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Meteorological Institute
Ministry of Infrastructure and Water Management

A volcano seismic monitoring network in the Caribbean Netherlands

Reinoud Sleeman and Elske de Zeeuw-van Dalfsen

KNMI - Research & Development Seismology and Acoustics

EGU 2022 SM2.3 – Enhancing seismic network operations from site scouting to waveform services and products

Tectonic setting

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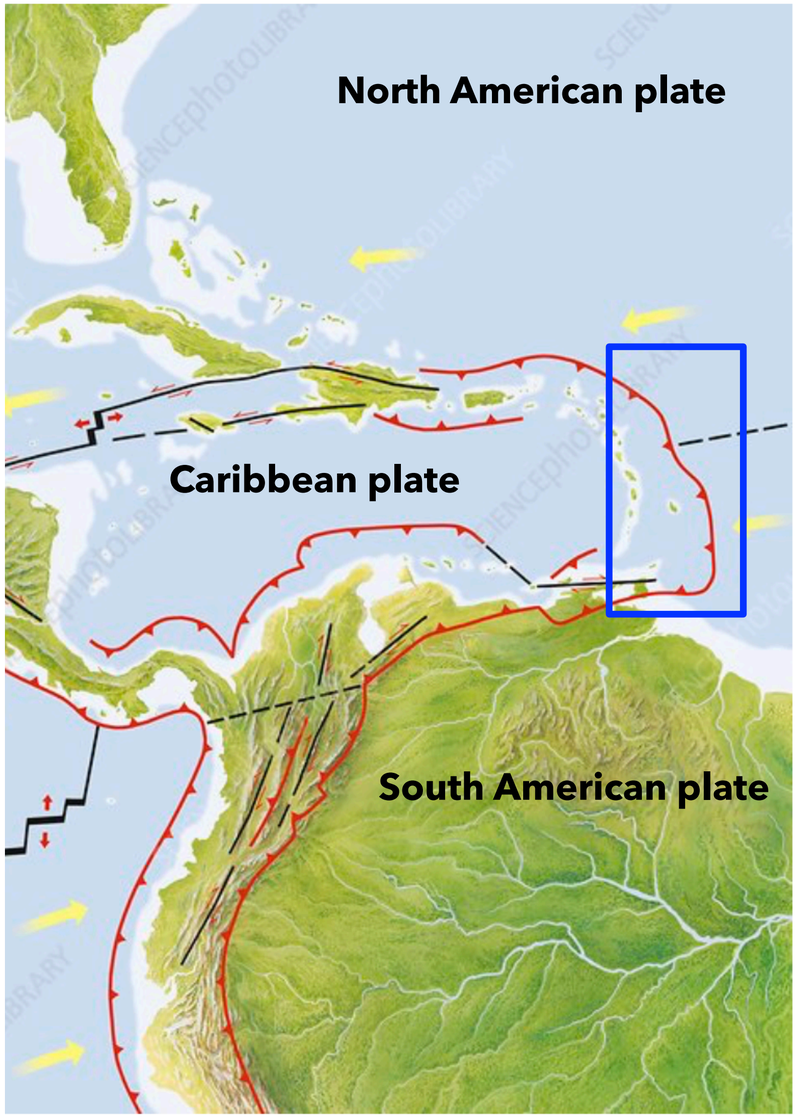
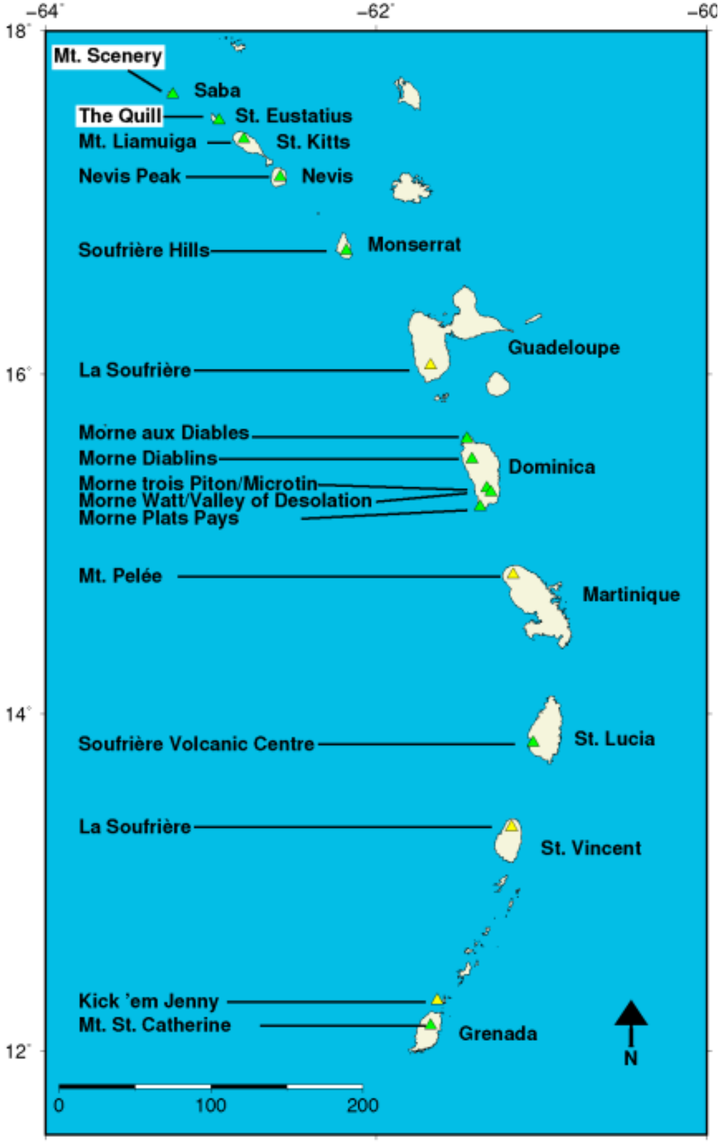
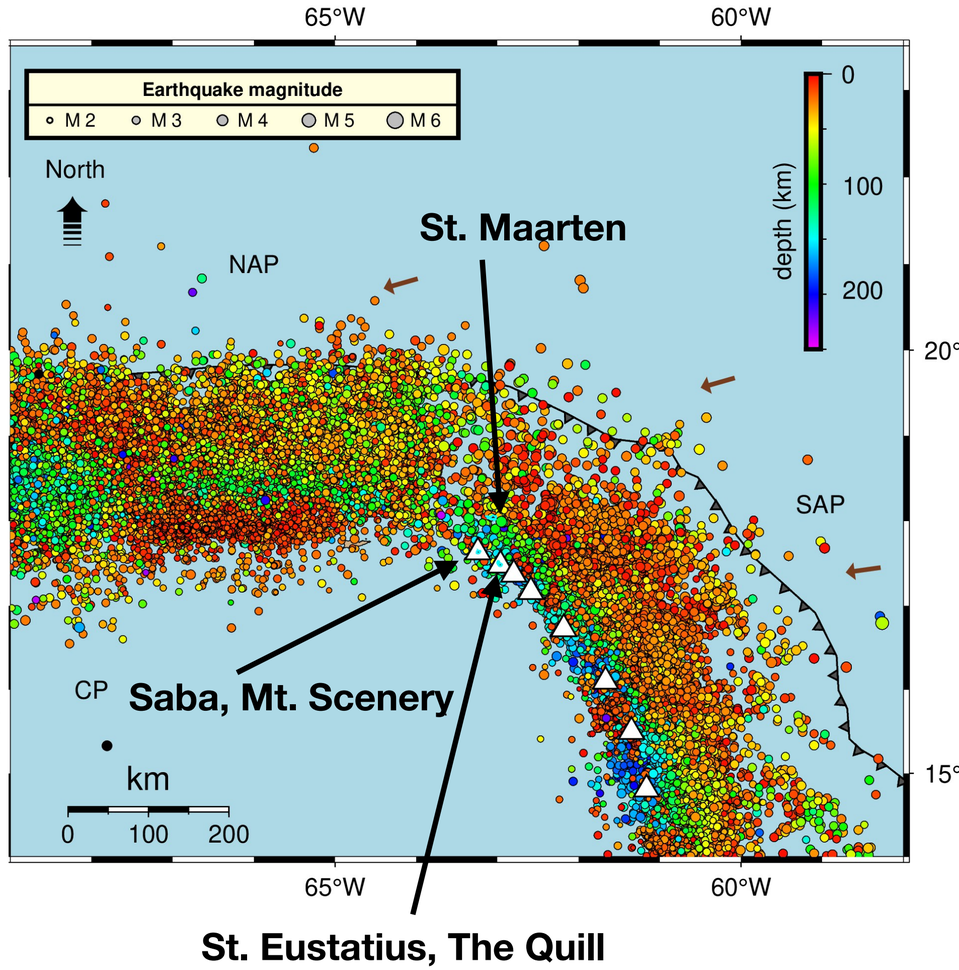
Lesser Antilles subduction zone



