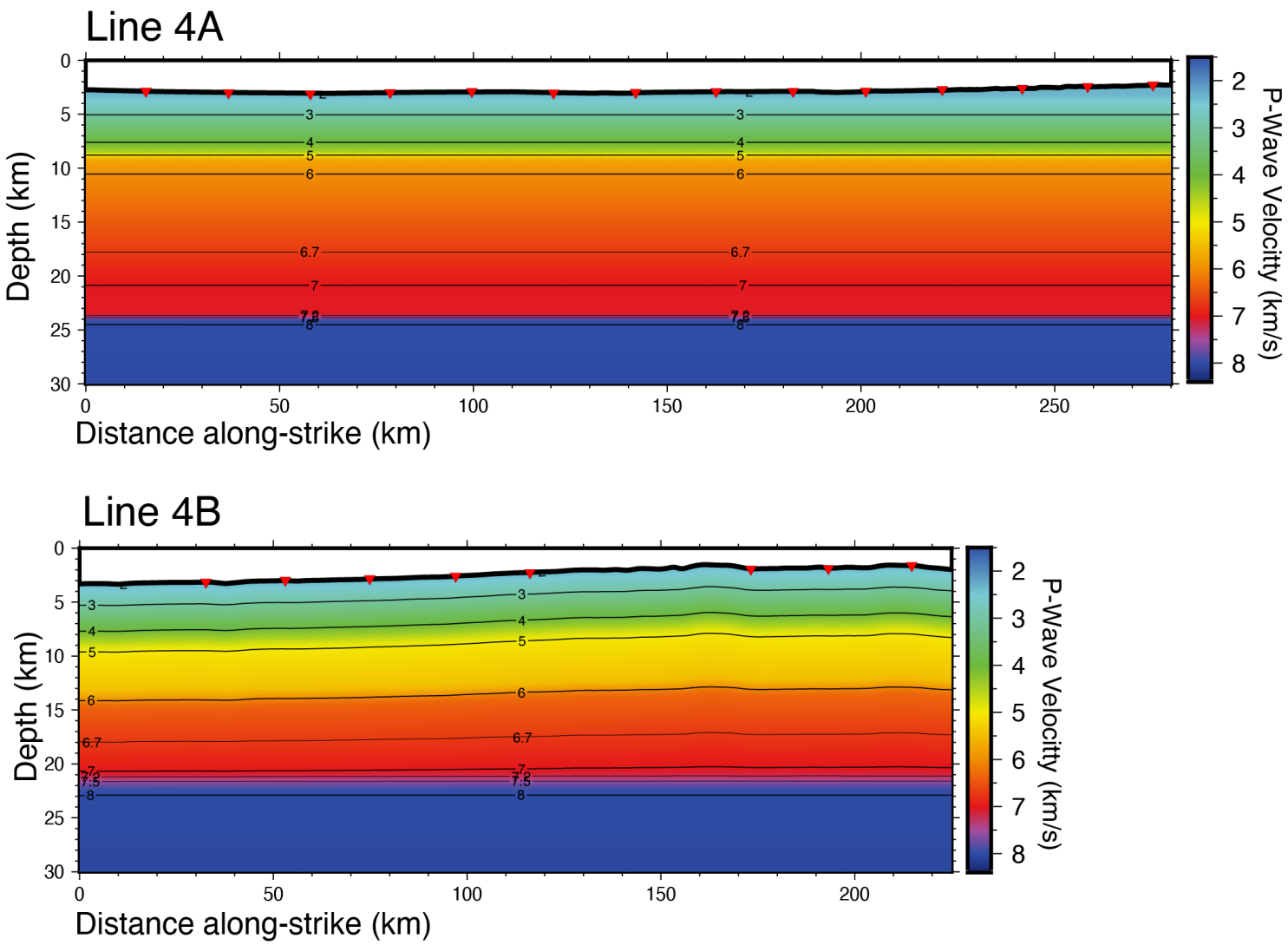
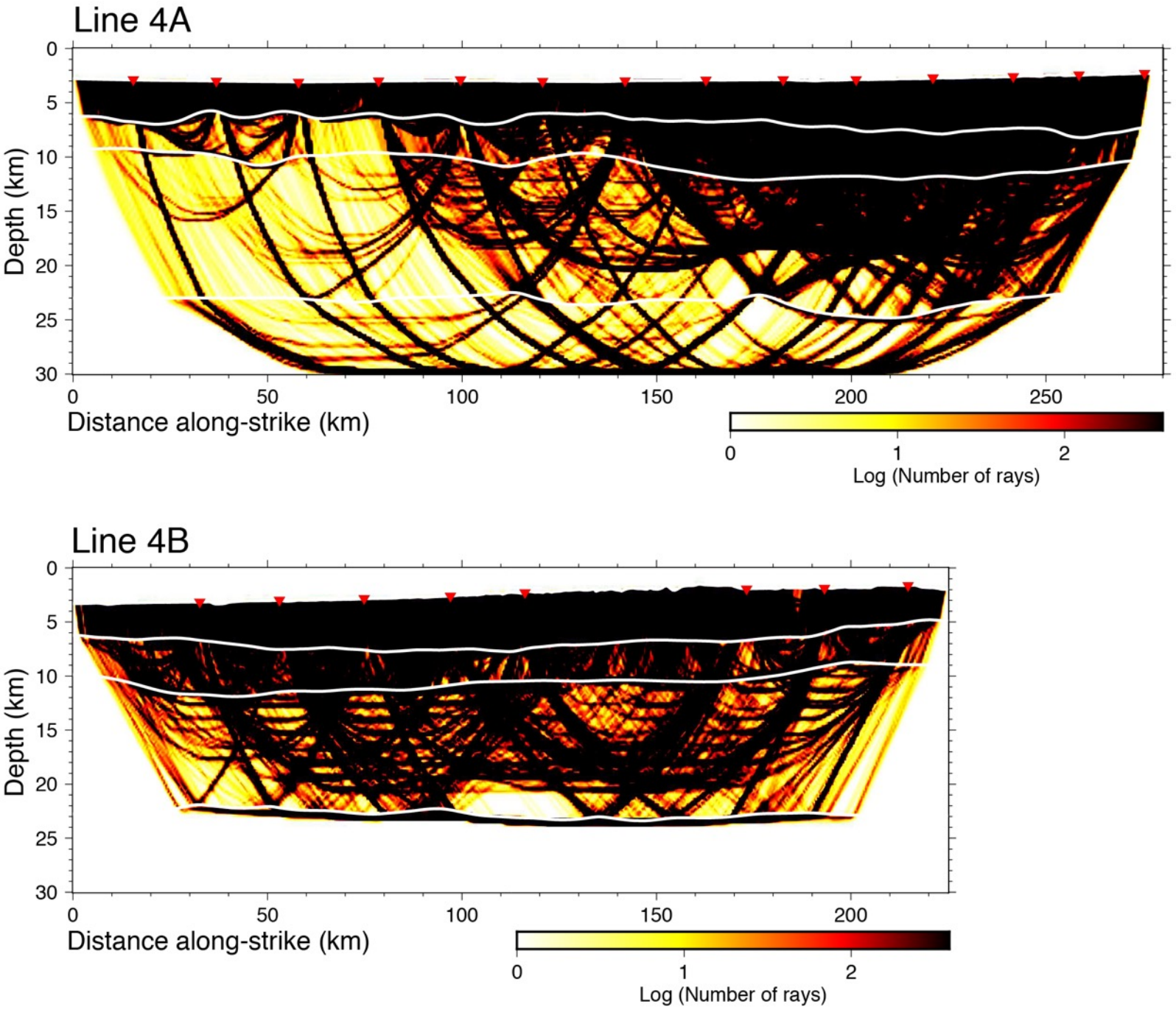
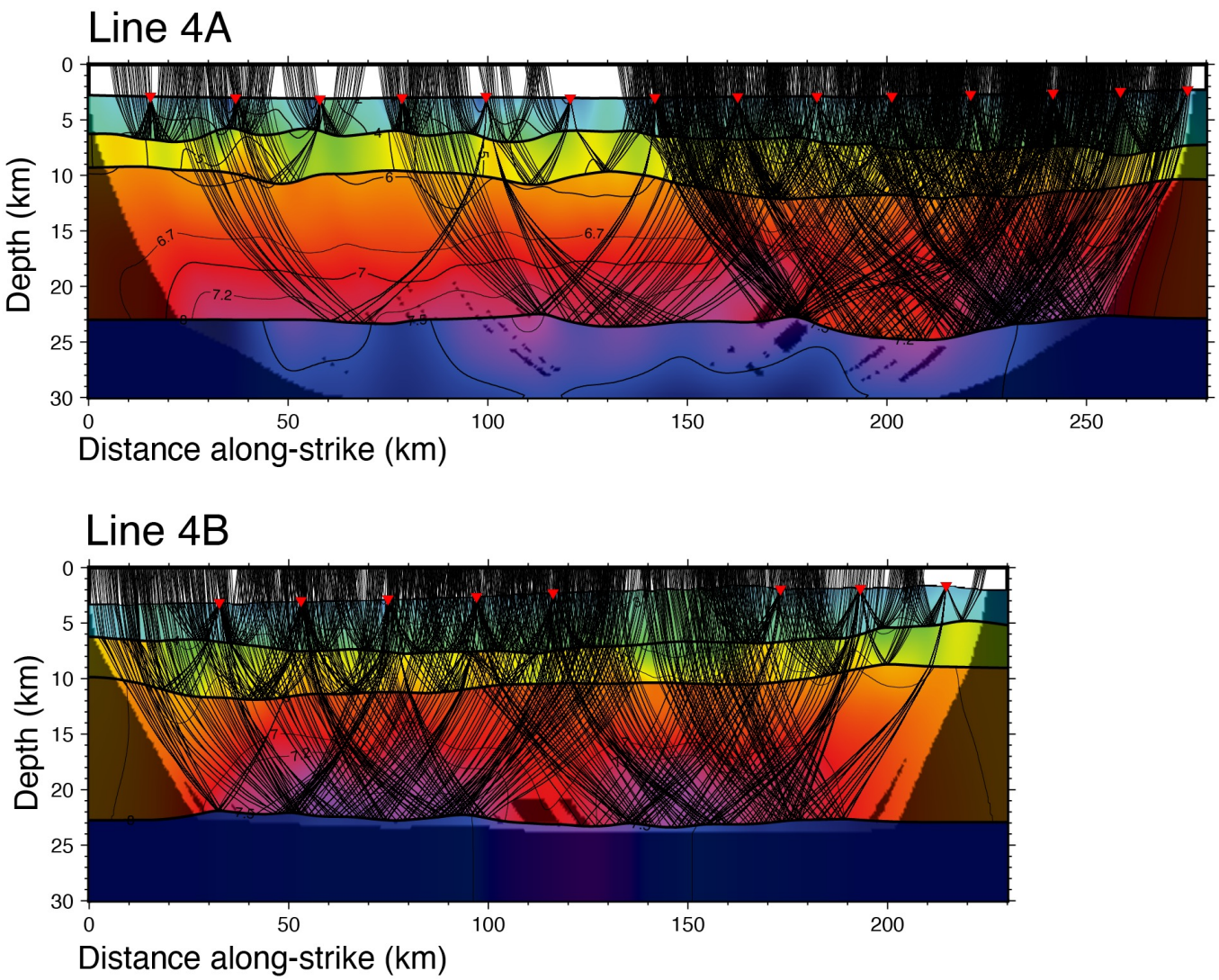


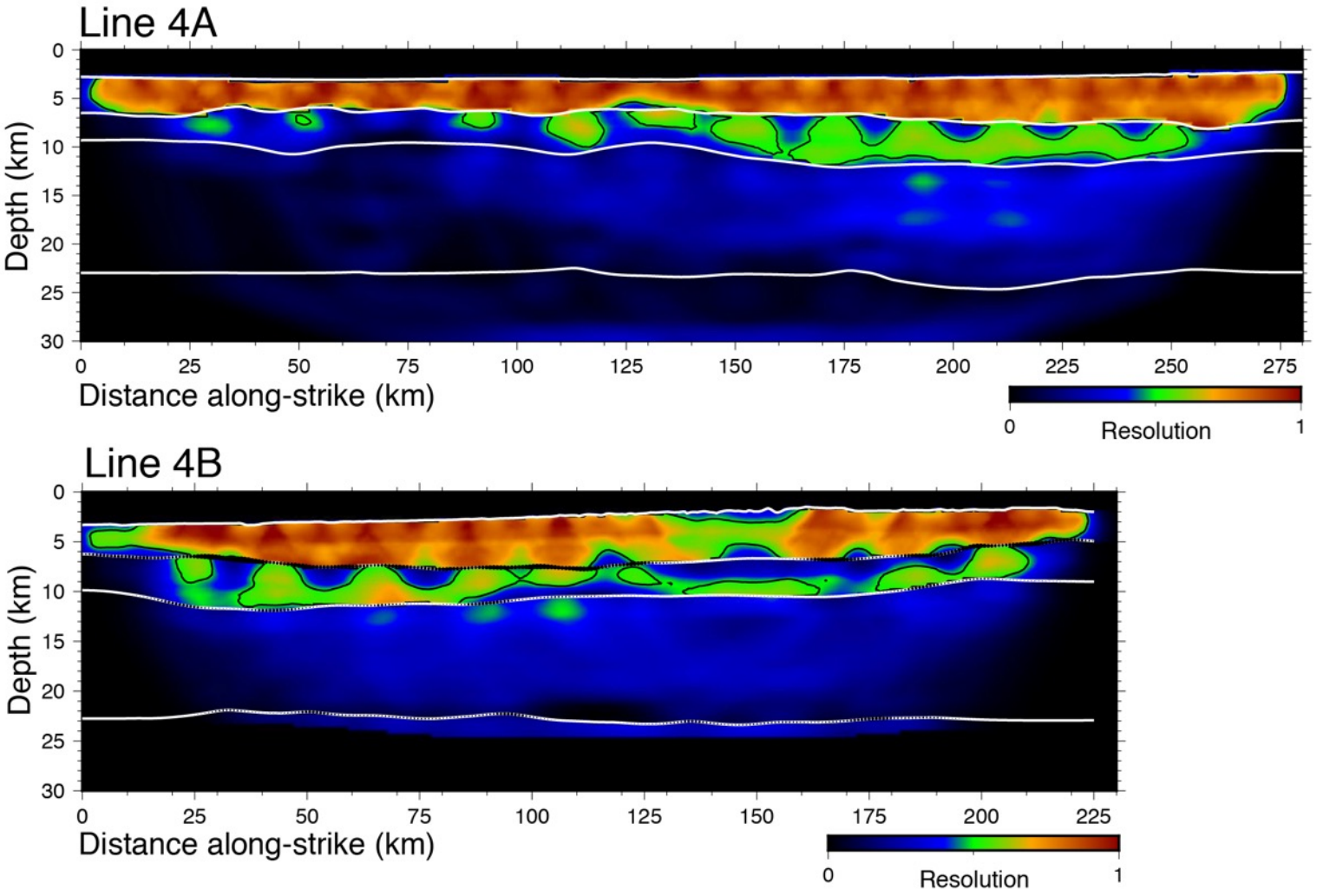
Supplemental Figure 1) **Starting models.** Starting velocity models for Line 4A (top) and Line 4 B (bottom) based on the velocity-depth profile taken from the Line 4A-Line 2 and Line 4B-Line 1 intersections (Shuck et al., 2019). One-dimensional velocity-depth profiles are shown in figure 3 inset.



