

Decomposition of an arc-trench system: Cretaceous-Paleogene Japan case

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The Japanese Islands still preserved the overall orogenic framework of Cretaceous arc-trench system; e.g. the Shimanto accretionary complexes (trench), Sanbagawa high-P/T blueschists (deeper Wadati-benioff zone), and Ryoke batholith belt (magmatic arc). We analyzed U-Pb ages of detrital zircon from coeval shallow marine sandstones in SW Japan deposited in fore-arc, intra-arc, and back-arc settings, in order to check the pattern of terrigenous flux within a matured arc and their later modification. Most of the Cretaceous shallow marine sandstones contain abundant detrital zircons from the Jurassic to Early Cretaceous ages, with minor amounts of Permo-Triassic and mid-Paleozoic ones. These common age spectra record that the provenance of the Cretaceous arc had the same compositions of crustal rocks for nearly 1,000 km along the arc; i.e., dominant Jurassic to Early Cretaceous granitoids with minor amounts of pre-Jurassic orogenic elements. The most peculiar age spectra was detected in western Shikoku and Kanto Mtn. near Tokyo; e.g., Cretaceous sandstones of the Atogura and Maana formations contain abundant Paleoproterozoic (2400-1600 Ma) zircons. The field occurrence of these two units as klippen on the blueschists suggests their allochthonous origin and post-depositional tectonic transport. The unique age spectra are correlative solely with those from the Tetori/Jinzu groups in the Hida belt on the Japan Sea side, which were deposited on the back-arc domain of the Cretaceous arc with provenance featuring Precambrian basements. These suggest that the Cretaceous sandstones in klippen were primarily deposited in the back-arc, and later transported to the fore-arc for nearly 100-200 km across the Cretaceous arc crust, by the Cenozoic tectonics. The Miocene Japan Sea opening represents a typical case of extensional tectonics in the back-arc domain; nonetheless compressional tectonics operated on the Pacific side at the same time by oceanic subduction. Probably sometime in the Paleogene and/or Miocene, a large-scale contraction of pre-existing arc crusts occurred to destruct the Cretaceous or older orogenic frameworks along the eastern margin of Asia. The direct juxtaposition of coeval blueschists and arc granitoids by the low-angle Median Tectonic Line is smoking gun evidence for such crustal shortening/destruction of arc crust.

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