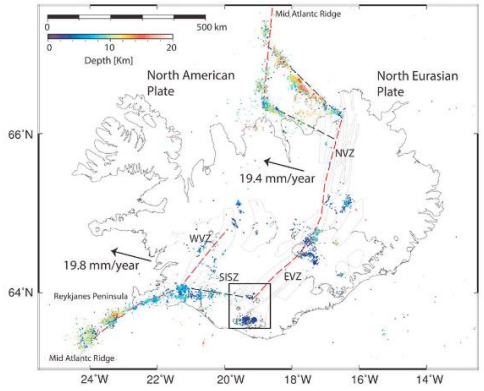
Volcanic Harmonic Gliding Tremors (HGT) during a non-eruptive event at Torfajökull volcano, Iceland

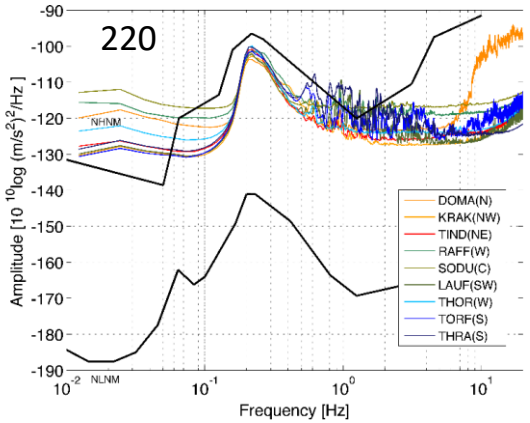
Joana E. Martins[1,2], Elmer Ruigrok[3,4], Andy Hooper[5]

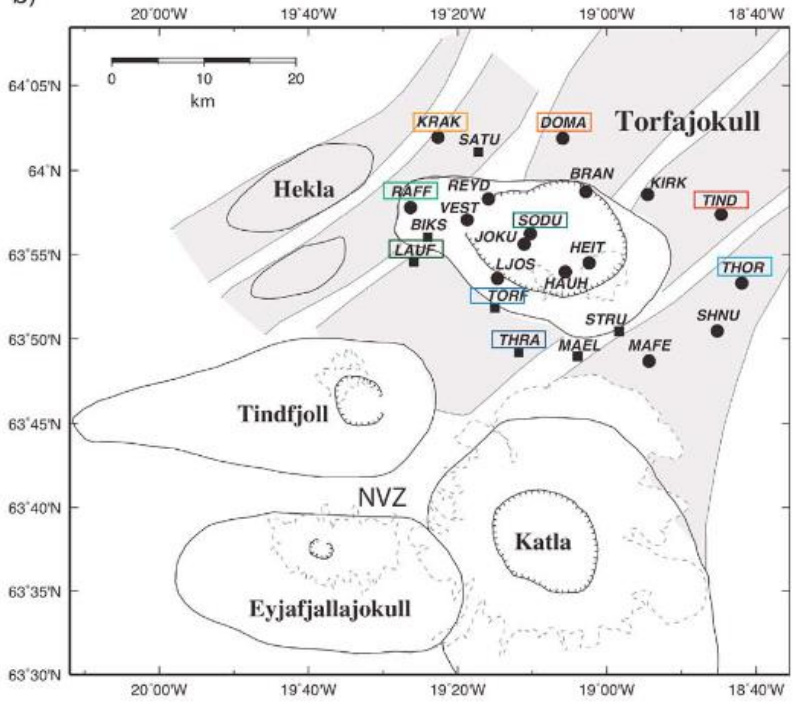
[1] Delft Technical University, Delft Netherlands
now at
[2]Netherlands Organisation for Applied Scientific Research TNO, Utrecht, the Netherlands
[3] KNMI, Royal Netherlands Meteorological Institute, De Bilt, Netherlands
[4] Utrecht University, Utrecht, the Netherlands
[5] School of Earth and Environment, Leeds University, Leeds, United Kingdom