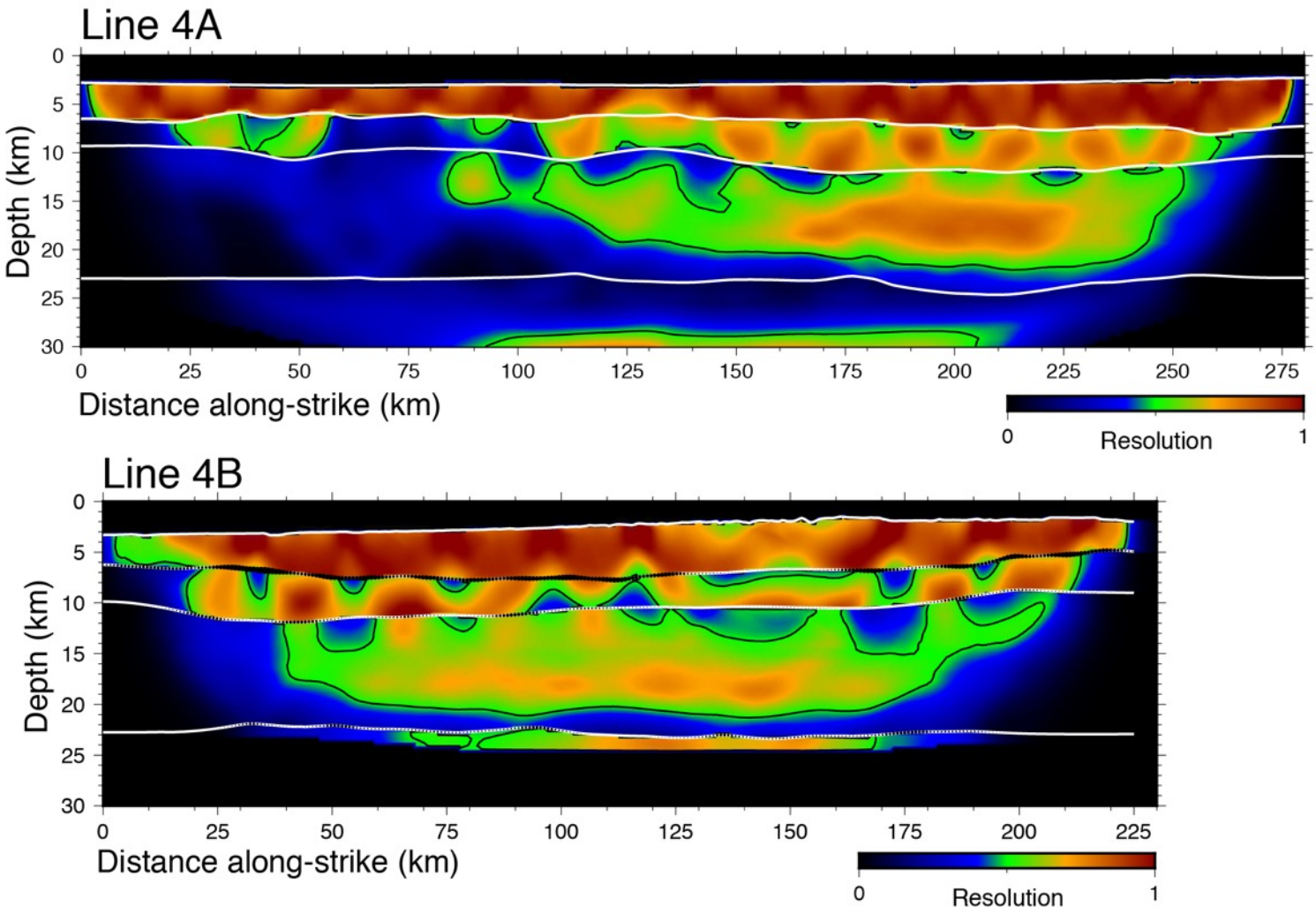
Supplemental Figure 2) **Ray coverage.** Derivative weight sum plots for line 4A (top) and 4B (bottom) showing density of ray coverage. Darker colors indicate denser ray coverage while lighter colors indicate less dense coverage. Light area between 0 and 100 km on line 4A corresponds to shallow salt diapirs that inhibit deeper arrivals for this area.



