

Reconstruction of subducted oceanic crust based on accreted metabasalts in Cretaceous Hokkaido, Japan

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Introduction: Ophiolites and metavolcanics in accretionary margins are records of the already subducted oceanic crust together with accompanied sedimentary rocks. They are thus good tools to reconstruct the paleogeography of the oceanic hemisphere. We first summarize the temporal change in rock types and occurrences of metavolcanics in central Hokkaido, and reconstruct the history of the correspondent oceanic plate.

Geologic Outline: The Hokkaido Island is the junction of NE Japan and Kurile arcs. The NE Japan arc, whose basement rocks are Jurassic to Paleogene accretionary complexes and Cretaceous magmatic rocks, collided with Upper Cretaceous to Paleogene accretionary and frontal arc terranes of the Kurile arc since the late Paleogene. The basement terranes of the NE Japan arc show a general eastward-younging trend from Jurassic Oshima Belt, latest Jurassic Sorachi (Horokanai) Ophiolite, Cretaceous Idonnappu and Kamuikotan zones, Cretaceous Poroshiri Ophiolite, and Paleogene Hidaka Belt in ascending order, resulted from west-dipping subduction of oceanic plates.

Classification of metavolcanics: Ophiolitic rocks of the NE Japan accretionary complexes in Hokkaido are classified into four types: OIB-, MORB-, Lower Sorachi-, and arc- types. The OIB-type rocks occur as blocks and slabs occasionally accompanied by pelagic reefal limestone and radiolarian chert, and are regarded as seamount fragments. They are dominant in Jurassic (Oshima Belt) to Lower Cretaceous (Idonnappu and Kamuikotan zones) accretionary units, and scarce in the younger units. The MORB-type rocks occur in Late Cretaceous to Paleogene units as sheared sheet bodies accompanied by chert (Idonnappu Zone), metamorphosed ophiolite sequence (Poroshiri Ophiolite), or *in-situ* pillows and sills in terrigenous clastic rocks (Hidaka Belt) They probably originated from abyssal basements and subducted spreading centers. The Lower Sorachi-type rocks comprise a basement ophiolite conformably overlain by the Yezo forearc basin

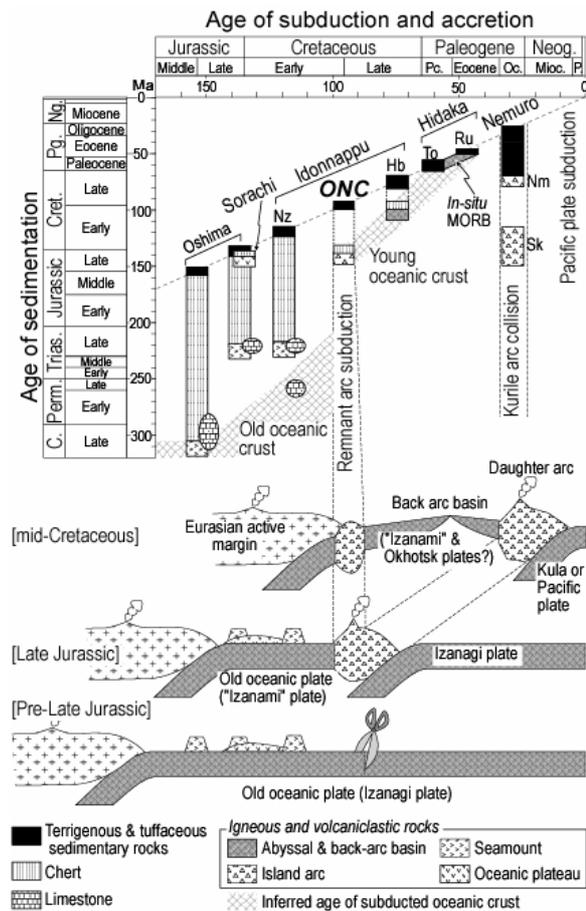


Fig. 1. Ocean plate stratigraphy and reconstructed subduction history for central to western Hokkaido (Ueda & Miyashita, 2005, *Island Arc*, 14, 582-598.). ONC: Oku-Niikappu complex.

deposits. They resemble MORB with slightly poorer in incompatible elements, and are regarded as accreted oceanic plateau. The arc-type metavolcanics, together with gabbro-tonalite and serpentinite, are contained in the mid-Cretaceous part (Oku-Niikappu complex) of the Idonnappu Zone as a dismembered ophiolite. The partly preserved volcano-sedimentary sequence, in which andesitic volcanics are overlain by radiolarian chert, suggests that they originated from intraoceanic remnant arc such as the present-day Kyushu-Palau Ridge.

