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Supporting information for

3D local earthquake tomography of the Ecuadorian margin in the source area of the 2016 Mw 7.8 Pedernales earthquake

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Contents of this file

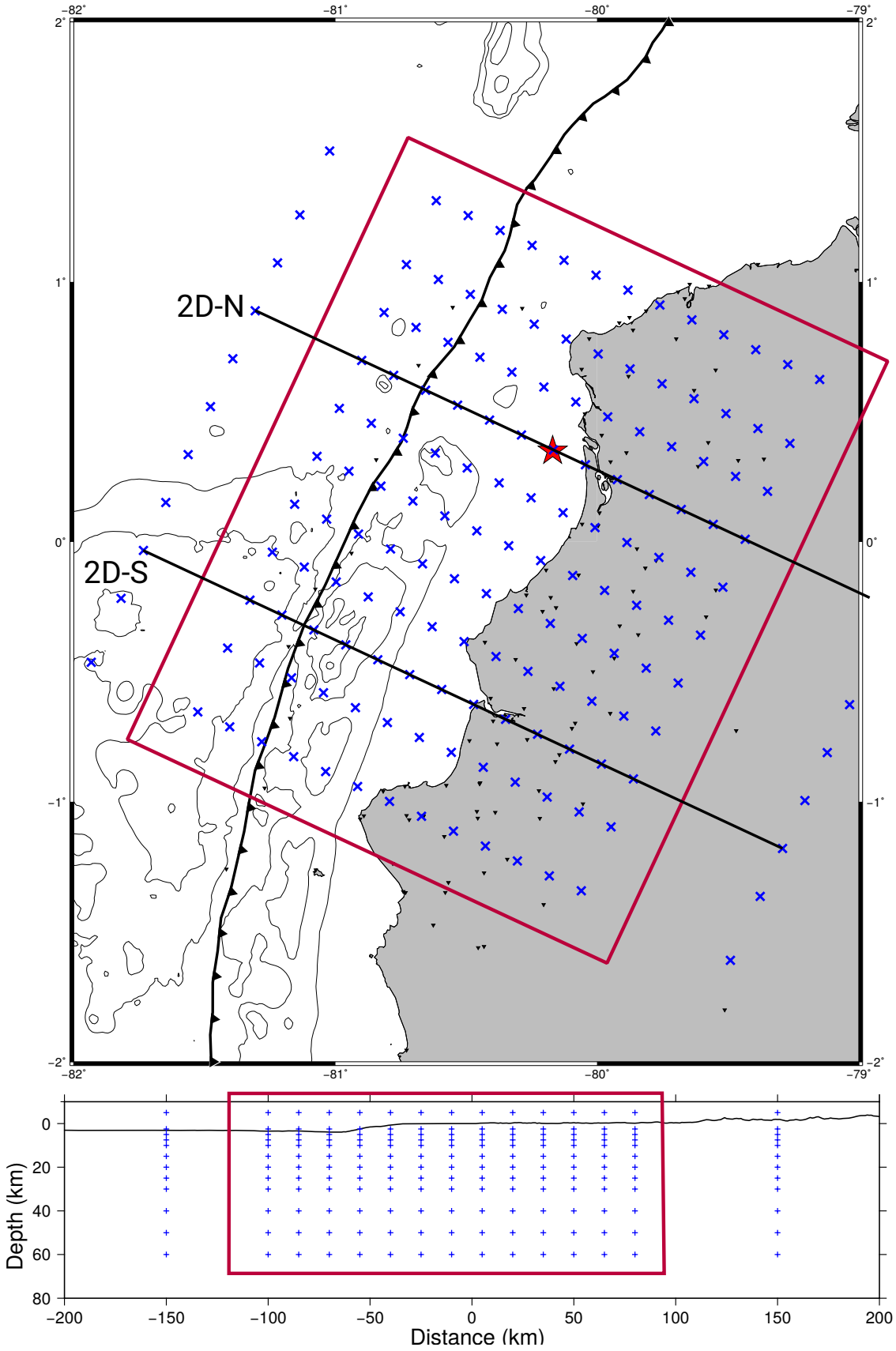

Figure S 1: Grid nodes distribution for the inversion process. Outer rectangle shows the distribution for the coarse grid, while inner rectangle represents the fine grid with a 15 km W-E nodes spacing and 22.5 km separation along strike. Bottom image shows the distribution in depth following the layering of the minimum 1D velocity model (Leon-Rios et al., 2019).

