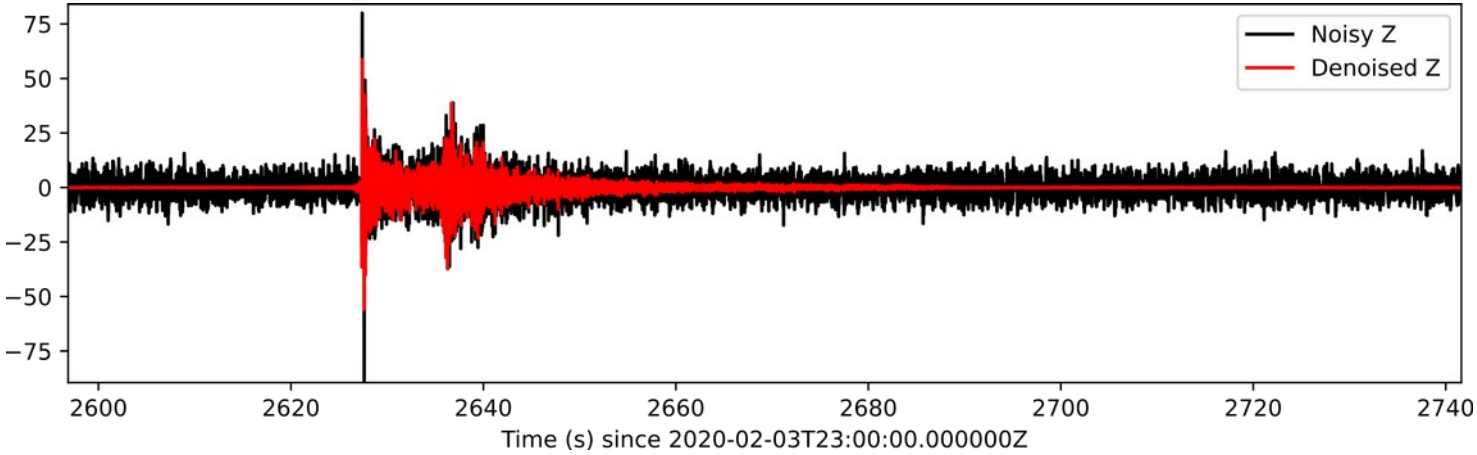

RUB

RUHR-UNIVERSITÄT BOCHUM

AMPLITUDE RATIOS OF DENOISED SIGNALS

DBMISS | 2024-11-27

Martina Rische, Janis Heuel (KIT)

Motivation

Amplitude decrease due to Denoising

→ Can magnitudes be determined on the denoising traces?

→ Can correlations be observed in the decrease in amplitude?

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Amplitude decrease due to Denoising

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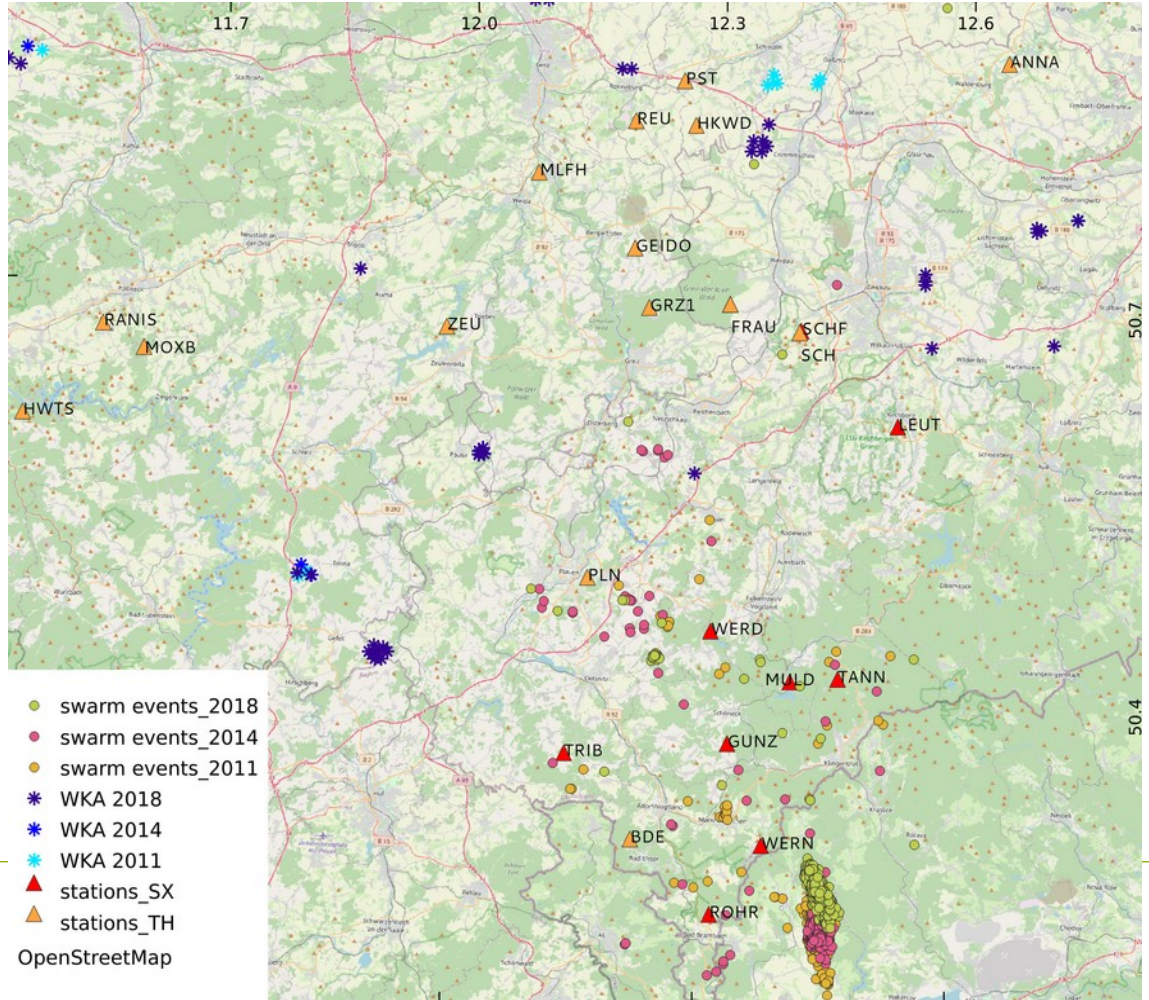
- Swarm earthquake Vogdtland with stations Saxony / Thuringia
- 3 x 2 months with approx. 1000 evaluated events
- Similar travel paths - no different travel path effects on the amplitude
- Different stations with different noise conditions / change of noise conditions with time
- Large magnitude range

