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Added value of low-cost seismic and infrasound sensors to local monitoring

Maria-Theresia Apoloner, Ulrike Mitterbauer, Peter Mohr & Fee-Alexandra Rodler

P3.1-265

POSTER

Bundesministerium
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Zentralanstalt für
Meteorologie und
Geodynamik

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Maria-Theresia Apoloner, NDC Austria @ ZAMG, maria-theresia.apoloner@zamg.ac.at

ABSTRACT

In the framework of a tabletop-exercise of the Austrian NDC, scheduled ground detonations within a week in November 2020 were monitored. Therefore, a local network was deployed. Additional to the permanent seismic station ABNA in the vicinity, the NDC deployed two seismic broadband stations with co-located low-cost seismic and infrasound sensors as well as a mobile infrasound array.

After the location of the scheduled ground explosions further analysis of the waveform data was performed: we reviewed the quality of the different seismic sensors as well as the added value of the low-cost infrasound sensor. Additionally, we looked into the background noise at the newest permanent station ABNA of the Austrian Seismic network

https://conferences.ctbto.org/event/7/contributions/1032/

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EXPERIMENT

Deployment of local multi-sensor network in **Allentsteig/Upper Austria** to monitor ground explosion

30th October 2020 – 6th November 2020

Evaluation with open source tools
- Pyrocko
- Obspy
- QGis

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INSTRUMENTS

ABNA: permanent installation STS-2.5 120 s
CENT1 & CENT2: Trillium Compact Posthole 20 s
RD469: Raspberry Shake & Boom 2 s with Microbarograph
R040A: Raspberry Shake 3D 2 s

KINEMETRICS

nanometrics

Raspberry Shake

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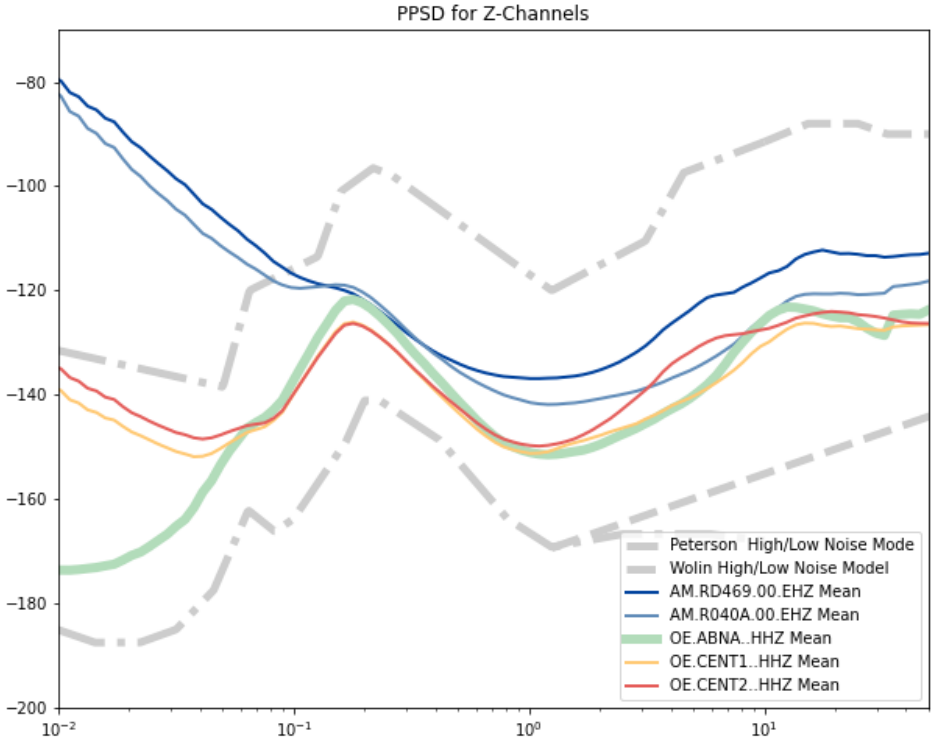
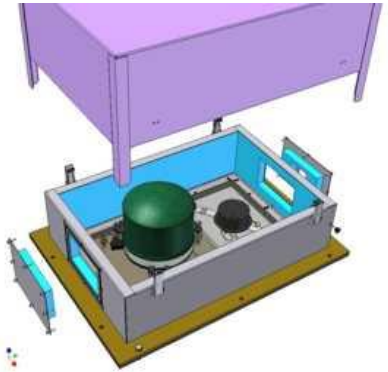
NOISE PPSD



ABNA: sophisticated installation, unused bunker



CENT1 & R040A: no insulation, basement
CENT2 & RD469 : no insulation, storage shed