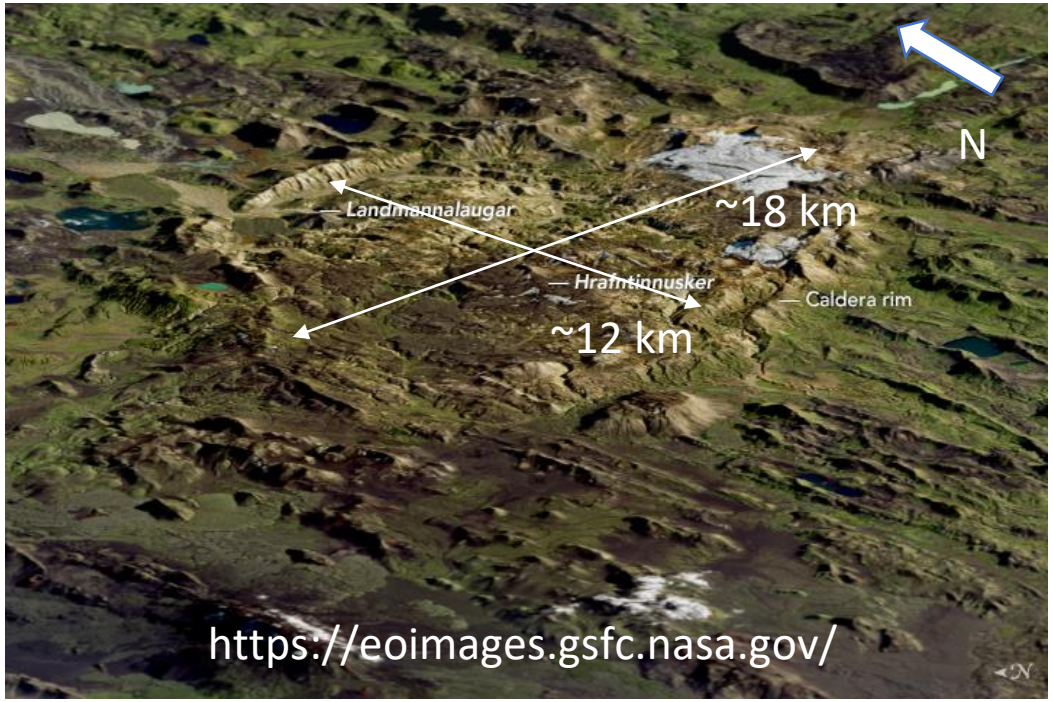
https://eoimages.gsfc.nasa.gov/

Background



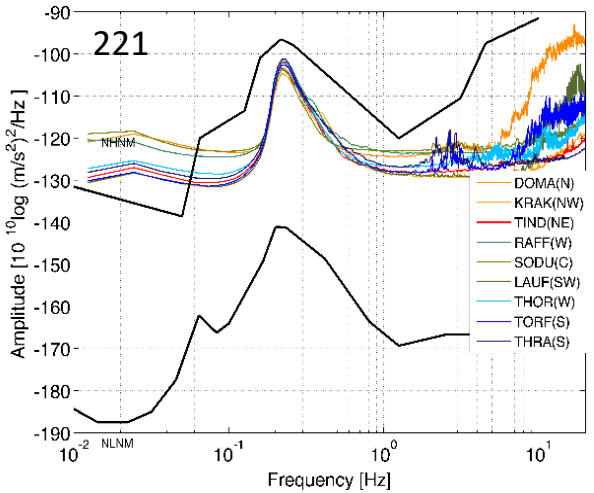


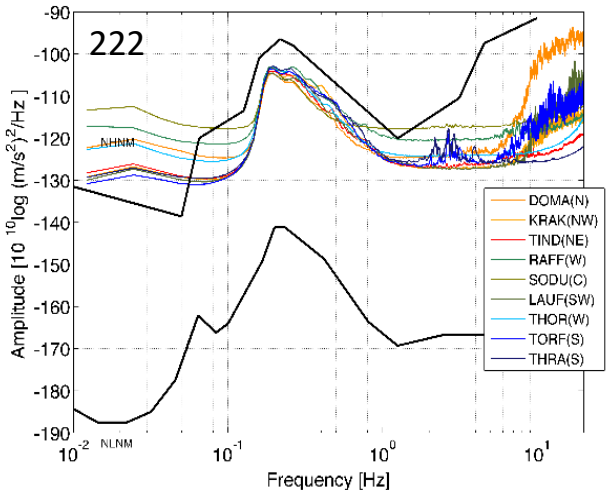


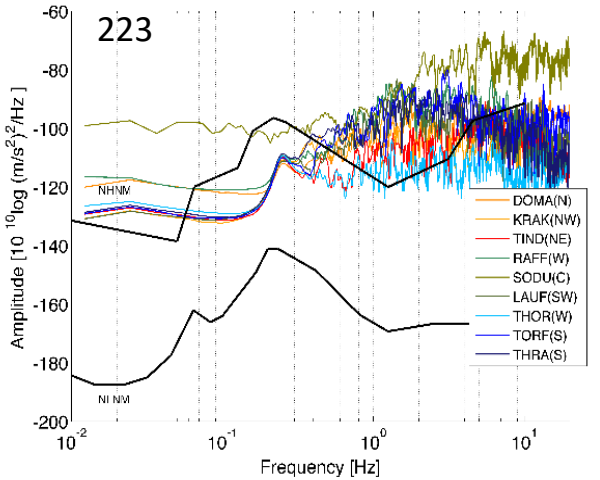


