

Mesozoic island arc rocks in Hokkaido: potential keys to reconstruct ancient oceanic plates offshore East Asia.

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Hokkaido Island is known as a Cenozoic arc-arc collision zone, where Kurile arc (Okhotsk Sea margin) collided to Eurasian active continental margin. However, Mesozoic island arc rocks also occur as ophiolites, volcano-sedimentary successions, and sedimentary clasts.

The oldest arc rocks in central Hokkaido are Jurassic ophiolitic rocks (Oku-Niikappu Complex and several similar ophiolites) typically associated with boninites. 160-165 Ma zircon U-Pb ages have been obtained from tonalites and diorites.

Traces of earliest Cretaceous arc are found as andesitic sedimentary clasts in pelagic sediments overlying MORB-like basalts, together comprising the Sorachi Group. These arc detritus yields zircons of ~140 Ma without any older grains.

120-125 Ma arc rocks comprise thick volcanoclastic sequences of the Rebun-Kabato Belt. In Tohoku (Kitakami) district to the south of Hokkaido, they were deposited upon Jurassic accretionary complex of Eurasian margin. However, our observation in Rebun Island has not found any sign of continental materials.

Since 120-125 Ma, depositional setting of central Hokkaido drastically changed to peri-continental. In contrast, post-120 Ma arc rocks, as well as traces of Jurassic to earliest Cretaceous arc activities, are found in eastern Hokkaido. Nikoro Group (Tokoro Belt) sandstones consists essentially of arc detritus with zircons of ~87 Ma, 90-100 Ma, and trace grains as old as 154 Ma, without any older grains. Sandstone and mudstone contain trace amounts of clasts and blocks of granitoids (tonalite), one of which yielded 146 Ma zircons. Late Cretaceous (Campanian) arc volcanic rocks occur in the Nemuro Group, and arc detritus continued to be supplied until Paleogene.

To summarize, arc activities found in Hokkaido intermittently continued from Jurassic to Paleogene. Continent-derived materials with Precambrian detrital or inherited zircons first appears in 125 Ma in central Hokkaido and 65 Ma in eastern Hokkaido, and before these timings, no signs of continental basements and sedimentary sources are found. Therefore, both central and eastern Hokkaido probably originated from intraoceanic arc-backarc plate(s) distinct both from Eurasia and Izanagi plates. The central Hokkaido was attached to Eurasian margin at 125 Ma, and eastern Hokkaido at 65 Ma.

Why intraoceanic arc activities continued so long time? Intraoceanic subduction must have been inevitable so far as two major but mechanically individual oceans of Tethys (to Indian) and Panthalassa existed since Paleozoic until recent. Long-term activity of intraoceanic arcs and their step-by-step attachments onto the Eurasian margin can be comprehensible if we consider that the Hokkaido geology developed influenced by a general triple junction geometry among Eurasia –Tethys –Pacific (Izanagi) plates.

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