GSA DATA REPOSITORY 2014066 Lin et al.

Supplementary Materials

Seismic evidence for a crustal magma reservoir beneath the upper east rift zone of Kilauea volcano, Hawaii
by Lin et al.

This electronic supplement includes supplemental figures (Fig. DR1) and model resolution tests (Figs. DR2 to DR8.)

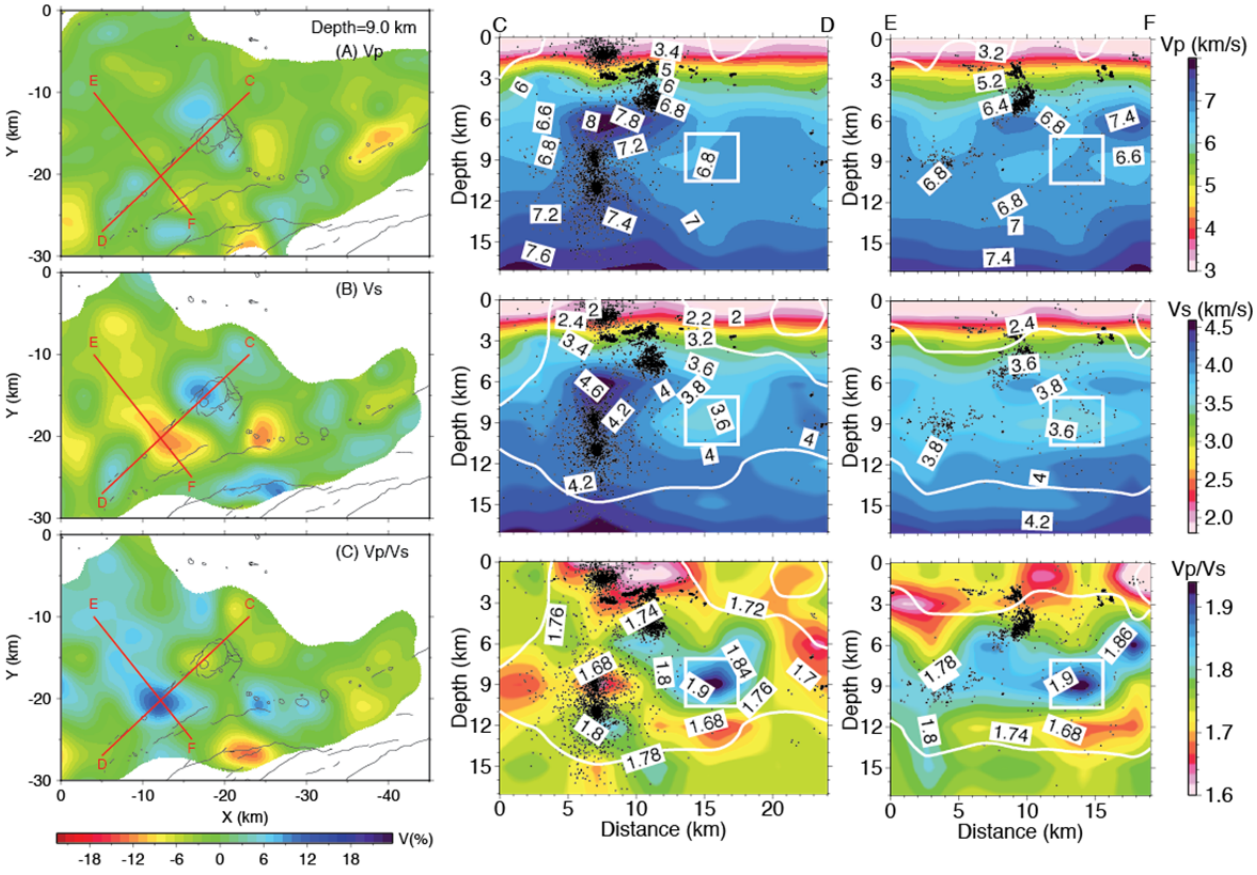

Figure DR1. Cross-sections through the resulting velocity models along the profiles CD and EF in the southwest rift zone. Black dots represent the relocated background seismicity by using waveform cross-correlation data within ±3 km distance of the profile line. The white contours enclose the regions with the resolution above 0.5. The boxes mark the area with velocity anomalies in the southwest rift zone.

