

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

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谷 健一郎^{1*}; Gabo Jillian Aira S.²; 堀江 憲路³; 石塚 治⁴; Padrones Jenielyn⁵; Payot Betchaida⁶; Tejada Maria Luisa⁷; Faustino-Eslava Decibel V.⁸; 今井 亮⁵; 荒井 章司⁹; 外田 智千³; Yumul Jr. Graciano P.¹⁰; Dimalanta Carla B.⁶
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

¹ 国立科学博物館, ² 九州大学, ³ 国立極地研究所, ⁴ 産業技術総合研究所, ⁵ 秋田大学, ⁶ University of the Philippines, Diliman, ⁷ 海洋研究開発機構, ⁸ University of the Philippines, Los Banos, ⁹ 金沢大学, ¹⁰ Apex Mining Co. Inc.
¹ National Museum of Nature and Science, ² Kyushu University, ³ National Institute of Polar Research, ⁴ Geological Survey of Japan/AIST, ⁵ Akita University, ⁶ University of the Philippines, Diliman, ⁷ Japan Agency for Marine-Earth Science and Technology, ⁸ University of the Philippines, Los Banos, ⁹ Kanazawa University, ¹⁰ Apex 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.