NASPMON WP7 - Preliminary results

Data: December 2019 – October 2020

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September 6, 2021

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Overview

- WP7 – expected results
- Preliminary 1-D velocity model
- Method for GMM determination
- Paper in preparation (WP7)
- New stations BLF and SHV

WP7 - Expected result

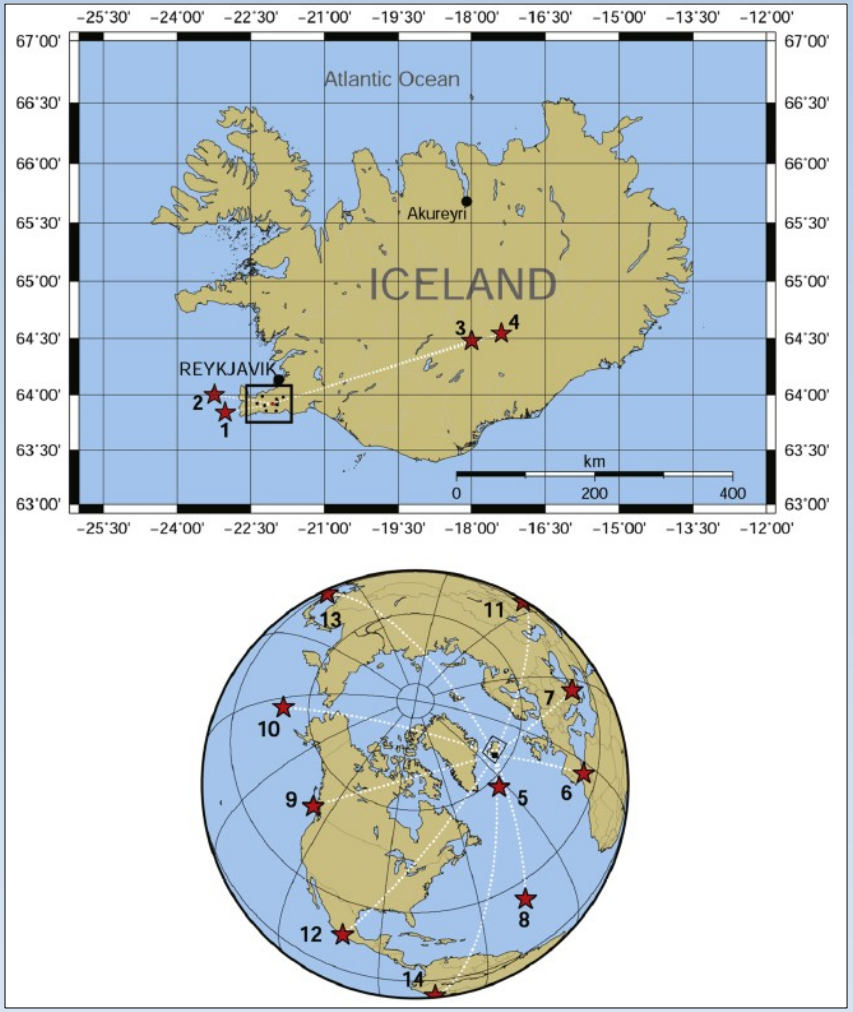
A special **software** will be developed to **estimate ground motion** from the earthquakes in the Reykjanes peninsula. Ground motion will be characterized by peak ground acceleration and peak ground velocity on a vertical axis and in a horizontal plane. Response spectra will be also computed. The ground motion model will be derived based on seismograms from weak local earthquakes and it will be extrapolated to larger magnitudes. The software can be used for the purposes of seismic hazard assessment.

