

## **Review for “Forearc density structure of the overriding plate in the northern area of the giant 1960 Valdivia earthquake”**

In this study, the authors have explored the continental fore-arc density structure of the Nazca-South America subduction zone. They compile a gravimetric data base combining public databases and lots of new measurements. They perform 2D and 3D inversion for a detailed density structure both onshore and offshore and further calibrated the results with 1D electrical resistivity models from MT and TEM measurements. The authors show the spatial distribution of the mantle wedge and the Coastal Cordillera domain resolved from this density structure. They propose a model for the current stress and friction evolution on the subduction plate which may relate to the high slip patch distribution of the giant 1960 Mw9.6 Valdivia earthquake. The study provides the density structure along the coast in detail and a geophysical perspective to understand the subduction process.

This study covers an activate region where huge megathrust earthquakes have taken place. The results are significant for understanding the environment of megathrust earthquakes and thus important for future hazard assessment. The manuscript is well written. However, I found some missing references for the method and data process, see comments below. Thus I recommend it to be published in *Solid Earth* with minor revision.

Minor comments:

Figure 1a. This is a very nice figure but with too many colors. I suggest to use gray scale for elevation.

Line 71: This is an old reference. Maybe use MORVEL.

Line 135: a reference of Lacoste & Romberg is missed.

Line 140: it is not clear how is this reference density used.

Line 150: why use 40 km-wide band? Any test on this?

Line 172: why does the cell size change along depth?

Line 176: why choose 6000 m by 6000 m by 3000 m? Additional information is needed to support this.

Line 216: more explanations for WinGLink.

Figure 4, 5,6,7: I feel some labels are too small. Please use consistent font size.

Line 323: how is this initial input model chosen?

Line 365: how is the dashed line of the incline of H1 determined? Here some explanations are needed. I am also wondering if the angle H1 has some implication of the subduction structure.

Line 386: is this compact process supported by other studies? Geological or geochemical?

Line 390: what is the physical meaning of this low horizontal gravity gradient?

Line 404: how well is the depth (30 km) of WS/ES constrained?

Line 410: it is interesting that the depth limit is related to seismicity. Is this observed in other subduction fault?

Line 460: Normally the fluid migration can be associated with high  $V_p/V_s$  ratio in subduction zone. Is there  $V_p/V_s$  ratio variation that is associated with the fluid migration here?