Martins et al., JGR 2019

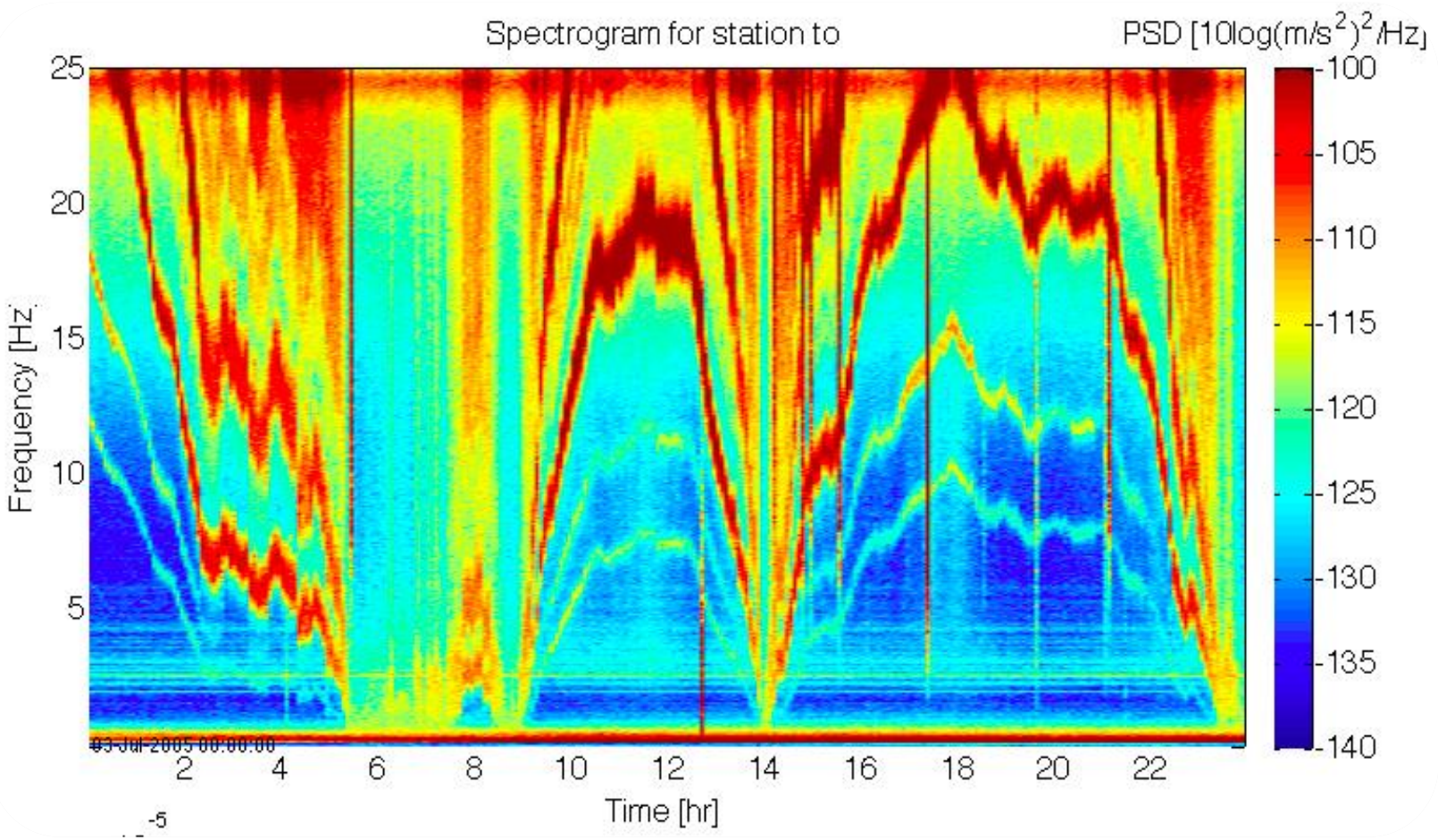
Same stations, other days

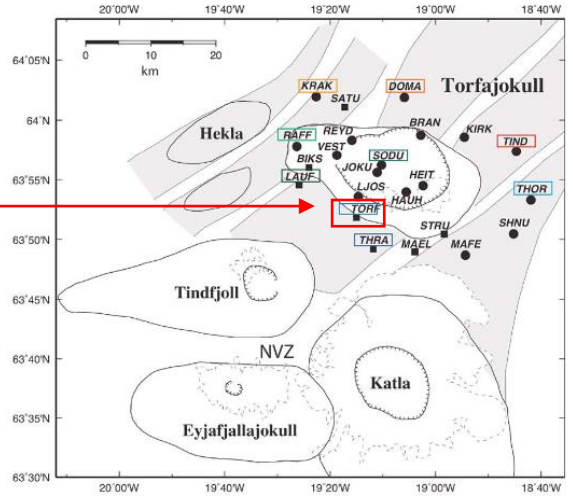






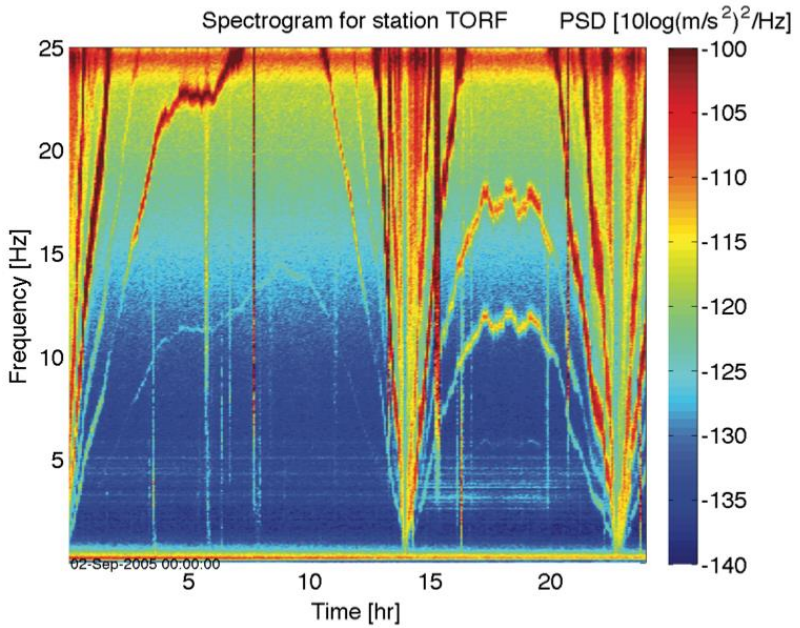
Harmonic Gliding Tremors (HGT)