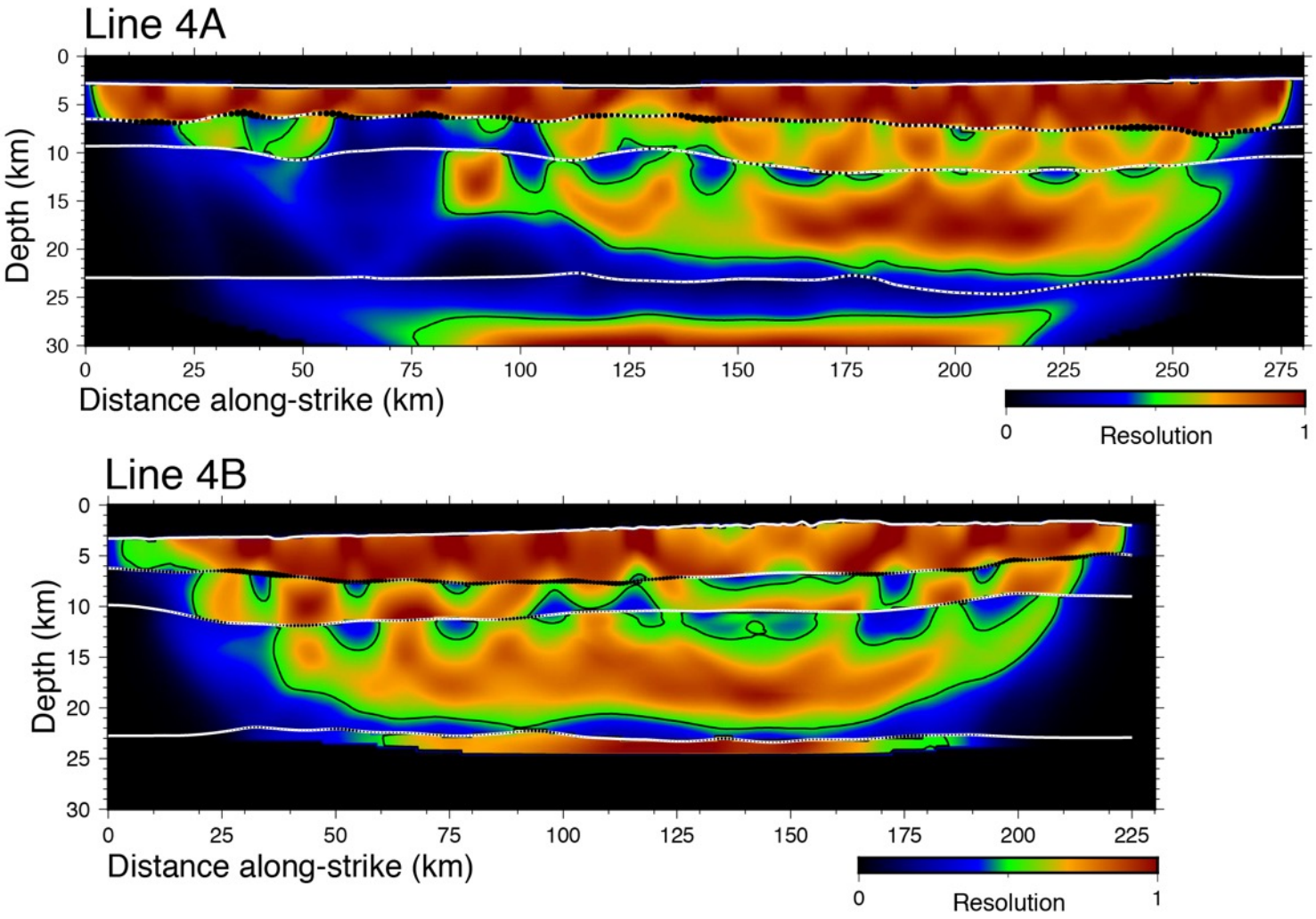
Supplemental Figure 3) **Wide-angle reflection ray coverage.** Raypath diagram for Line 4A (top) and Line 4B (bottom) showing only wide-angle reflections that constrain the boundary depths.