History of subducted oceanic crust: The oldest pelagic sediments give the youngest age limit of the oceanic crust, and the correspondent trench-fill turbidite confines the timing of its accretion, for a single accretionary unit. Based on such concept of ocean plate stratigraphy, we can reconstruct the age distribution within the subducted oceanic plate(s) as follows. The subducted parts during the Jurassic to Early Cretaceous had late Paleozoic seamounts, and were thus older than 250-300 Ma. Those in the mid-Cretaceous had an intraoceanic remnant arc whose activity ceased in the earliest Cretaceous (ca. 140 Ma). In the Late Cretaceous, the subducted parts were ca. 100 Ma. Spreading centers must have subducted during the early Paleogene (i.e. 40-60 Ma) resulting in the *in-situ* MORB. These suggest that the oceanic basement had an age gap more than 100 m.y. across the intraoceanic remnant arc. To take the remnant arcs of back-arc origin into account, the age gap is best explained by the following scenario: (1) The Paleozoic oceanic plate was internally cut by a new intraoceanic subduction zone; (2) The island arc, which formed on the edge of the Paleozoic oceanic crust, suffered back-arc spreading to form the Cretaceous to Paleogene oceanic floors; (3) the back-arc spreading center subducted beneath the NE Japan arc in the Paleogene. If this history analogous to that of the Philippine Sea is valid, the Kurile arc which collided since the late Paleogene is a candidate for the daughter arc.

Paleogeographic implication: Late Jurassic to Paleogene ophiolites and island arc terranes are common in the NW Pacific, especially clustered around the Okhotsk and Philippine Seas. They are roughly grouped into: (I) Latest Jurassic to Early Cretaceous ophiolite (either MORB- or arc-types) covered by pelagic deposits; and (II) Late Cretaceous to Paleogene, typically shallow-marine volcano-sedimentary successions (and partly ophiolites). This synchronism implies that they resulted from a common marginal basin plate with arc-backarc systems. The Oku-Niikappu remnant arc in Hokkaido can correlate with group I, which may record any of subduction initiation, parent arc activity, or subsequent backarc spreading. Group II might represent their daughter arcs and/or secondary backarcs. The marginal basin plate has thus possibly occupied a significant part of the Cretaceous NW Pacific, and we speculate that its descendants might be the Okhotsk and Philippine Seas.

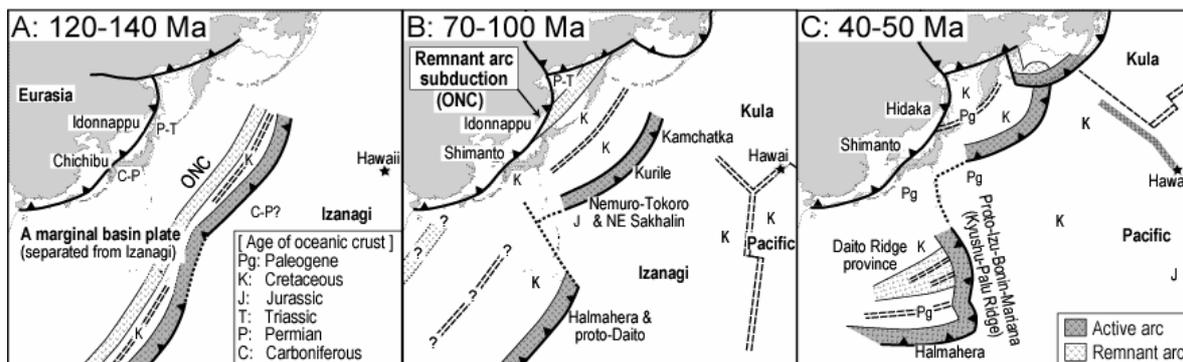


Fig. 2. Preliminary paleogeographic model for the Cretaceous NW Pacific (Ueda & Miyashita, 2005).