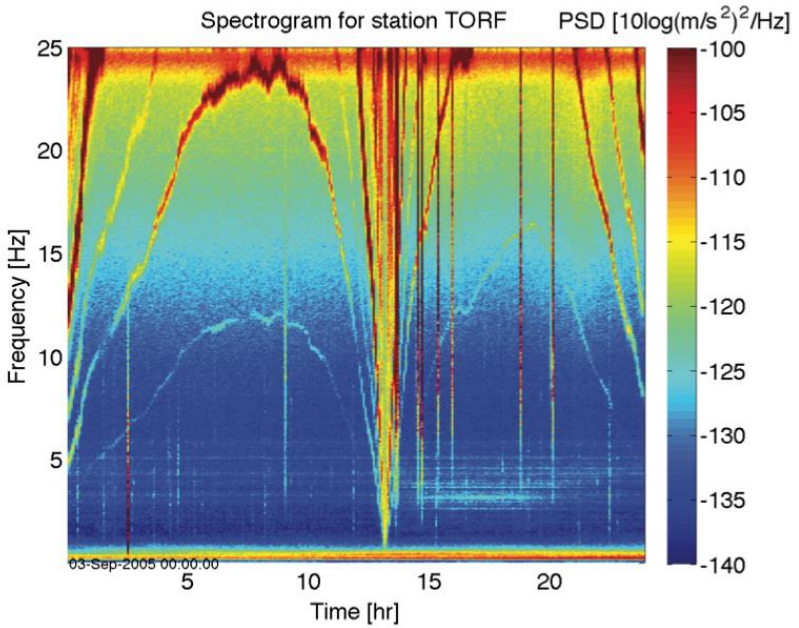


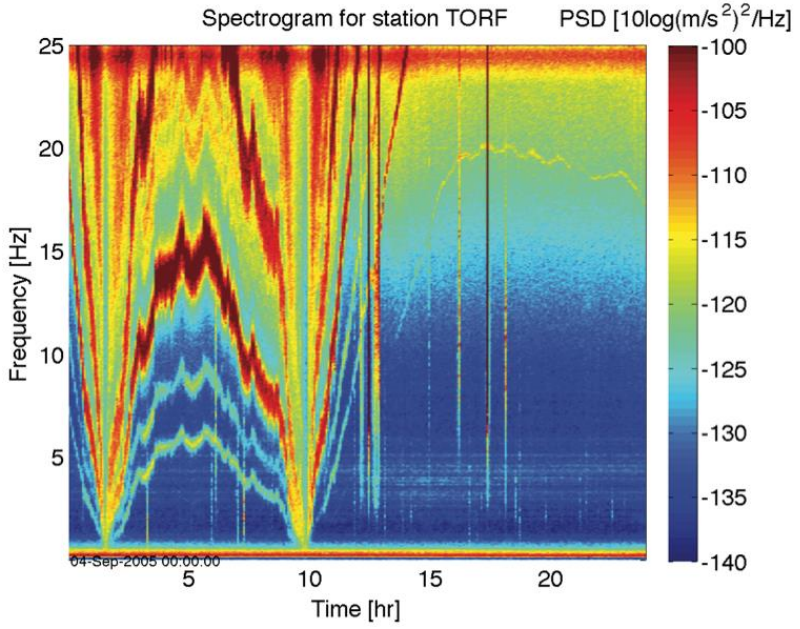


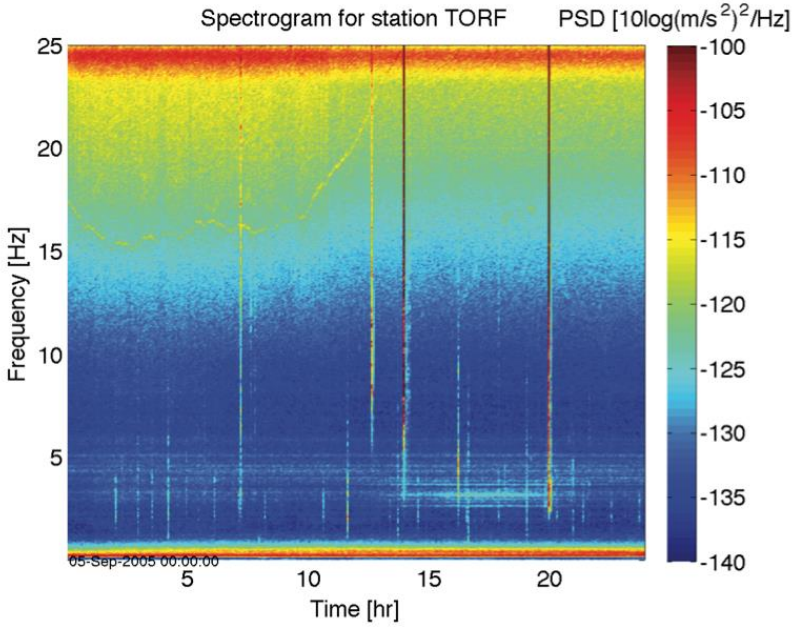
- ✓ One low frequency earthquake
- ✓ High frequency earthquakes
- ✓ HGT