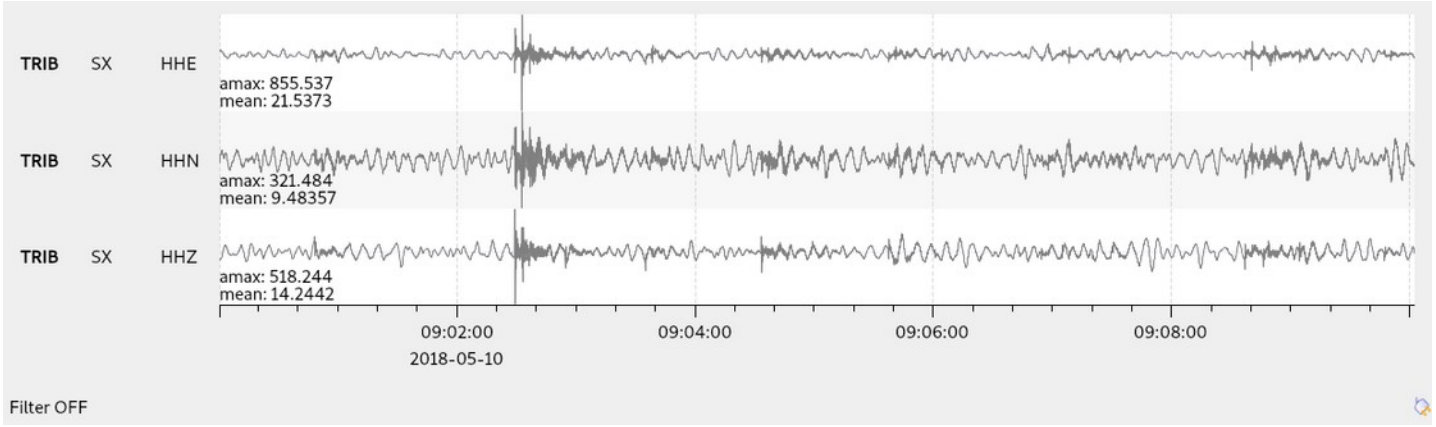
Swarms TH/SX

2011
2014
2018



https://doi.org/10.7914/SN/TH

https://doi.org/10.7914/SN/SX



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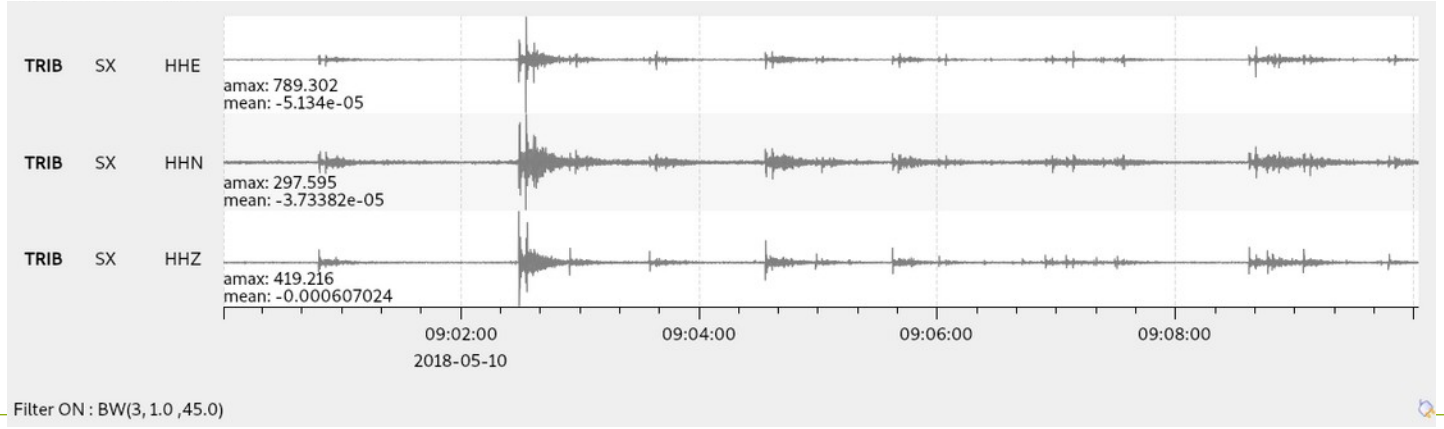
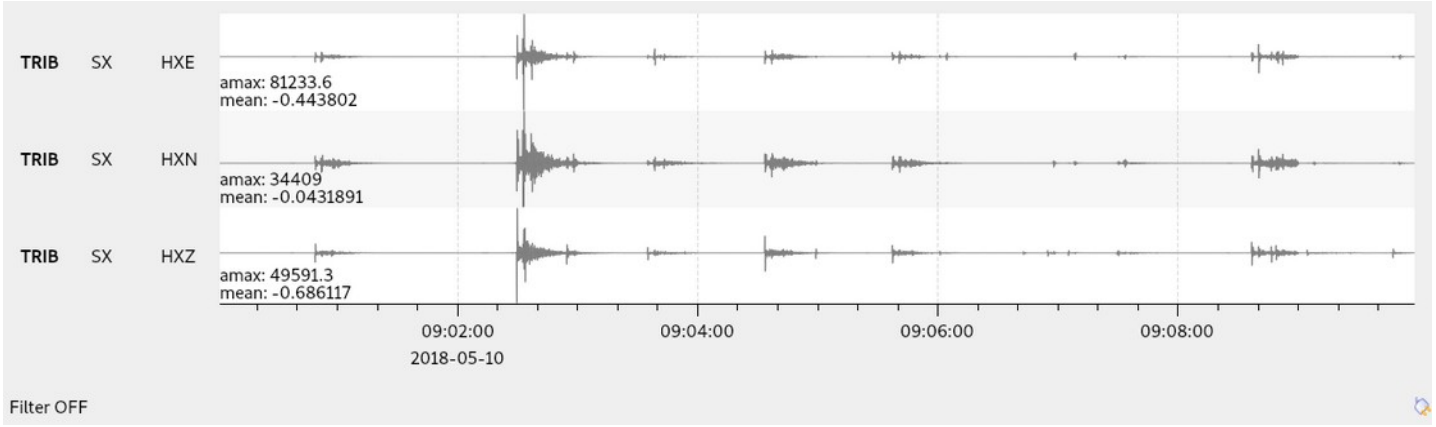
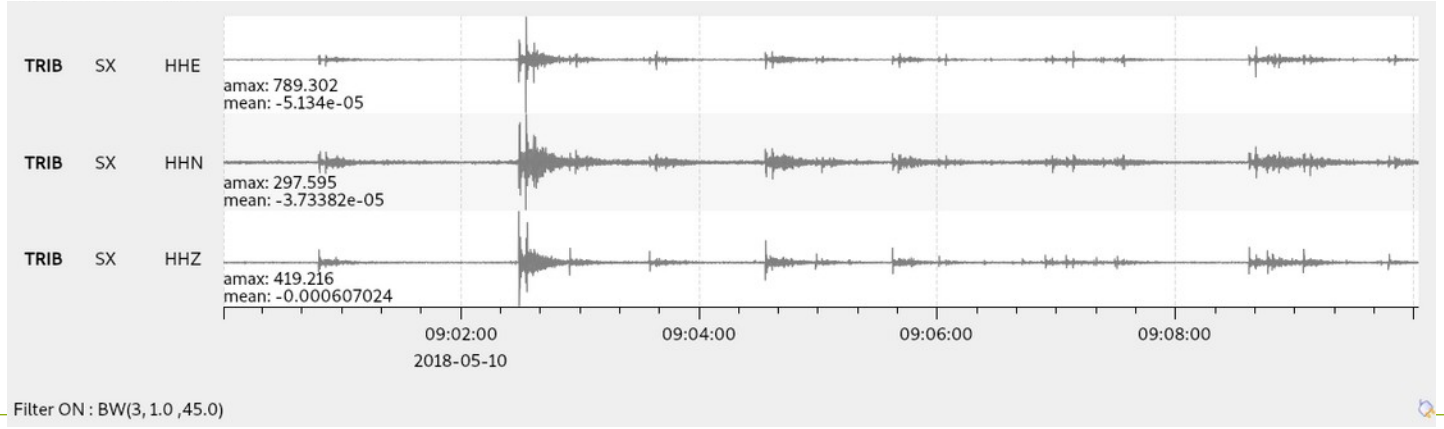


