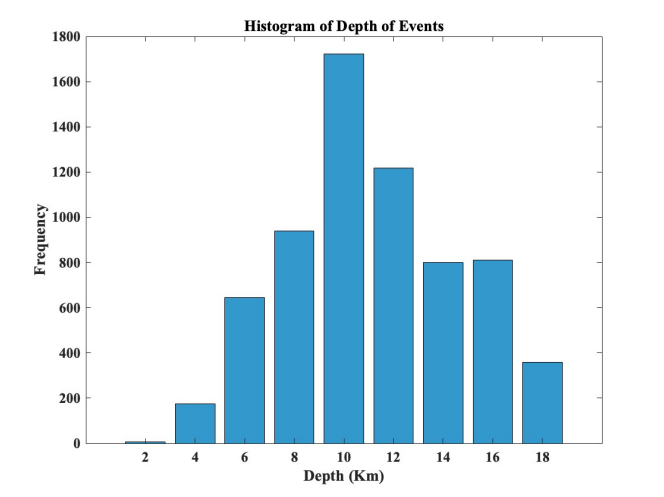


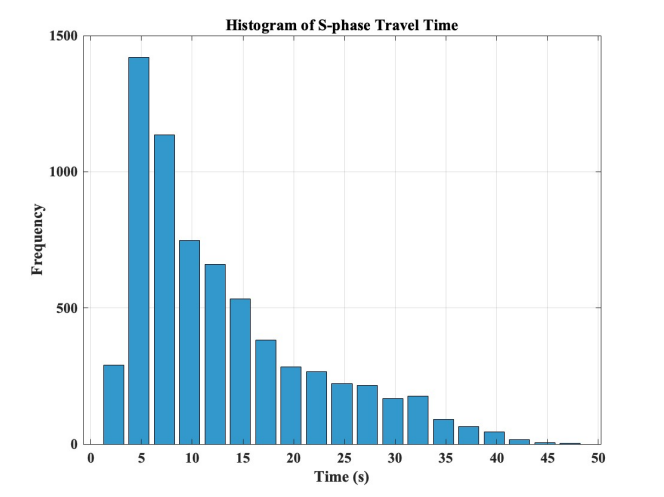


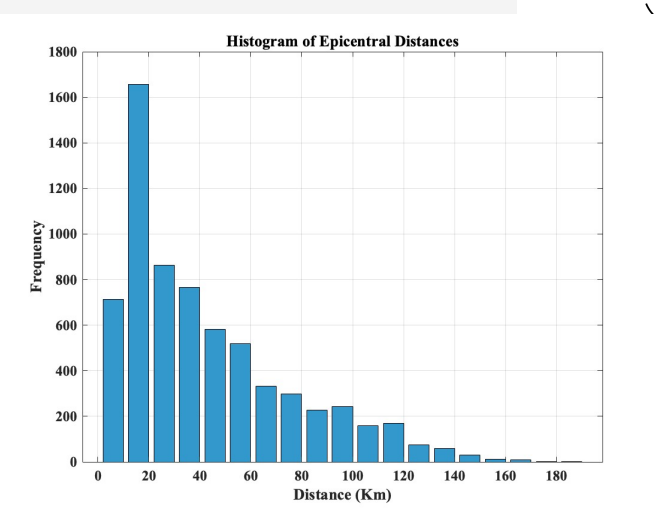
All rays (both P and S phase) used as input are plotted.
Final contribution of rays depends on quality at each frequency range required for processing method

Comparing two datasets:

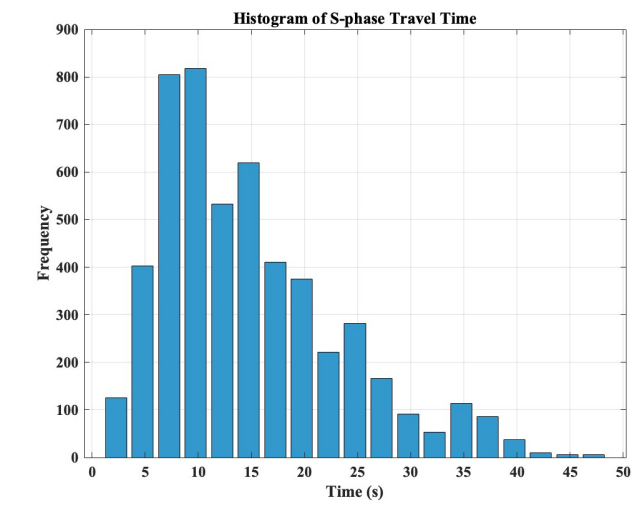
EQ

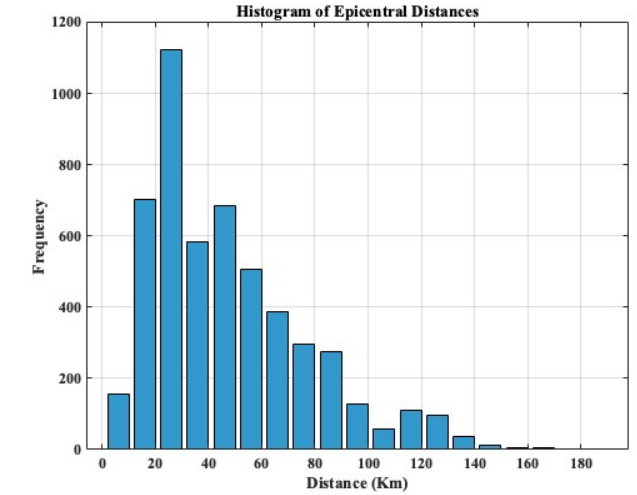






QB





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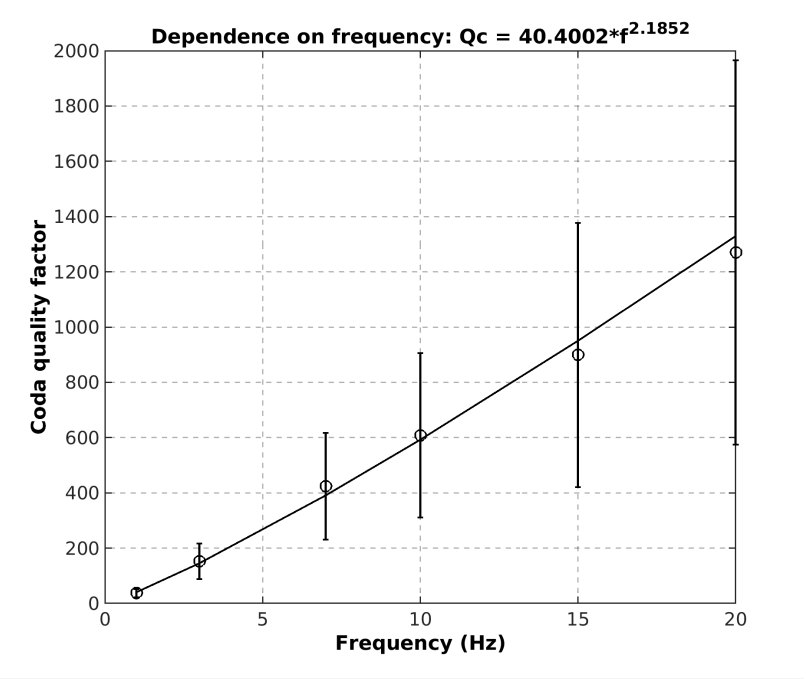
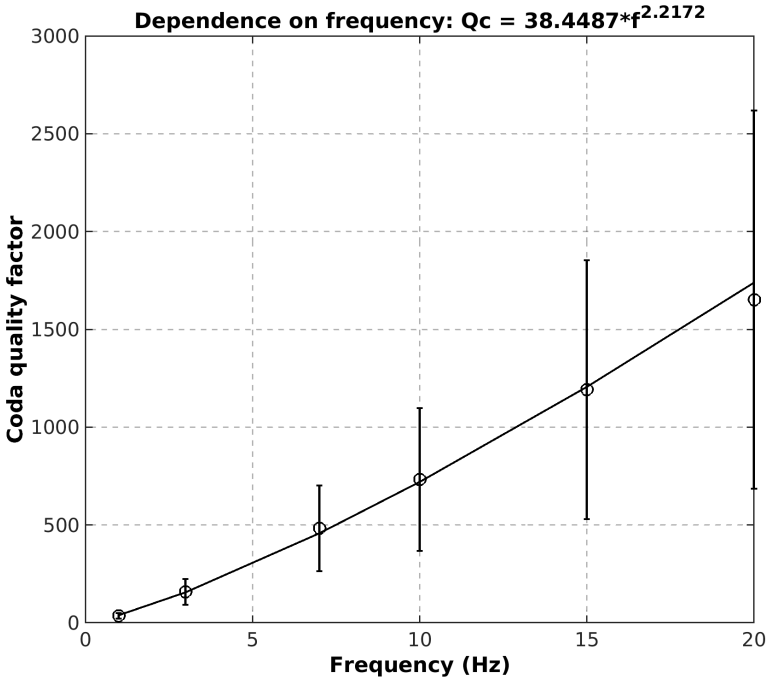
Average Frequency dependent Qc

Earthquakes



Quarry blasts



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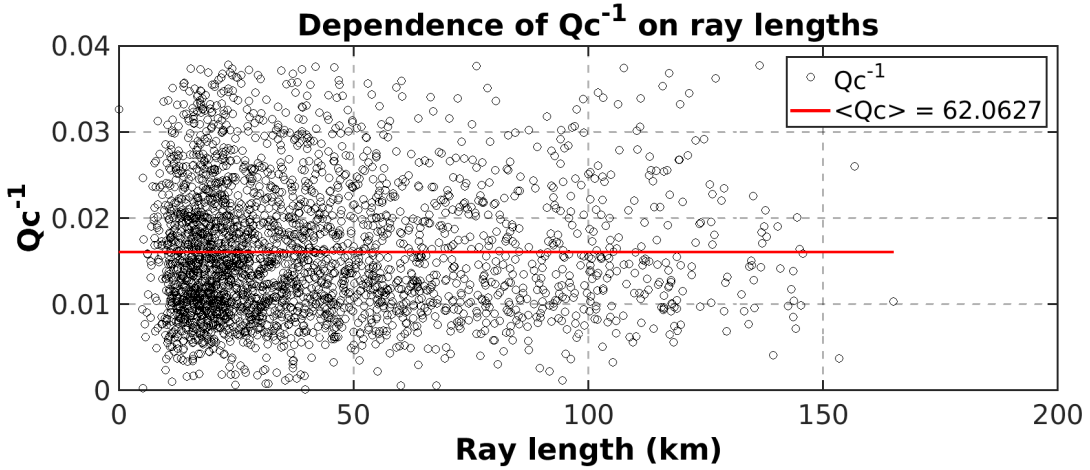
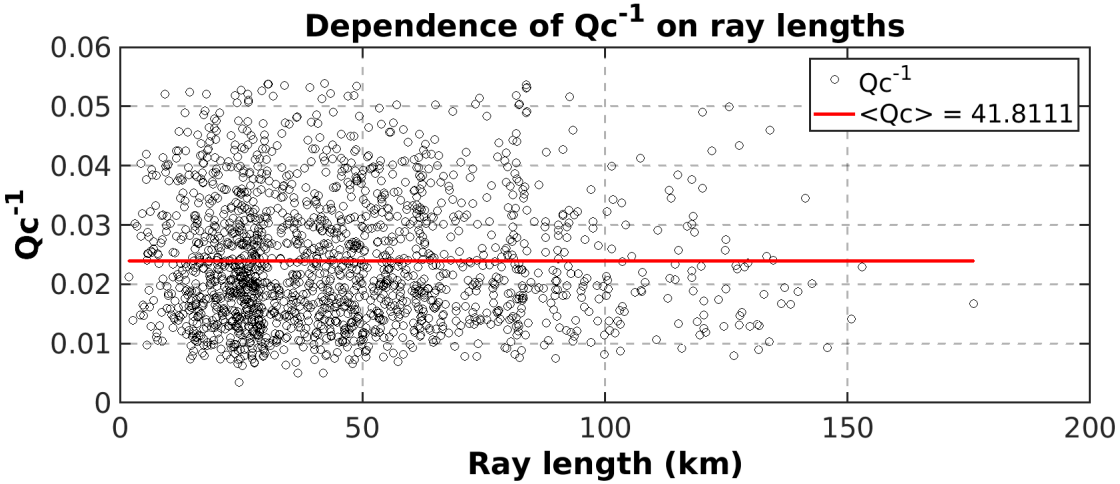
Qc at 1 Hz