HGT: Four consecutive days, same station

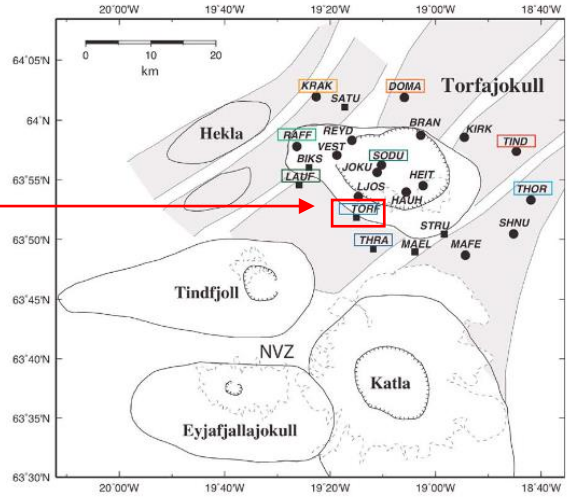






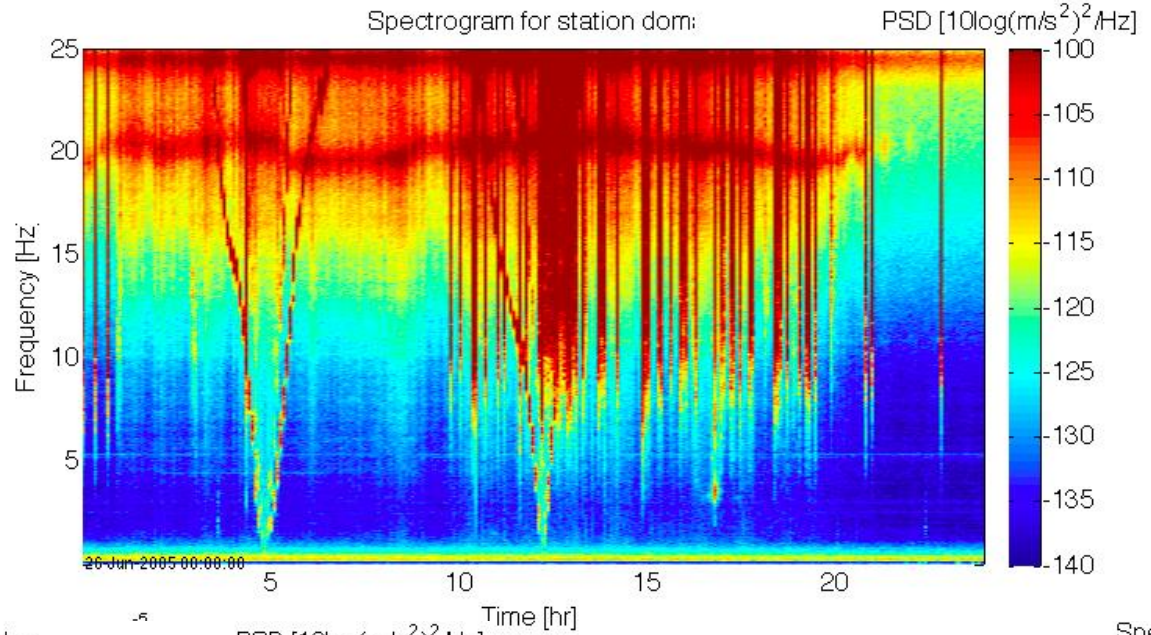


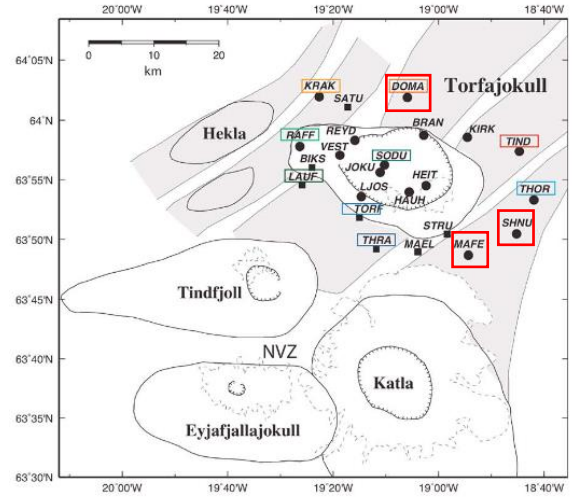
TORF



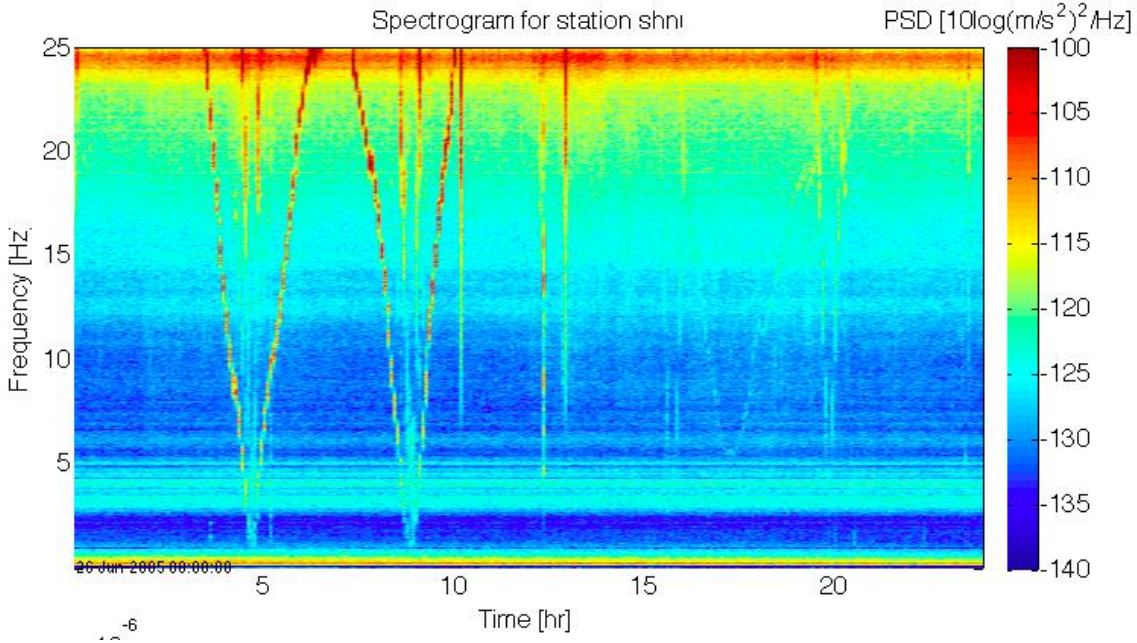
- ✓ Sequential HGT events
- ✓ High frequency earthquakes