filtered



denoised



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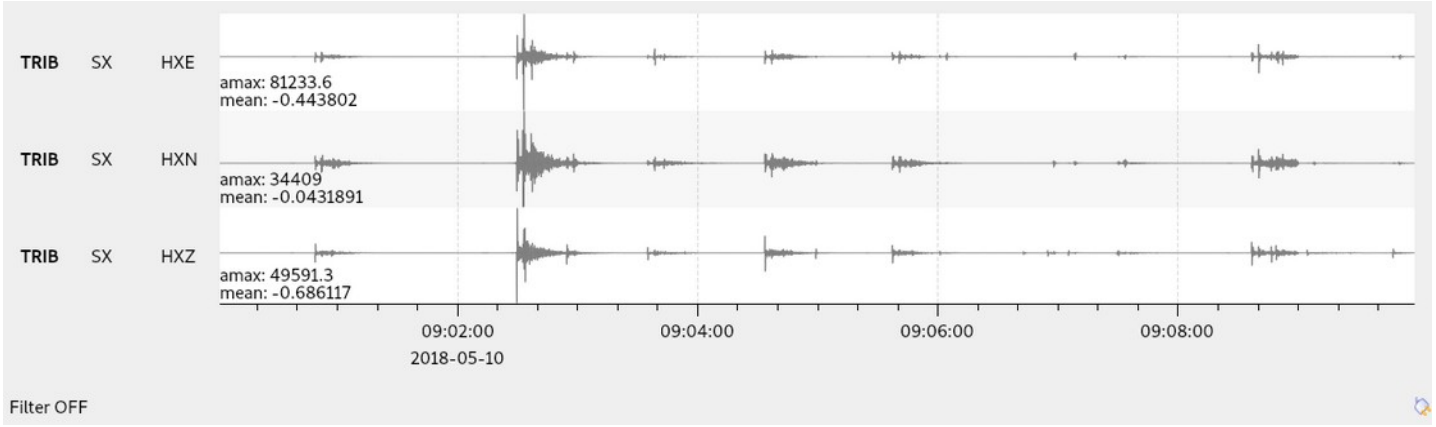
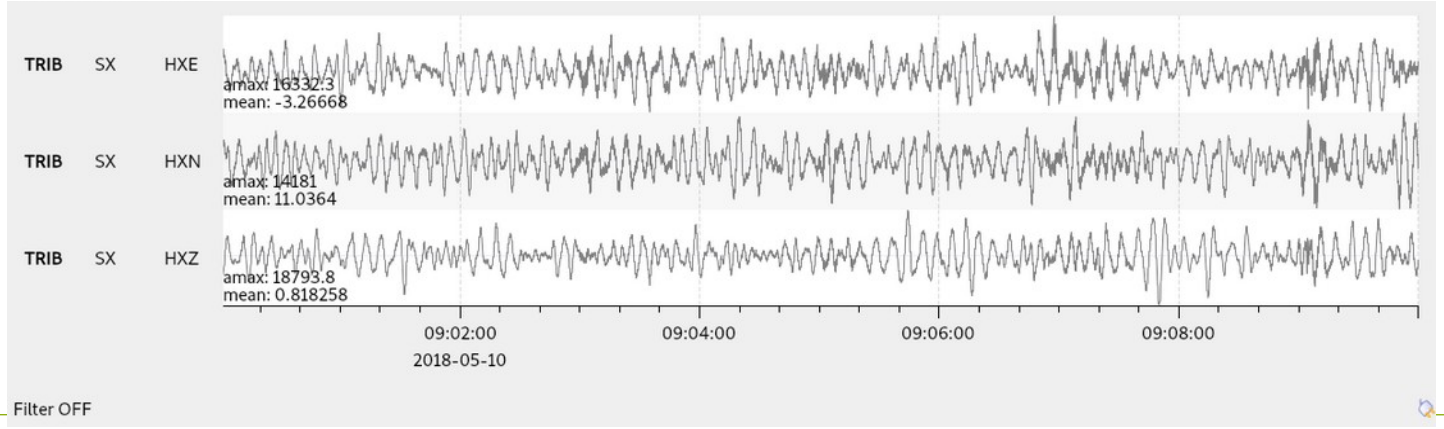
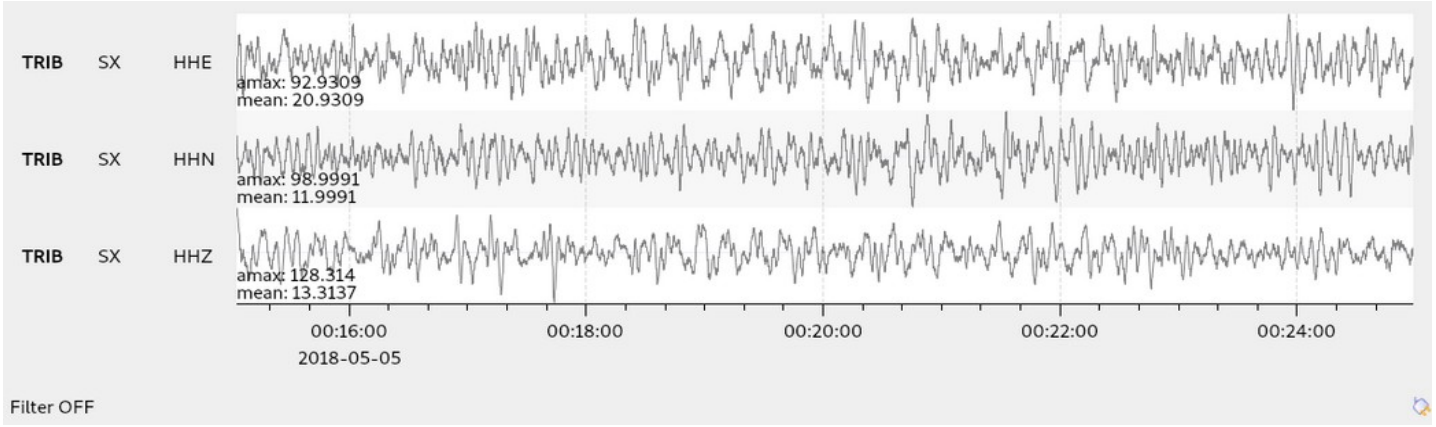