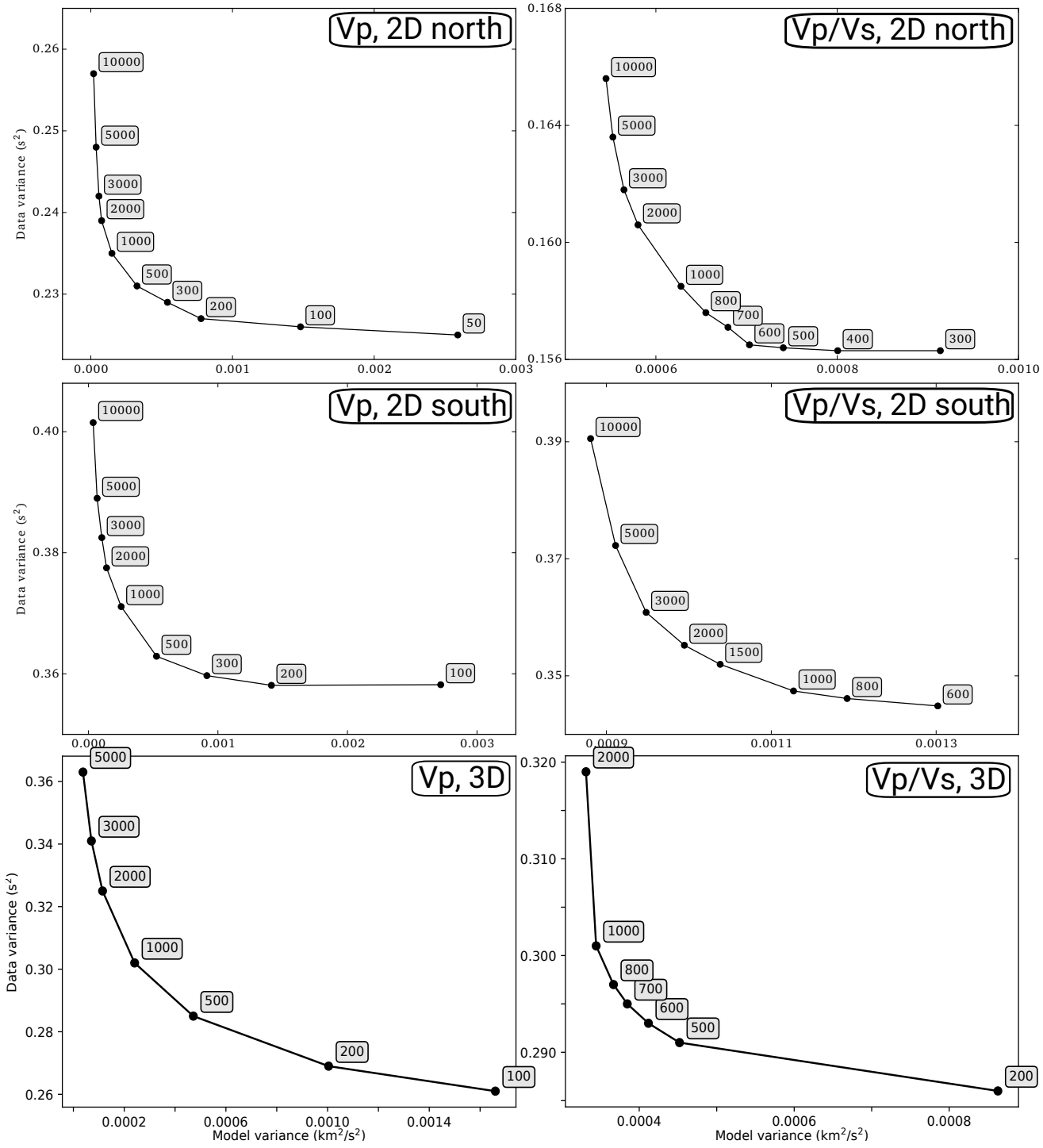

Figure S 2: Damping curves. Trade-off curves analysis for the different stages of this work. Left side shows the Vp and right side the Vp/Vs ratio. Damping curves were calculated for north and south segments in the 2D inversion, and for the complete dataset in the 3D inversion stage.

