

Stratigraphy and structure of the accreted arc province in the Izu Collision Zone, central Japan

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The Izu Collision Zone (ICZ) is a zone of ongoing collision between immature (oceanic) and mature island arcs. Collision-induced deformation has caused crustal shortening and thickening of the northern Izu-Bonin (IB) arc, and has exposed the deeper part of the oceanic island arc crust as accretionary terranes. A geologic map (scale 1:50,000) and the stratigraphy of the accreted arc province (AAP: so called 'South Fossa Magna') in the ICZ are constructed from the field data and examination of geologic ages using mainly calcareous nannofossil biostratigraphy, and by integrating those with preexisting geological and chronological data, from a systematic viewpoint.

The AAP and the Izu Peninsula can be divided into following five terranes bounded by major tectonic lines: Koma, Misaka, Tanzawa, Izu and Fujikawa Terranes. The former four terranes are regarded as accreted volcanic edifices of the IB arc, and are associated with trough-fill clastics accumulated along collision boundaries. The latter terrane is considered to be an accreted long-lived trough accompanied by contemporaneous volcanic edifices in the backarc region of the IB arc. Each terrane is subdivided again into several blocks bounded by major faults. Stratigraphy was established for each block, then the overall stratigraphy of each terrane was constructed by correlation between the blocks. Geology of the accreted IB arc terranes are as follows:

The Tanzawa Terrane forms a dome-like structure with southward vergence, and comprises granitoid bodies associated with gabbro occupying the central part; the Tanzawa Group, forming the roof of the granitoid bodies, 21-10 Ma in age, up to 11,000 m in thick, composed mainly of volcanoclastics; and the Nishikatsura Group unconformably overlying the Tanzawa Group, distributed chiefly along the periphery of the terrane, with restrict outcrops in the central part of the terrane forming a southward dipping half graben, 7.5-4 Ma in age, 700-2200 m in thick, comprised of clastic and volcanoclastic deposits.

The Misaka Terrane is an ENE trending mountain range characterized by short wavelength folds and strike-slip or thrust faults of the similar trend. This terrane is underlain by the Nishiyatsushiro Group, 15.5-12 Ma in age, 3000-6000 m thick, and is intruded in the eastern part by granitoid bodies amalgamating with the Shimanto Belt. Voluminous basaltic pillow lavas, 15-13.5 Ma in age, and contemporaneous mudstone are widely distributed, overlying the lowest volcanic and volcanoclastic strata. These are overlain by bimodal volcanoclastics. In the eastern terrane, the upper Nishiyatsushiro Group is dominated by trough-fill clastics and volcanoclastics, 13-12 Ma in age. In the western terrane, this group is conformably and unconformably overlain by the Fujikawa Group constituting the Fujikawa Terrane.

The Koma Terrane consists of three imbricated arc segments facing northward or northwestward, a block of clastic deposits with NNE trending folds, and a segment of oceanic island in the western margin. This terrane is occupied by Kushigatayama Group, 18-15 Ma in age, more than 4500 m in thick, composed mainly of volcanoclastics, and by the overlying, conformable Momonoki Group, 15-13 Ma in age, 2500-4500 m in thick, comprised of trough-fill clastics and volcanoclastics. In the northeastern part, granitoid bodies are intruded into the lower-middle part of the Kushigatayama Group.

A model of the collision history is also proposed. The incipient collision occurred at 17-16 Ma and the climax was about at 15 Ma. There were four large-scaled crustal partitions in the northern IB arc since the commencement of the collision, at about 13, 8, 5 and 2.5 Ma, producing intra-arc subduction zones which generally migrated southward. In addition, a regional deformation event affecting the entire northern IB arc occurred at about 11 Ma.