denoised



noise



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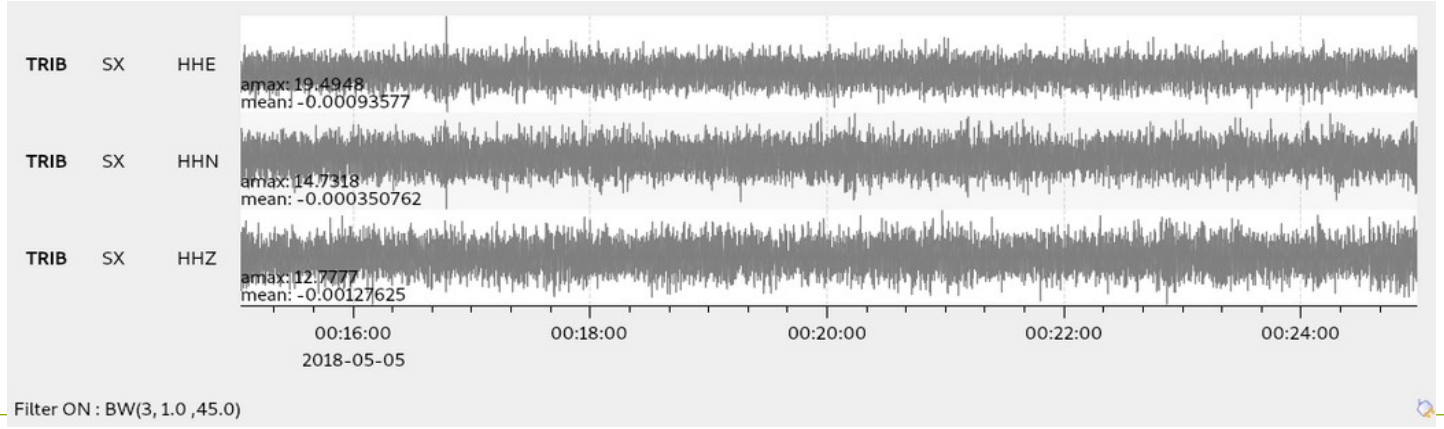
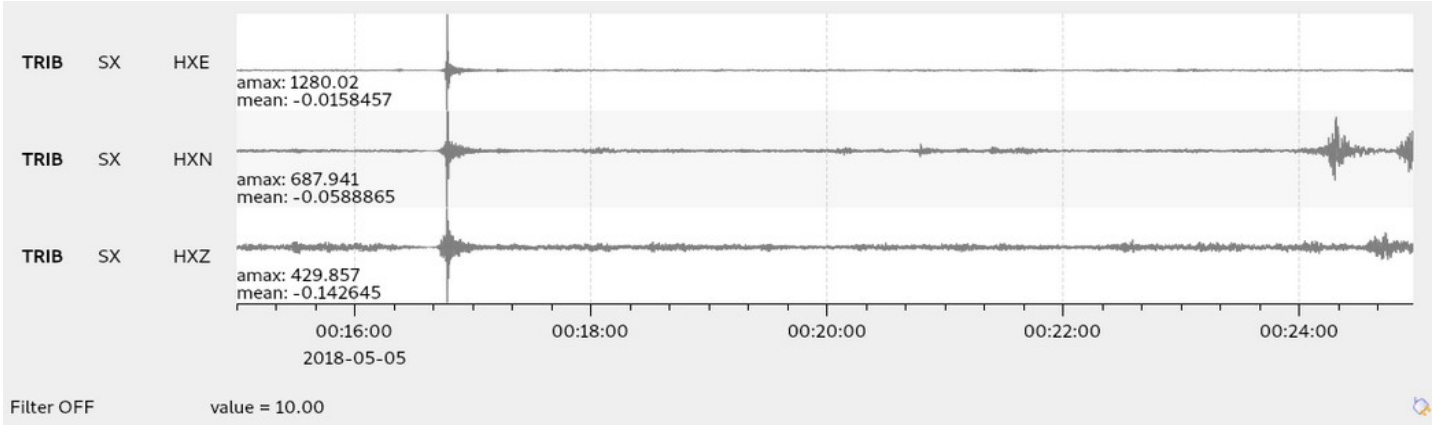
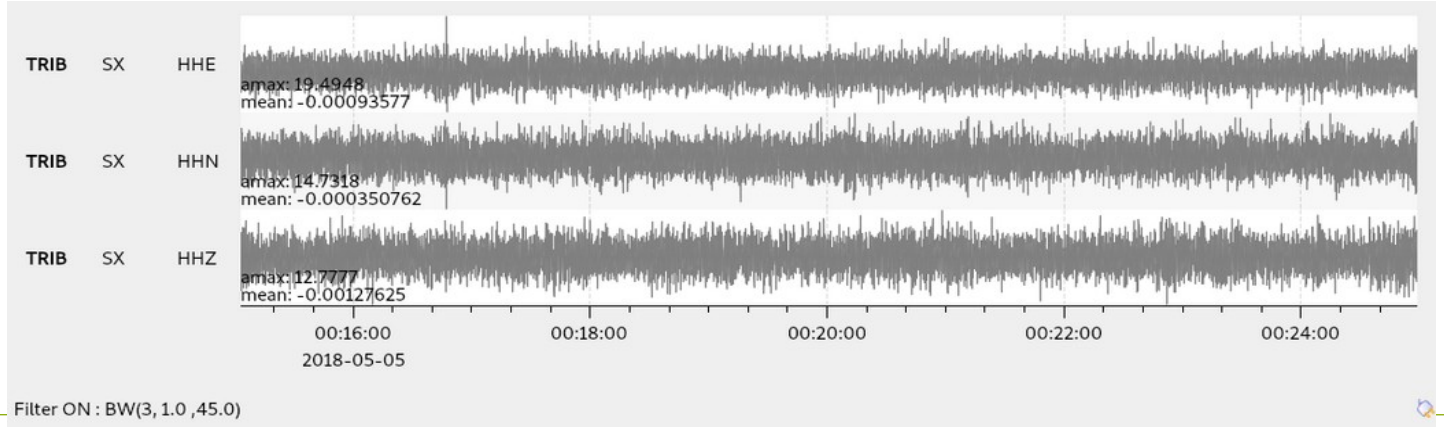