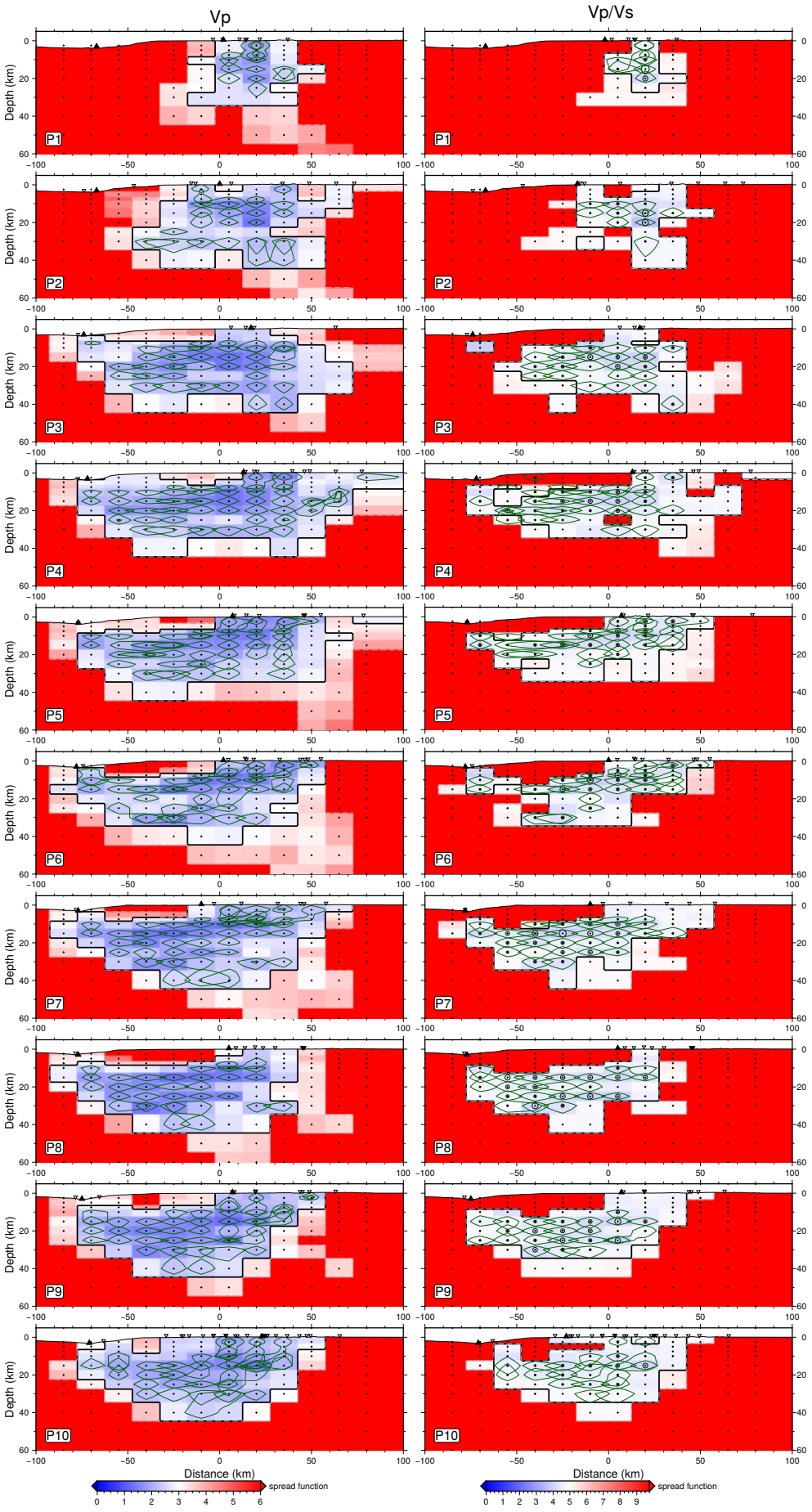

Figure S 3: MRM analysis. Model resolution matrix analysis using the spread function and the 70% of the diagonal elements of the MRM. Spread function is color coded with a blue-red with blue colors representing well resolved regions.

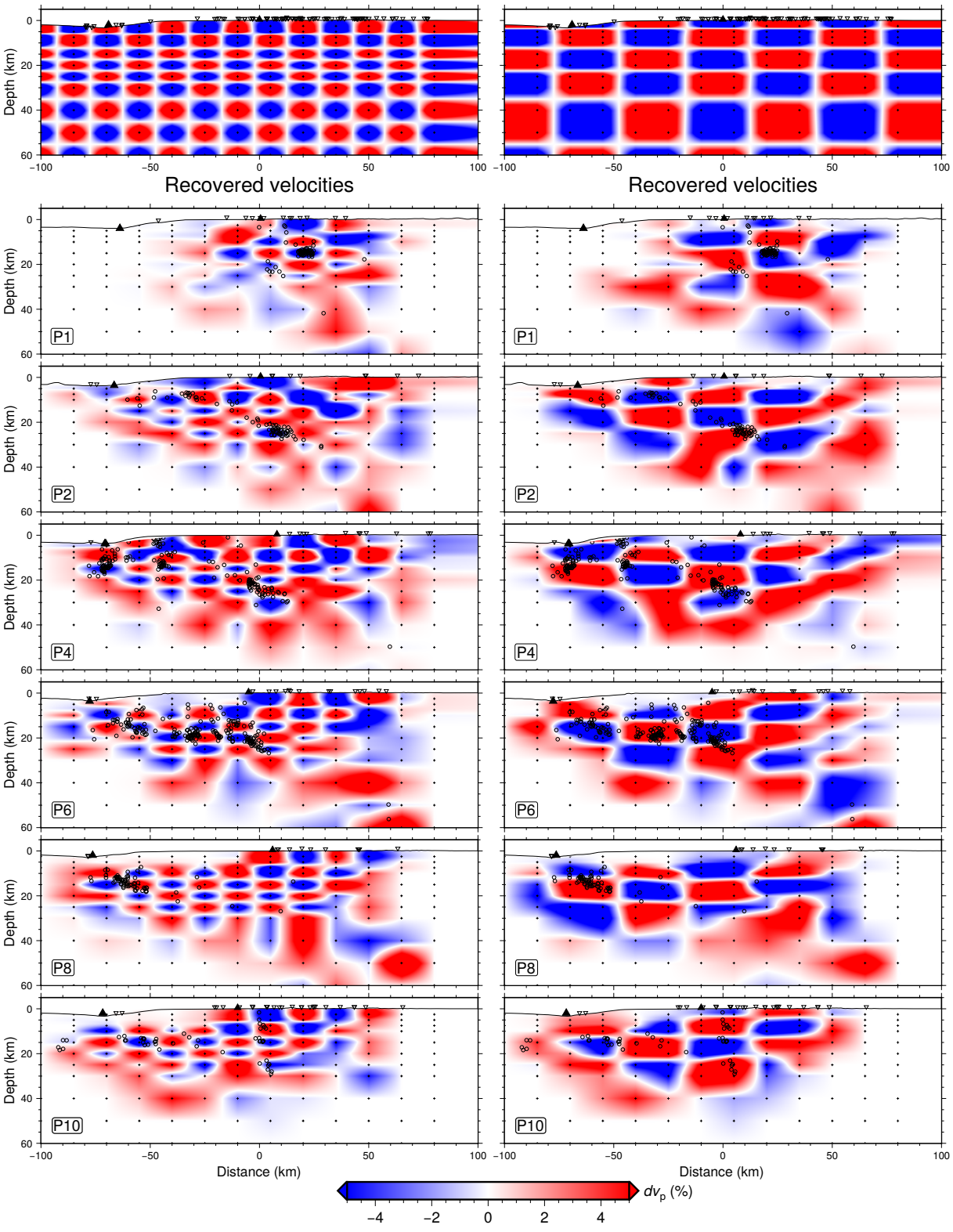

Figure S 4: Checkerboard test. Synthetic recovery test for **left)** small, 15km and **rgiht)** medium, 30 km anomalies. Top image show the input model comprised by alternated positive and negative anomalies of ±5% of the inverted model. Bottom images show the recovered velocities along representative profiles for the northern, central and southern segments in our region of interest.