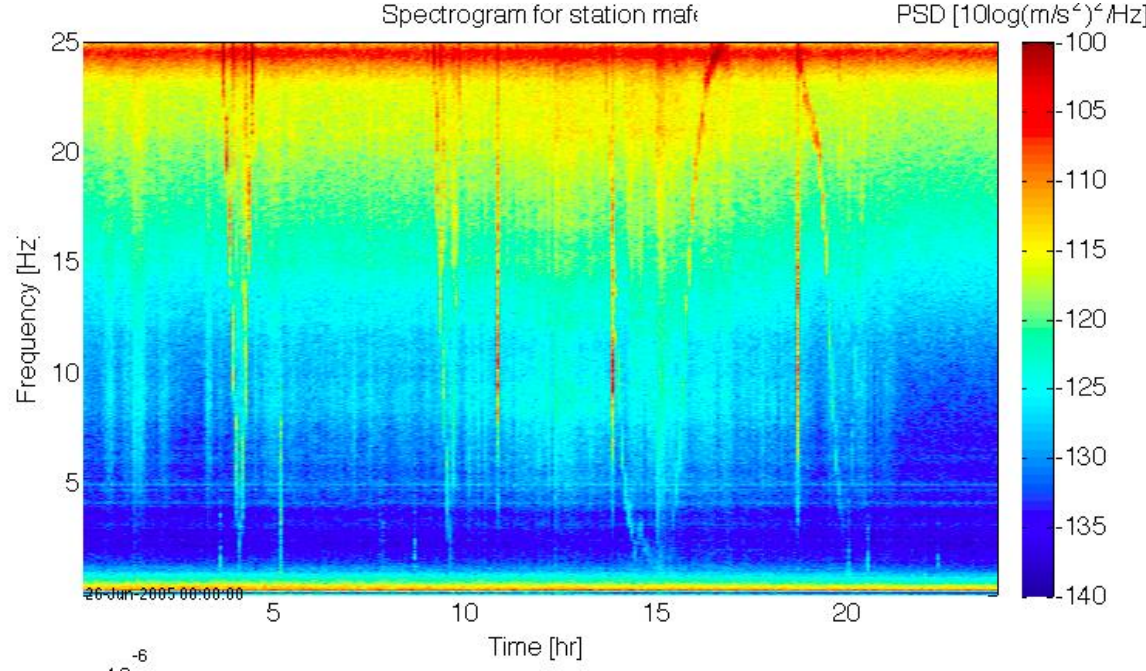
HGT: Same day, different stations



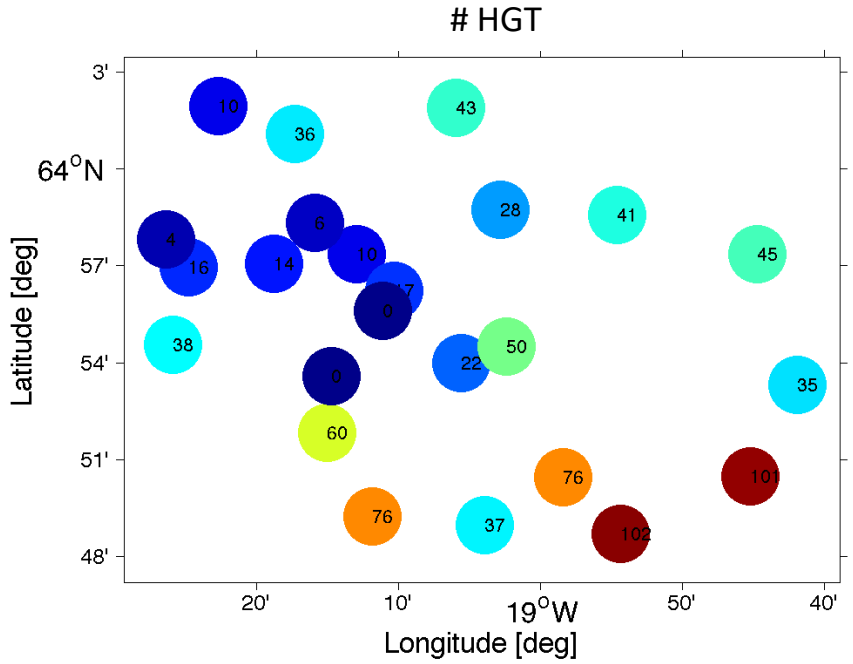


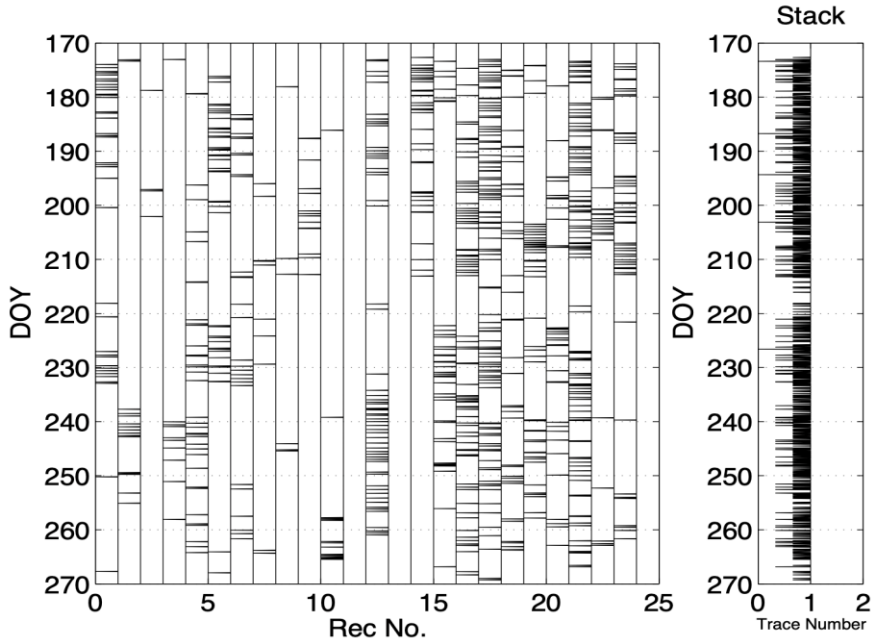
JD177 (26 June)