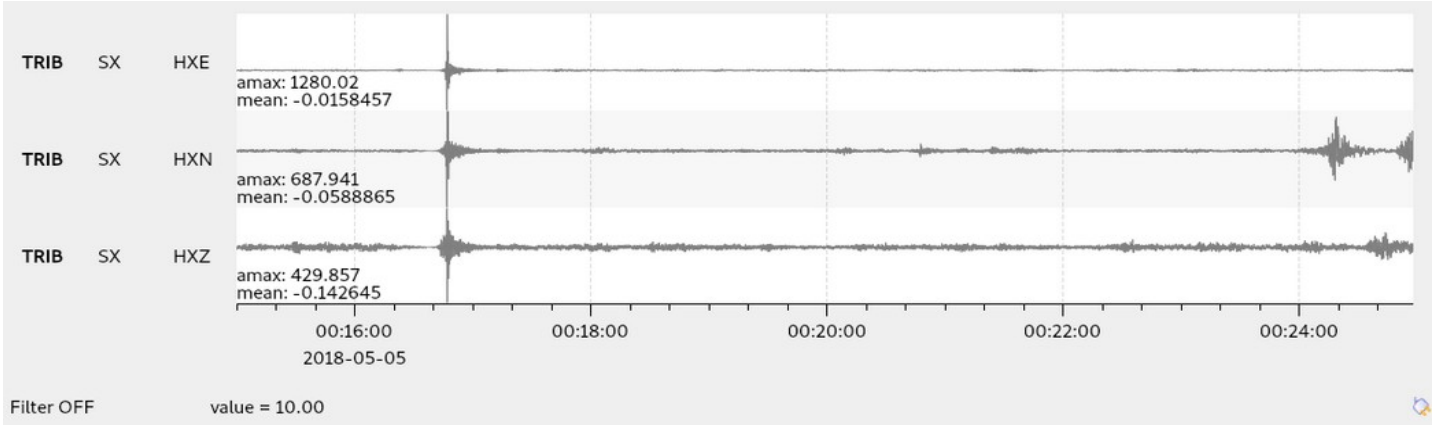
filtered



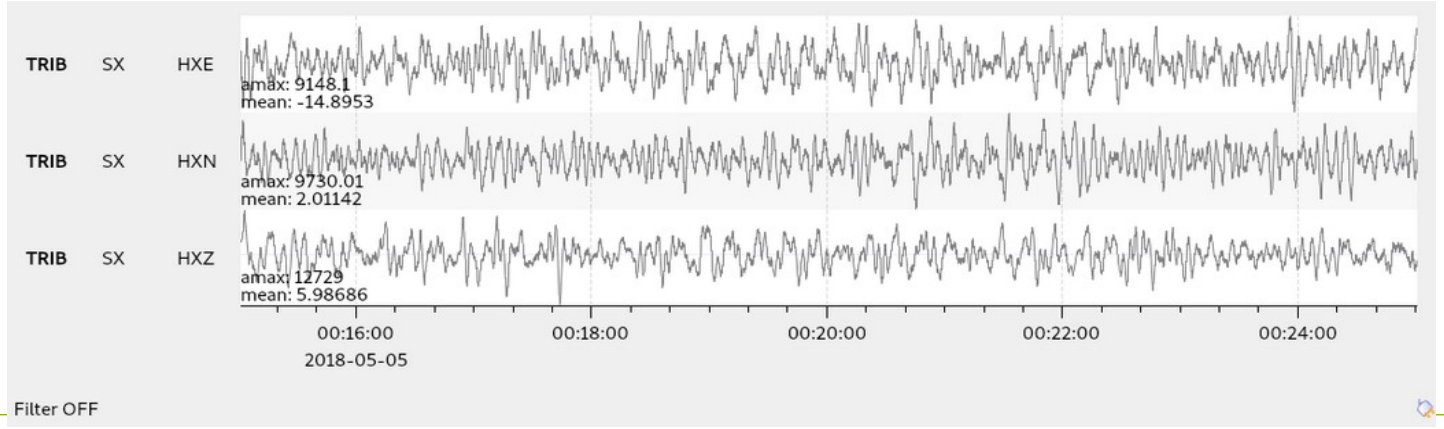
denoised



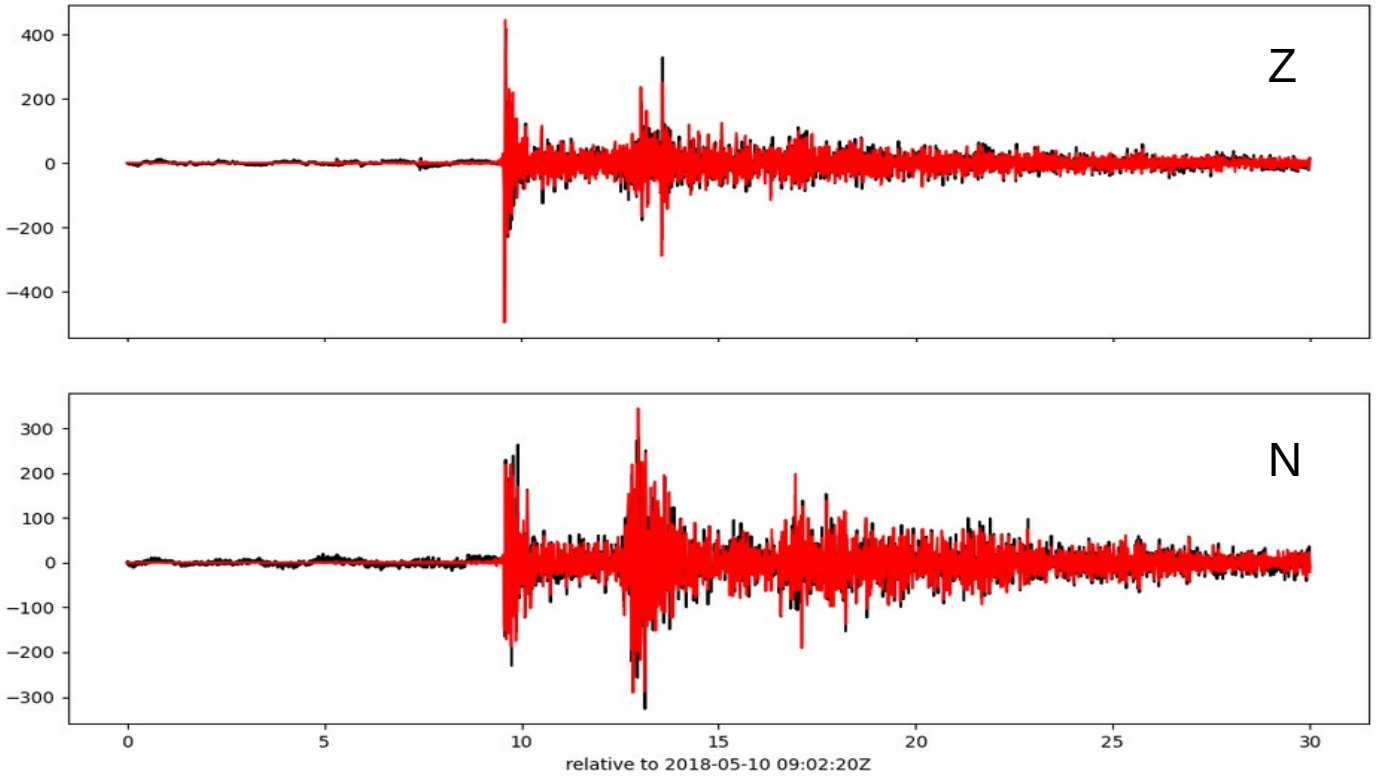
filtered