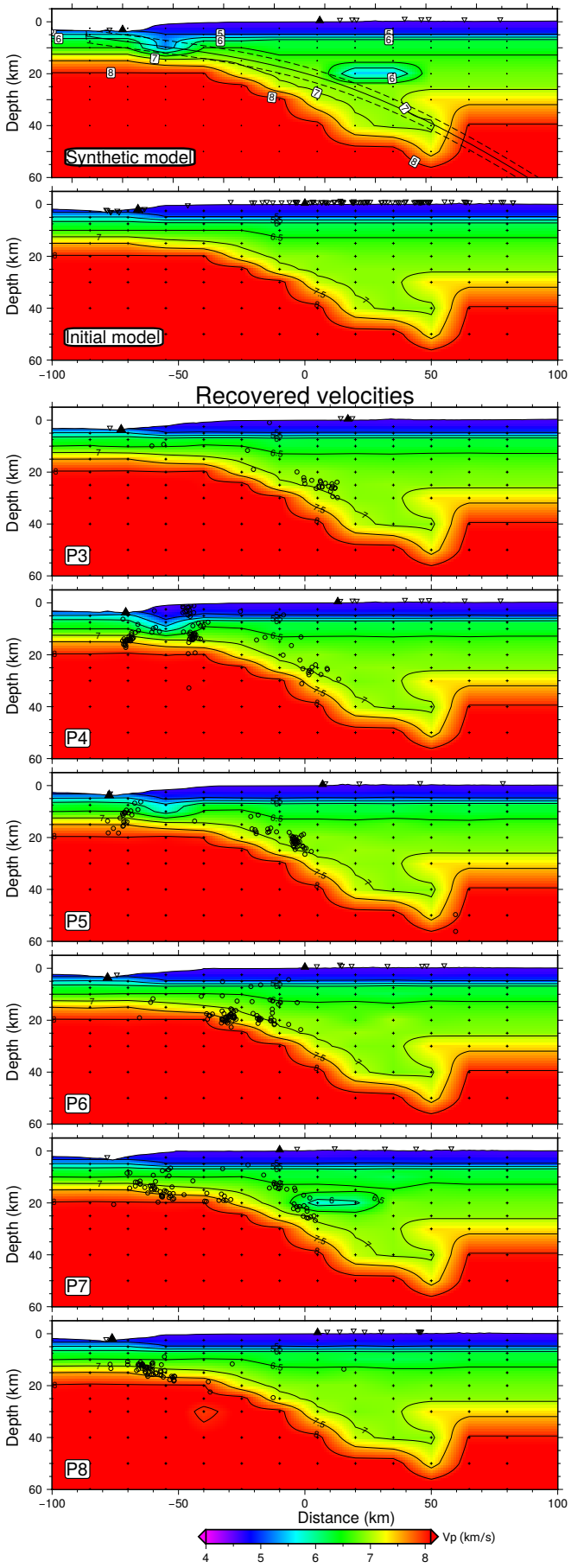

Figure S 5: Synthetic recovery test for a seamount represented by low Vp anomalies added in P4-P5. Also, a low velocity anomaly was included at 20 km depth in P7. Projection of the input model is shown at the top.

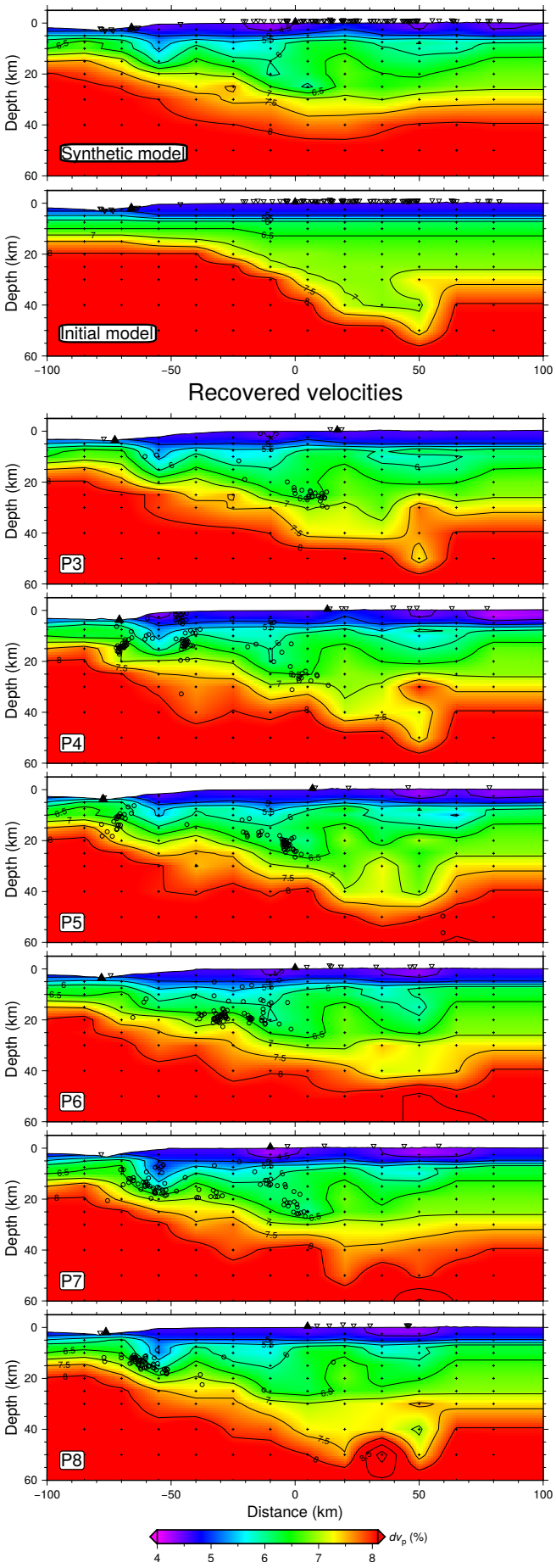

Figure S 6: Synthetic restoring test to evaluate the influence of our 2D Vp northern segment model (2D-N), over a homogeneous subduction zone. Synthetic arrival times were generated using the synthetic model (2D-N) and then tested over the homogeneous initial model. Recovered velocities are shown for central profiles (P3-P8).

