

The timing and the source of the double nappe structures in the Shimonita Geopark

*Hideo Takagi¹, Hiroyoshi Arai²

1. Department of Earth Science, Faculty of Education and Integrated Arts and Sciences, Waseda University, 2. Waseda University Honjo Senior High School

A story of geotectonic evolution must be difficult for geoguides to explain to understand easily for public. We try to explain the tectonic evolution of the nappe structure in the Shimonita Geopark as easily as possible on the basis of new age information on the Atogura Formation and previous our researches, and possibility of the related tectonic event in relation to the horizontal compression which presumably made the nappe movement.

Geological elements of the double nappe

Atogura Nappe: The Atogura Nappe overlies the basement Mikabu Greenstone, and is composed mainly of the Cretaceous Atogura Formation and subsidiary Early Cretaceous granitic and metamorphic rocks (mainly in Mt. Yotsumatayama area). The sedimentary age of the Atogura Formation has been considered Upper Cretaceous (ex: Santonian: Matsukawa and Obata, 2012), however, the possibility of Barremian has been pointed out recently using some ammonite (Ikuno et al., 2016). The report of 112Ma granitic rocks intruding into the Atogura Formation (Takeuchi and Makimoto, 2003) suggest that the formation should be older than that age. On the other hand, detrital zircon U-Pb ages are reported recently by Nakahata et al. (2015), and the youngest concordant age shows 119 +/- 11Ma. This age seems not contradict the Barremian sedimentary age considering the error, but the lack of younger age seems to be important.

Kinshozan Nappe: The Kinshozan Nappe overlying the Atogura Nappe or directly overlying the Mikabu Greenstone is distributed as klippe at the Mt. Kawayama and Mt. Fujiyama in the Shimonita area. The same nappe is also distributed in the Kanezawa and Yorii areas in Saitama Prefecture. The nappe is composed of Permian quartz diorite and related hornfels. The nappe boundary low-angle fault is only exposed along the Ogino River in the Shimonita area.

Correlation and tectonic evolution: The elements of the Kinshozan Nappe are correlative with the Permian granitic clasts in South Kitakami-Kurosegawa belt, whereas early Cretaceous granitic and metamorphic rocks with Abukuma-Higo belts (Takagi and Shibata, 2000). The origin of the nappes was presumably distributed between the MTL and the Mikabu Greenstone basement, and southward overthrust following the formation of large-scale recumbent fold (Arai and Takagi, 1998; Arai et al., 2008) was the most significant event of the nappes. The total displacement of the nappes is estimated as several kilometers.

Tectonic event brought about NW-SE compression

The timing of the southward overthrusting must be in between Late Cretaceous (metamorphic age of the Mikabu greenstones) and the final activity of the MTL which crosscut the low-angle nappe boundary fault. To reconstruct previous strike (c. N30E) of the MTL before the opening of Japan Sea and clockwise rotation of the SW Japan, the start of the Pacific Plate movement to the WNW (Hawaii Island chain direction) can make compressive stress onto the MTL and formation of southward nappe movement. The timing of initial movement to the WNW is considered as 50Ma (O'Connor et al., 2013). However, the timing of the southward overthrusting should be clarified in future.

Keywords: Shimonita Geopark, Nappe structure, overthrust, Atogura Formation

