

Antelope in Antarctica and seismological activities around Neumayer Station

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Neumayer Station - Antarctica

E GERLACHE





- Accessible Nov to Feb
- Winter personnel: 9,
 - 2 Geophysicists,
 - 1 Meteorologist,
 - 1 Airchemist,
 - 1 Cook, 1 Doctor, 2 Technicians
- Changing on a yearly base





Seismology

- No rapid hazard response necessary
- Providing data (waveforms, arrivals) for the scientific community
- Scientific output increasingly important



Current permanent network





- 3 permanent stations with real time data (on ice)
 1 array with 15 vertical component seismometer (VNA2)
- 6 permanent stations without real time data (5 on rock)
- 1 mini-array with 3 vertical component seismometer (UPST)

Datatransfer





Network code: AW

Alfred Wegener Institute for Polar and Marine Research (AWI) (1993): AWI Network Antarctica. Deutsches GeoForschungsZentrum GFZ. Other/Seismic Network. <u>doi:10.14470/NJ617293</u>.

Instrument Zoo

- 9 permanent stations
- 12-15 transportable stations
- Logger
 - Q330S+
 - Q330
 - Reftek130
 - Cube, testweise
- Seismometer
 - MBB-2
 - Guralp GMC-3ESP 120s
 - Lennartz LE3D-20s
 - 1C Mark L4
 - STS2









Technics

- Power supply
 - Solar (100 1000W)
 - (Wind, 150 300W)
 - AGM lead acid batterys, >200Ah
- (Battery heating)
- Real time data up to 80km distance
 - radio (400-500MHz)
- SOH
 - Iridium:
 - Xeos (Q330S+, Reftek 130)
 - Self dev with Schwartec: SeiDL (Reftek 130)
 - Under development: WSPR Beacon (2-13MHz), TU Muenchen





Routine observatory work



- VM with CentOS 7, Antelope 5.12@NM and 5.7@BHV
- ringserver for data export to Geofon
- slink2orb for magnetic data
- orb2wf and orb2db
 - seismic handler (array processing, polarization analysis)
 - Obspy: daily spectrograms
 - Module 'obspy_ext' for obspy stream from db
- Catalogs: cron for usgs2db and emsc2db
- No automatic event processing (orbdetect/assoc)
- Manuall waveform picking (winterer), still dbpick (missing 'next arrival' in traceview)

Daily spectrogram





Singing Icebergs



Singing icebergs (HP_3)



Scientific projects



Setup of temporary networks

- EKS 2020-2022
 near ice shear zone
 => icequake sources
- 2. GrouZE 2022-2023 at feeding ice stream => velocity variations

ICE FLOW

ICE SHELF

VNA1

SEA BED

VNA2/3

ANTARCTIC

ICE SHEET



HELMHOLTZ

Station setup

- 1 Skidoo/Team (2P.)
- 5 45min driving time
- setup time ~ 1.5h/station
- ca. 4 stations/day







Station demob



2023:

- 0.42 1.76m snow accumulation
- 1 Bully
- 15min 5h driving time
- demob time ~ 1.5h per station
- max. 4 stations/day



Temporary GNSS station

Network EKS (2020-2021)





Temporary deployment 11 BB stations Feb 2020 to Sep/Oct 2021 (~ 19month)









Data example – 10min record





Challenges with icequakes



- Far too many for manual analysis
- Trying deep learning techniques
 - simCLR
 - contrastive learning
 - Unsupervised learning
 - STA/LTA -> sort into classes of similar type
 - Choose the type of your interest for further analysis

AI – tackling icequakes?





AI – tackling icequakes?





AI - conclusions



- Alogrithm quickly produces output
- Still choose youself
 - Filter
 - Window length
 - Trigger parameter (STA/LTA)
 - Number of classes
- What's the seismological meaning of the different classes?

Impressions





Thank you

Questions? Comments? Remarks?