Marine seismic refraction profile GUMBO Line 1 was acquired in late November 2010 using the seismic vessel R/V *Iron Cat*. The acoustic source was an array of three strings of 12 air guns each. The total volume of the array was 5200 cubic inches (85L). This air-gun array was towed at a depth of 9 m, with the source was fired every 150 m, while the ship traversed Line 1 at a speeds of 3.5-3.7 knots (6.5-6.9 km/hr). The long shot interval (79-83 s) served to keep previous-shot noise at a relatively low level, which was beneficial to observing seismic refractions over long offsets (e.g., Christeson et al., 1996). In the data panels of Figure S1 we show 8 representative samples of the wide-angle seismic refraction records.

The seismic velocity model for GUMBO Line 1 (Figure 3A) generally fits the marine seismic refraction data well. We demonstrate this by plotting the picked and calculated travel times of all wide-angle seismic refraction and reflection phases that we used in the tomographic inversion, a subset of which are shown in Figure S1. Ray paths and travel times were calculated with a hybrid shortest path and ray bending method (Van Avendonk et al., 2001). In Figure S2 we calculate the model resolution at two different length scales using the generalized inverse matrix (Van Avendonk et al., 2004). The resolution matrix maps an elliptical feature of 16 km by 6 km (Figure S2B) or 8 km by 3 km (Figure S2B) in image space to examine how much of it is resolved. As expected, resolution generally decreases with depth, and larger model features are better resolved than small details.
ADDITIONAL REFERENCES


Figure S1. A. Bottom: Ray paths (black) for land seismic station TX1031 superimposed on seismic velocity structure. White lines represent model layer boundaries. Top: Red lines show calculated travel times, and blue lines show the picked travel times on the seismic refraction data. B: Ray paths and travel times for OBS 105.
Figure S1. C: Ray paths and travel times for OBS 109. D: Ray paths and travel times for OBS 114.
Figure S1. E: Ray paths and travel times for OBS 118. F: Ray paths and travel times for OBS 124. G: Ray paths and travel times for OBS 131.
Figure S2. A: Seismic velocity model for GUMBO Line 1, with highlighted upper (blue) and lower (yellow) layer boundary. White triangles: Seismic instruments used in the analysis. B: Resolution test where we examine how well the tomographic inversion resolves features that measure 16 km in the horizontal direction, and 6 km in the vertical direction. A resolution of 0.5 is considered reasonably reliable recovery of seismic structure (Van Avendonk et al., 2004). Layer boundaries are in green. Thin back dashed
lines are seismic velocity contours at 0.5 km/s. C: Same test for features that measure 8 km in the horizontal direction, and 3 km in the vertical direction.