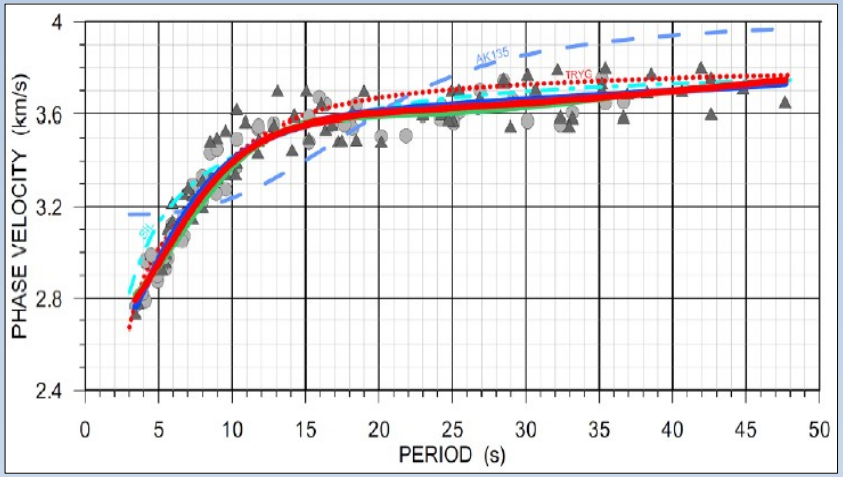
11/2023

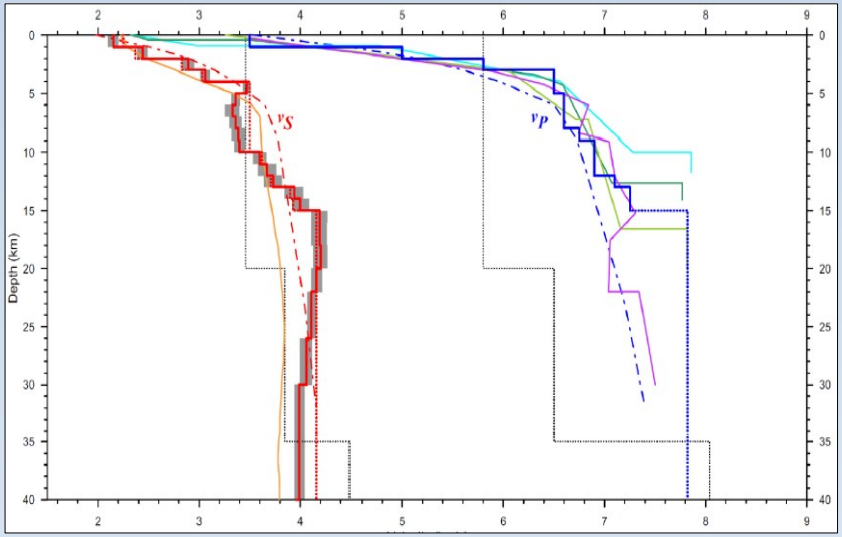
For determination of GMM we need:
1) Set of seismograms from local earthquakes (we have)
2) Velocity model
3) Precise location including depth
4) Magnitude of local earthquakes
5) Focal mechanisms
6) Measurements of Vs30 (local conditions)

Velocity model from surface waves

Málek J.,Brokešová J., and Novotný O., (2019). **Seismic structure beneath the Reykjanes Peninsula, southwest Iceland, inferred from array-derived Rayleigh wave dispersion**. *Tectonophysics* 753, 1 –14, DOI: 10.1016/j.tecto.2018.12.020







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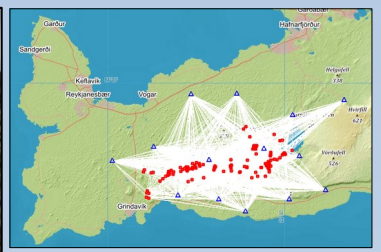
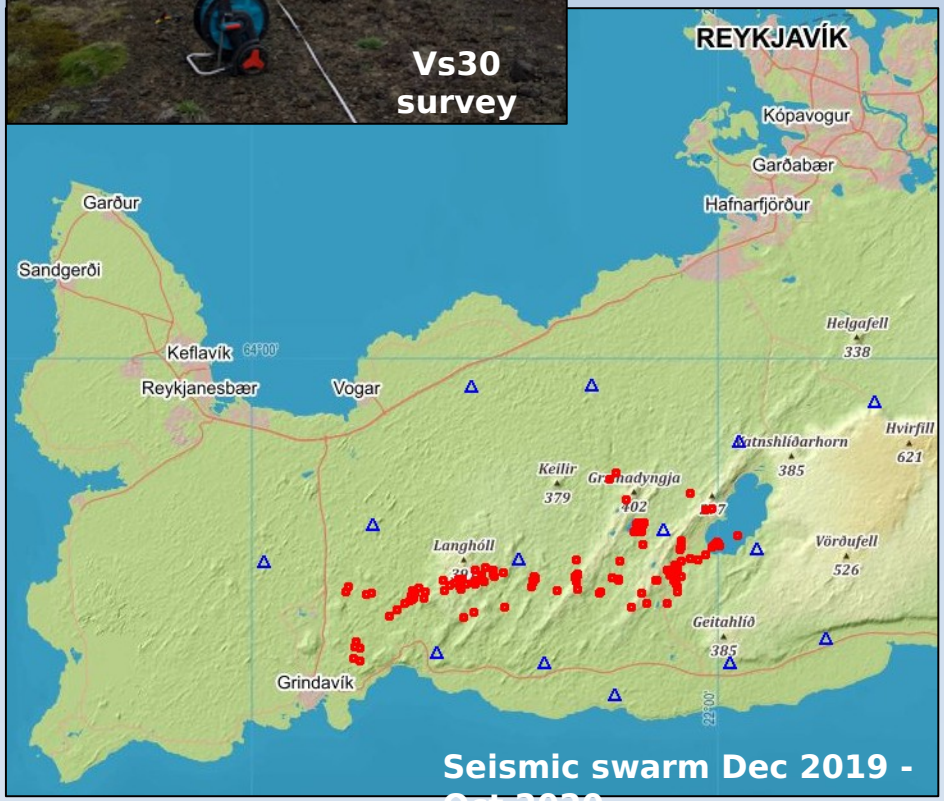
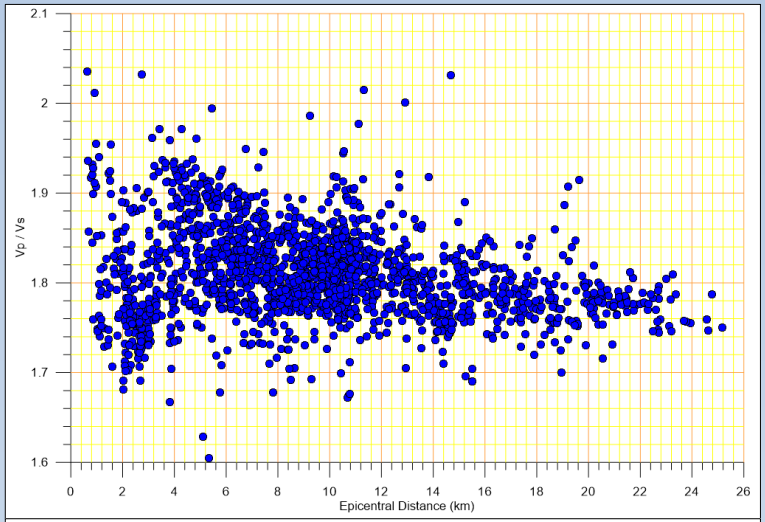
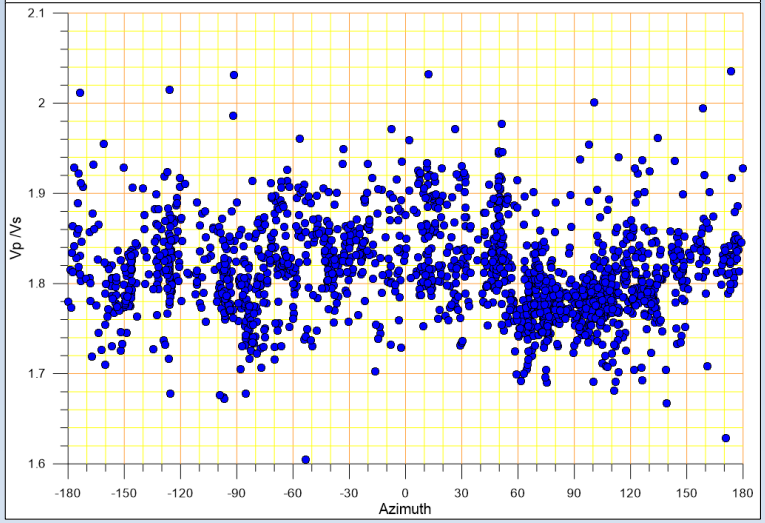
Improved velocity model