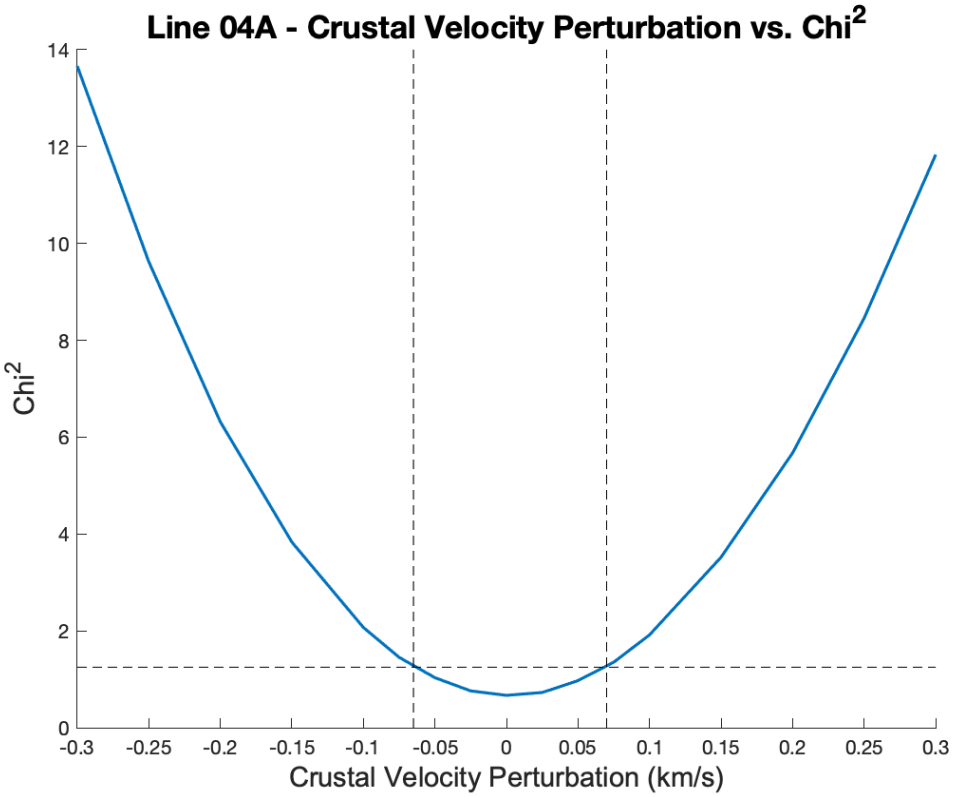
Supplemental Figure 4) **Small Object Resolution Test.** Resolution testing for line 4A (top) and 4B (bottom) with an ellipse of 10 km wide by 2 km tall. Acceptable resolution is considered greater than 50% (heavy black contour separating blue and green). Black dots on boundaries reflect constraint from wide-angle reflections.



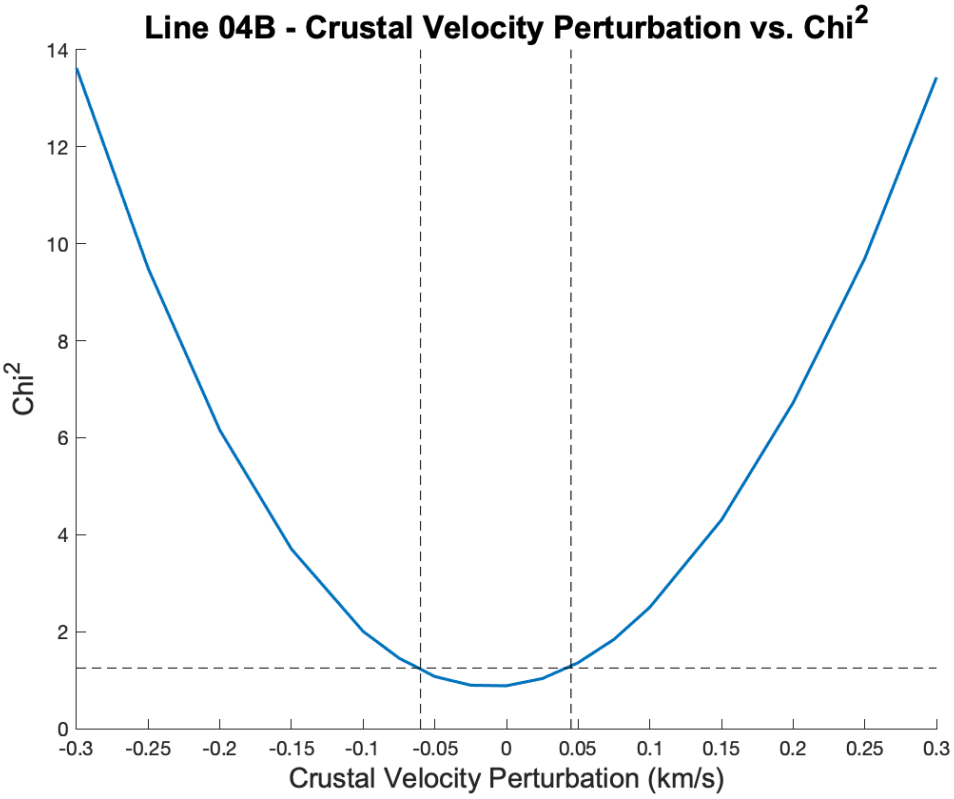
Supplemental Figure 5) **Medium Object Resolution Test.** Resolution testing for line 4A (top) and 4B (bottom) with an ellipse of 30 km wide by 5 km tall. Acceptable resolution is considered greater than 50% (heavy black contour separating blue and green). Black dots on boundaries reflect constraint from wide-angle reflections.