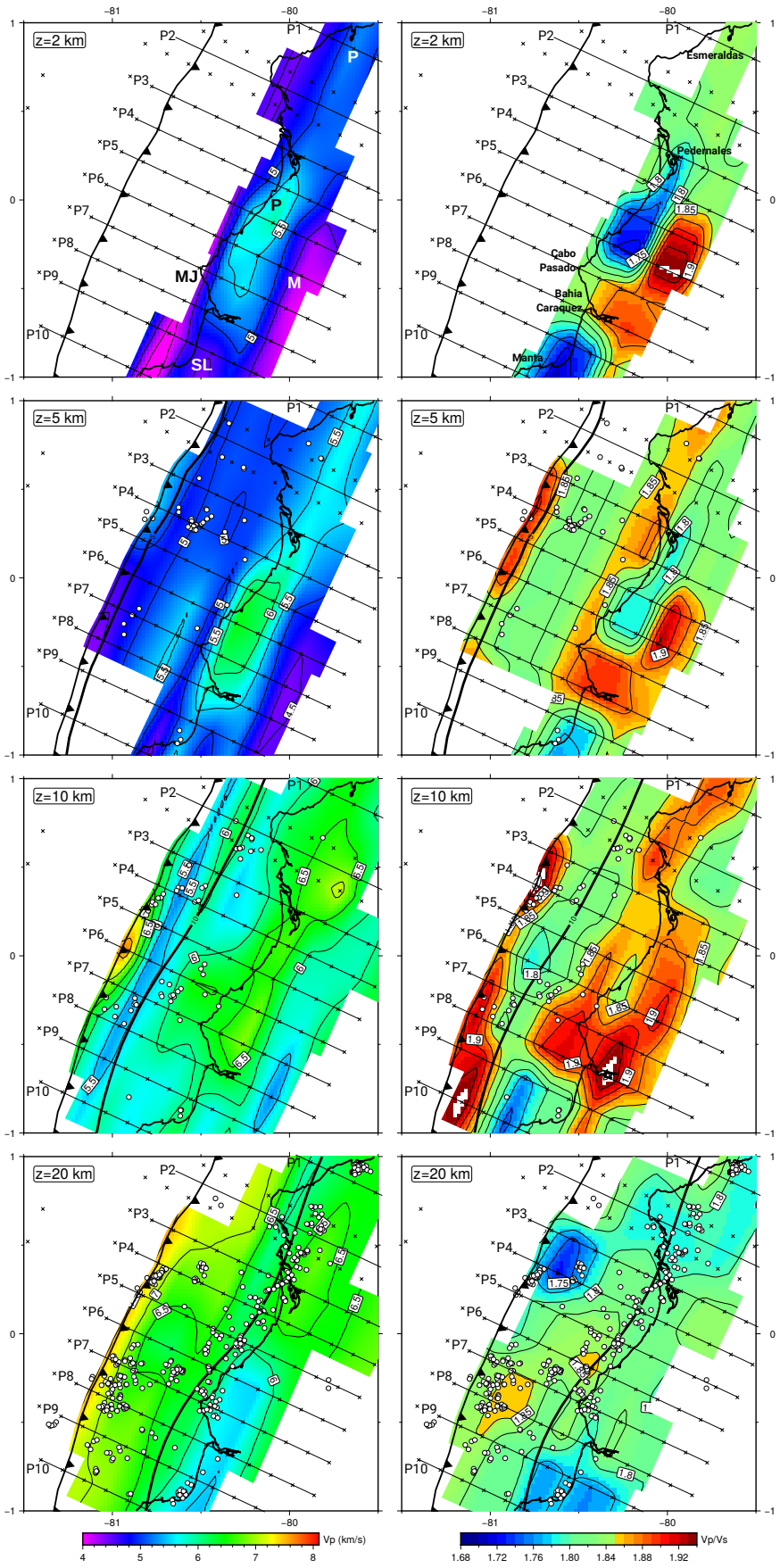

Figure S 7: 3D velocity model, merging modeling strategy. Horizontal slices. Vp (left) and Vp/Vs (right) horizontal slices at 2, 5, 10 and 20 km depth. Velocities and Vp/Vs ratios are color coded and iso-contours are plotted every 1.0 km/s and 0.025 for Vp and Vp/Vs, respectively. Based on MRM and checkerboard test, non resolved areas are blank. Seismicity is plotted by depth (d) following: d$\leq$5 km in z=5 km, 5$<$d$\leq$10 km in z=10 km and d$>$10 km in z=20 km. Further details in Figure 6 in main text.