Resolution Tests

To assess the model quality, we performed two types of resolution tests. The first one is the checkerboard test, in which the synthetic times are computed through the 1-D starting velocity model with ±4% *P*-velocity and ±8% *S*-velocity perturbations across two grid nodes. Event hypocenters, station locations and synthetic travel times have the same distribution as the real data. We also applied the same inversion parameters, such as the damping parameters, as in the real data inversion. Figures DR2-DR4 show comparisons between the true and resolved models. Given our criterion (i.e., the diagonal element of the resolution matrix greater than 0.5), the Vp model is well resolved up to 25 km depth, although some smearing is seen. Although the resolution of the Vs and Vp/Vs models is not as good as the Vp model due to the fewer number of *S*-*P* times used in the inversion, the area near the caldera is well resolved up to 12 km depth. Another resolution test is through the 1D starting velocity model with an anomalous body of low Vp, low Vs, and high Vp/Vs at the location of our proposed magma reservoir. From the comparison between the inverted model and the true model shown in Figs. DR5-DR8, the anomalous body observed in our study can be robustly resolved, although slight smearing is observed and the absolute anomalies seem underestimated due to the application of large damping parameters.

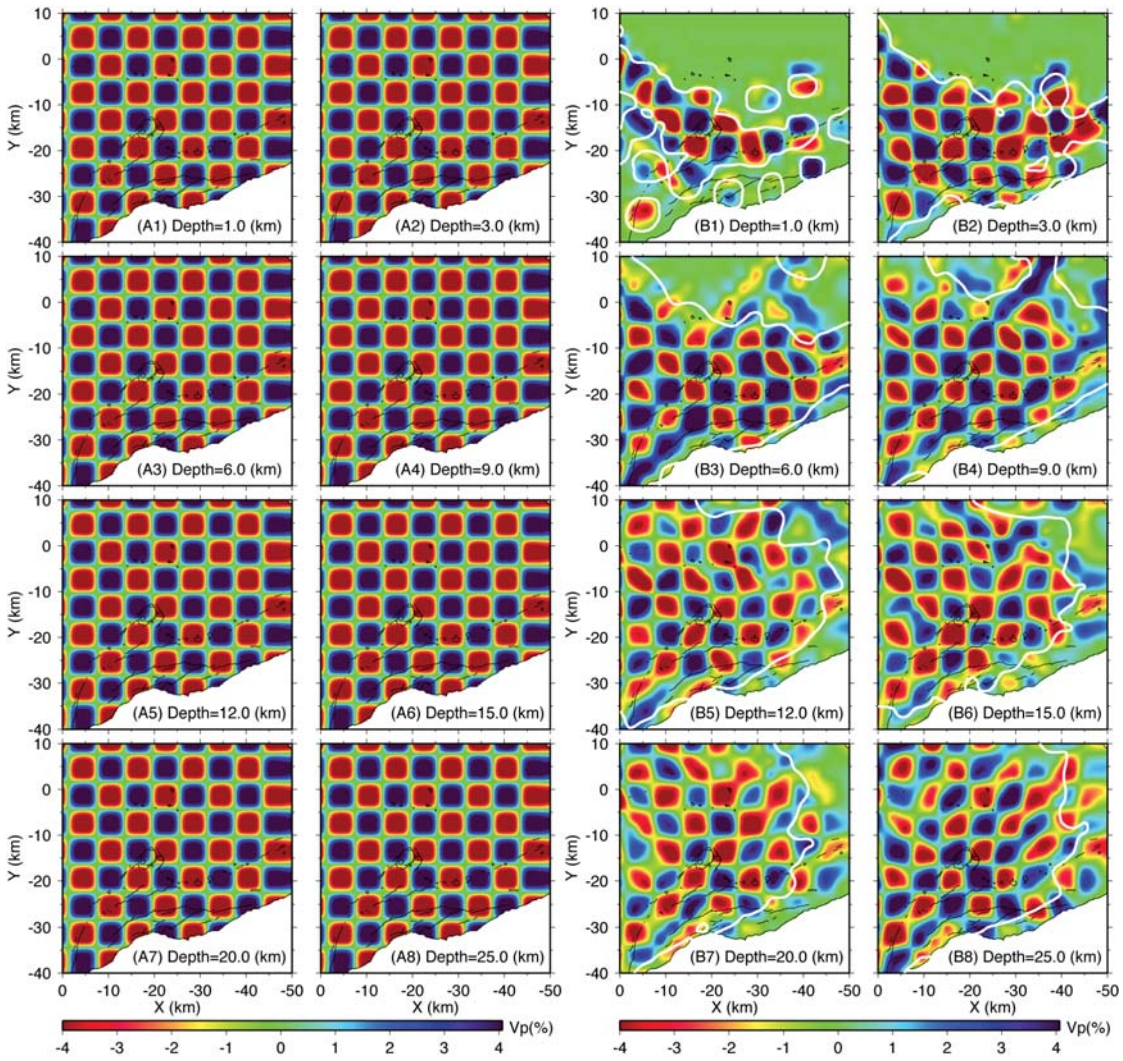

Figure DR2. Checkerboard test for Vp model, in which the synthetic times are computed through the 1-D starting velocity model with ±4% velocity perturbations across two grid nodes. The white contours enclose the well-resolved area with the diagonal element of the resolution matrix greater than 0.5.