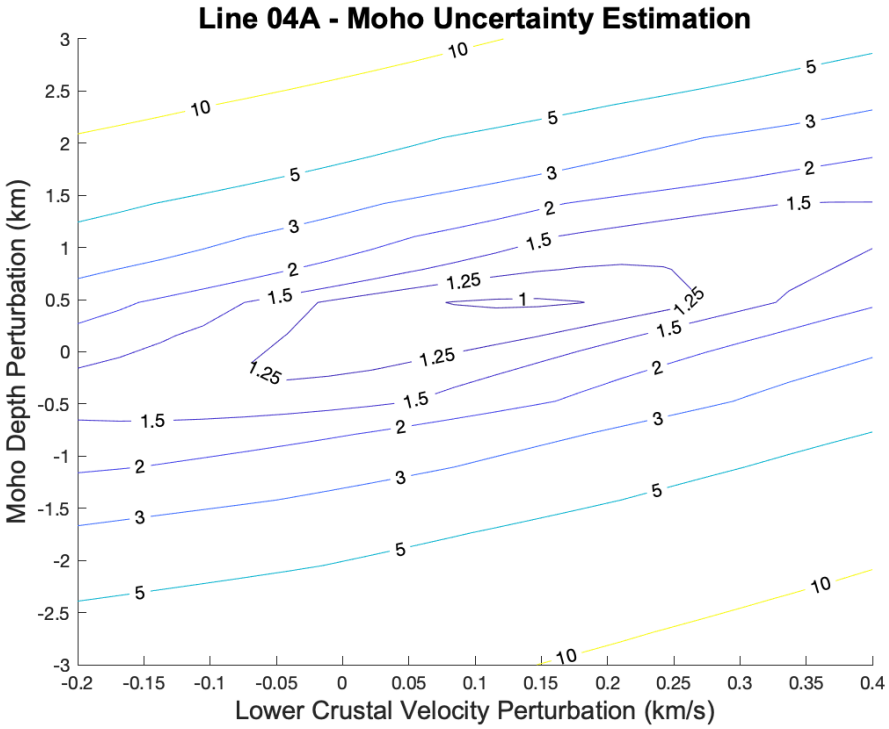
Supplemental Figure 6) **Large Object Resolution Test.** Resolution testing for line 4A (top) and 4B (bottom) with an ellipse of 60 km wide by 8 km tall. Acceptable resolution is considered greater than 50% (heavy black contour separating blue and green). Black dots on boundaries reflect constraint from wide-angle reflections.



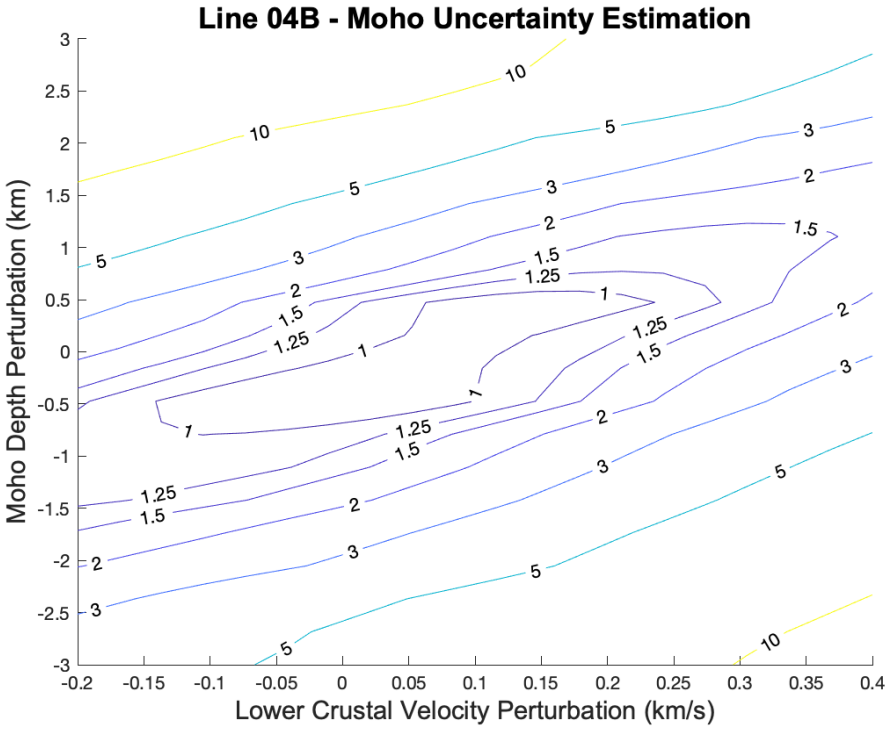
Supplemental Figure 7) **Crustal Velocity Uncertainty – Line 04A.** Testing the velocity uncertainty of Line 04A's crust layer. Velocities are perturbed by the value on the x axis, the model is raytraced only with the Pg phase, and the resulting chi^2 is calculated. A chi^2 of 1.25 (horizontal dashed line) is considered an acceptable value, which results in acceptable velocity perturbations ranging from -0.05 to 0.07 km/s (vertical dashed lines).