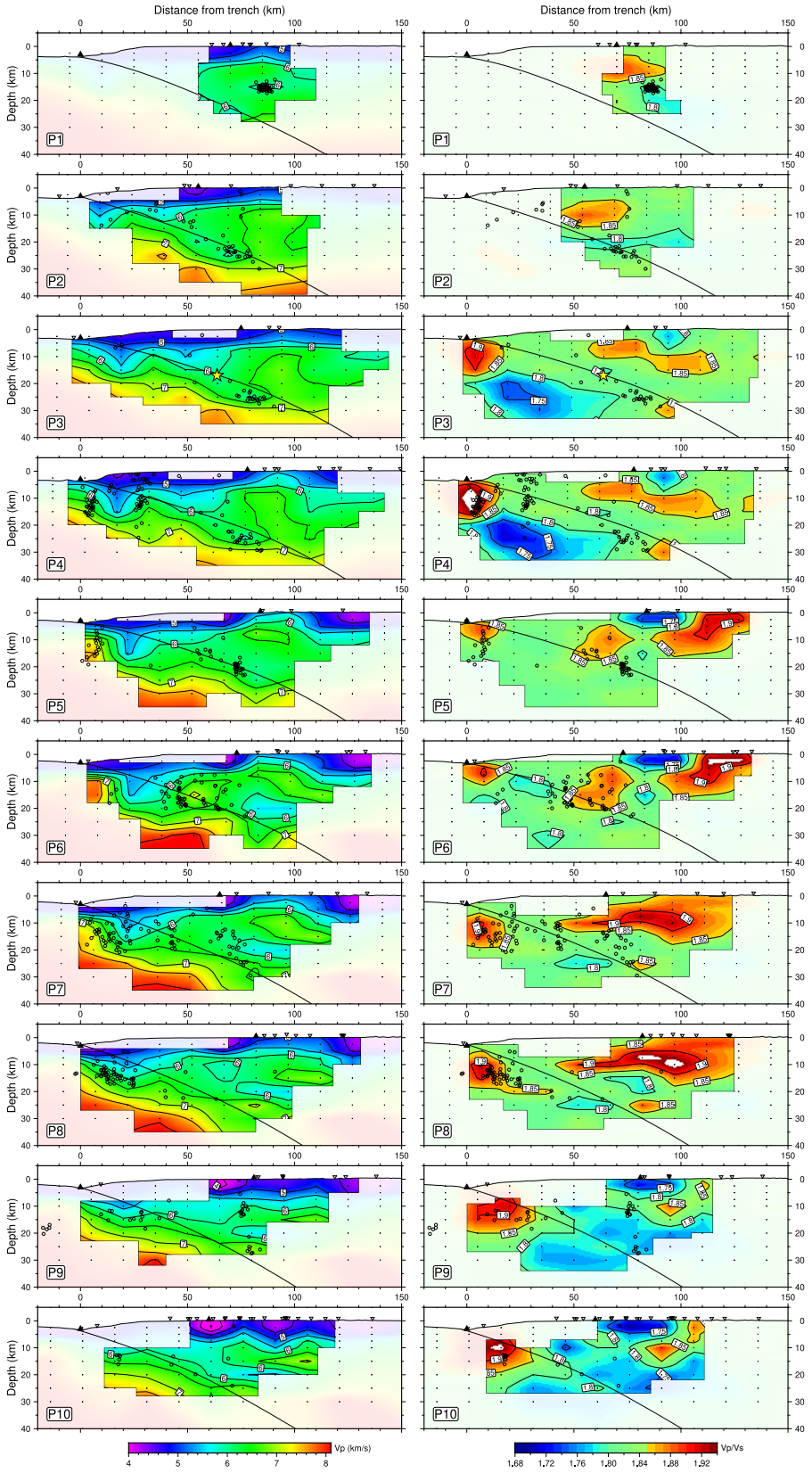

Figure S 8: 3D velocity model, merging modeling strategy. Cross sections. Three-dimensional models for both Vp (left) and Vp/Vs (right) based on a 2D-N and 2D-S merged initial model. Results are shown along 10 W-E profiles. Vp velocities and Vp/Vs ratios are color coded and iso-contours are plotted every 1.0 km/s and 0.025 for Vp and Vp/Vs, respectively. Based on the MRM and checkerboard test, non resolved areas are faded. Location of profiles, P1-P10, is shown in Figure 1. Width for projection of hypocenters and stations is 22 km. Relocated hypocenters are plotted in black circles, and stations are represented by inverted triangles. Grid nodes are displayed in black crosses and solid black triangles represent the projection of the trench and coastline. Yellow star in P3 indicates the hypocenter for the 2016 Pedernales earthquake (Nocquet et al., 2017). Modified slab interface (see main text for further details) is represented by solid black line.