Lesser Antilles volcanic arc



Seismicity 2000 - 2022 ISC



Network monitoring objectives

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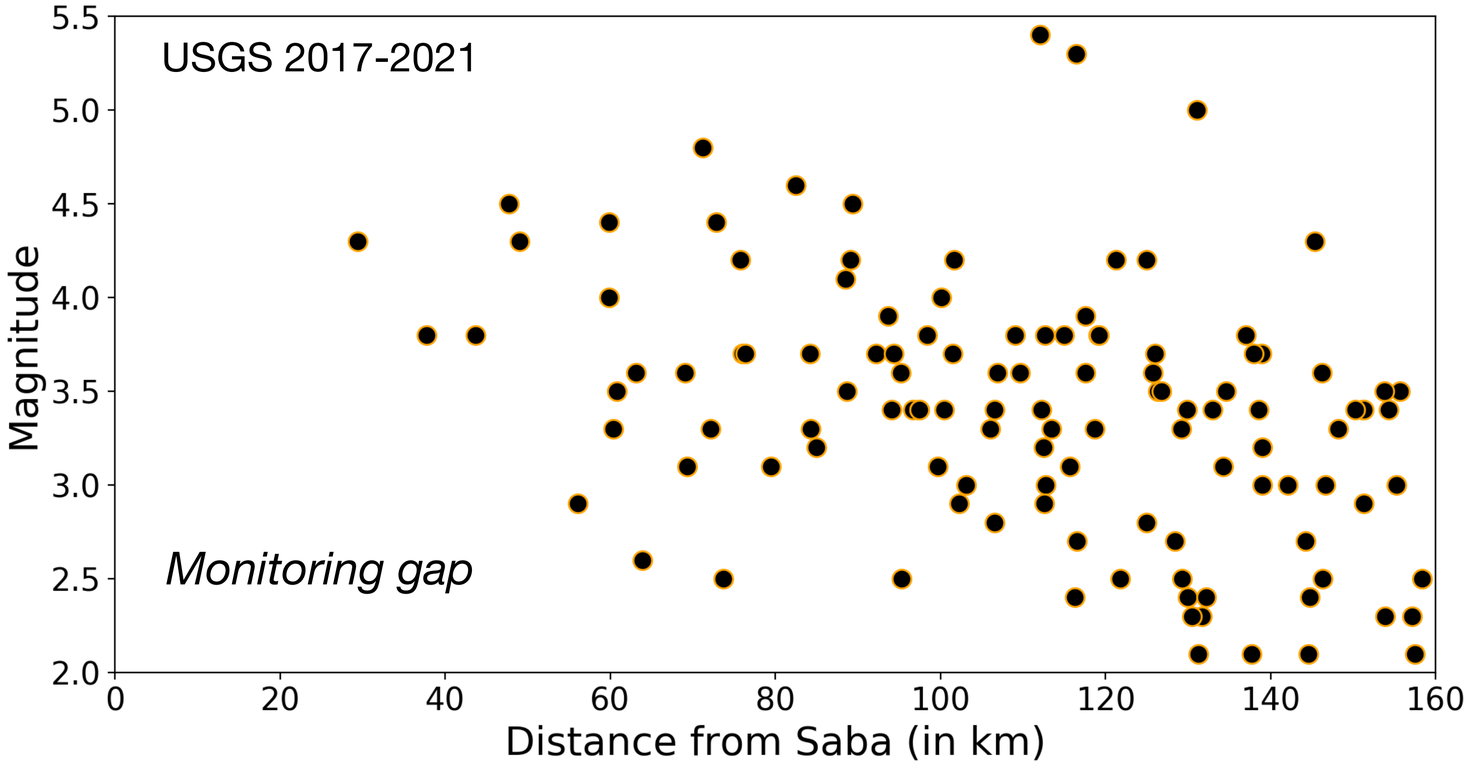
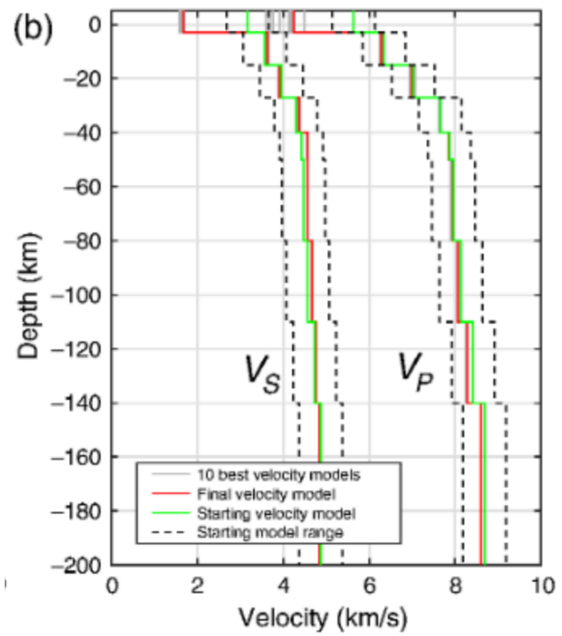