Earthquake

Q: 25-200



Quarry blast

Q: 24-100

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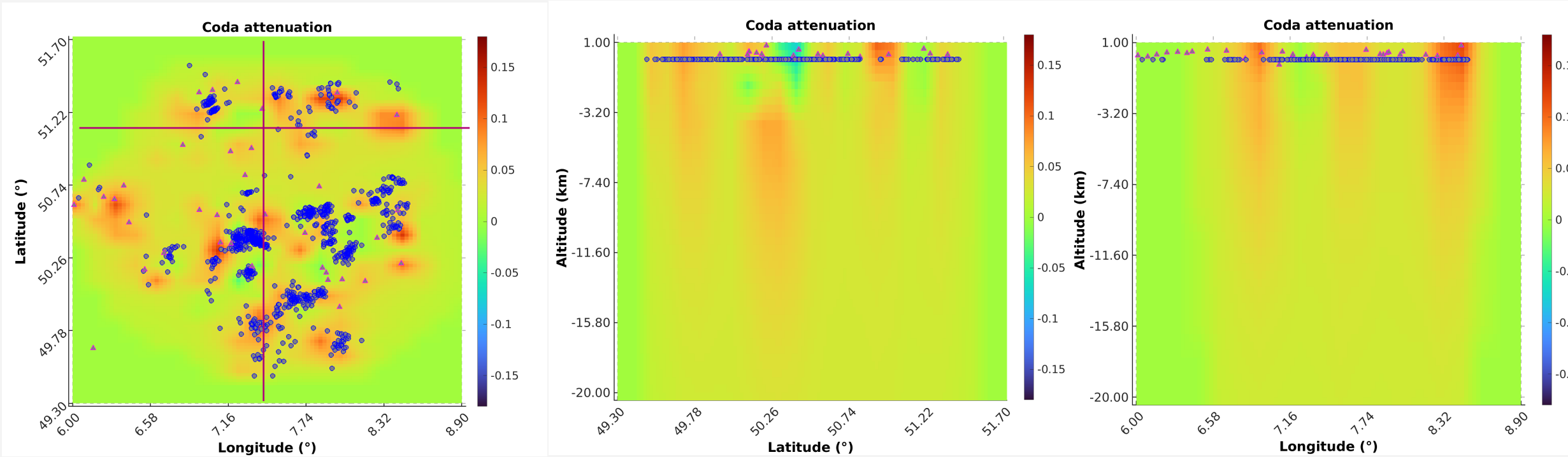
Tomographic image at 1 Hz, QB