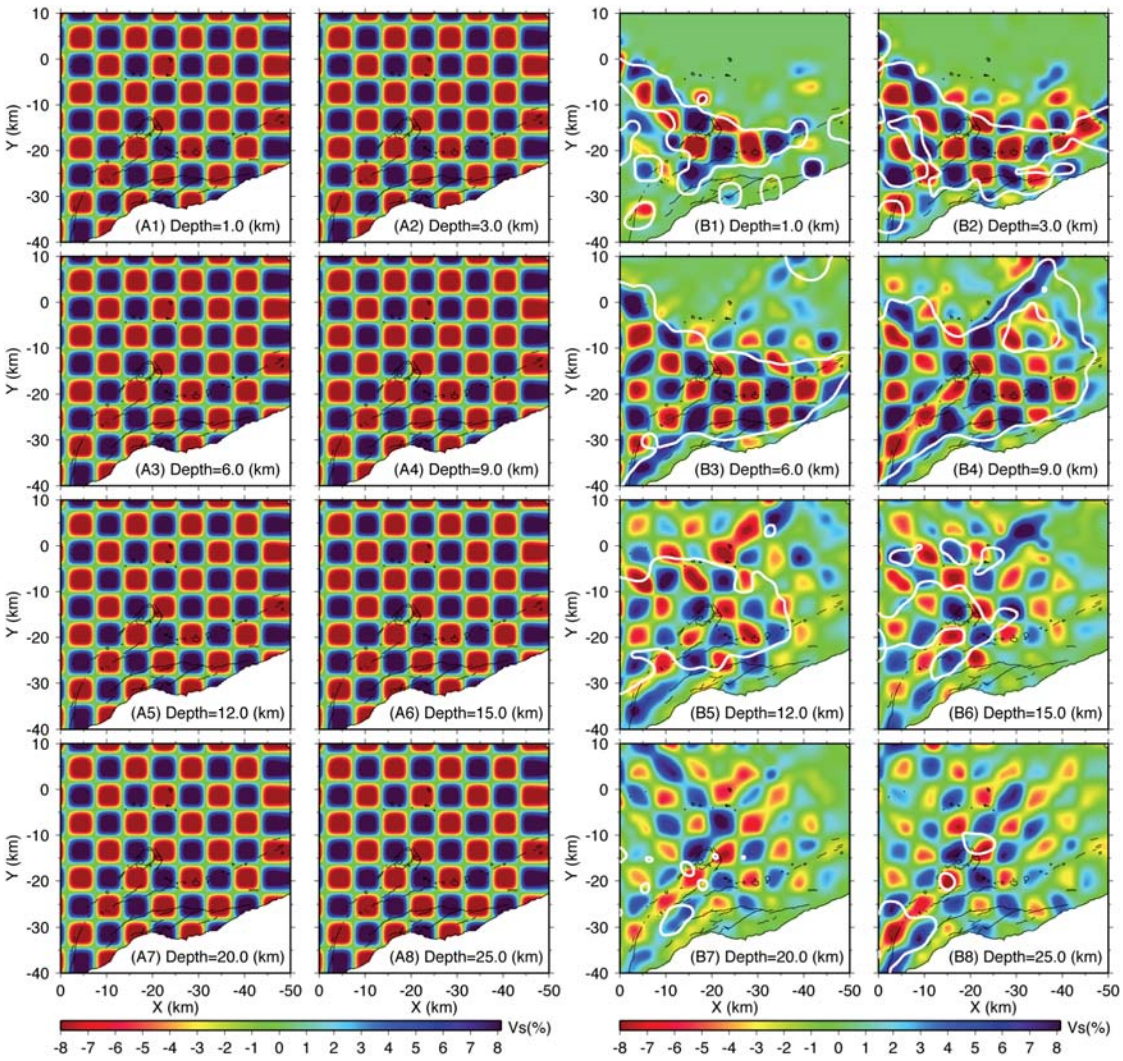

Figure DR3. Checkerboard test for Vs model, in which the synthetic times are computed through the 1-D starting velocity model with ±8% velocity perturbations across two grid nodes. The white contours enclose the well-resolved area with the diagonal element of the resolution matrix greater than 0.5.

