

Geochemical constraints on Pacific-Izanagi ridge subduction along the NE Asian margin from the magmatic record of Japan, Sikhote-Alin and Sakhalin

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Recent studies have debated the timing and spatial configuration of a Pacific-Izanagi spreading ridge subduction beneath the NE Asia continental margin in the Cretaceous (e.g. Maruyama et al., 1997) or early Cenozoic (Seton et al., 2015; Kimura et al., in revision; Wu et al., in prep). In contrast, other studies assert that a Pacific-Izanagi spreading ridge never reached NE Asia; instead, marginal seas existed along East Asia in the Cretaceous to early Cenozoic (Itoh et al., 2017; Domeier et al., 2017). In this study, we test these hypotheses against published and unpublished chronology and geochemical data of Cretaceous to early Cenozoic magmatic rocks from Japan, Sikhote-Alin and Sakhalin Island. We discuss their possible implications for a Pacific-Izanagi ridge subduction event, and further compare to the magmatic signature of other documented global ridge-trench interactions.

In general, the Cretaceous to early Cenozoic magmatism of Sikhote-Alin and Sakhalin Island are similar to Japan in activity time and isotopic character. Our synthesis of ~400 published and unpublished age dates reveal a clear magmatic gap between 55 to 46 Ma from the Russian Far East to Japan that most closely corresponds to the early Cenozoic Pacific-Izanagi ridge subduction models. The early Cenozoic magmatic gap is supported by geochemical data that show two major differences before and after the gap: (1) Nd isotopic compositions show a sharply increase from $\epsilon_{Nd} = -14$ to 2 in the Cretaceous and Paleocene to $\epsilon_{Nd} = -2$ to 5 in the Eocene; (2) $(^{87}\text{Sr}/^{86}\text{Sr})_0$ values showed a decrease after the magmatic gap. We also note that the volcanic arc shifted eastward from Sikhote-Alin and Honshu, to Sakhalin and east Hokkaido. Adakitic rocks were formed in the Sikhote-Alin and Kitakami areas. We compare our observed early Cenozoic magmatic gap and geochemical signatures to other documented ridge-trench interactions from the geological record.

Keywords: Ridge subduction, Northeast Asia, Sikhote-Alin, Izanagi-Pacific ridge