Tertiary multi-stage evolution of oceanic plates as revealed by new geochemical and age constraints of basalts in the Mineoka Belt

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The Pacific, North American, and Philippine Sea Plates are adjoined at a TTT-type triple junction 350 km SE of the Boso Peninsula in central Japan where the Japan, Izu-Bonin, and Sagami Trough Trenches intersect. The Mineoka ophiolite, outcropping in the southern Boso Peninsula, has been situated in a unique tectonic setting in the Izu Arc collisional zone on the SE-concave Honshu Island since the middle Miocene. We discuss the mode of occurrence, geochemistry, and radiometric ages of the basaltic and other igneous rocks from the Mineoka ophiolite to verify the origin and tectonic implications of these rock assemblages. The ophiolitic rocks are composed mainly of tholeiitic pillow basalts and doleritic sheeted dikes, alkali-basaltic sheet flows, and calcalkaline dioritic to gabbroic plutons. The tholeiitic basalts show variable trace-element compositions ranging from mid-oceanic ridge to island-arc type. The alkali-basalts have a within-plate affinity. Ar-Ar and K-Ar dates yield ages of 49+/-13 Ma for the tholeiitic basalts, 19.62+/-0.90 Ma for alkali-basalts, and 20 to 40 Ma for the calcalkaline plutonic rocks. These age brackets are inconsistent with the known ages from the Pacific or the Philippine Sea Plates; we therefore infer that the Mineoka ophiolitic assemblage was part of an oceanic plate, called the Mineoka Plate. The Mineoka Plate underwent an island-arc volcanism in the Miocene as a result of subduction initiation at a fracture zone or a transform fault system due to a change in the position of the Euler rotation pole of the Pacific Plate at 43 Ma. Rift volcanism associated with back-arc basin opening might have occurred within the Mineoka Plate shortly after the establishment of this subduction zone. Eruption of within-plate-type alkali basalts in the ophiolite likely took place near the paleo-Honshu continental arc just before the emplacement of the Mineoka ophiolite into the Japanese continental margin.