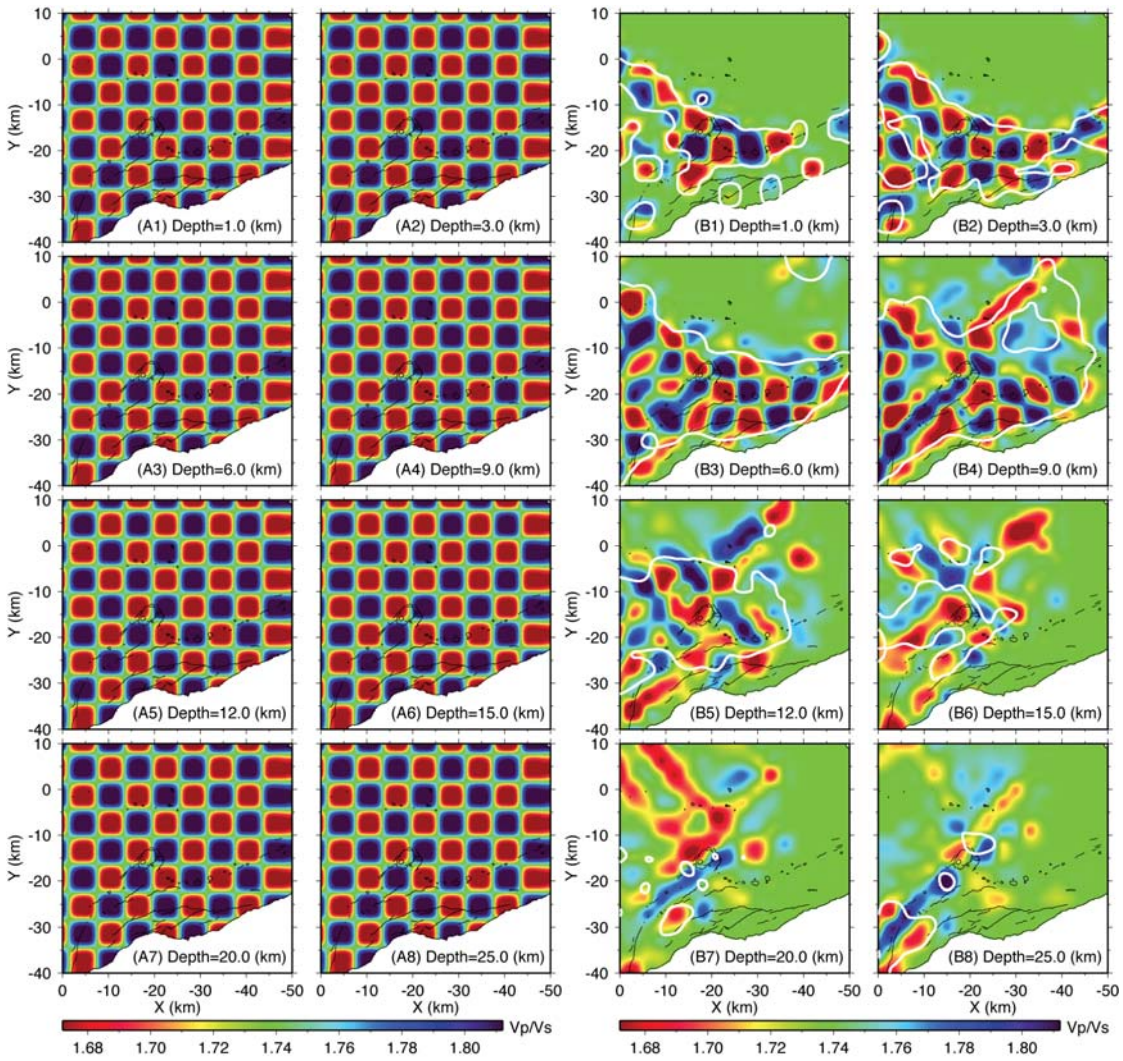

Figure DR4. Checkerboard test for Vp/Vs model, in which the synthetic times are computed through the 1-D starting velocity model with ±4% velocity perturbations across two grid nodes. The white contours enclose the well-resolved area with the diagonal element of the resolution matrix greater than 0.5.

