Origin of the Greenstone Blocks of the Northern Chichibu Belt in the Kanto Mountains

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The study of the Jurassic accretionary complexes has become an important subject in terms of tectonic subdivision of the Japanese Islands. In particular, relationships among the Northern Chichibu Belt and the Southern Chichibu, Kurosegawa, and Mino-Tamba belts are one of the main subjects of the discussion on the Jurassic accretionary complexes. Greenstone blocks in the accretionary complexes provide key information of oceanic plate materials before the accretion. The stratigraphy of the Northern Chichibu Belt are, however, based mainly on oceanic plate stratigraphy, while there are few works focusing on the origin of greenstone blocks. In this study, we present the results of field investigation and geochemical analysis for greenstone in the southernmost part of the Northern Chichibu belt.
In the study area, the Northern Chichibu Belt is divided into the Hebiki (Yusugawa), Sumaizuku, and Kamiyoshida units from south to north. The Hebiki Unit consists of strongly sheared shale matrix with sandstone block. The contact between the Hebiki and the Sumaizuku units dips steeply to the north. Gigantic limestone blocks called Kano-yama and Futago-yama limestones crop out along the boundary in the Sumaizuku Unit. The shale matrix of the Sumaizuku Unit is strongly sheared, and contains chert and greenstone blocks. The Sumaizuku Unit is overlain by coherent layers composed of chert, shale, and alternation of sandstone and shale. Main component of the sandstone in the coherent layer is chert fragments, which is a characteristic of the Kamiyoshida Unit. However, we need further investigation to reveal the nature of this layer. The Kamiyoshida Unit is dominated by greenstone blocks, in the study area. Accretion age of the Hebiki Unit was estimated to Early Jurassic, while the Sumaizuku and Kamiyoshida units are considered Middle Jurassic (Matsuoka et al., 1998).
Greenstone blocks in the Sumaizuku Unit occur as green or reddish brown colored, lenticular shaped, tens of meters to a few hundred meters blocks. They are highly deformed near the marginal part of lenticular blocks, but *in situ* structure is preserved in the central part. Pillow like structures are rarely recognized. Some greenstone blocks are associated with limestone. One sample contains crinoid fossil fragments. Greenstones in the Kamiyoshida Unit are pale green or purple, foliated greenstones laterally extend a few hundred meters. Foliations in the greenstones are parallel to those of surrounding shale matrix, dipping 30 - 40° to the south.
We determined bulk-rock chemical composition of greenstones in the Sumaizuku (11 samples) and Kamiyoshida (6 samples) units. They are divided ocean island basalt (OIB) and mid ocean ridge basalt (MORB) types depending on enrichment of light rare earth element (LREE). The Sumaizuku Unit contains both high-LREE OIB and low-LREE MORB types. MORB type greenstones are associated with the Kano-yama and Futago-yama limestones, while OIB crops out in the northern part of the Sumaizuku Unit. In contrast, composition of all greenstones in the Kamiyoshida Unit shows they are OIB type. These lines of evidences suggest that the Sumaizuku and Kamiyoshida units were taking different

positions in the accretionary complex. In the Sumaizuku Unit, accretion of both OIB (i.e. seamount) and MORB (i.e. ocean floor) occurred in the Jurassic time, while only OIB was accreted in the Kamiyoshida Unit. Based on field mapping, the Sumaizuku Unit is overlain by the Kamiyoshida Unit, which may indicate that the Sumaizuku Unit was located in the deeper part of the accretionary complex during the Jurassic. By comparing this result with studies in other areas of Jurassic accretionary complexes, we will discuss tectonic subdivision of Jurassic accretionary complexes. Furthermore, our new data may contribute to reconstructing volcanic history in the late Paleozoic Panthalassan Ocean.

Keywords: Jurassic accretionary complex, greenstone, Kanto Mountains, Chichibu Belt

