Geology and post mid-Miocene tectonics of the Ogawa basin and the Atogura Nappe

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The Sanbagawa Belt in the Kanto Mountains consists of the Sanbagawa Unit, Mikabu Unit and Atogura Nappe which are piling up in this order. The Atogura Nappe is widely distributed in the Yorii-Ogawa area. The main part of the Atogura Nappe is surrounded by autochthonous pre-Cretaceous geological units with high angle faults. The Atogura Nappe is unconformably overlaid by the early Miocene deposits in the Ogawa basin (Figure 1). The early Miocene Ogawa basin was a low mountainous area. The sea invaded, and conglomerates and sandstones of the Kozono Formation deposited. As the sea level rise further, mudstones of the Arakawa Formation deposited. Then the Miocene deposits and the Atogura Nappe were subjected to upheaval tectonics. Small rock masses of the Mikabu Unit in the Atogura Nappe are evidence for the post-early Miocene uplifts.

Gently dipping Miocene strata are distributed in the western part of the Ogawa basin which is divided into three areas, i.e., Notake, Iida and Central areas. Basement rocks of these areas are Yorii Formation, Atogura Formation and Kinshozan quartzdiorite, resepectively. In the Notake area, sandstones and conglomerates are widely distributed, and are overlaid by mudstones of the Arakawa Formation. The sandstone below the mudstone is about 3 m in thickness. The depth of the basement rock is unknown in the Notake area. However, judging from shallow Miocene valleys in the Ogawa basin, the thickness of the Kozono Formation may be about 50 - 100m. Miocene conglomerates are mainly composed of many large rounded granite clasts (open red circle in Figure 1). The provenance of the granite clasts appears to be the Ryoke Nappe located between the ridge lines rB and rC (Figure 1). Small Miocene deposits are exposed at three locations in the northeastern part of the Notake area. Miocene coarse sandstones unconformably overlie the Paleogene mudstones of the Yorii Formation at the northernmost exposure. The sandstones of about 10m in thickness are conformably overlaid by the Miocene mudstones. The boundary between the Kozono and Arakawa Formations is located at the altitude of about 140m in the Notake area.

In the Central area, Kinshozan quartz diorite is exposed widely, and is unconformably overlaid by sandstones of the Kozono Formation. In the Iida area, conglomerates are distributed near basement rocks (Figure 1, black circles), which mainly consist of clasts of chert, sandstone and mudstone. On the other hand, mudstones are widely exposed in hills and plains with low altitudes.

Figures 1A, 1B and 1C are schematic geological sections across the N-S direction of the western part of the Ogawa basin. Figure 1A is based on the assumption of slight post-Miocene uplift. On the other hand significant post-Miocene uplifts and tilting movements are assumed for Figure 1B. Judging from many exposures of the unconformity, early Miocene and present-day earth surfaces are close to each other in many localities (Figure 1C). Moreover, thin gently dipping Miocene deposits widely overlie the various rocks of the Atogura Nappe. These geological facts suggest that the Atogura Nappe and Miocene deposits were subjected to no remarkable tectonics after early Miocene. However, the quartz diorite in the Central area was subjected to upheaval tectonics. It is in contact with Miocene strata by high angle faults. However, early Miocene sandstones overlying the quartz diorite are distributed rather widely. Moreover, the Mikabu Unit is not exposed anywhere. Hence, no remarkable uplift occurred in the Central area. Contrary to the Central area small three blocks of Mikabu greenstones in the FujiYama area suggest a significant uplift of the Mikabu Unit. However, small exposures of Miocene sandstones are evidence for weak uplifts of the Atogura Nappe in the FujiYama area.

Keywords: Kanto Mountains, Ogawa basin, early Miocene, Atogura Nappe, Kozono Fm., Arakawa Fm.

Figure 1

Geological map of the Yorii-Ogawa area