> 1 sec → Sensors perform as specified
<1 sec → noise varies even on same site

! time error at R040A > 5 seconds

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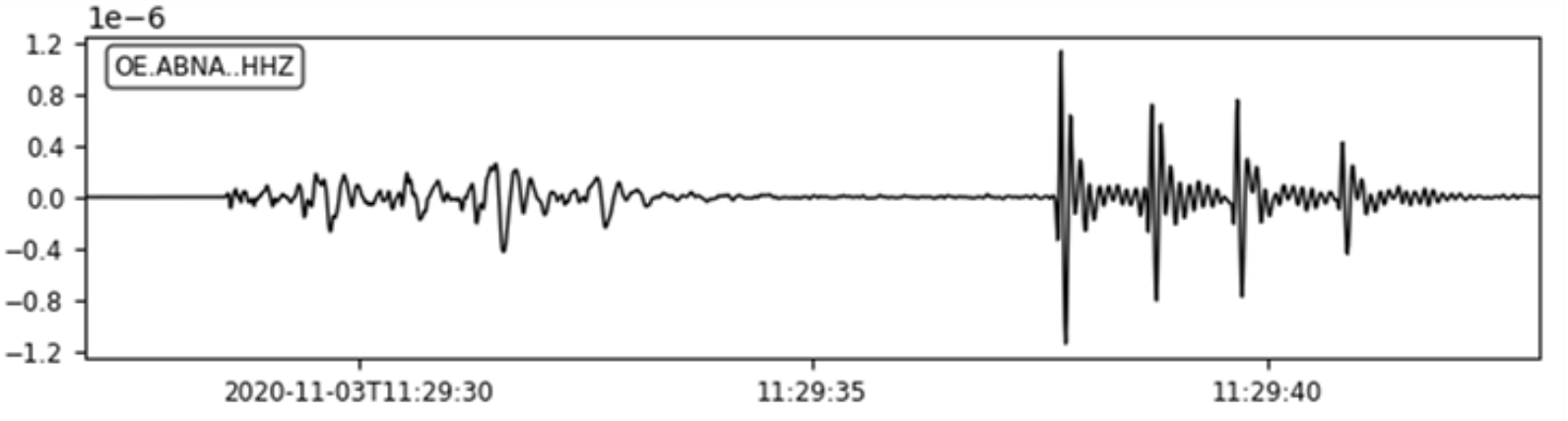
MAIN EVENT

4 shot explosion with similar loading:
First Shot on 2020-11-03 11:29:27.86400 Latitude 48.661° Longitude 15.391° Depth 0.0 km
Signal @ ABNA 3 km from shot



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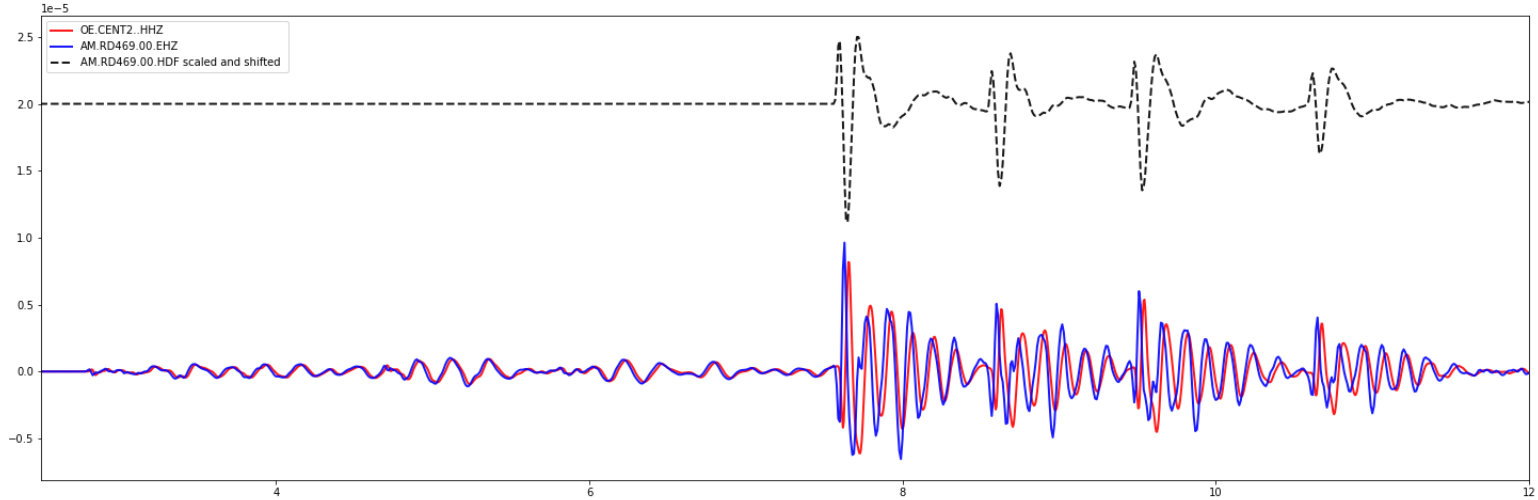
MAIN EVENT