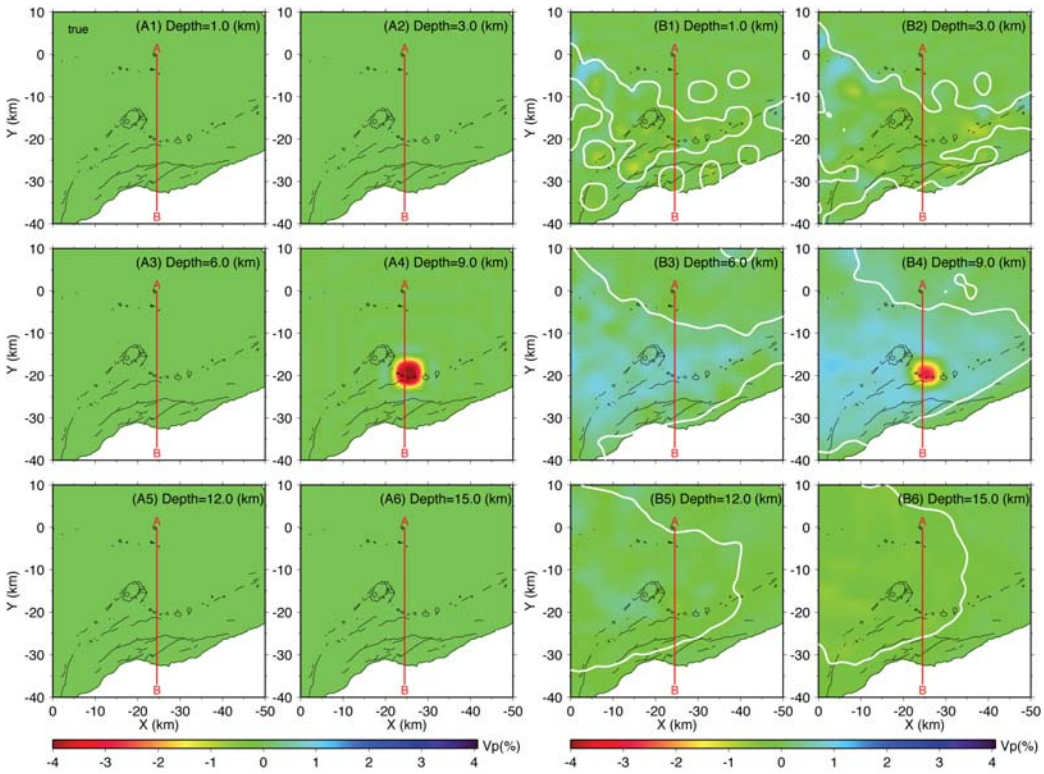

Figure DR5. Resolution test for Vp model, in which the synthetic times are computed through the 1-D starting velocity model with one low velocity (6.6 km/s) grid at 9 km depth (background velocity 6.84 km/s). The white contours enclose the well-resolved area with the diagonal element of the resolution matrix greater than 0.5.