depth: 1300 m

Depth profiles at 51.15, 7.24



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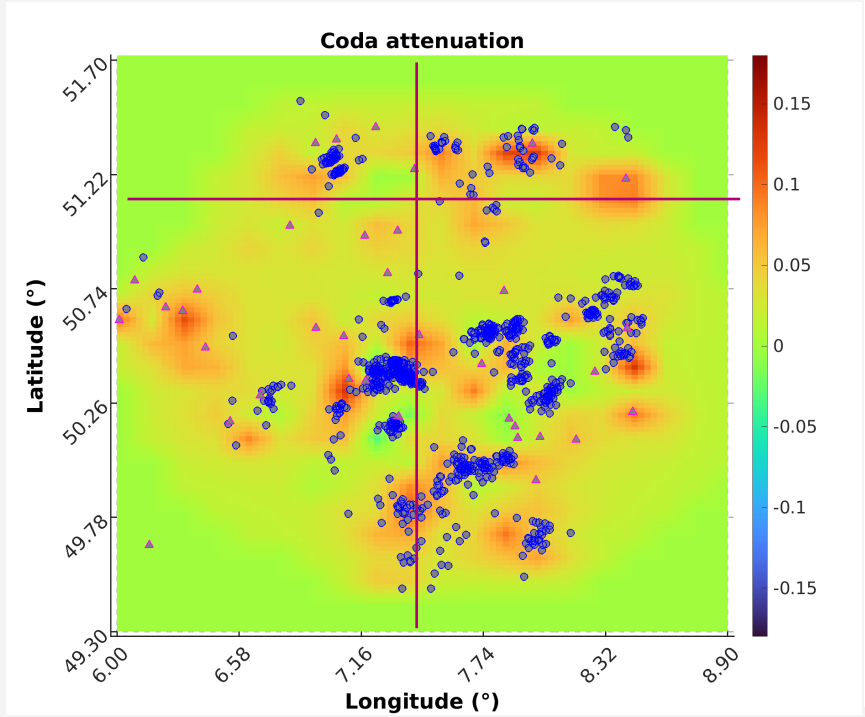
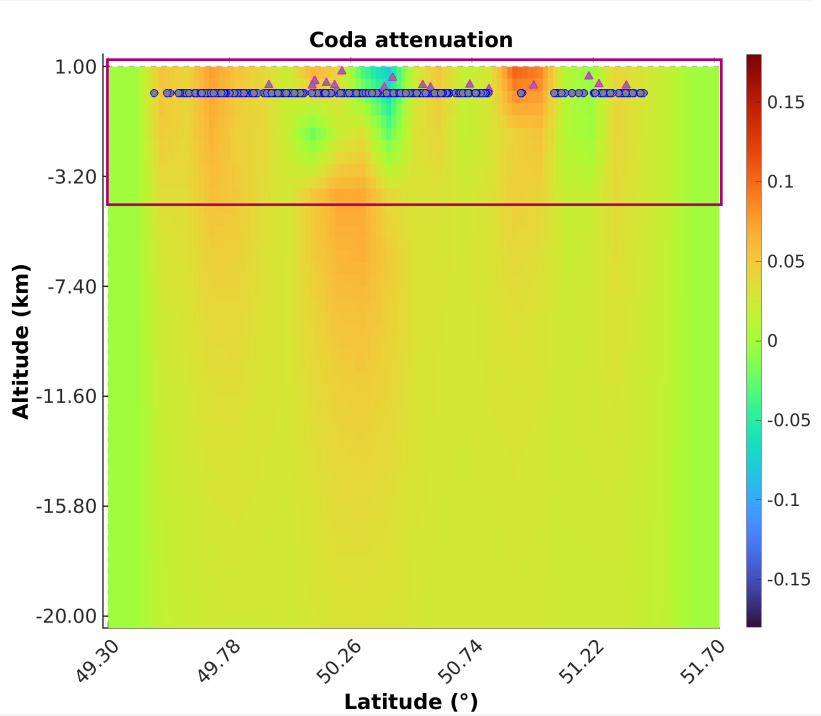
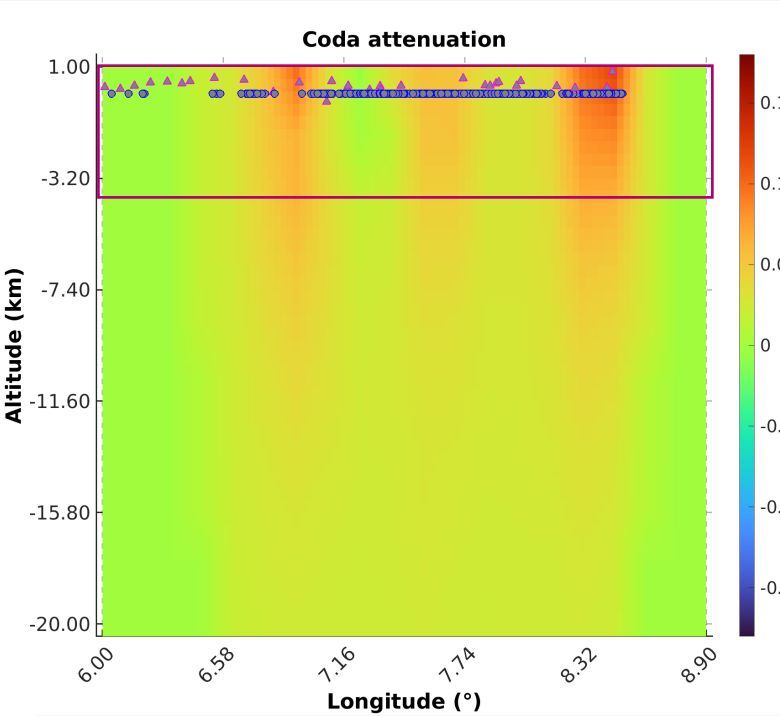
Tomographic image at 1 Hz, QB