(paper is under preparation)







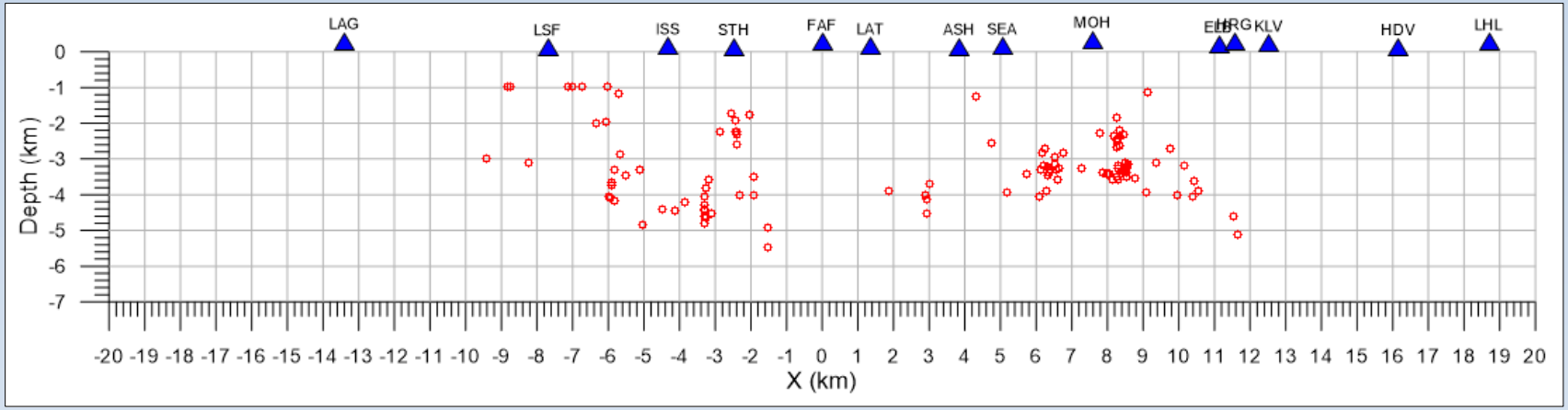


Vp / Vs ratio is azimuthaly dpendent

Selected 151 events (Dec 2019 - Oct 2020)
Depth distribution 1-6 km

Mean location error: 200 m in epicenter, 500 m in depth

The errors are mainly caused by innacurate velocity model !!!
The precision of onsets enable much better locations !!!