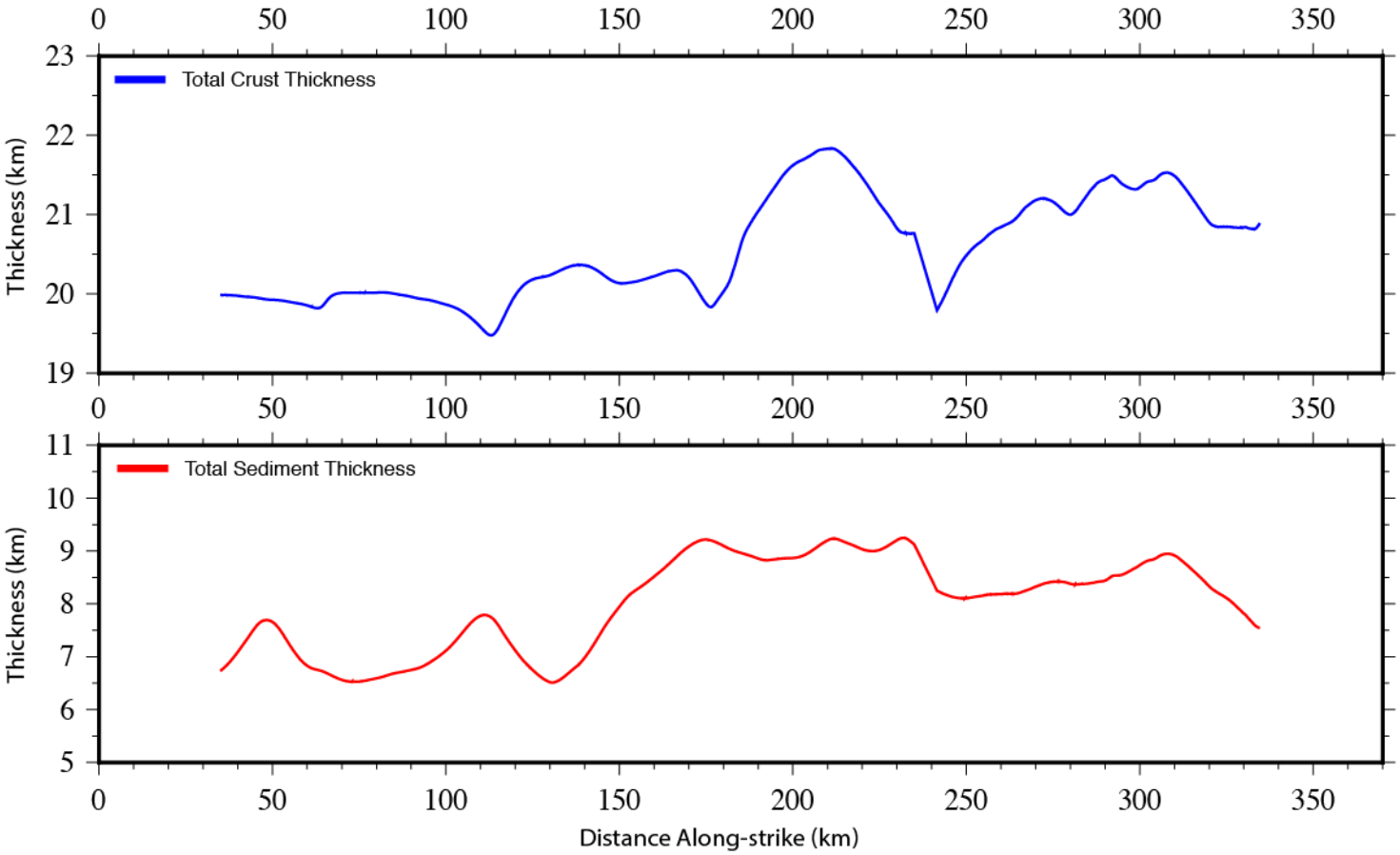
Supplemental Figure 8) **Crustal Velocity Uncertainty – Line 04B.** Testing the velocity uncertainty of Line 04B's crust layer. Velocities are perturbed by the value on the x axis, the model is raytraced only with the Pg phase, and the resulting chi^2 is calculated. A chi^2 of 1.25 (horizontal dashed line) is considered an acceptable value, which results in acceptable velocity perturbations ranging from -0.06 to 0.045 km/s (vertical dashed lines).



Supplemental Figure 9) **Moho Uncertainty Estimation – Line 04A.** Testing the Moho velocity-depth tradeoff uncertainty of Line 04A. Velocities are perturbed by the value on the x axis and the Moho depth is perturbed by the value on the y axis. The model is then raytraced only with the PmP phase and the resulting chi^2 is calculated. A chi^2 of 1.25 is considered an acceptable value, which results in acceptable velocity perturbations ranging from -0.07 to 0.27 km/s and acceptable depth perturbations from -0.28 to 0.85 km.



Supplemental Figure 10) **Moho Uncertainty Estimation – Line 04B.** Testing the Moho velocity-depth tradeoff uncertainty of Line 04B. Velocities are perturbed by the value on the x axis and the Moho depth is perturbed by the value on the y axis. The model is then raytraced only with the PmP phase and the resulting chi^2 is calculated. A chi^2 of 1.25 is considered an acceptable value, which results in acceptable velocity perturbations ranging from -0.2 to 0.29 km/s and acceptable depth perturbations from -1.5 to 0.78 km.



Supplemental Figure 11) **Additional along-strike calculations.** *Top* – Total crustal thickness from seafloor to Moho. *Bottom* – Total sediment thickness from seafloor to top of the crust.