depth: 1300 m

Depth profiles at 51.15, 7.24

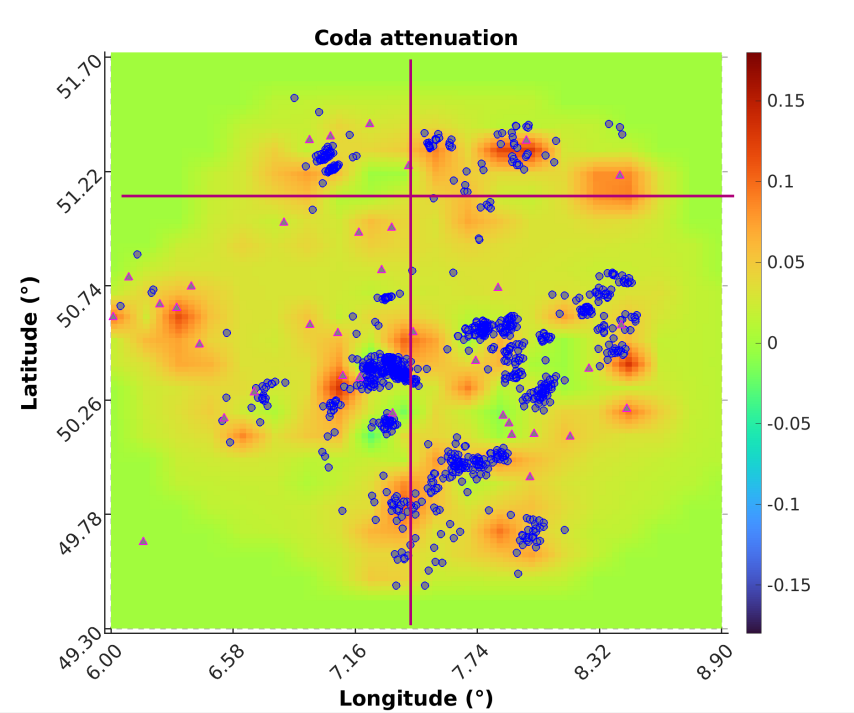


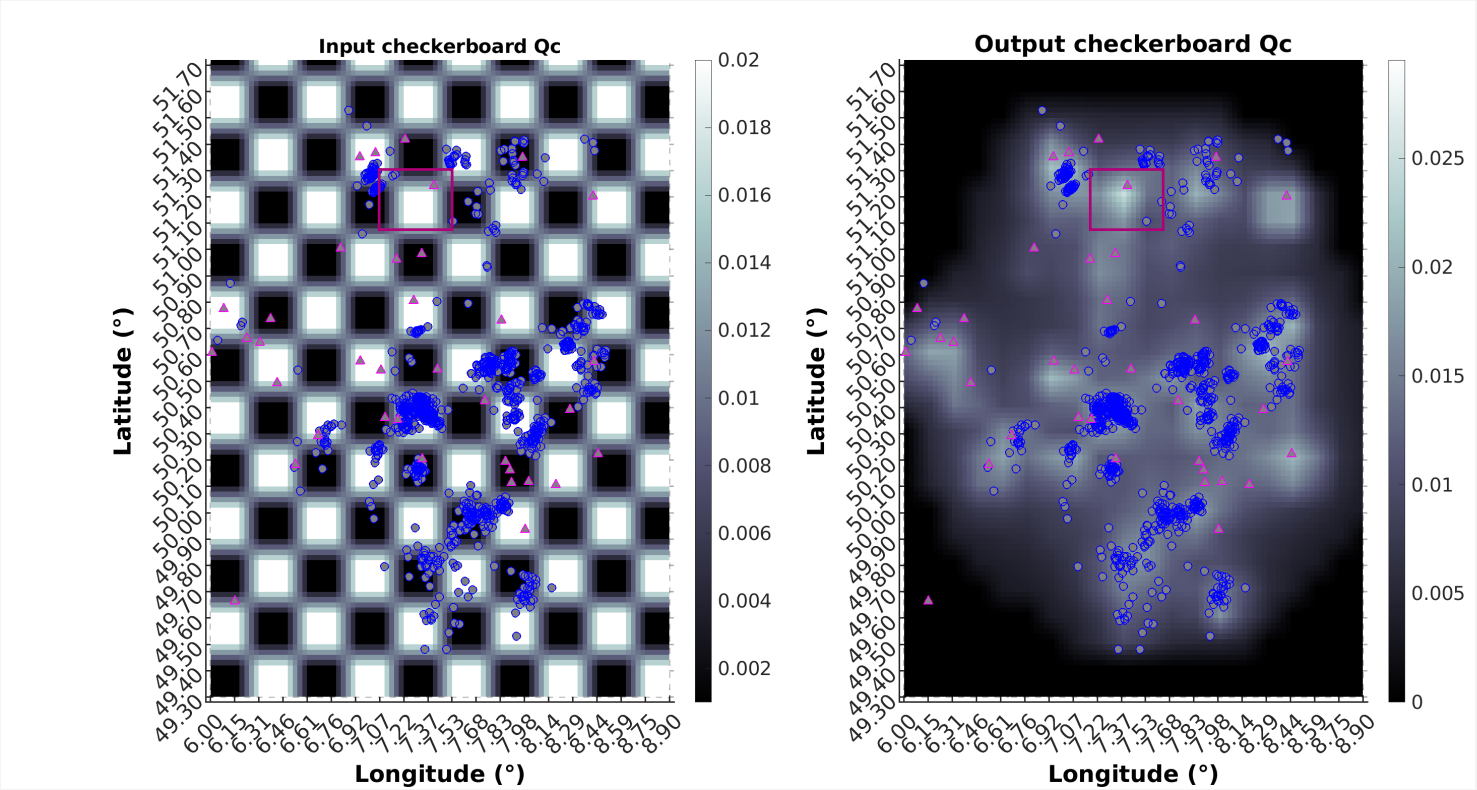




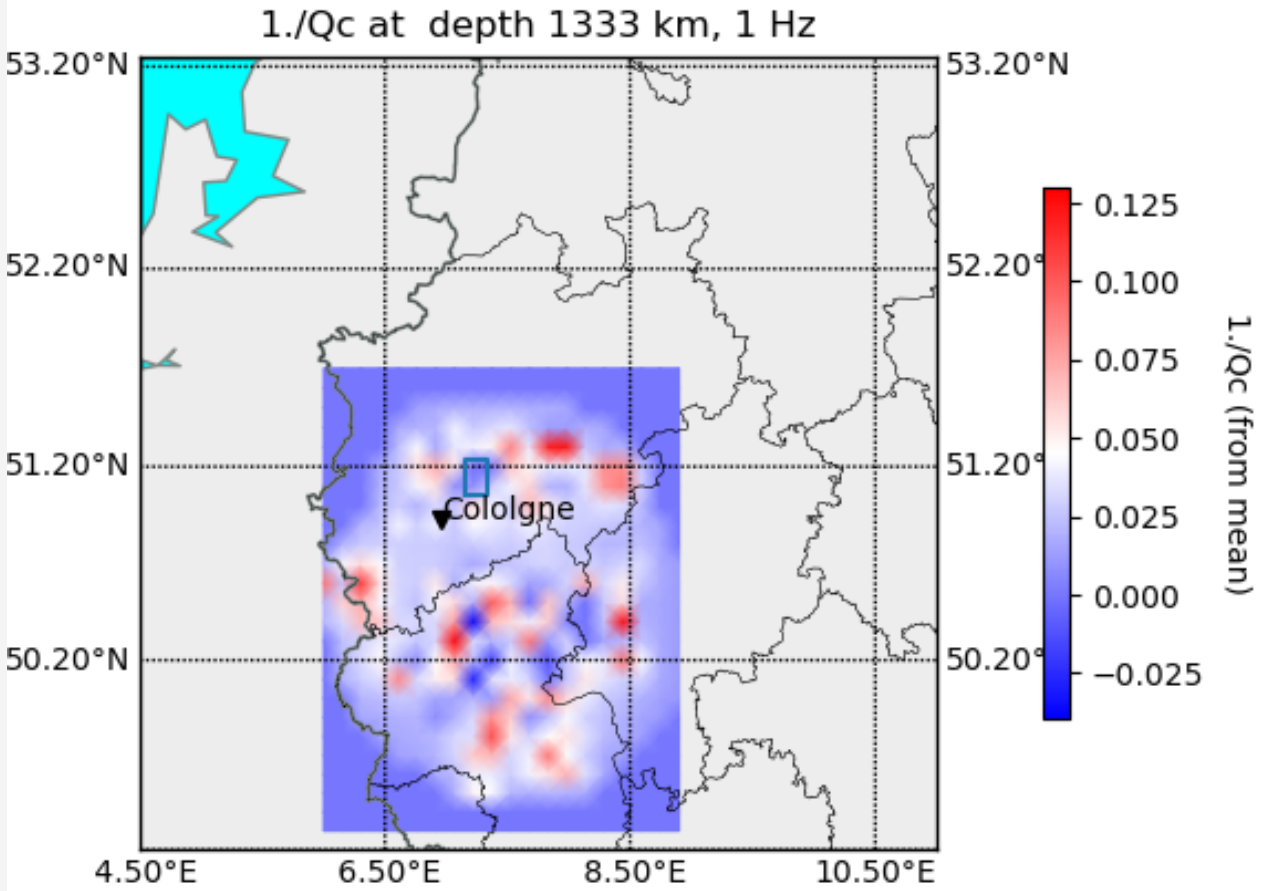
Tomographic image Qc at 1 Hz (QB) 1300 m depth