- Fill monitoring gap
  - regional, tectonic EQs
  - volcanic EQs
- Tsunami Warning (PTWC)
- Research (e.g. de Bie et al., 2019; Sleeman et al., 2020)



(de Bie et al., 2019)

Monitoring network NA

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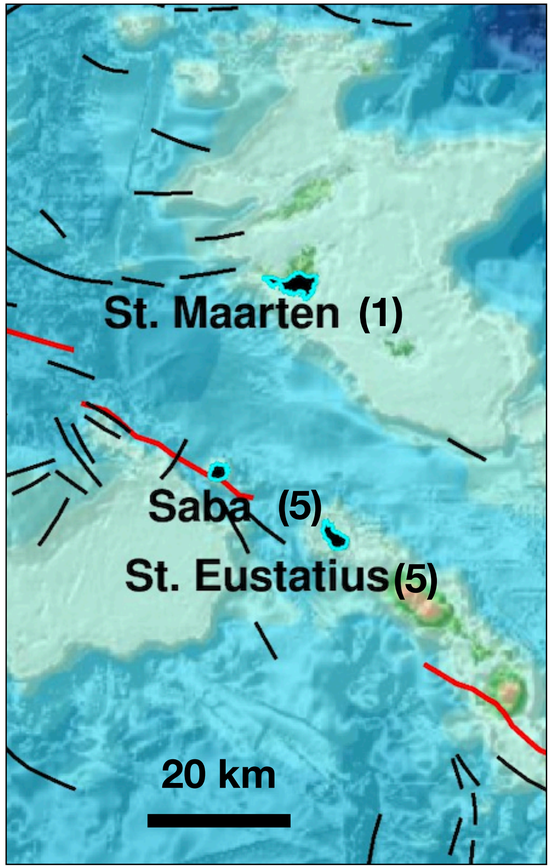
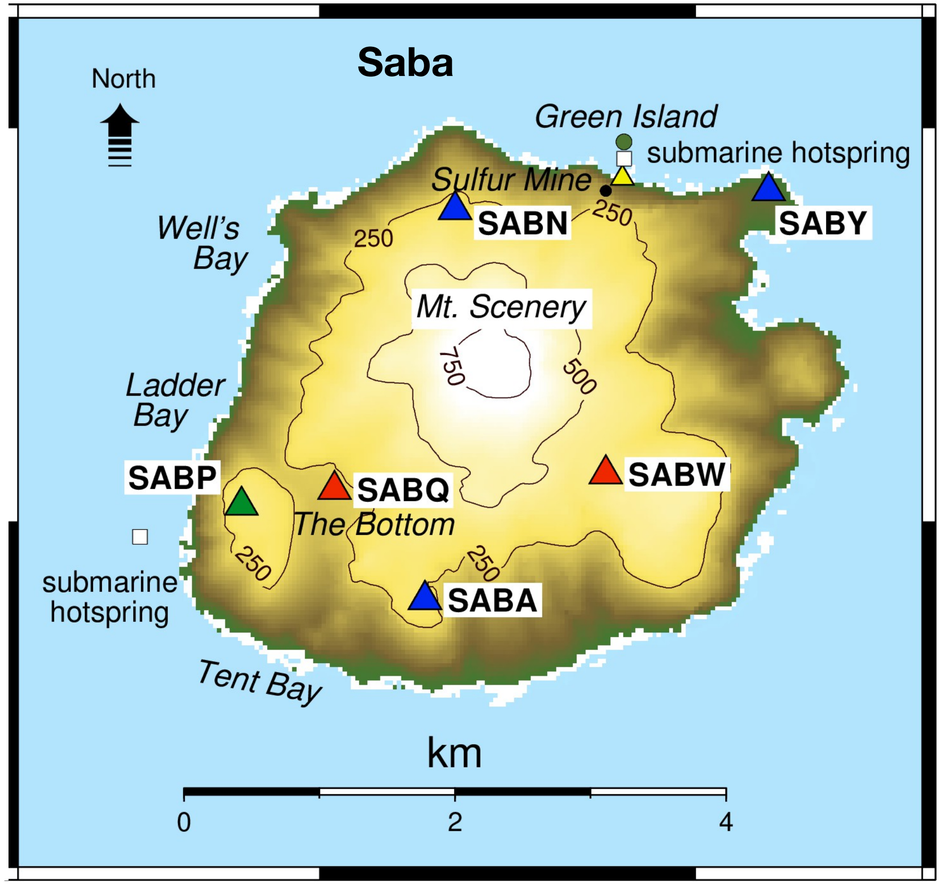
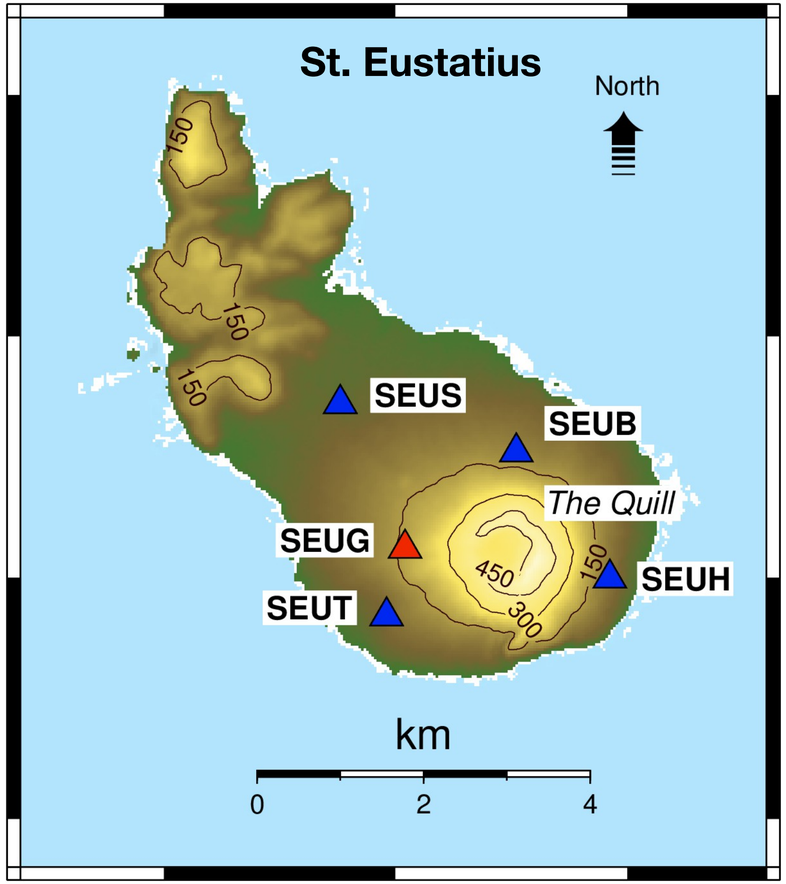






