

A tomography-led plate reconstruction of NE Asia during the late Cretaceous

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Contrasted plate tectonic reconstructions have been proposed for the northeast Asian margin during the late Cretaceous, including: an Andean-type subduction margin, the existence of marginal seas, the subduction of a spreading ridge, the subduction of remnant arcs, or continental block collision and continental subduction. Here we investigate which scenarios are consistent with tomography models by mapping and unsubducting the vanished western Pacific slabs along the Kurile-Kamchatka, Japan, and Izu-Bonin-Marianas trenches from global tomography models. We show that a mapped 4,000 km-long slab gap within the East Asian lower mantle is the tomographic signature of the subducted Izanagi-Pacific spreading ridge based on a comparison to global mantle flow models. We reconstruct the size of the lost Izanagi conjugate from the geometry of the unsubducted western Pacific slabs, the age of Pacific oceanic crust, and published synthetic seafloor isochrons.

Our tomography-based plate reconstruction implies that: (1) the Izanagi ocean basin crust (i.e. formed by Pacific MORB) first reached and subducted along Sikhote-Alin and northern Japan around ~100 Ma; (2) subduction of the Izanagi plate along northeast Asia during the late Cretaceous ~75 Ma was limited to north of southernmost Korea and Bohai Bay, China, and west of westernmost Alaska; and, (3) the Izanagi-Pacific ridge intersected with the northeast Asian margin at a low angle in the early Cenozoic. We discuss our plate model against proposed northeast Asian margin plate tectonics during the Cretaceous.

Keywords: NW Pacific Ocean, Izanagi plate, NE Asia