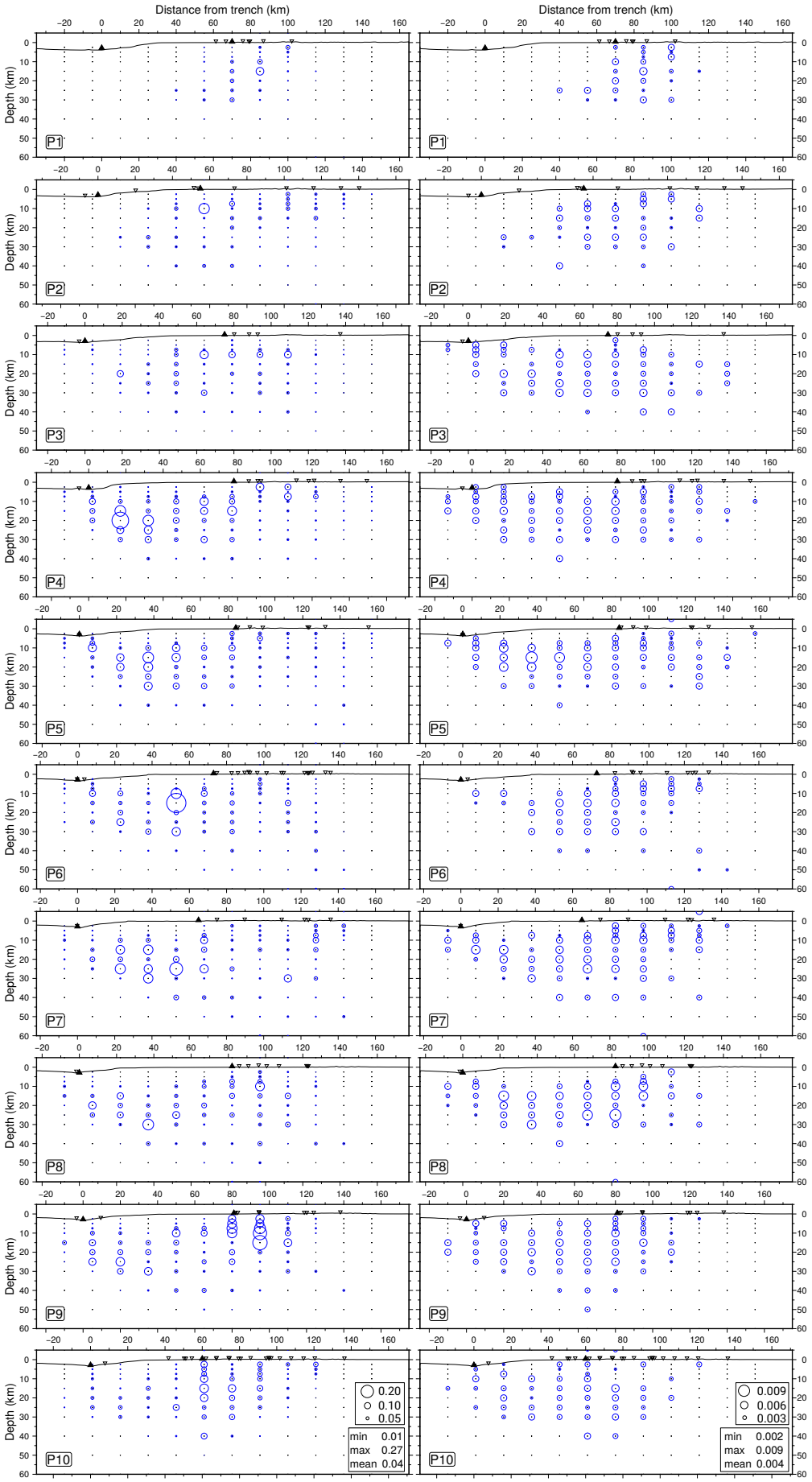

Figure S 9: Estimated Standard deviation. Bootstrap results for an inversion based on a randomly selected subset of aftershocks comprising 80% of the events in our actual catalogue. Blue cirles indicate the size of the standard deviation at each profile. (left) Vp, (right) Vp/Vs.

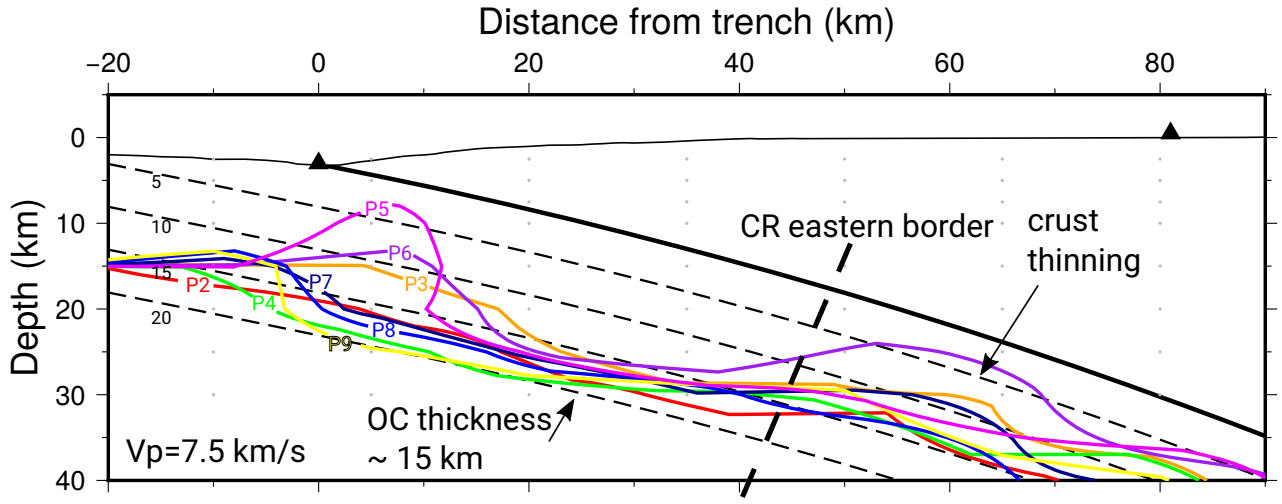

Figure S 10: Analyzing Vp iso-velocity contours. Vp velocities associated to the oceanic upper mantle (bottom). Cross sections compare the depth of profiles P2-P9 identified by colored solid lines. Slab interface and its projection at 5, 10 , 15 and 20 km are plotted for reference. Black triangle represents the trench.

