

Geology and petrology of extrusive rocks from the Isabela Ophiolite, Philippines: basalts of varying age and geochemistry

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Geological and petrological characterization of crustal sections of an ophiolite is essential in the pursuit of understanding its geologic history, especially in complex terranes. In the case of the Isabela Ophiolite, Philippines, two sets of pillow lavas of different ages are associated to it and no comparative study between the two is available.

The Isabela Ophiolite, Philippines is a Cretaceous ophiolite located in the northeastern margin of Luzon Island, Philippines. It is mainly composed of the mantle peridotite section with fertile nature. Crustal sections (basalt and gabbro) occur as patches in the central and northern portion of the ophiolite body. Previous workers identified two sets of pillow lavas with different ages, one of Early Cretaceous (Bicobian Basalt) and the other is Late Cretaceous (Dibuakag Volcanics). The Dibuakag Volcanics is partly described by Billedo et al., (1996). However, no petrographical or geochemical data exists for the Bicobian Basalt. Furthermore, a new locality (San Isidro, Palanan) of pillow basalts, not mentioned in previous works, has been identified. Understanding the genesis and the relation between these basalt units is important in the overall history of the Isabela Ophiolite.

Samples from the two basalt units (from Bicobian Basalt and San Isidro Basalt) were analyzed for whole-rock major, trace and rare earth element compositions. Geochemical data suggests that the Bicobian Basalt is geochemically different from the younger Dibuakag Volcanics but similar to the San Isidro Basalt. Although similar in many ways, bulk rock Mg# and spinel mineral chemistry further suggests that the San Isidro Basalt was derived from a more evolved magma compared to that of the Bicobian Basalt. The difference in the REE composition of the younger Dibuakag Volcanics could mark the onset of transition from mid-ocean ridge environment to a different setting.