Comparison of CENT2 & RD469 (incl. Infrasound) @ 1,9 km distance



→ clear sound signal at seismic and barometric sensors
→ time drift at RD469 compared to CENT2

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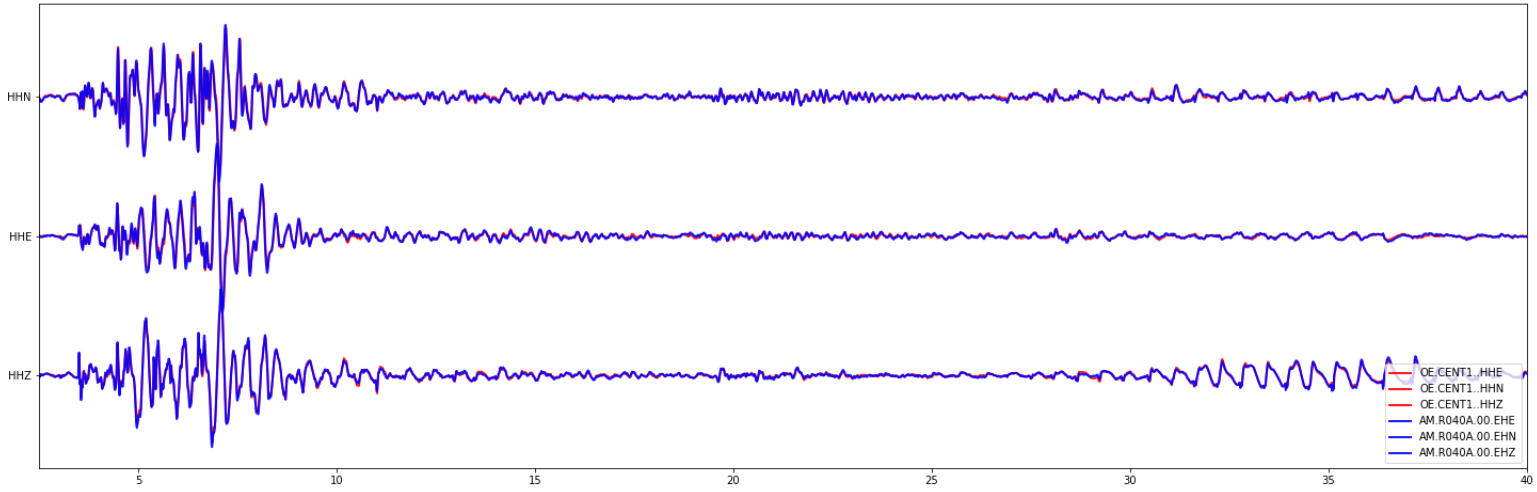
MAIN EVENT

Comparison of CENT1 & R040A @ 5.8 km distance



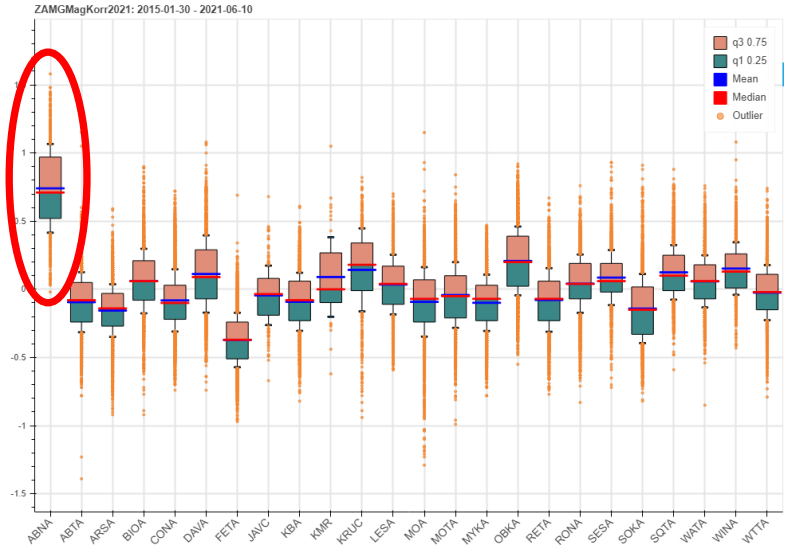
→ Traces of sound signal at both sensors on all components