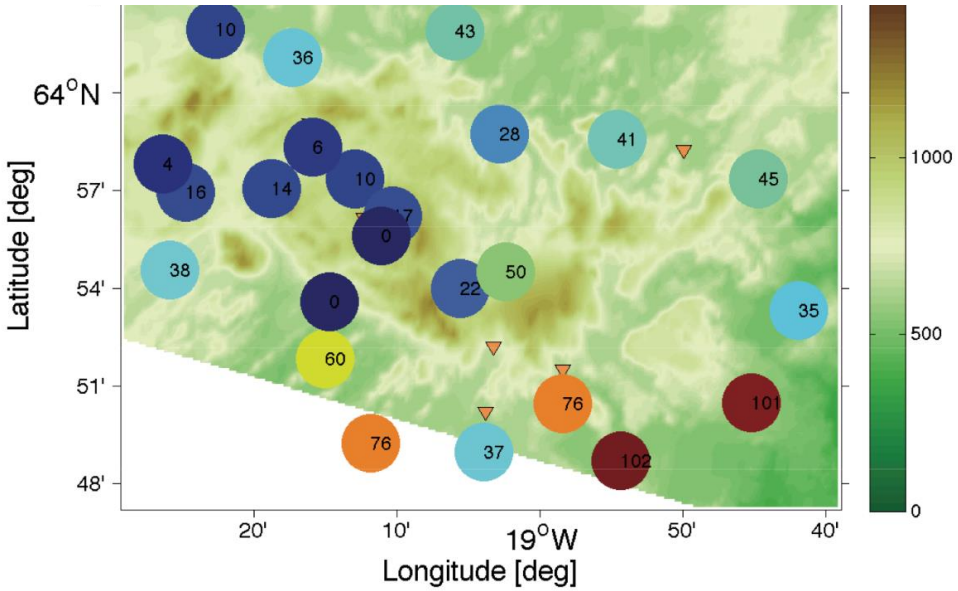


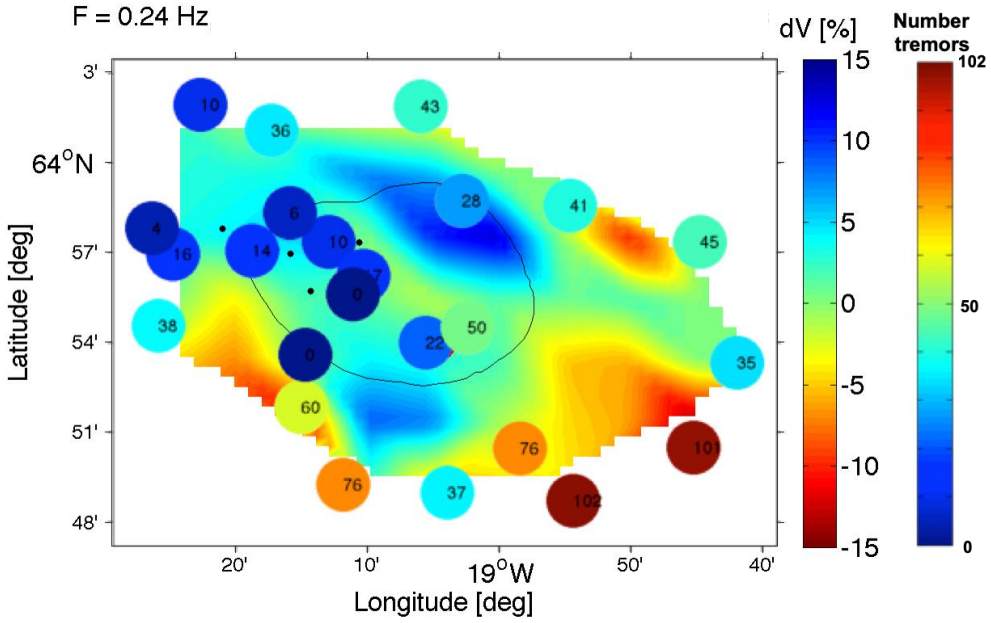


HGT: Space and time classification



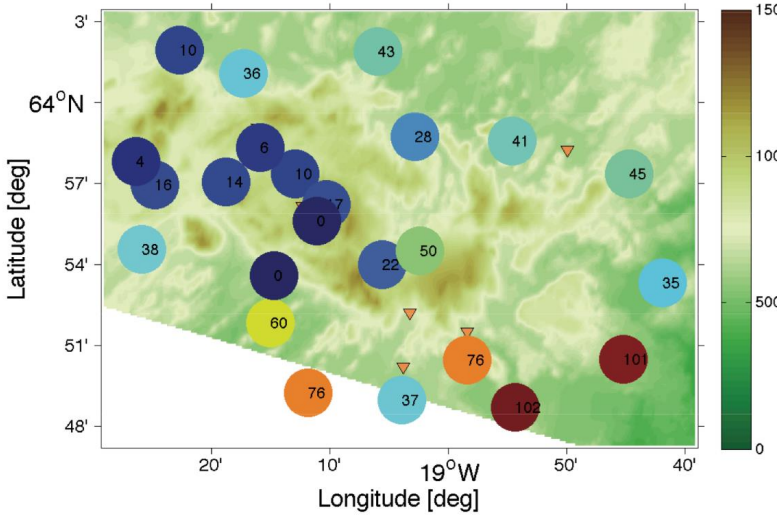


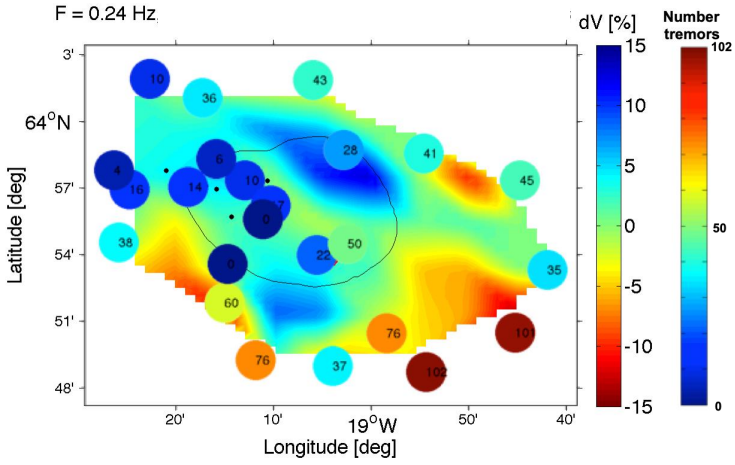




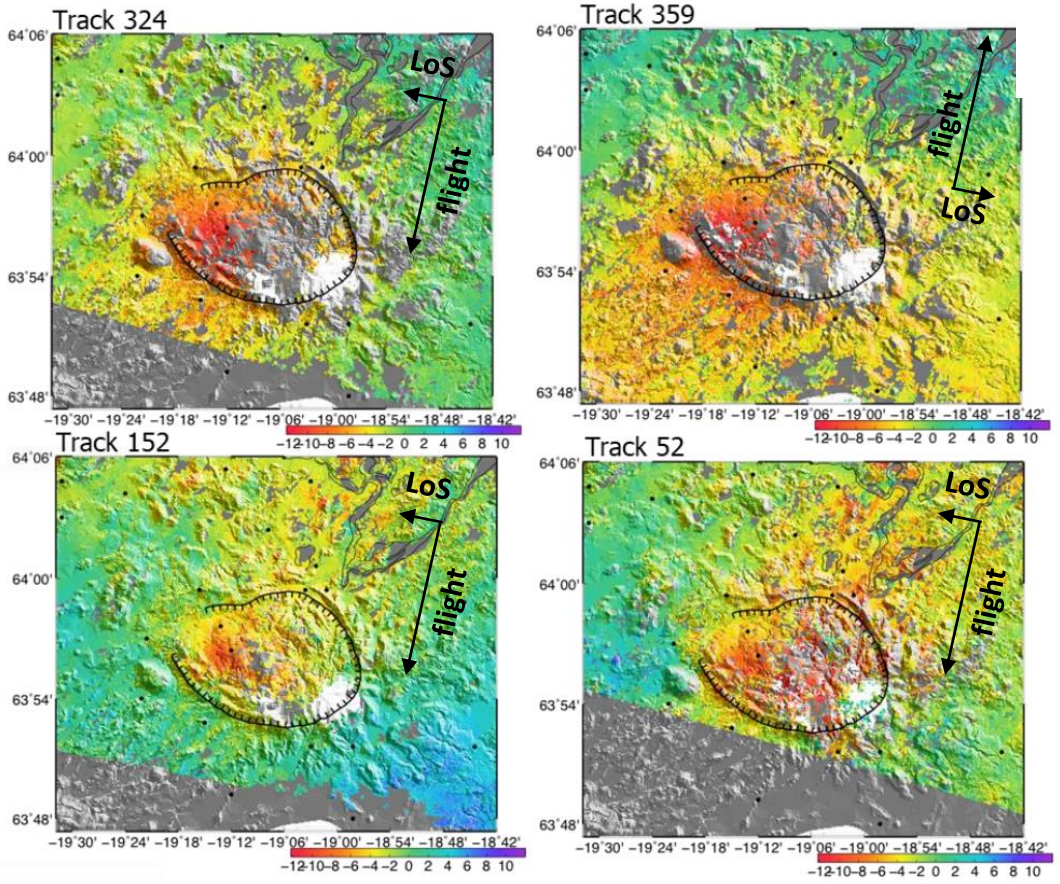
A working hypothesis

Background Information: Topography
Satellite Geodesy
seismic tomography



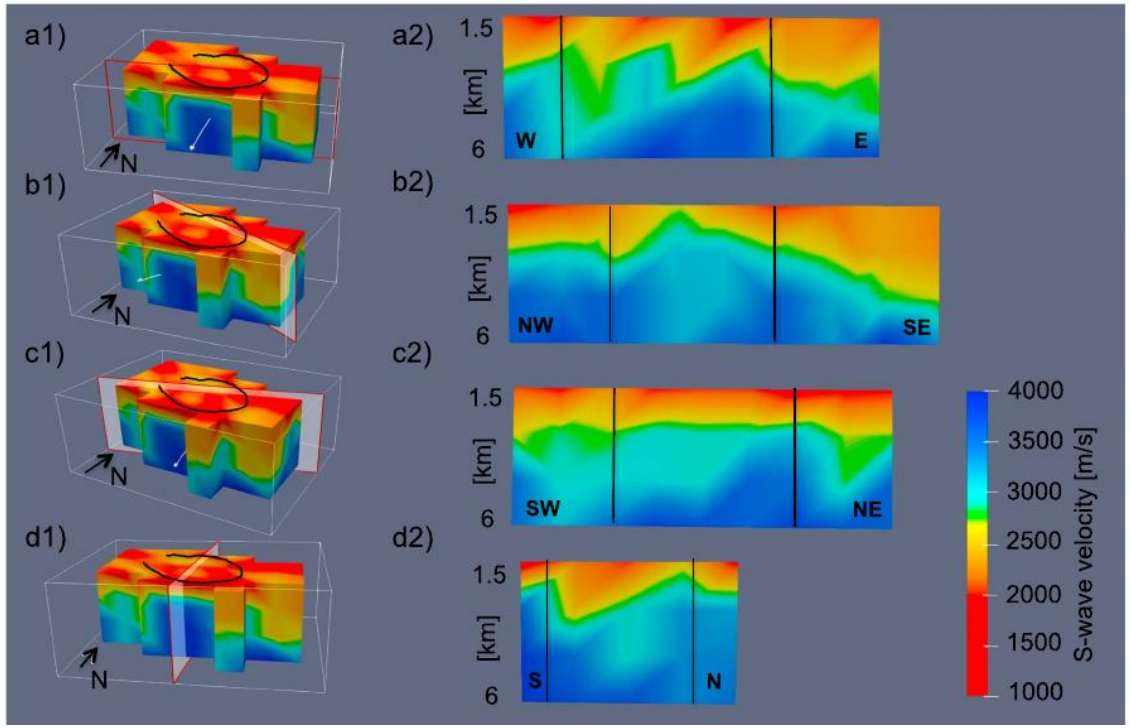


Surface deformation: ENVISAT 2002 – 2010



Martins et al., WGC2020+1, 2021

S-wave tomography: 2005 seismic network



