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Coastal tectonics of west Luzon, Philippines: Clues from thorium-230 ages of variably uplifted coral terraces



Maxwell, K.V.¹, Ramos, N.T.¹, Tsutsumi, H.², Duan, F.³, Chou, Y-C.³ and Shen, C.C.³

¹National Institute of Geological Sciences, College of Science, University of the Philippines, Diliman, Quezon City 1101, Philippines; kvmaxwell@up.edu.ph

²Department of Geophysics, Graduate School of Science, Kyoto University, Kyoto 606-8502, Japan

³Department of Geosciences, National Taiwan University, Taipei 10617, Taiwan, ROC

Emergent coastal geomorphic features such as raised coral terraces and marine notches are examined along the coast of west Luzon Island, Philippines to understand their implications for sea level changes and seismotectonics of the Manila trench subduction zone and associated upper plate structures. Emerged coral terraces exhibiting a step-like topography with recognizable notches and meter-scale terrace risers are exposed in select areas in Ilocos Norte, Ilocos Sur, La Union, Batangas, and Occidental Mindoro and are usually observed along promontories and nearby smaller islands. New geomorphic data suggest variable elevations of terrace steps across west Luzon Island: Burgos and Badoc, Ilocos Norte (2 to 3 m above mean sea level (amsl)), Santa Maria and San Esteban, Ilocos Sur (1.2 to 1.4 m amsl), Bacnotan and San Fernando, La Union (1.2 to 3.6 m amsl), Calatagan, Batangas (1.3 to 2.4 m amsl), and Lubang and Cabra, Occidental Mindoro (1 to 5 m amsl). We constrained the terrace ages through ²³⁰Th-dating of fossil coral samples taken from terrace surfaces. Fossil corals take from lower terraces yielded ages that range from ~7.5 ky to ~3.5 ky. Meanwhile, young coral ages (~1 ky) were obtained from the upper terraces of Badoc Island, Ilocos Norte at 4 to 5 m amsl. Using the ages and heights of these raised sea level indicators, we infer that the older (~7.5 ky to ~6 ky) fossil corals are related to the mid-Holocene marine transgression while younger attached corals (~1 kyr) are interpreted to be related to coseismic uplift or strong wave events. Also, we recognize the different factors that may be attributed to the emergence of the coral terraces which include regional sea level changes and possibly accumulated uplift from aseismic and seismic processes along the Manila Trench and nearby faults.