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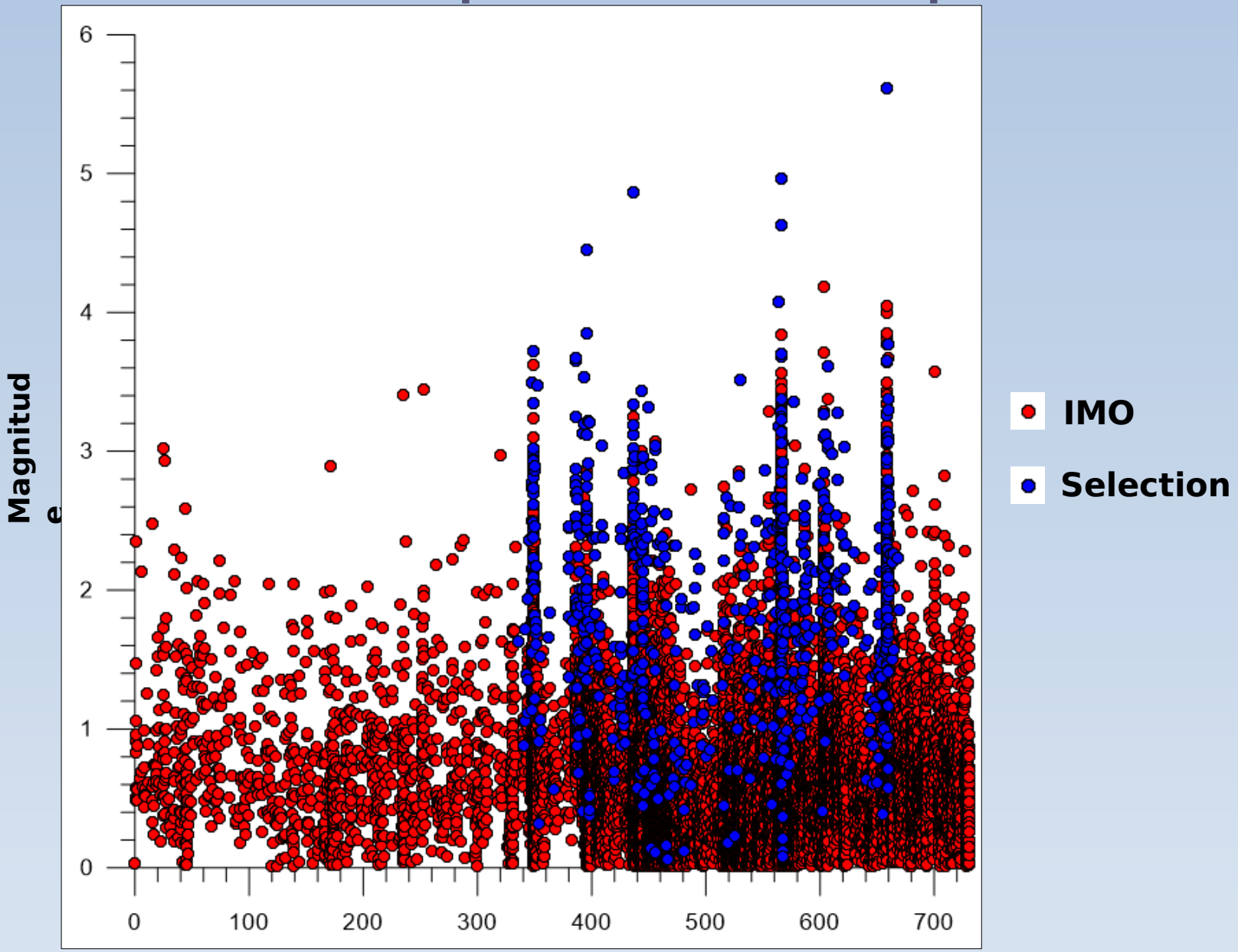
Selection of earthquakes for GMM computation



Method of GMM determination

$$A_i = A_{10}(M).\frac{10km}{R_H}.e^{-\alpha(R_H-10km)}.L_i.(1+C_H(H-3km))$$

- predicted amplitude at i-th station, vertical or horizontal, displacement, velocity or acceleration.

- amplitude at the reference hypocentral distance of 10 km

- term representing geometrical spreading of the rays.

- represents material attenuation.

- constants represent local amplification

- dependence of amplitude on depth

Method of GMM determination

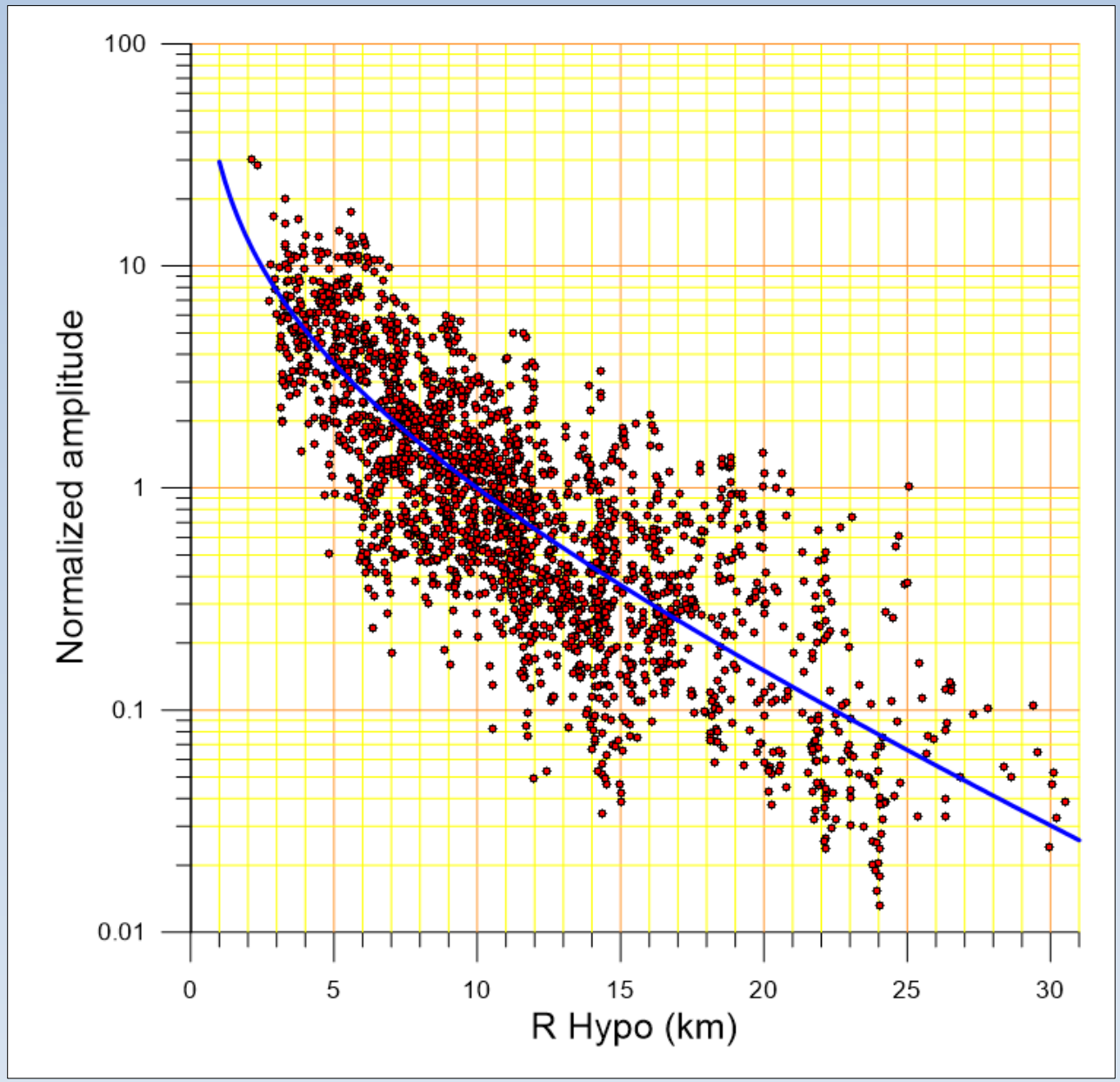
The model does not consider:

- **Radiation pattern of the earthquakes**
- **Focusing or defocusing of rays in consequence of inhomogenities**
- **Local anomalies of material attenuation**

They can be derived from differences between predicted and observed amplitudes

Reduced amplitudes: Amplitudes are compensated (according to model) to the same magnitude and depth and hard rock

Reduced amplitudes α=0.12



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New station BLF

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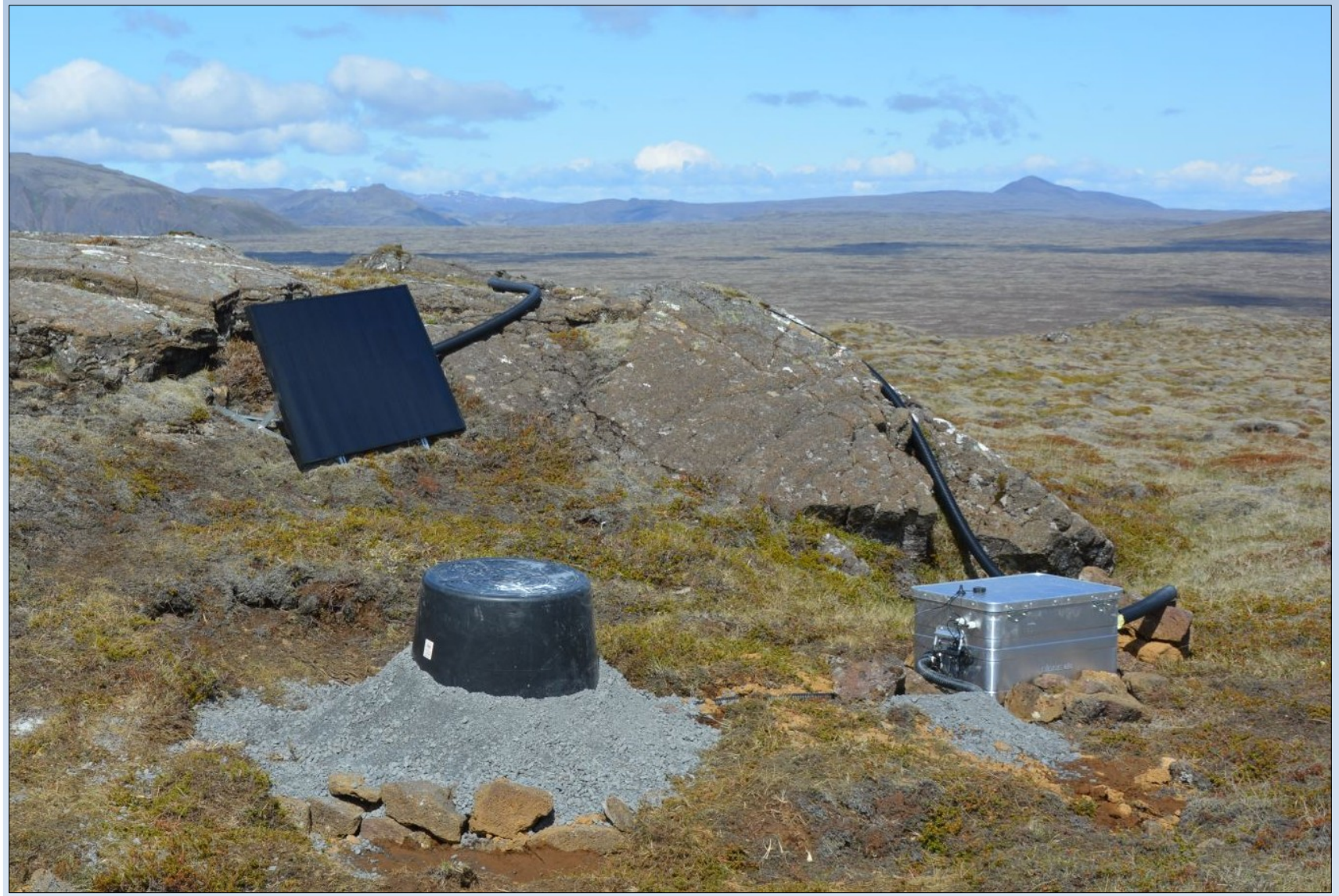
New station SHV