Seismometer: STS-2/2.5 + Quanterra Q330/S+

GNSS: Septentrio PolaRx5/x5S

Data communication: DSL, 4G, VSAT; q330 plugin, wget

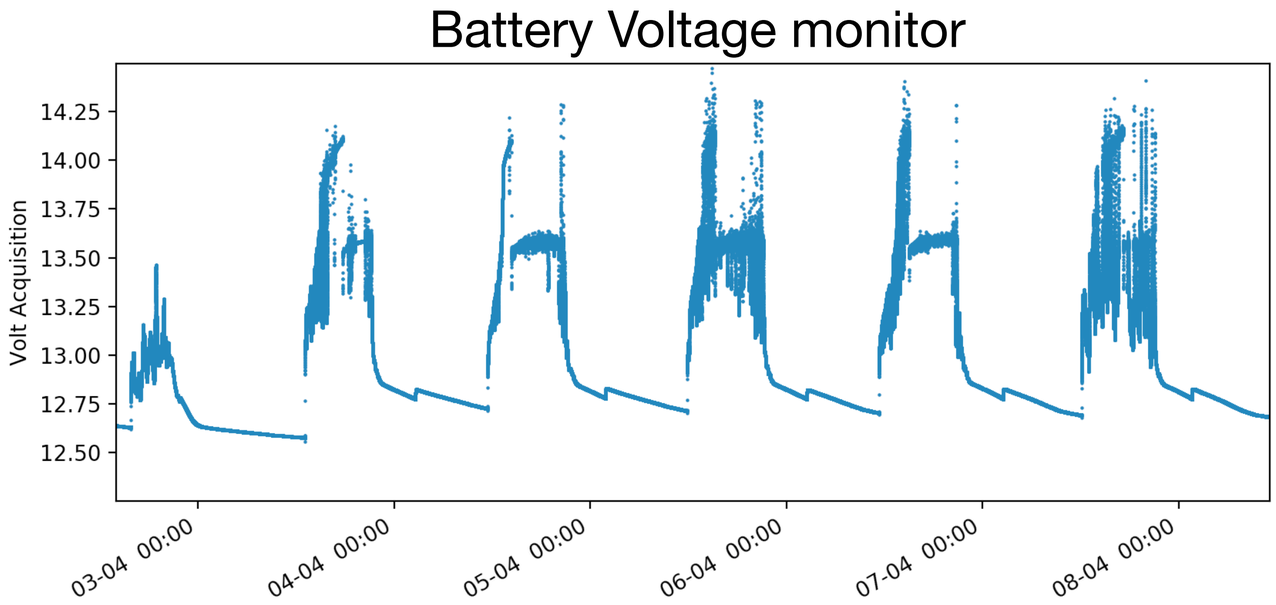
Co-located seismometer and GNSS

Seismometer

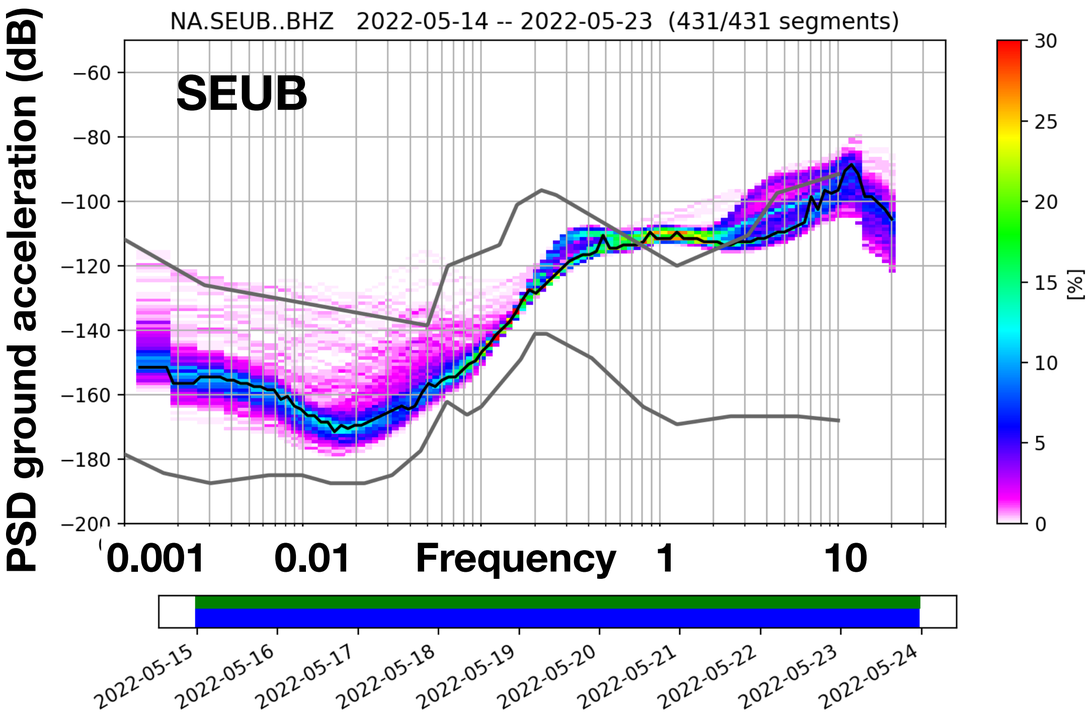
GNSS

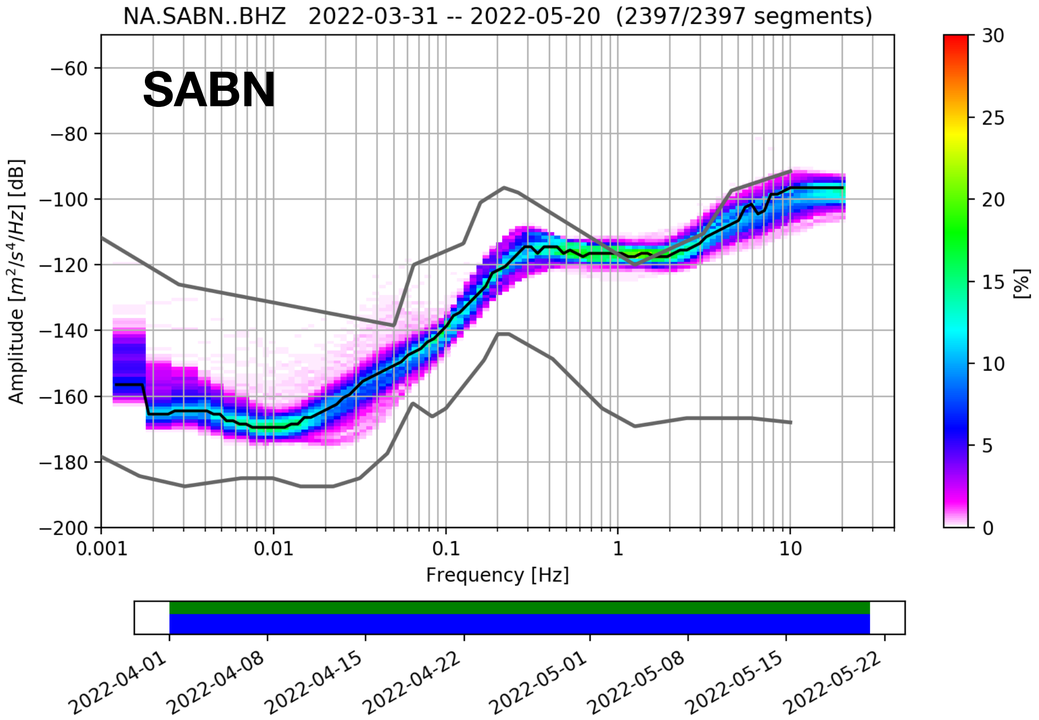

KNMI
SEUH (St. Eustatius)

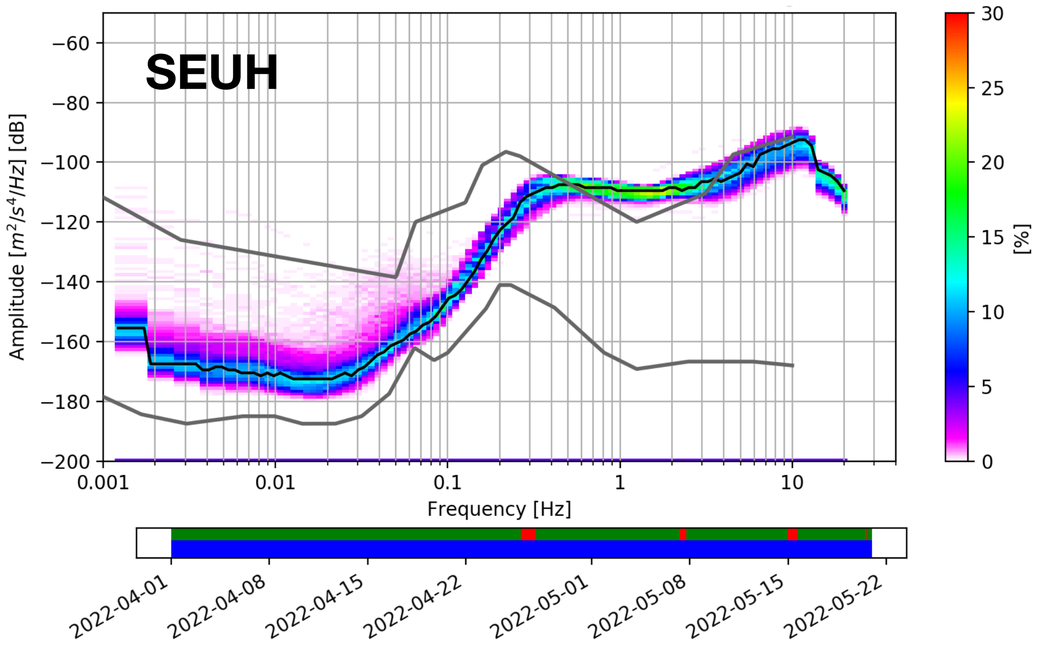

SABN (Saba)

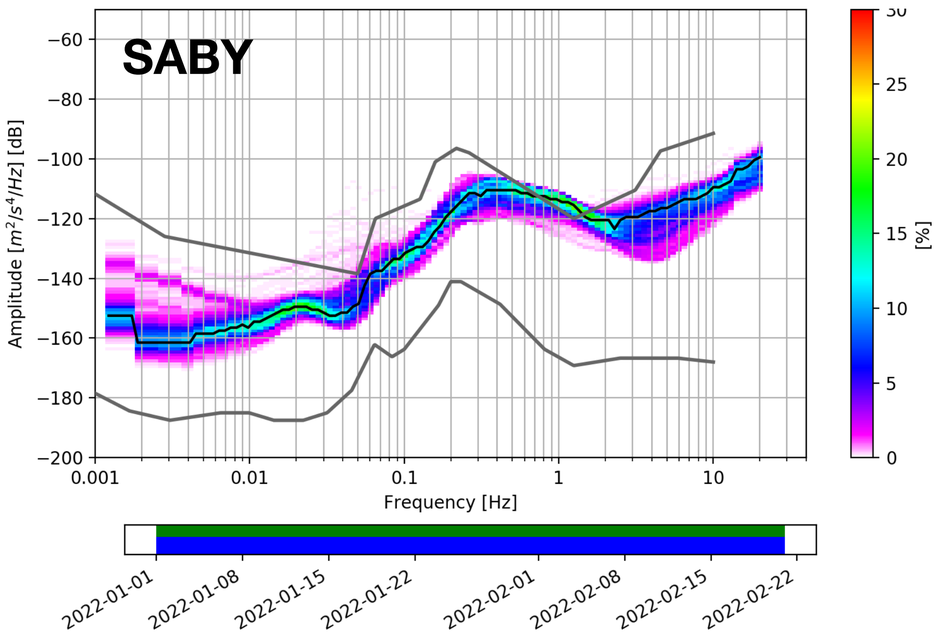

Battery Voltage monitor
Volt Acquisition
14.25
14.00
13.75
13.50
13.25
13.00
12.75
12.50
03-04 00:00
04-04 00:00
05-04 00:00
06-04 00:00
07-04 00:00
08-04 00:00


SEUB (St. Eustatius)


NA.SEUB..BHZ 2022-05-14 -- 2022-05-23 (431/431 segments)
SEUB
PSD ground acceleration (dB)
Frequency
[%]
2022-05-15
2022-05-16
2022-05-17
2022-05-18
2022-05-19
2022-05-20
2022-05-21
2022-05-22
2022-05-23
2022-05-24


