Solid Earth Discussions

Solid Earth Discuss., referee comment RC1
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Comment on se-2021-138

Anonymous Referee #1

Referee comment on "3D deep geothermal reservoir imaging with wireline distributed acoustic sensing in two boreholes" by Evgeniia Martuganova et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-138-RC1, 2021

The authors present results of a VSP experiment for geothermal explorations using DAS. This is an interesting topic and of great societal interest. The paper is generally well written and figures are broadly all relevant and of good quality.

Be fore final publications I recoment that the authors clarify the overall purpose of the paper: Is it a DAS paper, a processing paper, or interpretation paper. I feel it is more of the latter. The overall question(s) that are adressed should be stated more explicitly in the introduction. Notably why and how VSP can help to make geothermal energy production in that particular area a success. Also, what are recommendations for future sites, both in similar and different geological settings. This would IMHO increase the "citability" of the manuscript.

Minor comments:

Line 16: Referenced Spica 2020b before Spica 2020a

Line 25: The well is probably "completed", not just "drilled" ?

L27: "...rarely found in [peer-reviewed] literature"...

L30: Add comment on how your work will contribute to geothermal exploration. What questions for decission makers are you adressing? What scientific quesitons are you adressing?

Figure 1: The world map is too small. It is hard to localise the site geographically

L63: "optimal" SNR. Is that optimum subjectively chosen? is there a quantitative approach to find the optimum? Is this published earlier and you could reference a figure?

L81: Please comment on if there are any DAS-specific steps neccesary (beside the polarity flip). strain(rate) data may be quite different from usual velocity data. Explicitly stating that no additional steps are required may help to promote this technology.

Table1: What do you mean by data conditioning?

L100: add references for Burg convolution and TF-attenuation

L104: "slapping" of the cable. Do you mean that loose bits of the cable are dangling around in the tubing and cause these signals. IT might need some additional explanation here.

L119: "iteratively optimised" was that a manual or automatic process?

L123: Was the ray tracing done in the anisotropic velocity model? Is it worth mentioning a reference to that ray tracer? is it publicly available?

L134: "cleanest": subjectively or objectively?

Figure 4: The legend and text is too small

Figure 5: 3D figures are difficult to understand in paper form. is that really neccesary here? would simple 2D slices be better?

L191: the "Green arrow" is very hard to identify in the figure 6 (as are the other markers.

L205: Why is that sandstone formation chosen as target formation? What do you expect

to find with VSP that wasn't known from seismics? did you find this? I suspect faults are relevant for reservoir integrity. What is known about faults in the area and can you in this paper help to comment on risks for geothermal production? I suspect the plan is for hydraulic stimulation? Any risk for fault reactivation and major EQs?

L271: Contractions shouldn't (sorry, should not) be used in scientific writing

L324: it would be beneficial to posiiton your work in the broader geothermal exploraiton picture. Do you recoomend VSPs for all sites? What can be gained? What geological setting would justify it? Was DAS an adequate tool? Any lessons learned (in design, acquisition parameters, or processing)