

Modification of continental margin lithosphere by slab subduction beneath northeast Asia

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The removal of continental lithosphere is a complicated and enigmatic process. Here we present seismic observations of modified lithospheric mantle beneath continental margins (along the southern and eastern side of the Korean Peninsula) adjacent to back-arc rifts in northeast Asia. Crustal and upper mantle structures are imaged by applying two independent methods: multi-mode receiver function stacking and Bayesian transdimensional ambient noise tomography. The complementary observations provide robust constraints on seismic velocities and topography of interfaces across the Moho and lithosphere-asthenosphere boundaries. Relatively thinner crust (<30 km) and lithosphere (<60 km) are found beneath the continental margins. We relate the trend to sub-lithospheric low velocity structures extending from subduction zones. By triggering hot and possibly water-rich mantle upwelling, former and current subducting oceanic plates likely affect and remove the bottom of the continental lithosphere. This process could lead to intraplate volcanism by melt generation and uplifting by buoyancy effect along the margins.