Solid Earth Discussions

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Comment on se-2021-132

Anonymous Referee #1

Referee comment on "Ambient seismic noise analysis of LARGE-N data for mineral exploration in the Central Erzgebirge, Germany" by Trond Ryberg et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-132-RC1, 2021

General Comments

The article uses seismic tomography of ambient noise to show that seismic noise can be used to image the subsoil when it comprises complex structures of metamorphic origin. In particular, the method is used in a mineralized field. Furthermore, velocity contrasts are confronted with resistivity data obtained from the electromagnetic method.

The article is reasonably well structured and written. Seismic tomography results show subsurface structures that can be correlated with larger geological structures. Therefore, in my opinion, the article can be accepted after making some adjustments and clarifications. Since the primary method is the ambient seismic noise tomography, the authors must emphasize quality control and processing of the noise records and dispersion curves obtained. Hence, I have only general comments in the first stage, which need to be addressed to clarify and support the ambient seismic noise method.

The Empirical Green Functions (EGF) in Figure 2 are very symmetrical. So, it looks like the acausal and causal parts are stacked up, right? Or, which part of the EGF was used to calculate dispersion curves? A noise directionality analysis (e.g., beamforming) would improve the understanding of the noise sources that contribute to the emergence of EGF. 10 days of continuous noise is enough to extract the FGE robustly?

According to the authors, dispersion curves were estimated using the software of Ryberg et al., 2021a. The authors should explain any difference in obtaining the dispersion curve when using the acausal or causal parts of EGFs or indicate the validity of using the stack of both sides.

Figure 3 shows an erratic dispersion curve with values between 1.5 and 2.0 km / s. I consider all dispersion curves should be displayed and discuss the bandwidth filter effect of the filter. The authors indicate that they resolved 30 frequencies between 1.2 and 20 Hz; if so, it is necessary to show the number of velocity values (or arrival times) resolved in each frequency. How did they go from group velocity to phase velocity to get a Vs model?

Since the 3D inversion model shows a series of contacts with significant velocity (or resistivity) contrasts, as indicated by the sections in Figure 10, it is rare that the EGFs in Figure 2 are so uniform and do not present some discussion indicating a change in velocity. Consequently, the authors should show some virtual source gathers produced along with the seismic stations that coincide with Figure 10a sections. These sections let to see that the correlations capture these property contrasts.