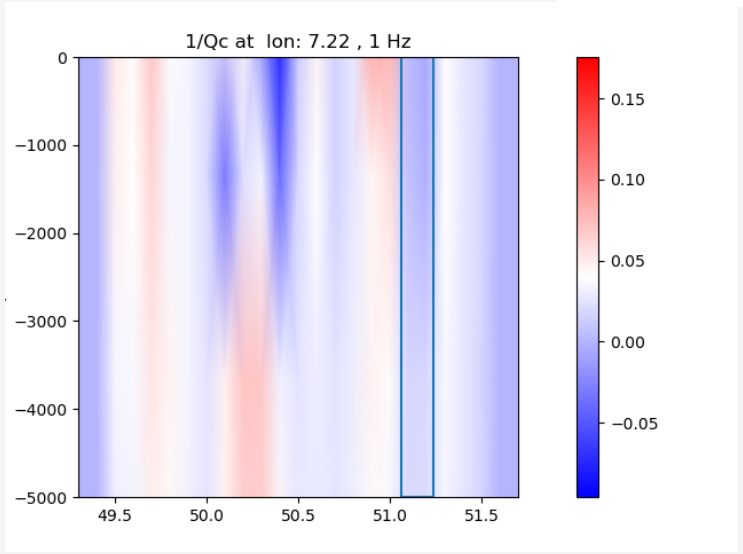
“Checkerboard test”

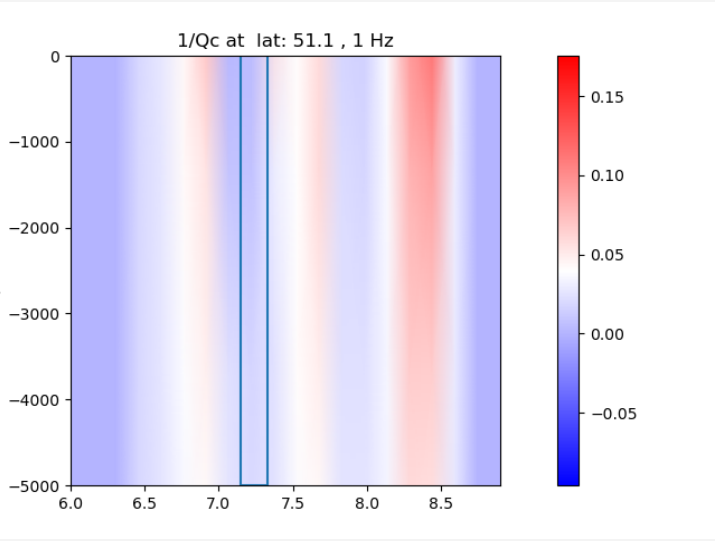




20 km profile at 51.15, 7.24







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Temporary network of university of Münster