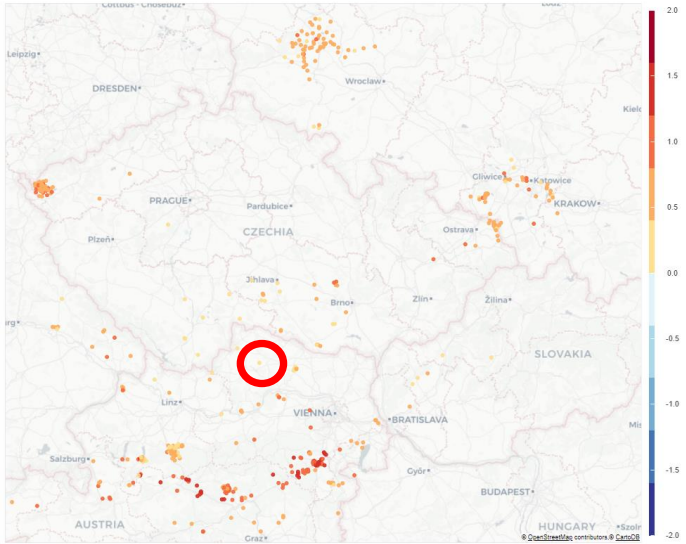
NEW STATION

Stationmagnitude @ ABNA

09/2020 – 06/2021 compared to Austrian Broadband Stations

Magnitude Residual = Network Magnitude – Station Magnitude

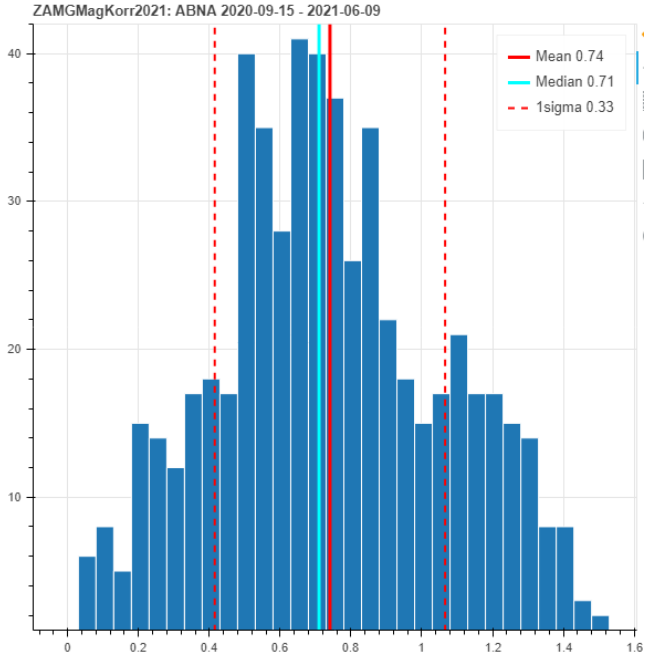


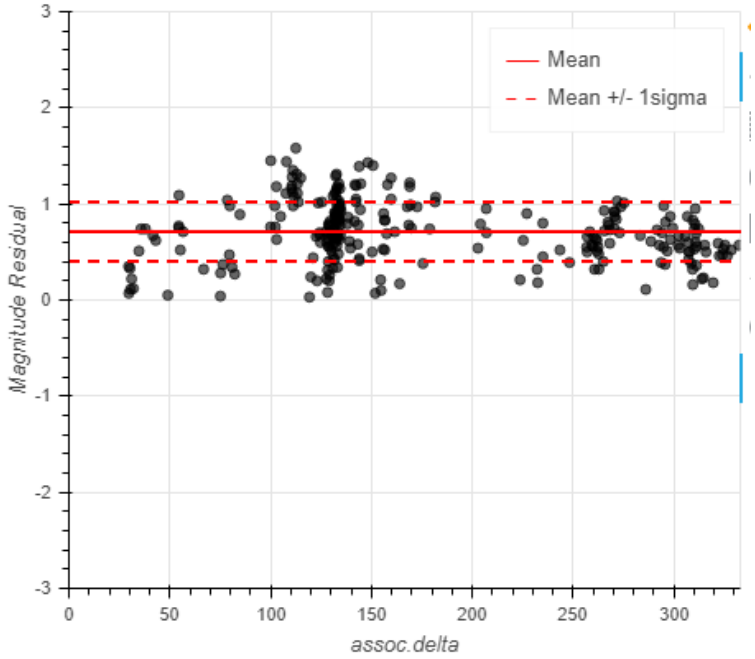


Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO

NEW STATION

Magnitude Residual for all events Ml > 1.0 and > 6 stations used for network magnitude → station magnitude correction ~0.





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CONCLUSIONS

1. Different sensors perform as specified
2. Timing issues with Raspberry Shake & Boom using GPS-Antenna
3. The new station ABNA provides low noise data, but needs magnitude correction
4. Investigation of known local noise sources needed

- Further results from Infrasound:
  https://conferences.ctbto.org/event/7/contributions/935/
- Austrian NDC NPE2019 participation
  https://conferences.ctbto.org/event/7/contributions/1173/