NA.SABN..BHZ 2022-03-31 -- 2022-05-20 (2397/2397 segments)
SABN
Amplitude [m²/s⁴/Hz] [dB]
Frequency [Hz]
[%]
2022-04-01
2022-04-08
2022-04-15
2022-04-22
2022-05-01
2022-05-08
2022-05-15
2022-05-22


SEUH
Amplitude [m²/s⁴/Hz] [dB]
Frequency [Hz]
[%]
2022-04-01
2022-04-08
2022-04-15
2022-04-22
2022-05-01
2022-05-08
2022-05-15
2022-05-22


SABY
Amplitude [m²/s⁴/Hz] [dB]
Frequency [Hz]
[%]
2022-01-01
2022-01-08
2022-01-15
2022-01-22
2022-02-01
2022-02-08
2022-02-15
2022-02-22

(Automated) detection / location

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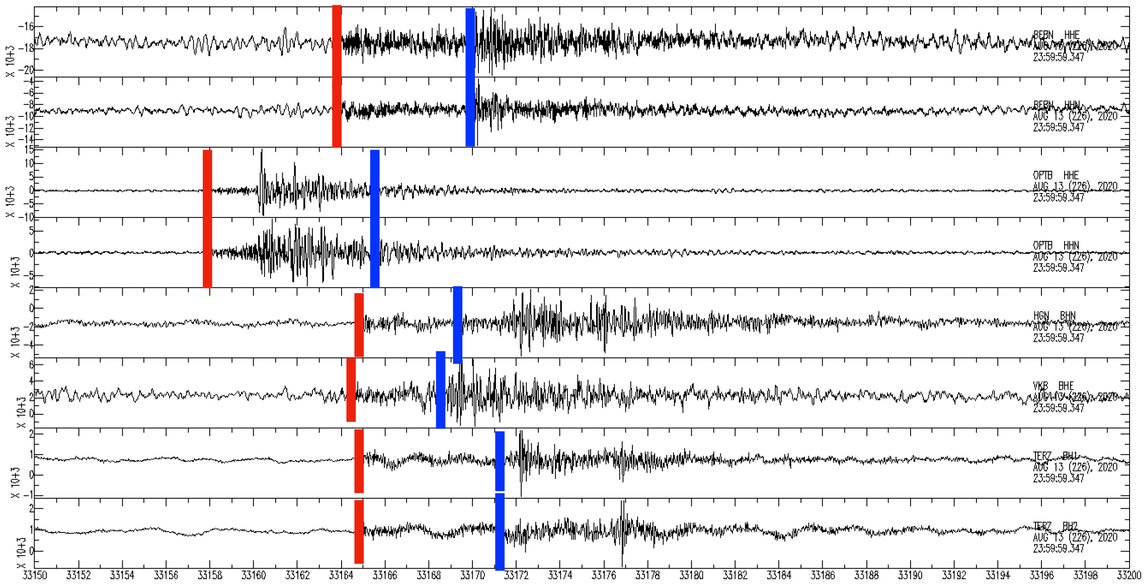
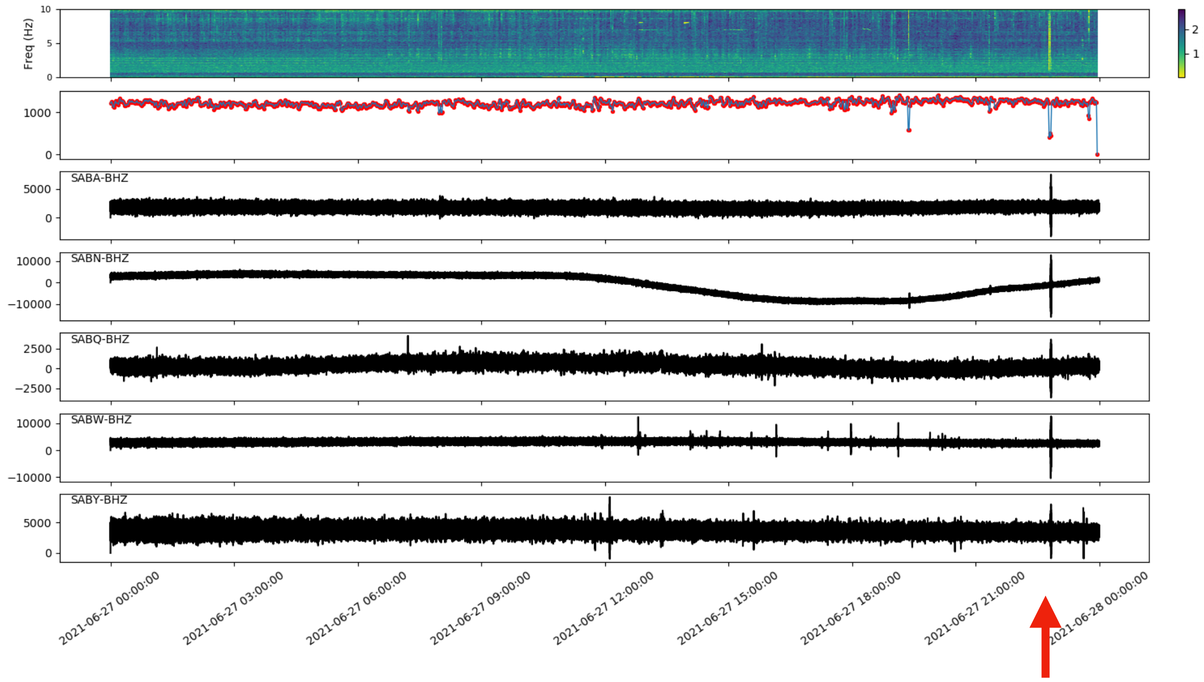
- SeisComP real-time acquisition, detection, location - local/regional tectonic
- Coincidence trigger (ObsPy) - small, local and regional
- Network covariance (CovSeisNet; Seydoux et a., 2017) - small, local (in test)
- Daily manual review (SeisComP; LocSat, iaspei91; other models in testing)