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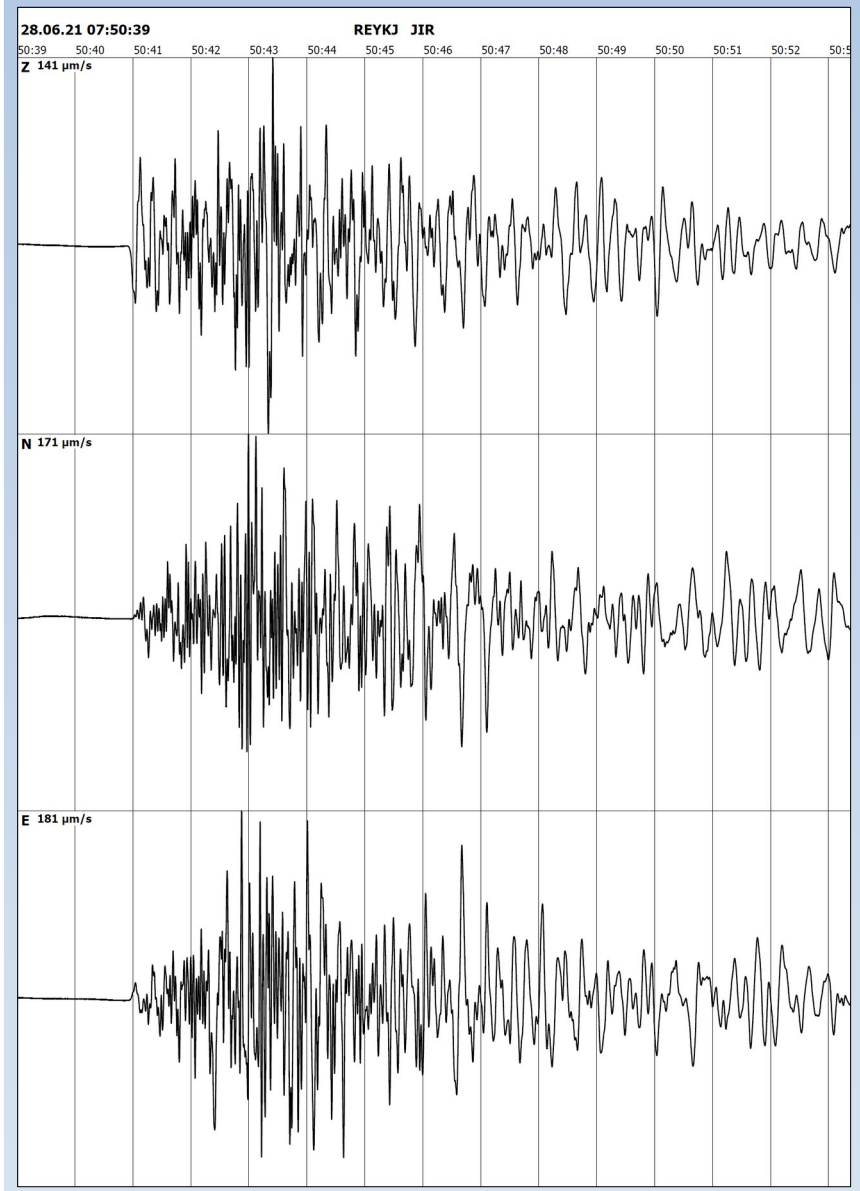
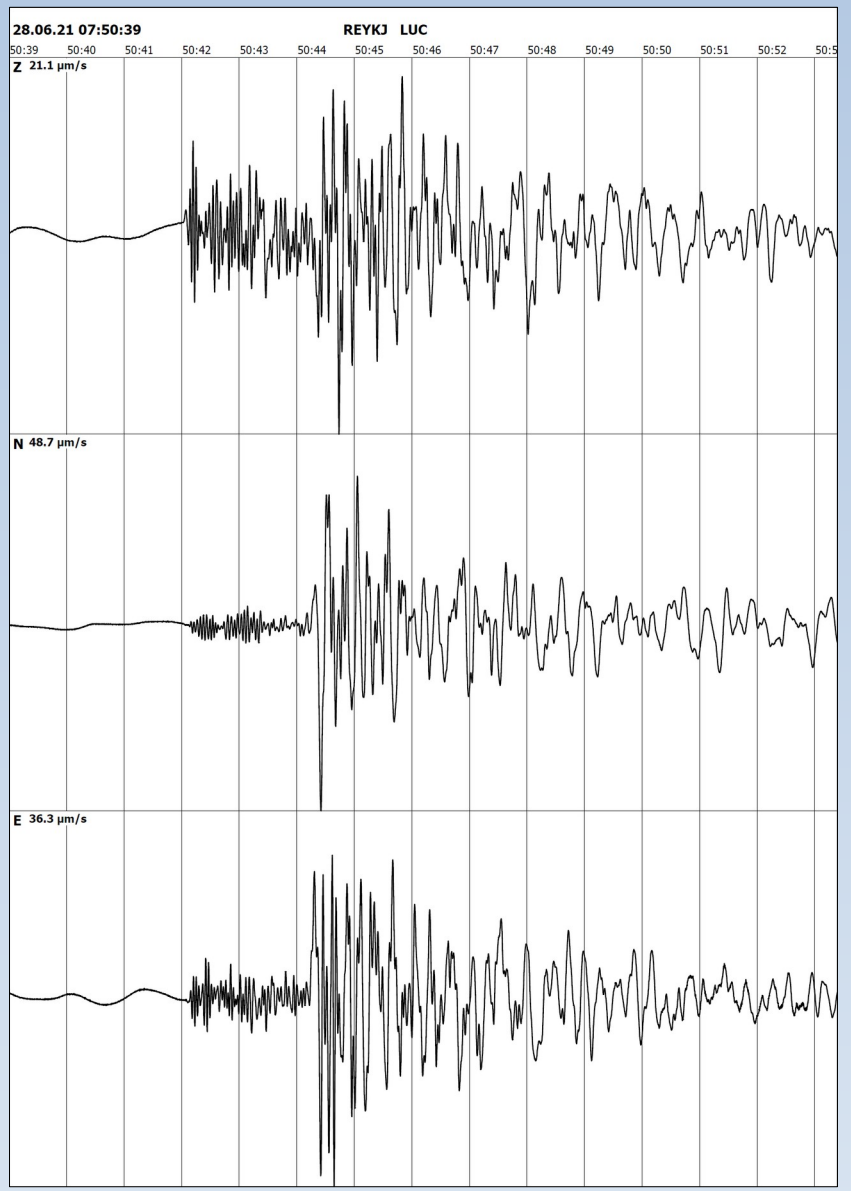
BLF