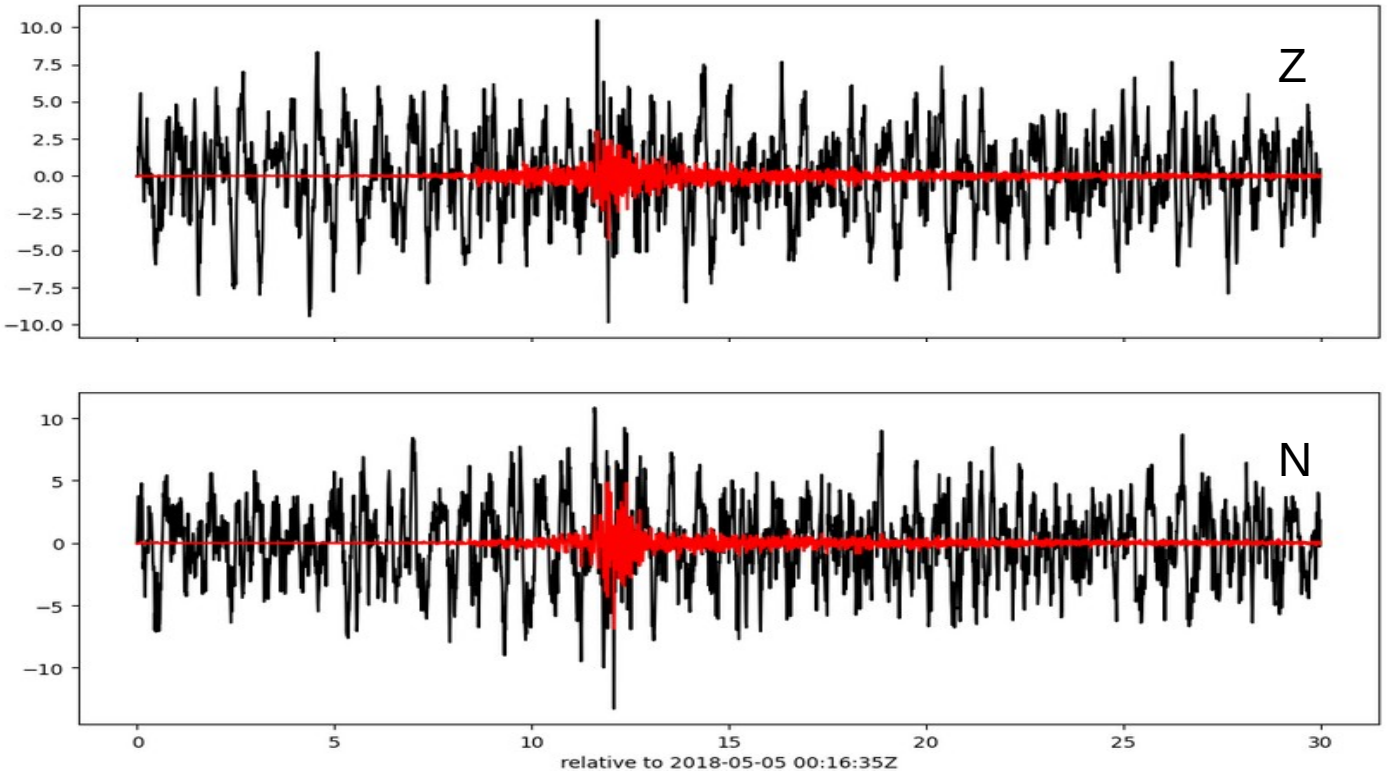
denoised



noise


Z
N
400
200
0
−200
−400
300
200
100
0
−100
−200
−300
0
5
10
15
20
25
30
relative to 2018-05-10 09:02:20Z

