

We thank the reviewer for the time taken marking the manuscript and the figures. Corrections have been entered in the text “Manuscript_corrections” in green to make them easier to follow.

Reviewer 2:

The authors of this study propose a new 3D model of shear wave velocity (V_s) and moho depth of eastern Venezuela, from the Caribbean Basin in the North to the Guiana Shield in the South, using both receiver function alone for Moho depth imaging and a joint inversion of Rayleigh and Love phase and group velocity measurements obtained from noise cross-correlations, using an amphibious (land-ocean) seismometer array. This 3D model is built from 1D profiles spaced $0.5^\circ \times 0.5^\circ$. 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 geologic features. Overall, this study seems to improve knowledge of the area. However, even if my field of expertise is not the use of earthquake waves to image Earth Interior, I have three major concerns about this contribution:

1) Some figures need to be improved. Particularly, Figure 1 (left panel) should only show seismicity used during this evaluation. Minor comments on the other figures are provided in an annotated pdf.

Answer: We have updated the figures accordingly with the reviewer’s comments (see new Figs. 1, 4, 5, 6, 10 and 11 in the revised manuscript) and new figures (Figs. S11 and S12 in the Supplementary Material). We have checked and updated the bibliography accordingly and have included more references in the discussion (see pages 12, 13, 14, 15 and 16 of the revised manuscript). This has strengthened the interpretation of our V_s model. Furthermore, we have made sure to add the active faults and Precambrian tectonic provinces in most figures to ease their interpretation. We must make clear that the events in Fig 1 are just for explaining the tectonic and seismic of the region, they are not used in this study, therefore events for a long range of dates are shown (we added some explanatory text to the figure’s caption).

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“The earthquakes in this cluster range from shallow to intermediate depths (~ 40 to 150 km), and their magnitudes vary from M_w 3 to 5, with a few relatively large events ($M_w \approx 6.5$). The Paria cluster contains a gap in seismicity between 36-51 km depth that Clark et al. (2008) used to conclude that the subducting and buoyant pieces of the South American Plate occur along a near-vertical tear and support a “jelly sandwich” rheology.”

2) Some previous internationally-reviewed studies on crustal structure of the same region by local researchers (e.g., Schmitz et al, 2005, 2021), using other methods (e.g. wide-angle data) are curiously not cited. Of course, comparison of results between those different studies (with different approaches: active seismics) is not presented.

Answer: We have updated our discussion to include these references and have compared our results to theirs. We would like to point out that the two main previous works (Niu et al., 2007 and Schmitz et al., 2021) show important discrepancies and our results lie in the middle between those two studies. We also note that new data is required in Eastern Venezuela to further understand the crustal architecture of that region.

3) the authors keep the comparison of their results to other similar (geophysical/seismological: passive seismics) studies: Niu et al.; Miller et al.; Masy et al.; Arnaiz et al., and so on. It would seem that they are well aware of the Bolivar Project results. However, even the aim of the paper being the correlation/imaging/identification of geological/tectonic/geodynamic features, little referencing of geological studies is applied. For instance, the Espino Graben geometry and its Cenozoic-Quaternary southward directed inversion is well known from oil-industry seismics and other studies.

Answer: We have included several new references throughout the manuscript and especially in the Discussion section to address these shortcomings. The new key references and additions to the original text are highlighted in green in the updated manuscript.

Minor comments, typo and form corrections are provided in annotated pdf of the contribution.

Answer: We have reviewed the entire manuscript, figures and captions to correct all the mistakes pointed out by the reviewer.