SHV



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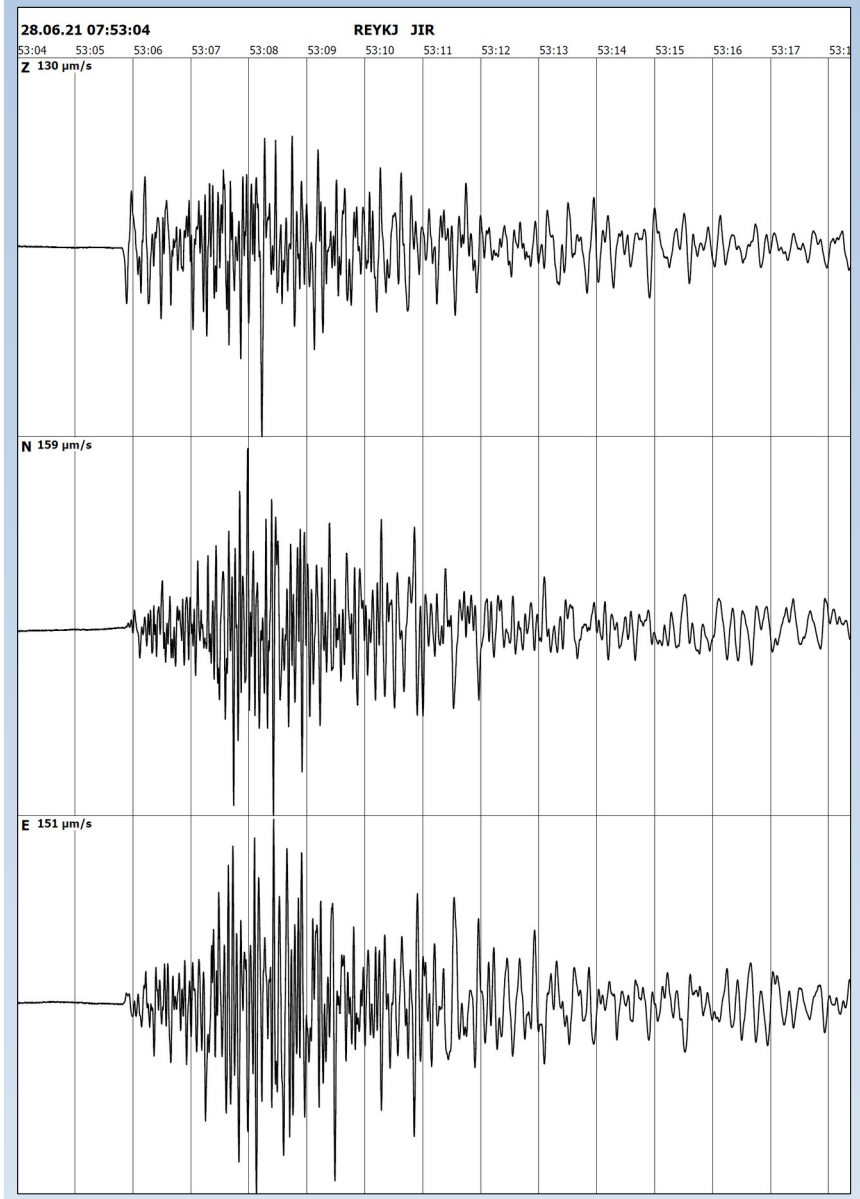
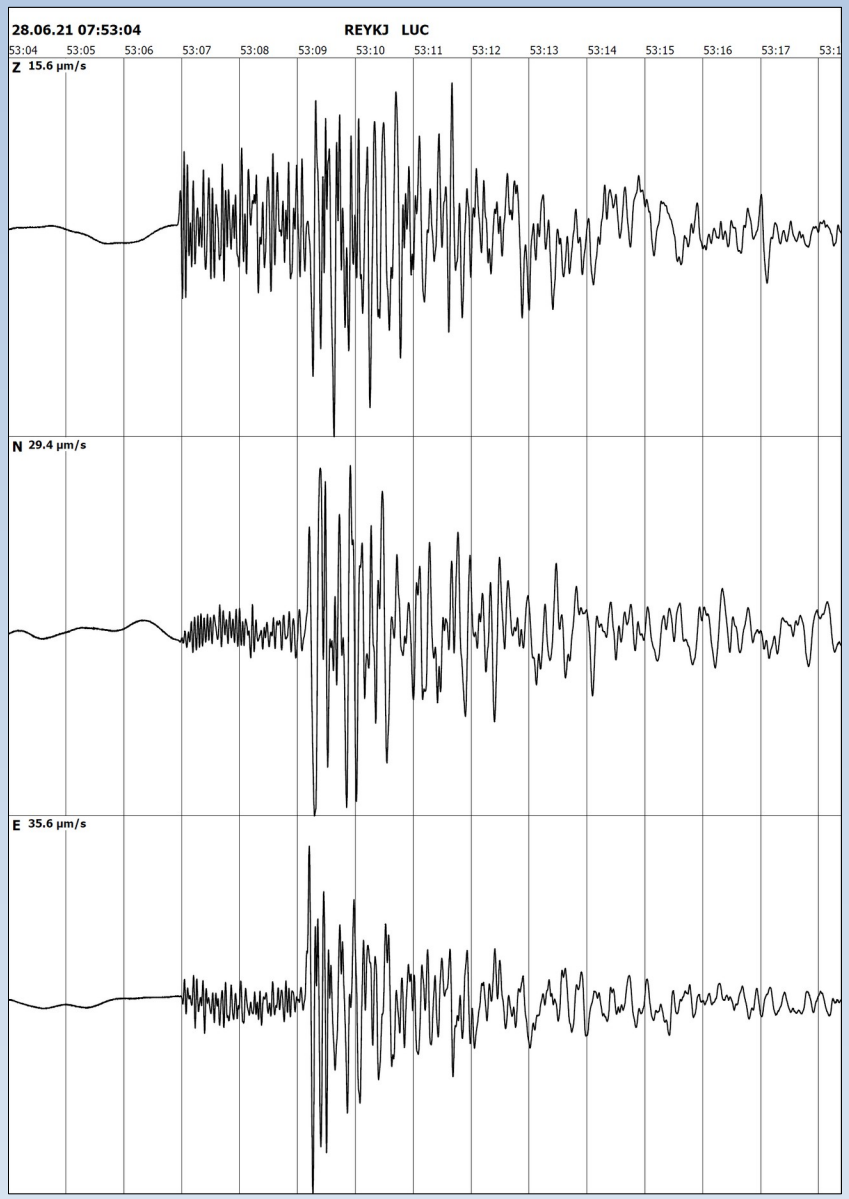
BLF



