

Temporal constraints for the tectonic development of the Philippine ophiolite belts from new zircon U-Pb ages

TANI, Kenichiro^{1*}; GABO, Jillian aira S.²; HORIE, Kenji³; ISHIZUKA, Osamu⁴; PADRONES, Jenielyn⁵; PAYOT, Betchaida⁶; TEJADA, Maria luisa⁷; FAUSTINO-ESLAVA, Decibel V.⁸; IMAI, Akira⁵; ARAI, Shoji⁹; HOKADA, Tomokazu³; YUMUL JR., Graciano P.¹⁰; DIMALANTA, Carla B.⁶

¹National Museum of Nature and Science, ²Kyushu University, ³National Institute of Polar Research, ⁴Geological Survey of Japan/AIST, ⁵Akita University, ⁶University of the Philippines, Diliman, ⁷Japan Agency for Marine-Earth Science and Technology, ⁸University of the Philippines, Los Banos, ⁹Kanazawa University, ¹⁰Apex Mining Co. Inc.

The tectonic framework of the Philippine Islands is important in understanding how the western Pacific margin developed along the Eurasian and the Pacific Plates since the Eocene.

The basement rocks of the Philippine Islands are characterized by the presence of ophiolitic complexes exposed among the islands. Yumul (2007, Island Arc) defined four belts in the Philippine ophiolites and proposed that they progressively become younger towards west, from Early ? Late Cretaceous at the easternmost belt to Eocene - Oligocene in the west. However, most of the ophiolitic complexes have been dated by radiolarians and foraminifera in the overlying sediments and lacked reliable radiometric ages from the igneous rocks.

To precisely determine the igneous ages of the Philippine ophiolites, we have conducted SHRIMP zircon U-Pb dating of the gabbroic and leucocratic rocks collected from the ophiolitic complexes in the Philippine Islands, including those from Luzon (Zambales, Isabela, and Lagonoy ophiolites), Masbate (Balud ophiolite), Tablas (Sibuyan ophiolite), Dinagat, and Cebu.

New zircon ages show that most of the ages obtained from the northern ophiolite belts are Eocene in age, from 52 Ma to 41 Ma. These ages coincide well with the opening of the West Philippine Basin (49 ? 33 Ma, Taylor and Goodliffe, 2004, GRL), which is a backarc basin formed behind the incipient Izu-Bonin-Mariana Arc. Furthermore, geochemical data available from the igneous rocks in the eastern ophiolite belts show backarc basin basalt-like geochemical affinities (e.g. Yumul, 2007), suggesting that these ophiolites are genetically associated with the West Philippine Basin.

On the contrary, southern ophiolites are significantly older, gabbroic and leucocratic rocks that are associated with the ophiolitic complex in Cebu and gabbroic rocks in Lagonoy and Dinagat ophiolites are Jurassic to Late Cretaceous (200 - 90 Ma) in age. Similar Mesozoic arc and ophiolitic rocks have recently discovered in the Daito Ridges, currently located north of the West Philippine Basin. Such Mesozoic terranes in the Philippine Sea Plate may potentially be correlated to the Mesozoic ophiolites in the southern Philippines, before the opening of West Philippine Basin in the Eocene.