

Accretionary Orogens in Japan - What Was Accreted in the Accretionary Complexes Since the Late Paleozoic?

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Abstract

The Japanese Islands represent a segment of a 450 Ma old subduction-related orogen developed along the western Pacific convergent margin, and most tectonic units are composed of late Paleozoic to Cenozoic accretionary complexes and their high P/T metamorphic equivalents (Isozaki, 1996). The formation of the Japanese Islands has been taken as a standard model for the accretionary orogeny and often serves as an example for understanding the crustal evolution of the Central Asian Orogenic Belt (CAOB). According to Maruyama (1997), the most important cause of the orogeny is the subduction of oceanic ridge, by which the continental mass increases through the transfer of granitic melt from the subducting oceanic crust to an orogenic belt. Sengor and Natal'in (1996) named the orogenic complex "Nipponides", consisted predominantly of Permian to Recent subduction-accretion complexes *with very few fragments of older continental crust*. These authors pointed out the resemblance in orogenic style between Japan and CAOB, and further emphasized the large proportion of the volume of accretionary complex with respect to the volume of older crust. It is, by implication, that the accretionary complex in Japan must be quite juvenile as a whole. In this scenario, voluminous granitic melts emplaced in SW Japan and elsewhere in the Japanese Island would show Sr-Nd isotopic signatures indicative of juvenile crust as observed in most parts of Central Asia. In the first place, this appears to be consistent with the absence of Precambrian rocks in Japan. However, the available isotopic data, compiled from the literature and new analyses on Cretaceous granites from the Sanyo Belt, indicate that they are in strong contrast with those observed in the Central Asian Orogenic Belt. In fact, the isotopic signatures are more comparable with those observed in SE China, including Taiwan, or in classical collisional orogens in the European Hercynides and Caledonides. A large proportion of Mesozoic and Cenozoic granitoids from SW Japan have Proterozoic Sm-Nd model ages, high initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios and negative $\epsilon_{\text{Nd}}(\text{T})$ values. This raises questions about the types of material accreted in accretionary complexes, and the validity of the hypothesis that the Nipponides contains very few fragments of older continental crust. We conclude that the subduction-accretion complexes in Japan are composed mainly of recycled continental crust, probably of Proterozoic ages. The scenario is comparable with that in Taiwan. The proportion of mantle-derived juvenile crust in the edifice of the Japanese Islands is much smaller than that in the CAOB. The future accretion of SW Pacific islands, like the Philippines, to Asia will be discussed (NSC grants 93-2116-M-001-025, 94-2116-M-001-021).

References:

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