

Crustal and tectonic evolution of accretionary orogens in NE Asia

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The NE Asian Orogenic Belt (NAOB) is a Mesozoic-Cenozoic accretionary orogenic collage, and it constitutes the northern and most essential part of the "Nipponides" (Sengor & Natal'in, 1996). The tectonic framework of the NAOB was formed in Mesozoic and Cenozoic, and it continues to evolve along the modern Pacific arc-trench systems. Generally, an oceanward younging of tectonic units may be discerned, but such a simple pattern is disrupted in many places by extensive strike-slip faulting, most of which is left lateral. In this talk, the issue of crustal evolution in the sector of Sikhote-Alin, Sakhalin and Japanese Islands will be discussed based on the geochemical and isotopic analyses of granitoids that intruded in various tectonostratigraphic terrains.

The majority of granitoids in the NAOB formed from Jurassic to late Cenozoic, with Cretaceous as the dominant period of granitic magmatism and silicic volcanism. Though remnants of Paleozoic granitoids have been preserved in Japan, most granitic rocks were emplaced in the Mesozoic and Cenozoic times. Cretaceous granitoids are widespread in Sikhote-Alin and Japan. However, granitoids were emplaced only in the Cenozoic in Sakhalin and Hokkaido. Cretaceous to Paleogene granitoids from Sikhote-Alin share the same geochemical and Sr-Nd isotopic signatures as those from SW Japan. Likewise, Cenozoic granitoids of Hokkaido and Sakhalin have remarkably similar chemical and isotopic characteristics. These data suggest that the granitoids from NAOB were generated by melting of sources with mixed lithologies, including subducted accretionary complexes and probably some hidden older basement rocks. However, Nd isotopic data also suggest a significant amount of juvenile crust was produced and added to the NAOB (30-77% for Sikhote-Alin, and 65-95% for Hokkaido and Sakhalin).

Several workers have proposed geological correlations between Sikhote-Alin and Japan, and between Sakhalin and Hokkaido. The present work lends support to the general scenario. However, the significant difference between SW Japan and NE Japan in their crustal composition and probably tectonic evolution has to be reckoned. The two geologic entities might have evolved in very different ways. Finally, a brief comparison of crustal evolution in the NAOB and CAOB (Central Asian Orogenic Belt) will be presented.