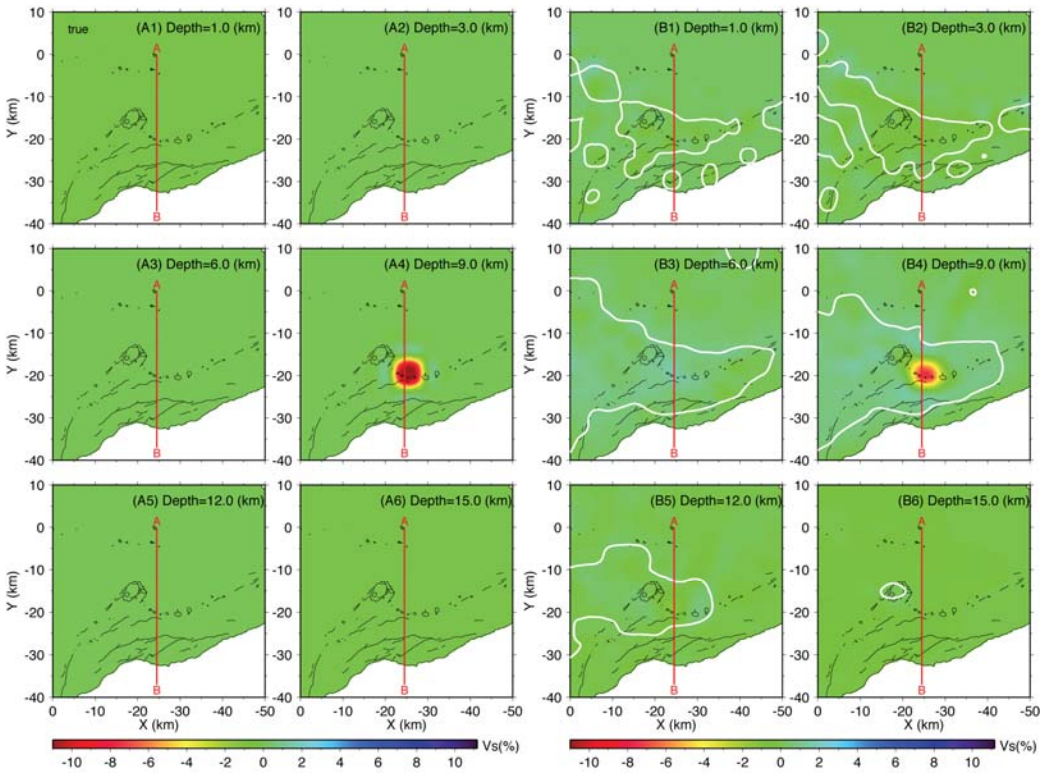

Figure DR6. Resolution test for Vs model, in which the synthetic times are computed through the 1-D starting velocity model with one low velocity (3.55 km/s) grid at 9 km depth (background velocity 3.93 km/s). The white contours enclose the well-resolved area with the diagonal element of the resolution matrix greater than 0.5.

