

## Review

3D shear wave velocity imaging of the subsurface structure of granite rocks in the arid climate of Pan de Azúcar, Chile, revealed by Bayesian inversion of HVSR curves

By Rahmantara Trichandi et al.

### General Comments:

This paper evaluates the 3D structure of monzogranite bedrock near the Pan de Azúcar National Park (Atacama Desert, Northern Chile), using Bayesian inversion of horizontal-to-vertical spectral ratios (HVSR). The authors analyzed a large number of HVSR curves, derived from ambient noises, recorded at over a dozen stations in the study region. The authors used their best HVSR curves to invert for 1D shear wave velocity models, which later used to generate 3D model beneath the study region. The results are summarized in **7. Conclusion and outlook:**

*Based on the  $V_s$  model, we identified fractured and altered granite in Pan de Azúcar to reach 30 – 40 meters deep. We found no  $V_s$  signature of a saprolite layer that is indeed absent in Pan de Azúcar due to the arid climate. Mafic dike structures were identified at depth.*

The technical quality of the paper is good although there are considerable grammar/writing mistakes that should be corrected before publishing. Authors have clearly analyzed and interpreted the results. Novelty of the research is also acceptable. However, I have some suggestions for authors to improve the quality of the manuscript before publishing it. Therefore, I recommend accepting this article with major revisions. My suggestions are as below:

The authors assembled a large data set and rigorously processed HVSR curves to generate 3D shear wave velocity model. However, it is somewhat disappointing that the presented results do not include resolution test (e.g., checkerboard test. See Wang et al., 2021) to estimate the horizontal and vertical resolution of the model. I would suggest adding that into the results section which will improve the quality of the manuscript.

It would be great to compare shear wave velocity profile in the borehole with the 1D profiles extracted at nearby stations. If any information available, please add that comparison into the manuscript.

### Specific comments:

1. Line 24: Add “shear wave velocity ( $V_s$ )”.
2. Line 44-45: Not clear what authors wanted to report here.

3. Line 50-53: Not clear. Re-write the sentence.
4. Line 89-90: Use subscript (e.g., Na<sub>2</sub>O)
5. Line 104-106: Remove sentences start with “Initially...” and “However...”
6. Line 203: Remove “quickly”
7. Line 233: Define “masl”
8. Line 116: Define “SESAME”
9. Line 238: Please add velocity contour lines into figure 7b to show 3 layers discussed in the text.
10. Line 307: Replace “also ask” with “assume”. I noted similar types of wording at many places in the manuscript (e.g., sentence start with “We found...” in line 377) and I would recommend fixing those.
11. Line 293: What is “βpo”

Figures:

Fig 1: Caption- Replace “Red dots” with “Black dots”.

Fig 2: Please add Y-axis labels for figures A-F. Where is this receiver located? Add receiver location into figure 1. Are the records in velocity or displacement or raw data?

Fig 4: Add shading (e.g., gray color) to the area where you have less data coverage (white region in your plots) or lower resolution (see example figures in Wang et al., 2021).

Fig 5: Add data point location into figure 1. If Vs profile beneath the borehole is available, please add that into figure B for comparison.

Fig 6: Add shading as I mentioned above for Fig 4. Please add color scales corresponding to each slice. If you use same color scale for all figures, then, put only one-color scale bottom of the figure. Fig A-C needs x-axis labels. Remove words top on each figure (e.g., Depth Slice DS: XX) and add depth value upper right corner of each figure as “10 m or 20 m etc.” (see example figures in Wang et al., 2021). Keep black solid line (cross section) within the area where you have the best resolution.

Fig 7 & 8: For Fig A; similar comment as Fig 6.

For Fig B; Zoom into the region where you have the best resolution. It seems like X axis is not correct. Remove text above the figures B and C. Mark 'NW' and 'SE' corner of the profile (see example figures in Wang et al., 2021). Remove depth axis in Fig B and C.

Reference suggested:

Wang, W., Nyblade, A., Mount, G., Moon, S., Chen, P., Accardo, N., et al. (2021). 3D seismic anatomy of a watershed reveals climate-topography coupling that drives water flowpaths and bedrock weathering. *Journal of Geophysical Research: Earth Surface*, 126, e2021JF006281. <https://doi.org/10.1029/2021JF006281>