Martins et al., JGR, 2019

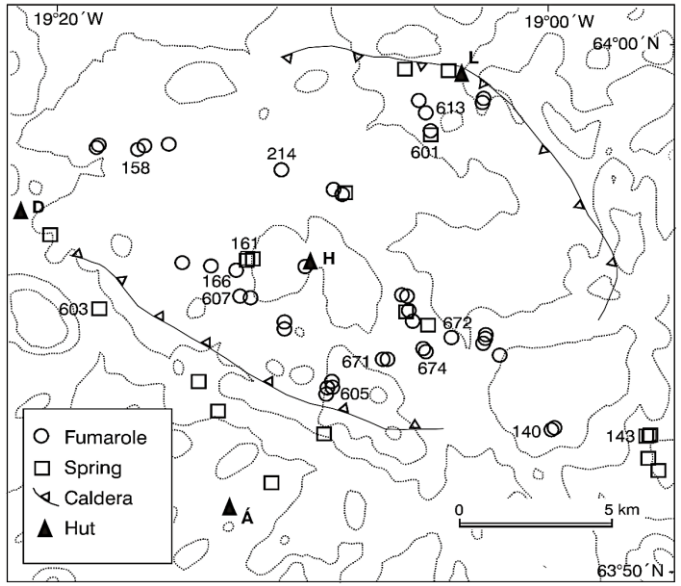
Magma filled cavities without a second fluid is an unlikely candidate!

A working hypothesis

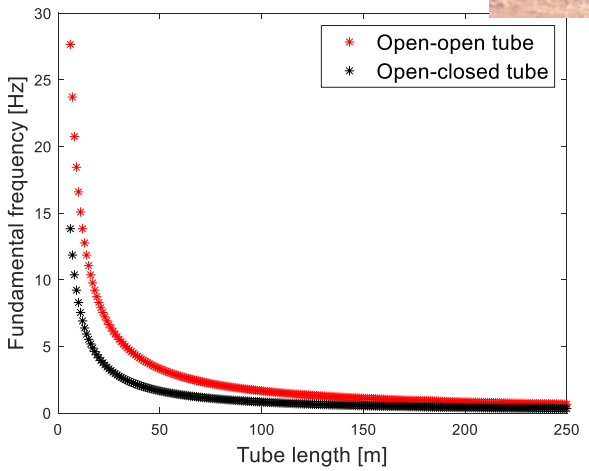
- ✓ Movements of water or gases in the hydrothermal system near the surface;

- ✓ Fluid dynamics modelling:

- The release of gas through a very small conduit (the soda botle model)
- Slug flow in a narrow conduit
- Bubble clouds



Ólafsson and Orkustofnun, 2000



Thank you

joana.estevesmartins@tno.nl

Martins et al., [in prep]