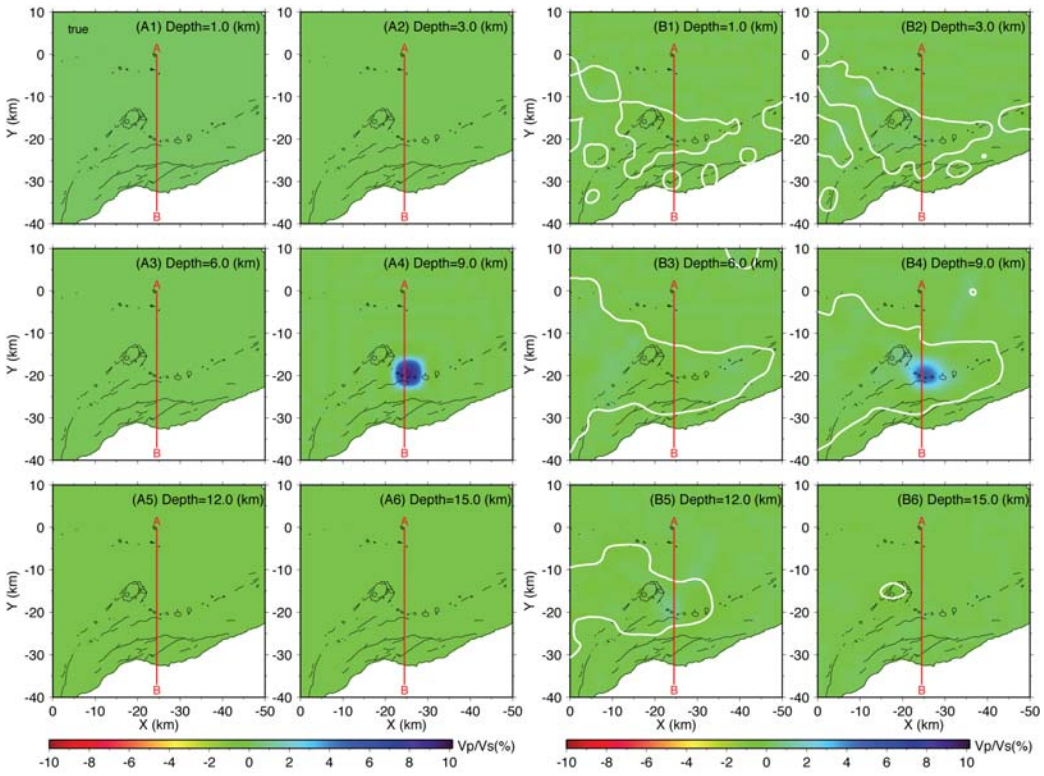

Figure DR7. Resolution test for Vp/Vs model, in which the synthetic times are computed through the 1-D starting velocity model with one high Vp/Vs (1.86) grid at 9 km depth (background Vp/Vs 1.74). The white contours enclose the well-resolved area with the diagonal element of the resolution matrix greater than 0.5.

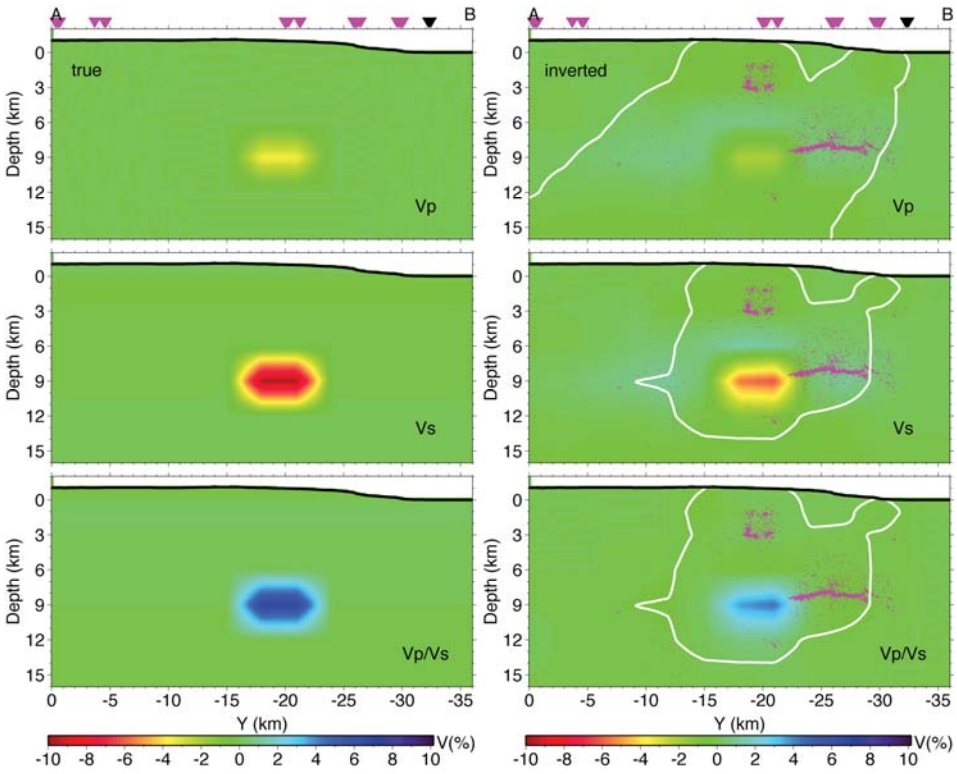

Figure DR8. Cross sections of the resolution test, in which the synthetic times are computed through the 1-D starting velocity model with low Vp, Vs, and high Vp/Vs anomalies at the location of our proposed magma reservoir. The white contours enclose the well-resolved area with the diagonal element of the resolution matrix greater than 0.5.