

Early Cretaceous to Paleocene magmatism in the Sikhote-Alin area and their implications for Paleo-Pacific plate subduction and continental evolution

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The Sikhote-Alin area in southern Russian Far East is one of the few places in the East Asian margin that has extensively exposed Mesozoic geological units. In particular, Cretaceous to Cenozoic igneous rocks are abundant and formed in response to periodic subduction of Paleo-Pacific plates. Previous geochemical studies of igneous rocks, mainly from southern Sikhote-Alin, resulted in significant insights into the continental evolution of East Asian margin and subduction history of Paleo-Pacific plates (Kruk et al., 2014; Jahn et al., 2015; Grebennikov et al., 2016). In this study, we present new zircon U-Pb chronology and geochemical data from ~50 samples in across the entire Sikhote-Alin area. We combine our new results with published data to discuss the history of arc magmatic evolution in the region.

In general, the data show a cycle of arc magmatism that started from the early Cretaceous to Paleocene in Sikhote-Alin. Zircon U-Pb geochronology of igneous rocks indicate a major population of granitoids that had ages of 135-57 Ma; a small population of volcanoclastic rocks were dated at 55-53 Ma. Three magmatic episodes with distinct geochemical characteristics were recognized: 135-120 Ma, 110-100 Ma and 100-57 Ma. The 135-120 Ma granitoids are dominated by S-type granites; zircons with inherited cores were frequently observed in this episode. The 110-100 Ma episode has mostly I-type granites, whereas the 100-57 Ma magmatism had I-type granites that show greater degrees at fractional crystallization than the other groups. Some magmatic rocks with 67-57 Ma and ~100 Ma were A2 type granites, suggesting that two periods of intraplate magmatism could had occurred within this subduction setting. The La/Yb ratio and Nd isotopic ratios of the granitoids remained relatively similar during the Cretaceous and even showed a La/Yb ratio decrease in the late Cretaceous, implying that the Andean subduction margin crustal thickening model (Haschke et al., 2002) may not applicable to the Sikhote-Alin area.

Keywords: continental arc, paleo-pacific plate subduction, Northeast Asia, Sikhote-Alin, continental evolution