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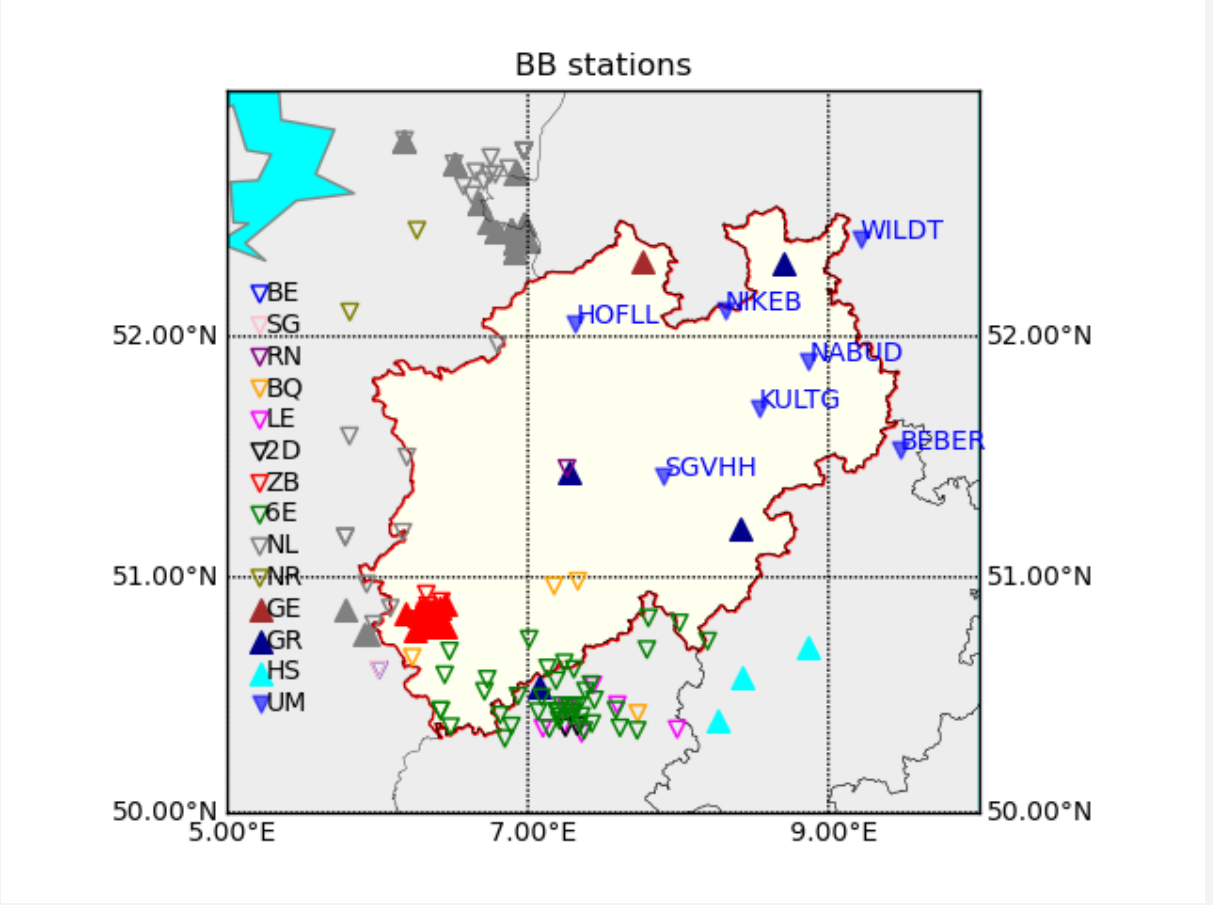
Temporary stations: 7
added to other 72 BB stations
with Open access from FDSN servers
are used for ambient noise CC

From 25-06-2024 to 08-05-2025 data is collected,
the stations are still running



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Scanning the data for events:

Source scann algorithm, Lassie Friendly earthquake detector, (Heimann, 2016)

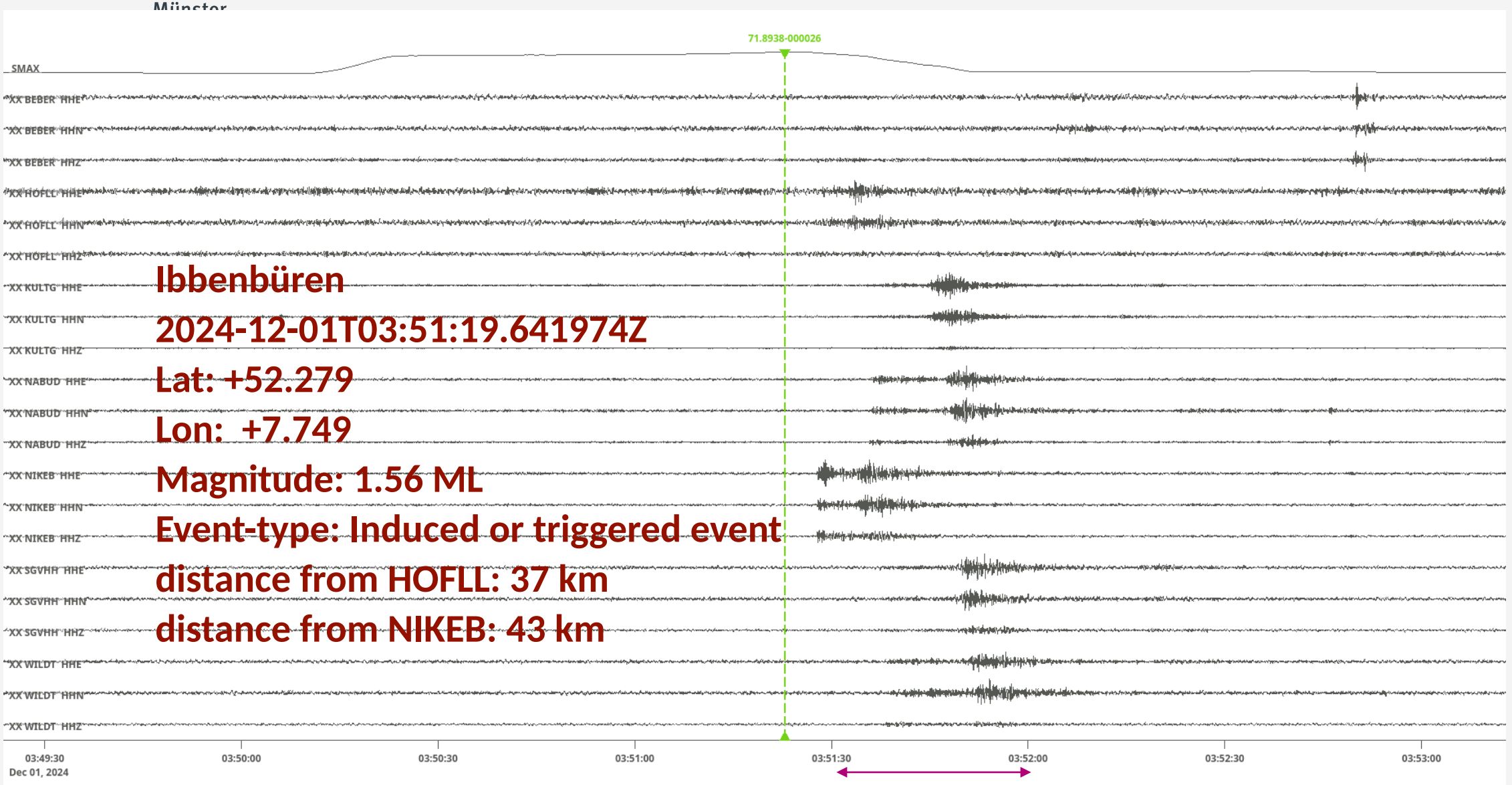
(1-15 Hz, NRW Velocity model, Thr: 60)