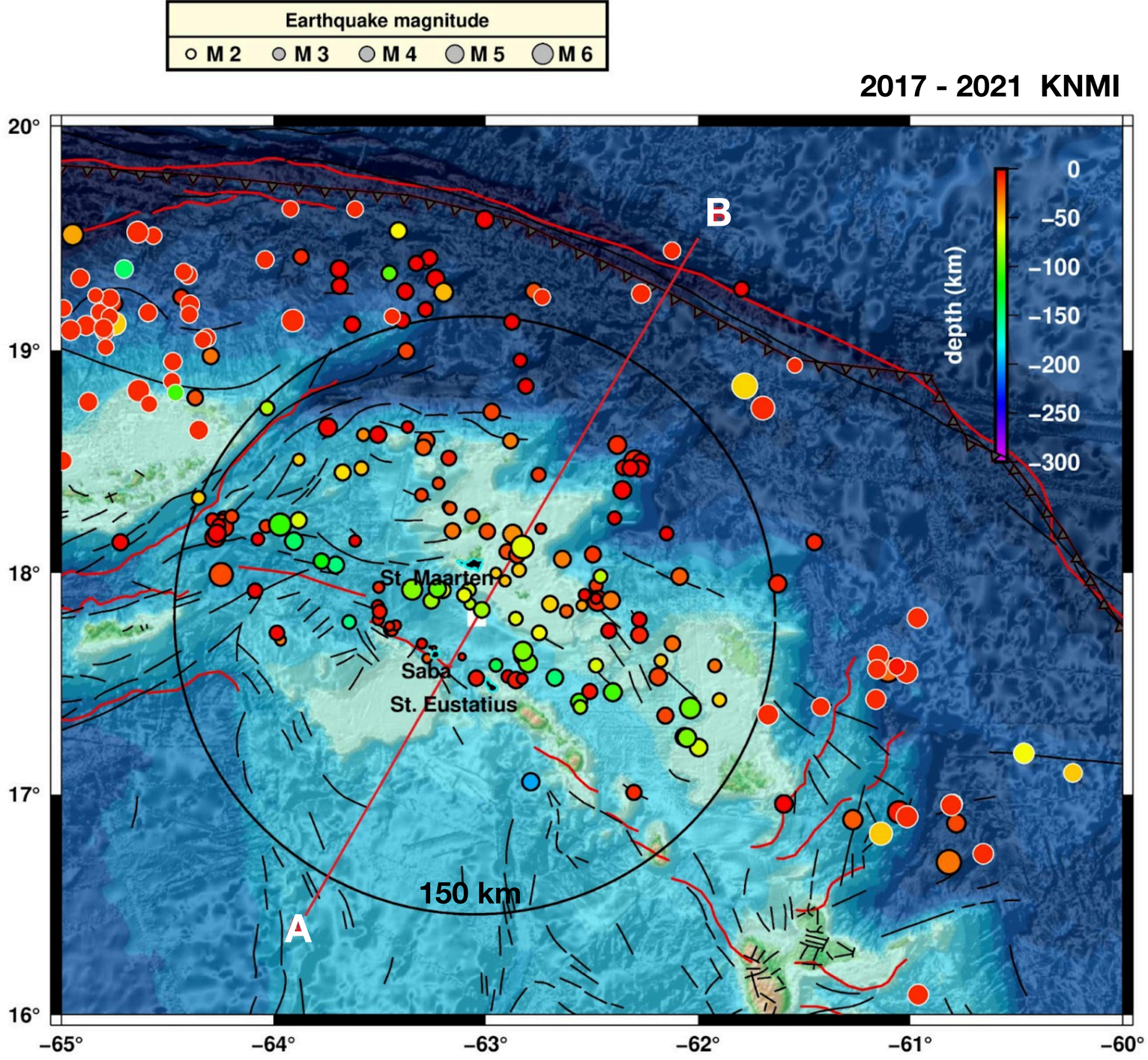
Coincidence trigger

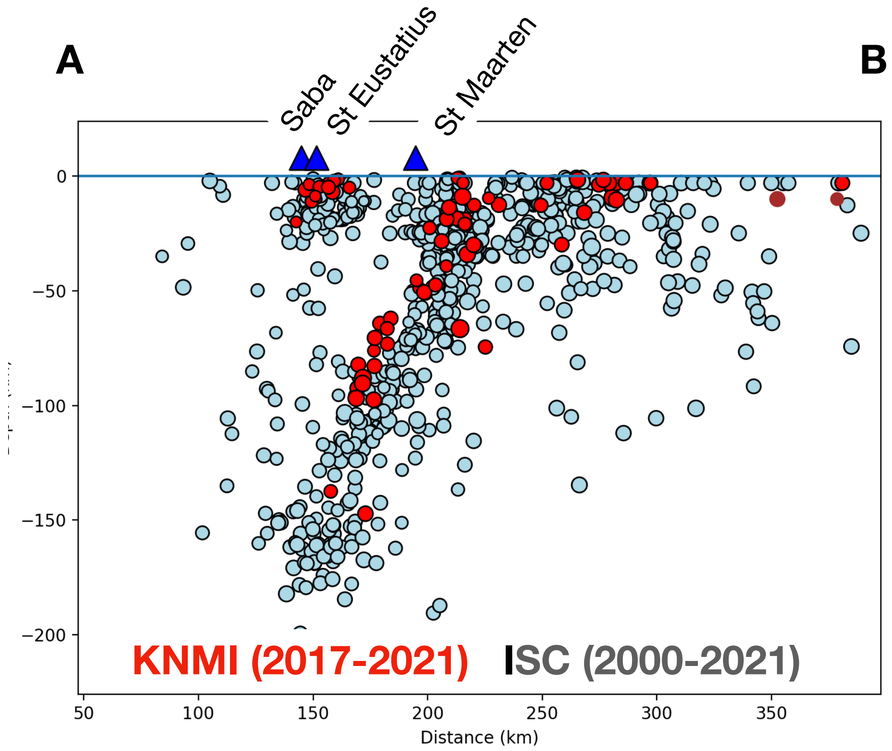


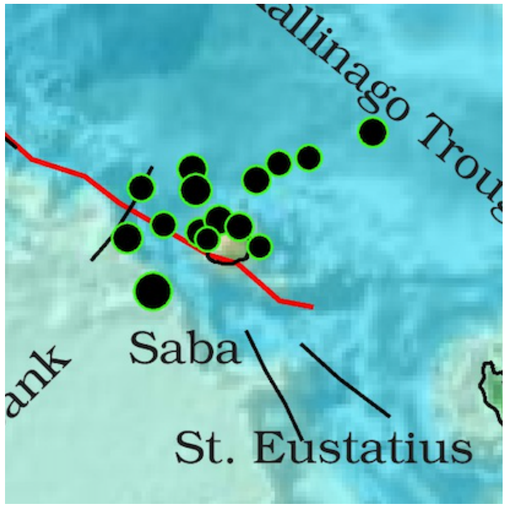
bpf (3,8) + coincidence_trigger(“recstalta”, 3.0, 1.0, st, 9, sta=1.0, lta=9.0)

CovSeisNet









Swarm 1992 (Ambeh et al., 1995)