M_L 1.1

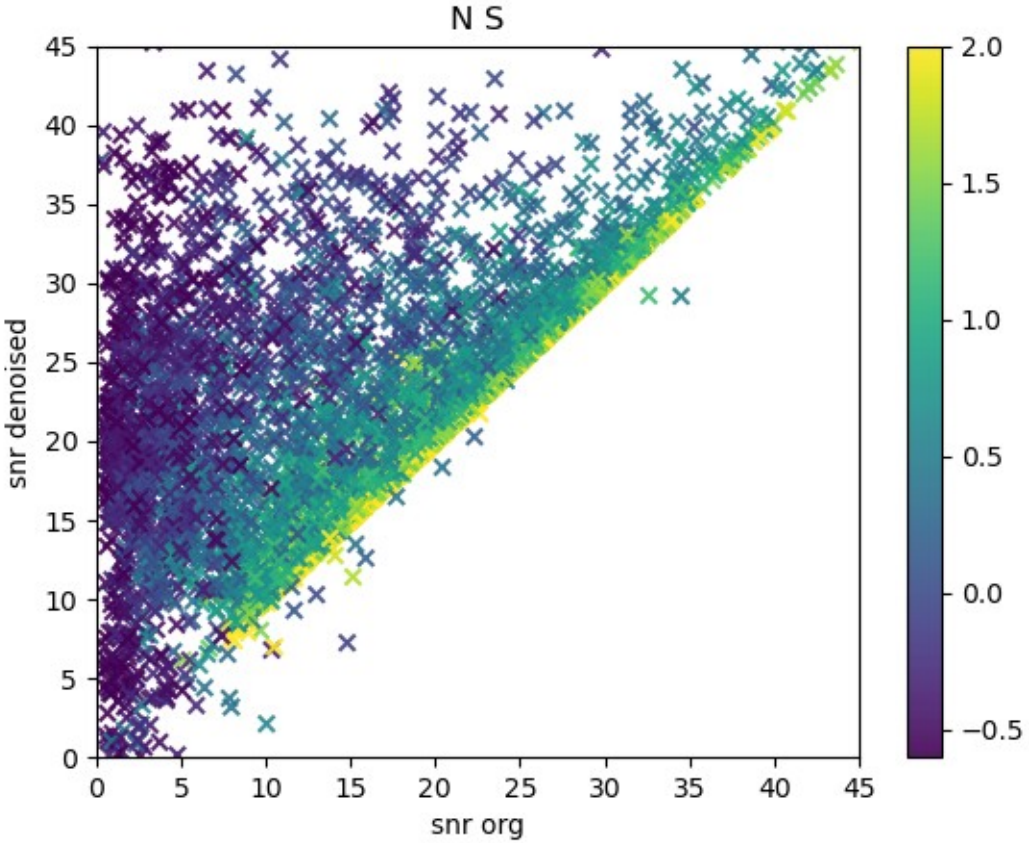


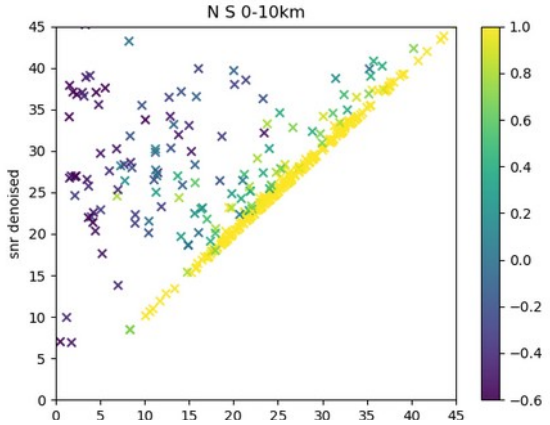
M_L -0.6

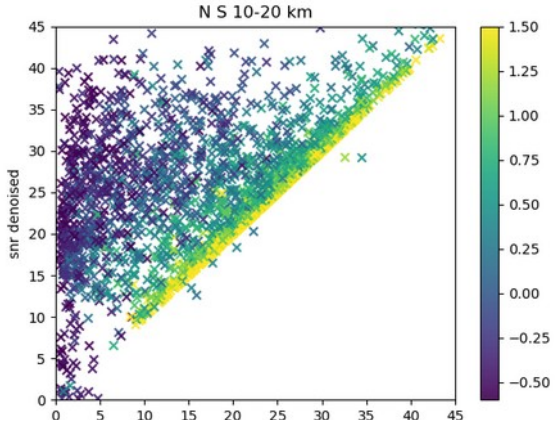
Determination of various parameter

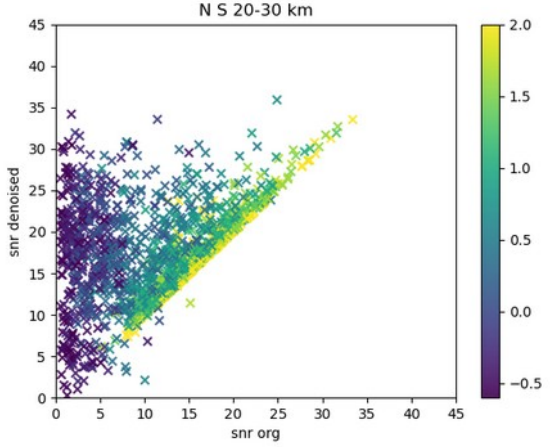
- From raw data and denoised data
  - Amplitudes of noise
  - Ampltitudes of P waves
  - Amplitudes of S-waves
  - SNR

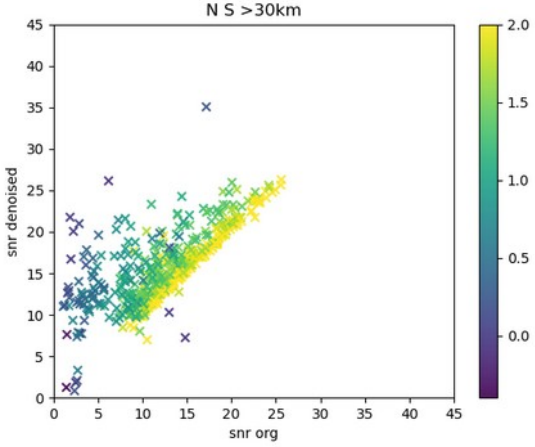
Thanks to Uni Jena for their phase catalouge