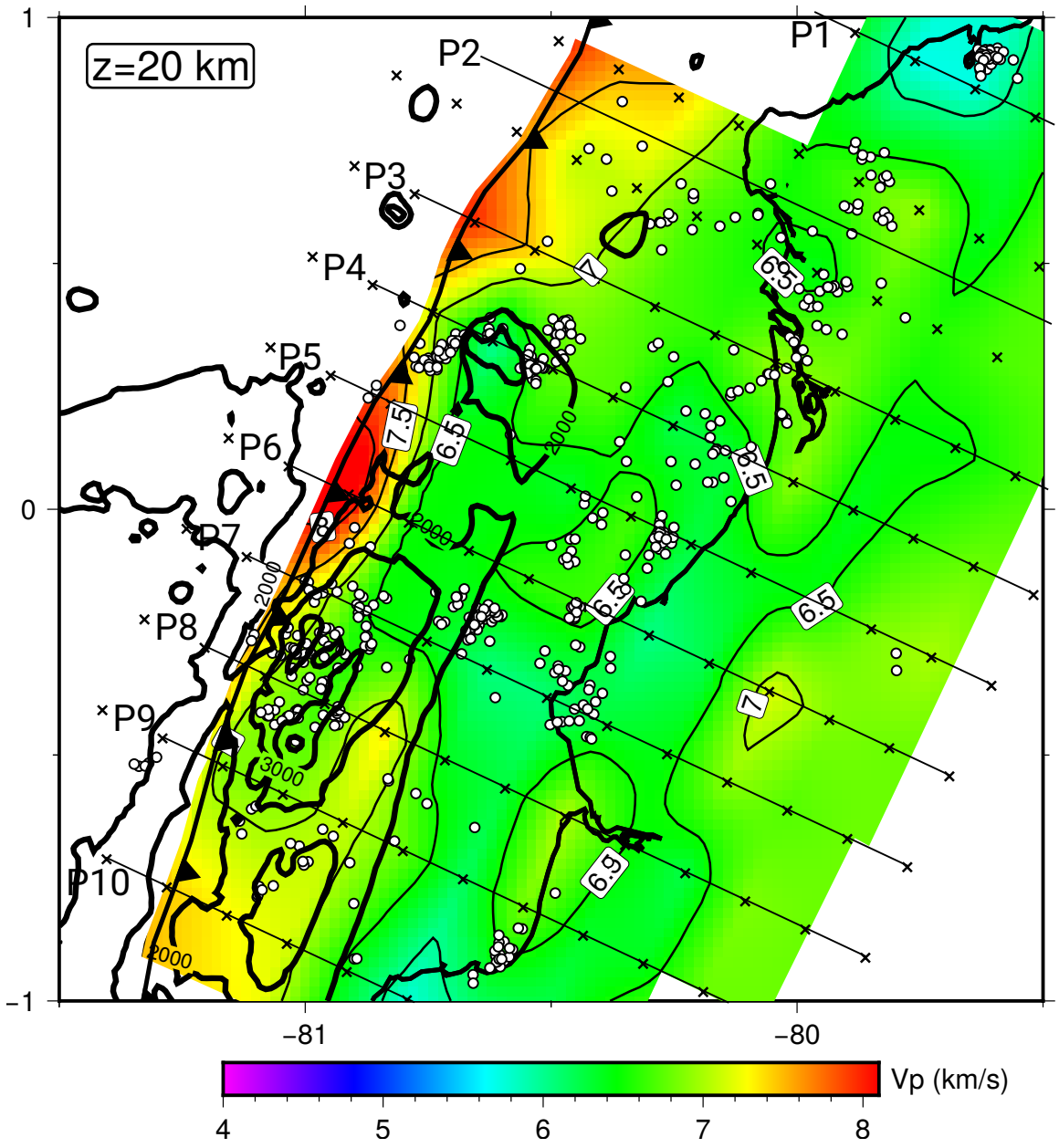

Figure S 11: Constrasting residual bathymetry and Vp horizontal slice. Residual bathymetry derived by Agurto-Detzel et al (2019) superimposed over our 3D Vp velocities obtained for a horizontal slice at 10 km depth.

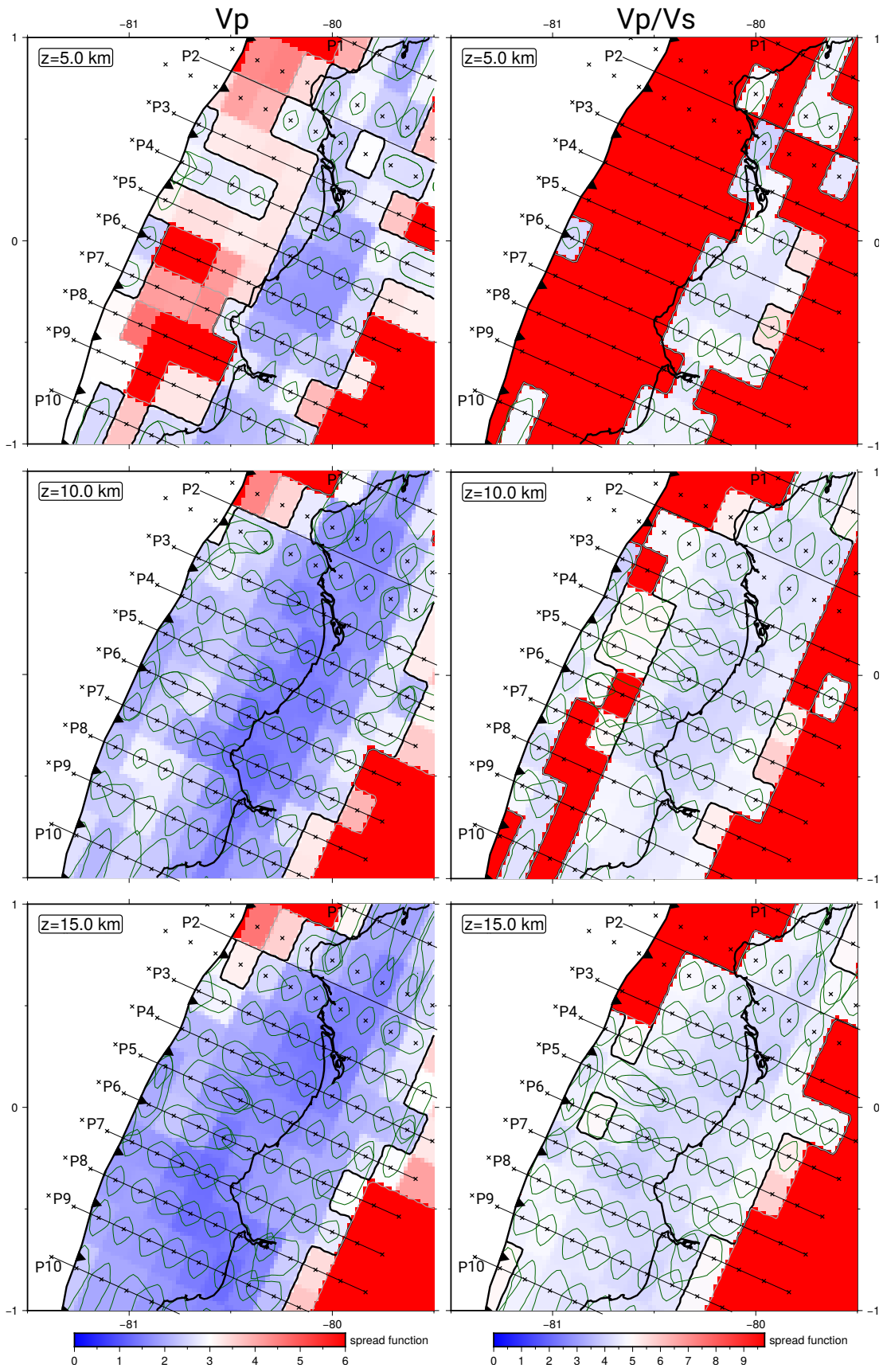

Figure S 12: MRM analysis along strike. Horizontal slices for the obtained 3D Vp (left) and Vp/Vs (right) models at 5, 10 and 15 km depth to estimate the sentivity of the solution along strike.