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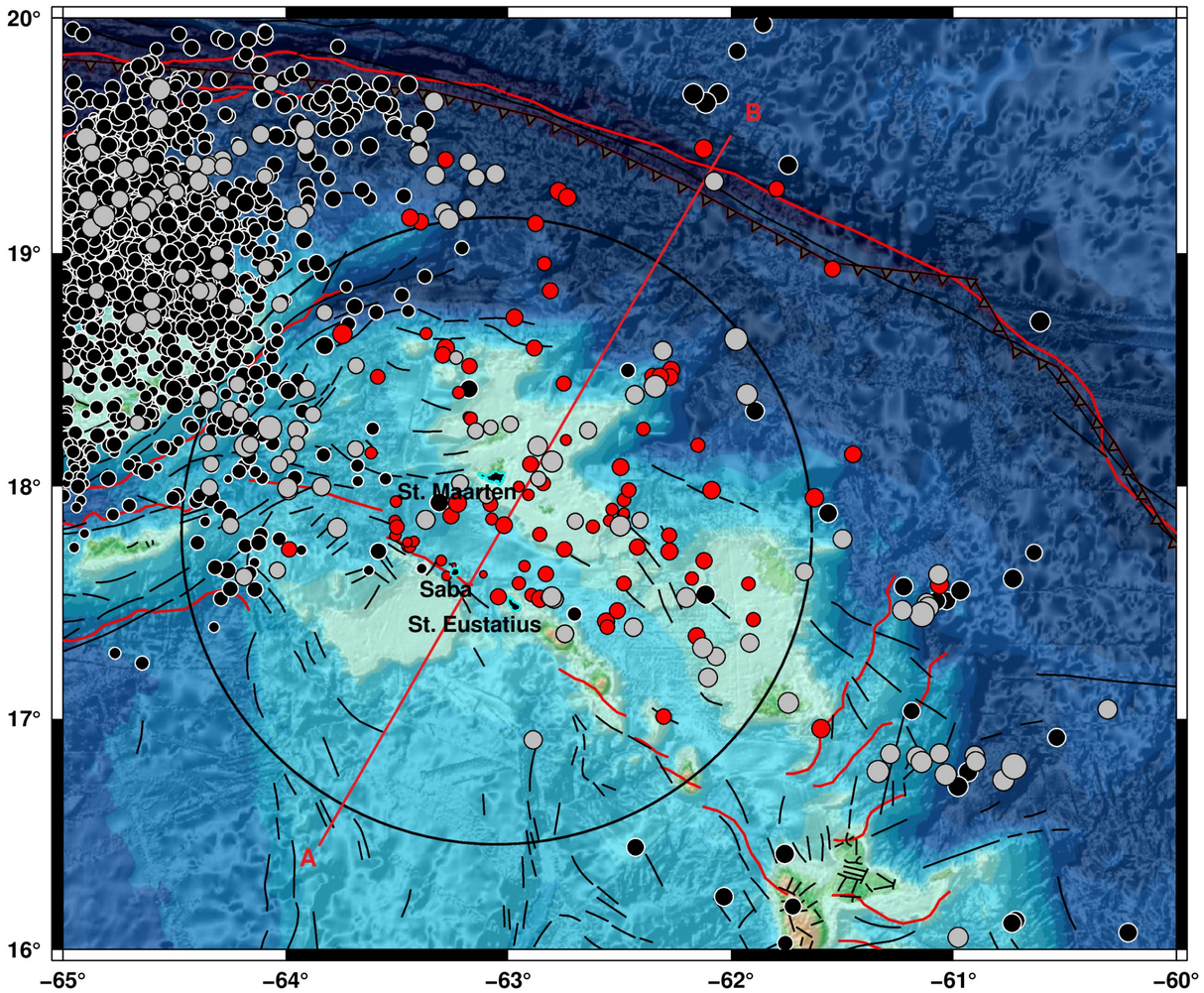
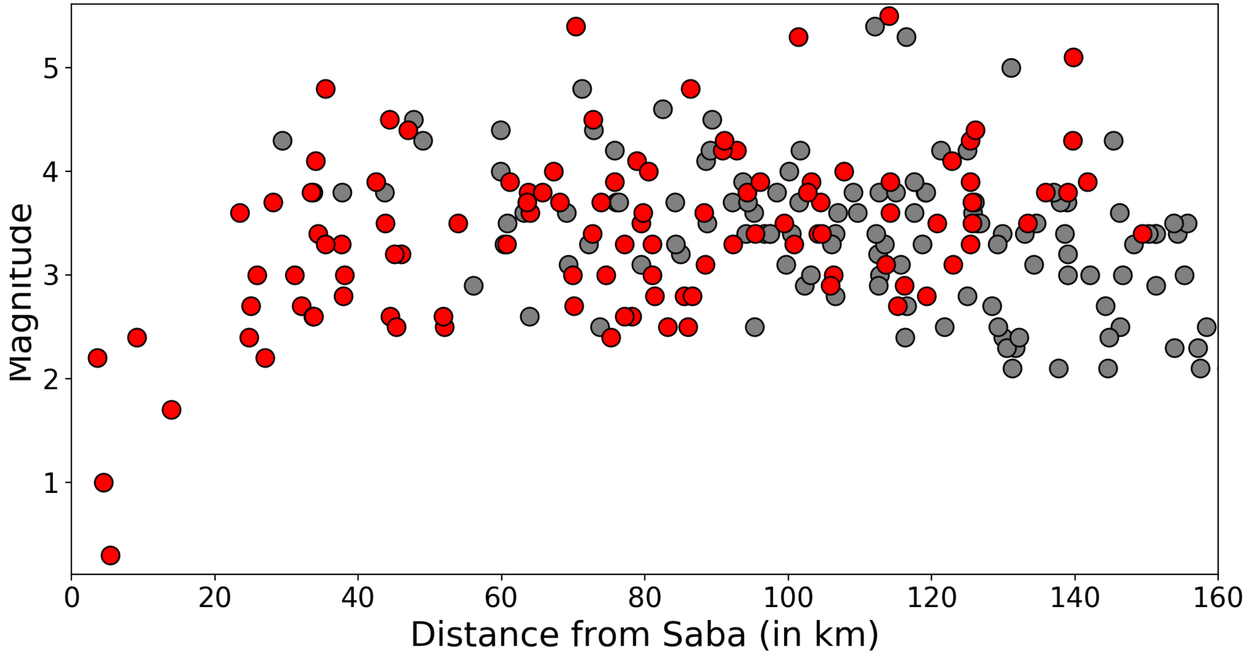
KNMI only
USGS only
Common

2017 - 2021 KNMI



KNMI USGS (2017-2021)



Data availability

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FDSN web services

- KNMI: http://rdsa.knmi.nl/fdsnws/dataselect/1/query
- ORFEUS: http://www.orfeus-eu.org/fdsnws/dataselect/1/query

Live seismograms

- https://www.knmidc.org/seismology/