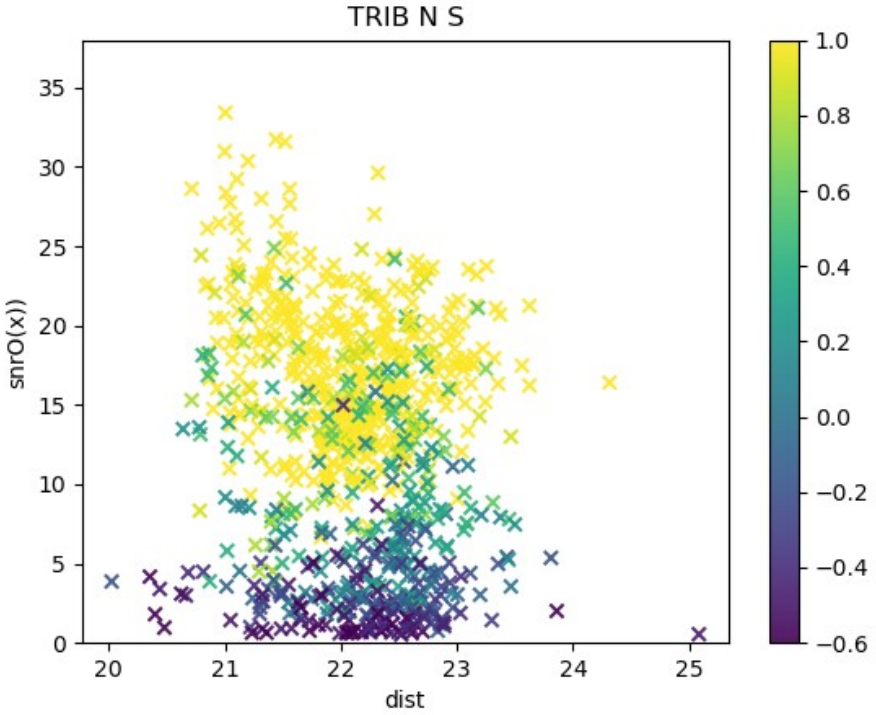

N S
snr denoised
snr org
0
5
10
15
20
25
30
35
40
45
2.0
1.5
1.0
0.5
0.0
−0.5

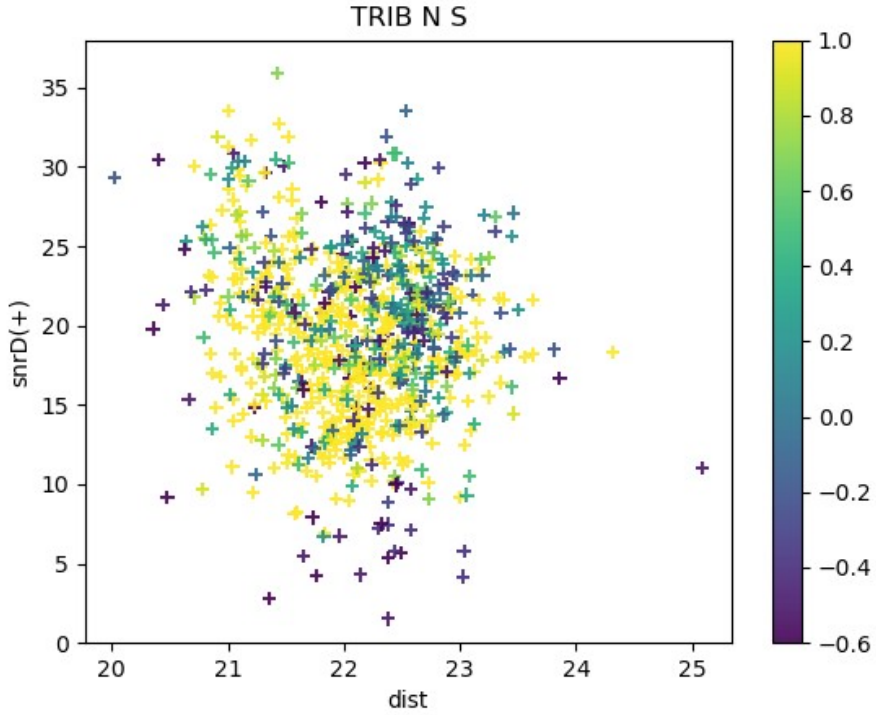

N S 0-10km
snr denoised
0
5
10
15
20
25
30
35
40
45
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6

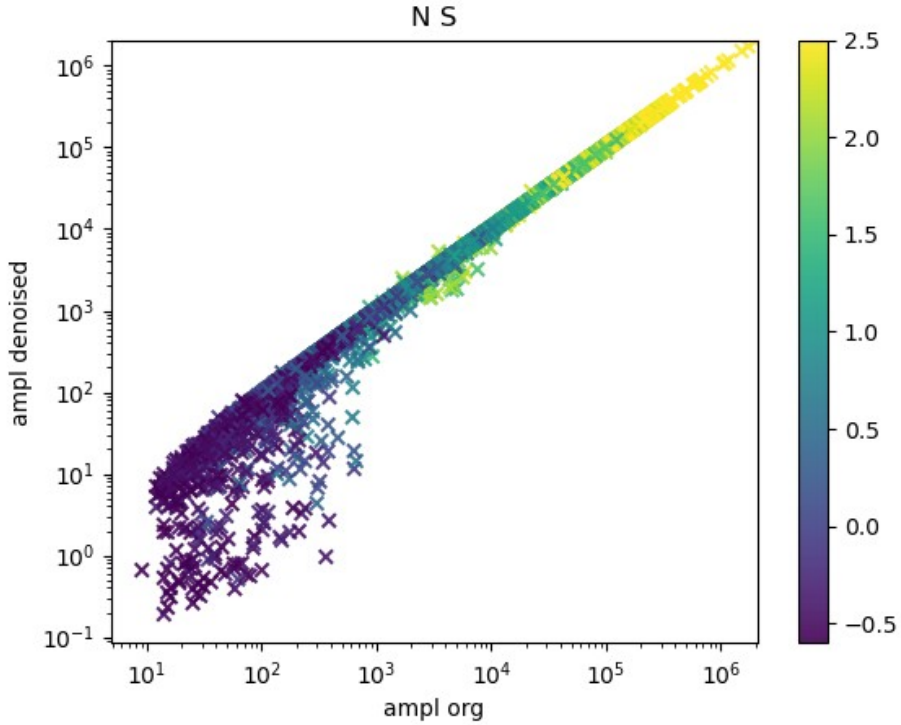

N S 10-20 km
snr denoised
0
5
10
15
20
25
30
35
40
45
1.50
1.25
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50

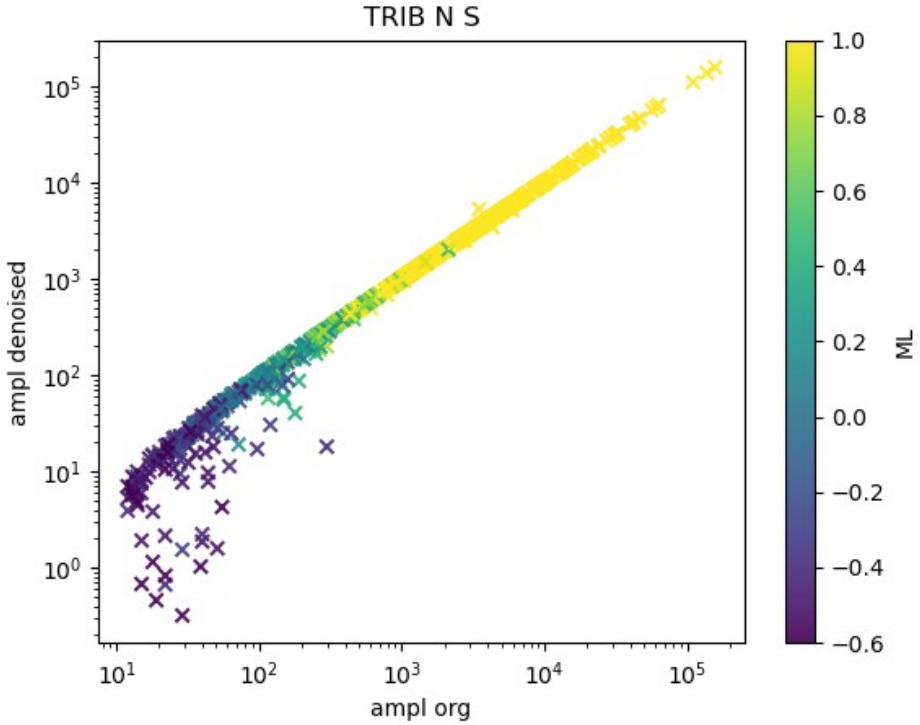

N S 20-30 km
snr denoised
snr org
0
5
10
15
20
25
30
35
40
45
2.0
1.5
1.0
0.5
0.0
−0.5


N S >30km
snr denoised
snr org
0
5
10
15
20
25
30
35
40
45
2.0
1.5
1.0
0.5
0.0









Conclusion

- up to now no correction factor for small amplitudes found in the data.
- amplification of the denoised signal / reduction of the noise is too different – even in such a homogenious dataset

Thanks

- to Uni Jena for their phase catalouge
- Continious data: https://doi.org/10.7914/SN/TH, https://doi.org/10.7914/SN/SX
- DbMiss project
- Your attention