



EGUsphere, referee comment RC1
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Comment on egusphere-2022-230

Anonymous Referee #1

Referee comment on "Upper-lithospheric structure of northeastern Venezuela from joint inversion of surface-wave dispersion and receiver functions" by Roberto Cabieces et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-230-RC1>, 2022

This is a study in which the authors propose a new 3-D model of shear wave velocity (V_s) and moho depth in northern Venezuela using both receiver function on their own for Moho depth and a joint inversion of Rayleigh and Love phase and group velocity measurements obtained from noise cross-correlations, using both land-based and ocean-bottom seismometers. The authors use H-k stacking for measuring Moho depth and a linearised least-squares inversion to obtain surface wave dispersion curves and then use a hierarchical, transdimensional bayesian inversion scheme to jointly invert surface-wave data and receiver function data for shear wave velocity. The results show clear geographical coherence and known tectonic features. Overall, I think this is a good study that improves our knowledge of the area. However, I have some concerns about the methods and some figures need to be improved.

Major Comments

The authors use a joint inversion of receiver functions and surface-wave data, but they use receiver functions alone to measure the Moho depth. I do not understand why they perform a separate measurement for Moho depth instead of obtaining it from the joint inversion. Why use receiver functions in an inversion if not to better constrain the location of interfaces and especially the Moho? Figure 9 shows that the Moho is clearly visible on the inversion results. Consequently, the results of Moho depth measurements and the results of the V_s inversion as shown on Figure 11 do not seem to match, for example on profiles B-B' and D-D'. Also, some of the Moho depth measurements such as shown in Figure 8 for station PRPC are apparently not well constrained, maybe a joint inversion could have helped there.

Minor Comments

Figure 1 is hard to read. The colorful background map and the many earthquakes make finding the stations challenging. As the authors are using seismic noise and teleseismic data, it is not clear why the local seismicity is shown. Figures 2 and 3 refer to Figure 1 for the location of stations CUBA, LAPC and CMPC, but those are not shown on the map. An indication of the location of the study area on the small map in the upper right corner would also be useful.

Page 4, line 99: The steps are listed in the wrong order, the authors first show how to retrieve Rayleigh and Love wave dispersion measurements, then how to obtain the RF and Moho depth measurements.

Page 5: It would be useful to indicate the direction of the main noise sources. This would make it easier to understand the kind of asymmetries and biases that are to be expected from the noise cross-correlations.

Figure 4: What are the red and blue bars on figures c-f? Why is the period scale logarithmic on figures a and b and linear on figures c-f? The caption needs to be clarified, like line 85: 'd) and f) Love velocity histograms of dispersion measures for Rayleigh and Love waves, respectively.'

Page 6, line 60: 'The measurements of phase and group velocity from all station pairs **at** different periods', not '**in** different periods'

Figure S1: The caption is unclear: is this the output of the picking software?

Page 8, line 44: Did the authors use thinning for the MCMC? 100 000 iterations on 40 cores does not seem like a lot for a joint transdimensional hierarchical bayesian inversion, would it be possible to show a density plot to show the inversion has fully converged?

Page 9, line 84: Could the elongated feature seen on surface wave velocity maps be due to smearing? The resolution tests show some smearing in the area in the same direction.

Figures 5 and 6: Would it be possible to show the relevant locations like in figure 10? Figure 1 is a long way and has a different size.

Page 14, line 16: shouldn't it be 'slab roll-back' rather than 'slab-roll back'?

Page 16, line 08: It would be necessary to cite the networks used in this study, the relevant information and DOI can be found on <http://www.fdsn.org/networks/>