SHV



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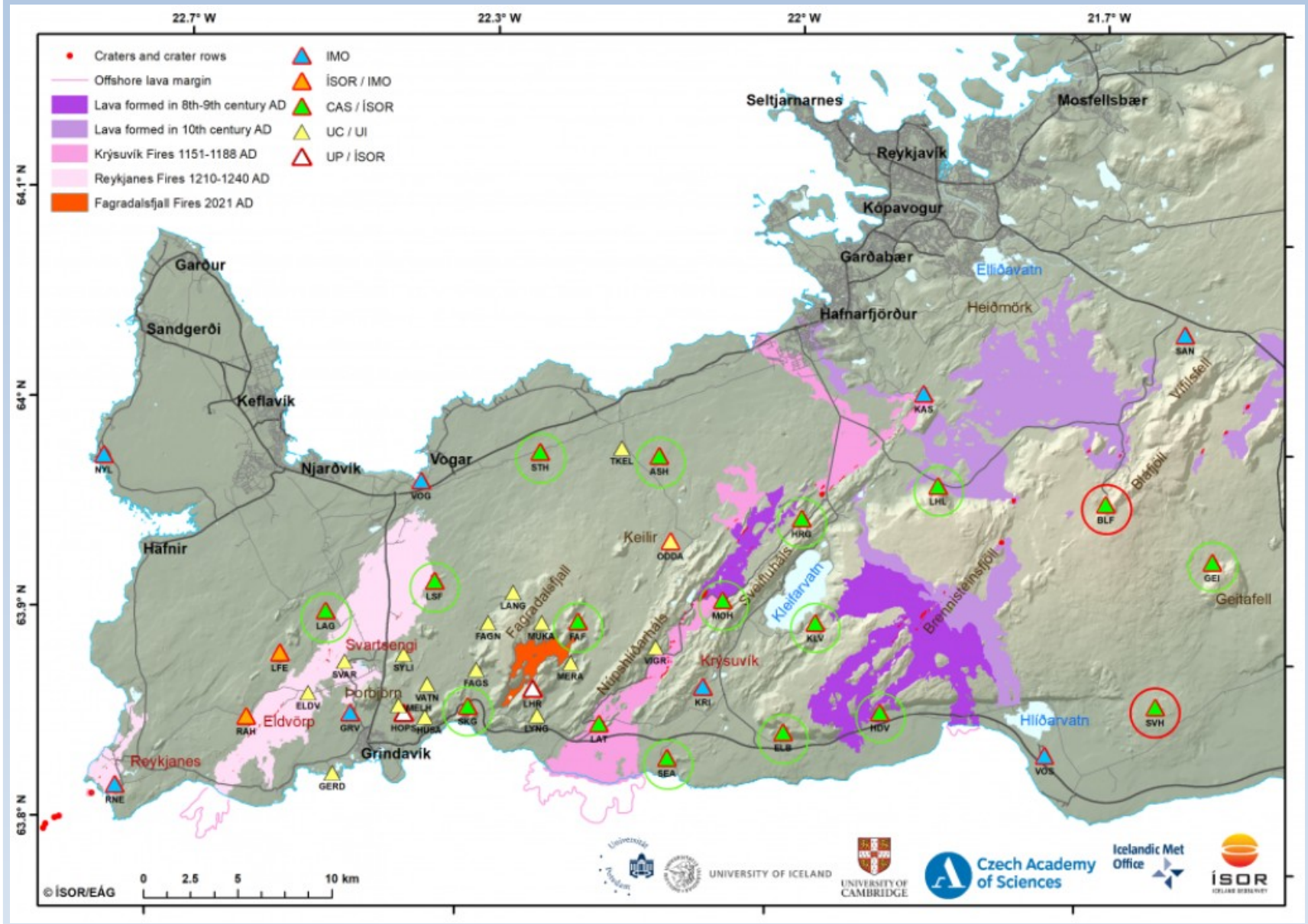

NASPMON meeting, Reykjavík, September 2021

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Thanks for your attention!

Picking of rock samples at Fagradalsfjall volcano, June 7, 2021