Collapse and accretion of Permian and Triassic seamounts in the Deadman Bay terrane, the San Juan Island, Washington State, USA

Takeshi Yamagata[1]

[1] Natural Sci., Komazawa Univ

The Deadman Bay terrane is the Jurassic accretionary complex in the San Juan Island, Washington State, USA. Rocks of the terrane are grouped into the Deadman Bay Volcanics and the Orcas Chert. The Deadman Bay Volcanics is originated in the Permian seamount, which is composed of basaltic rocks, shallow-marine limestones, and limestone-breccias on the top and slope of the Permian seamount, and Triassic gravity-flow deposits transported onto the deep-sea floor from the seamount. It is characterized by the stacked, fault-bounded slabs of these rocks and the completely preserved primary stratigraphy in the slabs.

The gravity-flow deposits of the Deadman Bay Volcanics include chert-sandstone, chert-conglomerate, and volcaniclastic rocks containing blocks of Permian shallow-marine limestone and Triassic chert. The size of the blocks is several centimeters to a few meters. The blocks are chaotically embedded in and supported by the matrix of unsorted basalt fragments. The chert-sandstone and the chert-conglomerate are graded sediments composed of a siliceous mud matrix and angular clasts of Triassic radiolarian chert and siliceous shale, basalt, and Permian shallow-marine limestone yielding Permian fusulines. The rocks are coherently interbedded with others.

The Orcas Chert consists of the Permian to Lower Jurassic orderly bedded chert and minor chaotic rocks derived from the seamount and deep-sea floor deposits. The chaotic rocks contain the isolated blocks of the Triassic shallow-marine limestone and basaltic rocks ranging several tens centimeters to several hundred meters in size. These blocks are randomly embedded in the intraformationally folded chert and siliceous mudstone. The chaotic rocks overlie on the chert and siliceous mudstone.

The different modes of occurrence of the rocks originated in the seamounts in the Deadman Bay Volcanics and the Orcas Chert can be best explained by the timings of seamounts reaching the convergent plate boundary. The Permian seamount in the Deadman Bay Volcanics needed a long time from Permian to Triassic to reach the trench after the formation of the seamount. The basaltic rocks of the seamount had been already cooled off and had a density enough to subduct the accretionary prism. The oceanic rocks derived from the down going seamount were scraped off and accreted to the accretionary prism by faults. On the other hand, the seamount of the Orcas Chert reached the convergent plate boundary as soon as it was built up during Triassic period. Therefore the basaltic rocks of the seamount had not sufficiently cooled yet and the density was low, so that the seamount couldn’t subduct and at last collided with the accretionary prism composed of accreted chert and siliceous mudstone accumulated on the deep-sea floor. The collision caused the large-scaled submarine landslide at the accretionary prism with the seamount.