Detected events:

6 out of 60 automatic event detection are verified

20 of events of university of Cologne catalog (with magnitude above 1) are visible

Examples of clear verified events



Ibbenbüren

2024-12-01T03:51:19.641974Z

Lat: +52.279

Lon: +7.749

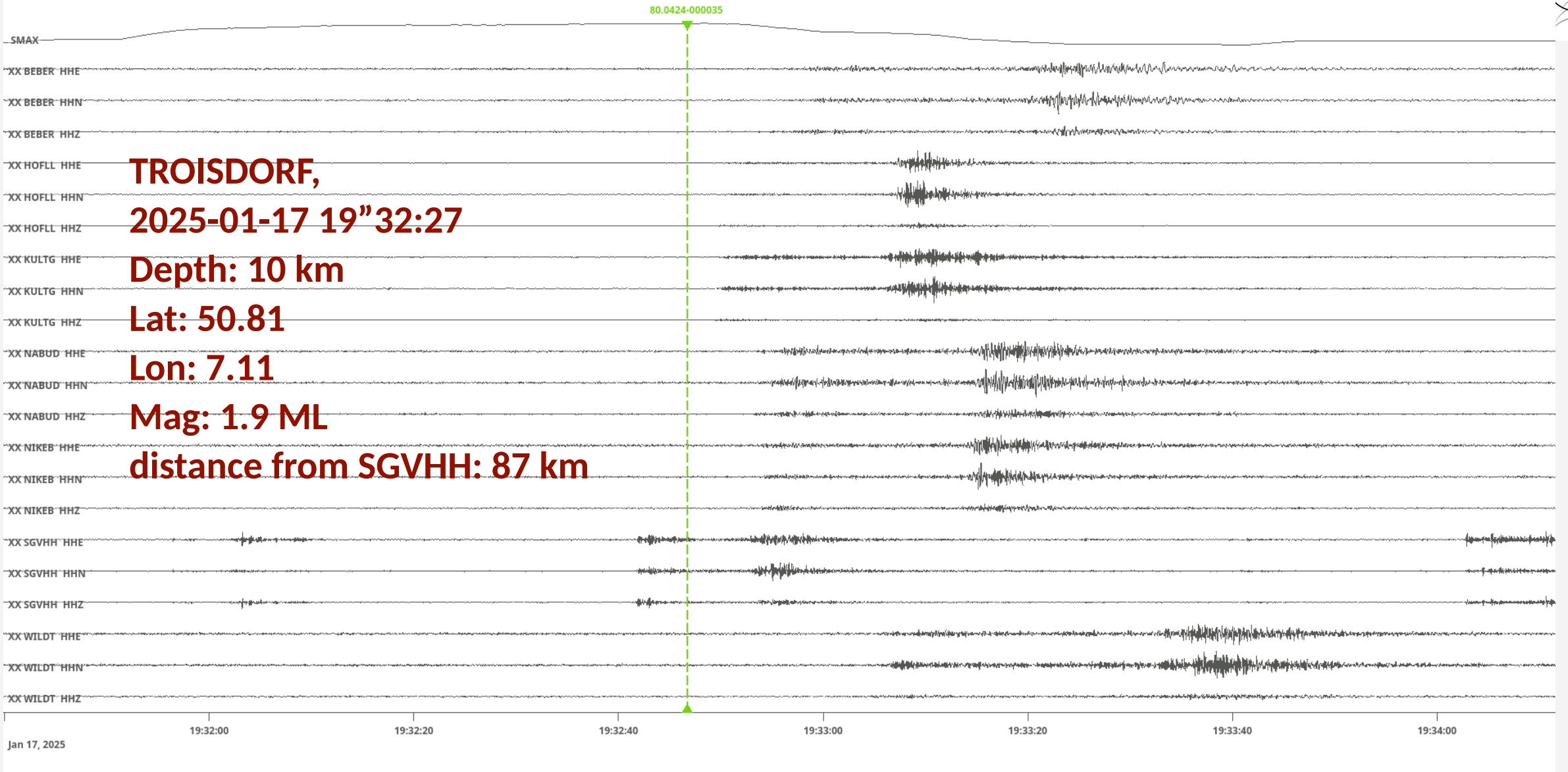
Magnitude: 1.56 ML

Event-type: Induced or triggered event

distance from HOFLL: 37 km

distance from NIKEB: 43 km

https://fdsnws.geophysik.ruhr-uni-bochum.de/



TROISDORF,
2025-01-17 19”32:27
Depth: 10 km
Lat: 50.81
Lon: 7.11
Mag: 1.9 ML
distance from SGVHH: 87 km

https://www.seismo.uni-koeln.de/catalog/2025.htm

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Concluding remarks

- Adding QB datasets adds resolution of attenuation parameters at shallower depth
- The results of two completely different data sets verify each other.
- The reliability of measured Qc and Q values are variable
- adding the data collected by temporary broadband network which needs that the EQ data set also updated will increase the ray coverage at the north part of NRW.

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Thank you for your attention