

The Age of Hata Formation, type section of Miocene in west San'in district, SW-Japan

Yoshihiro Sawada[1]; Tetsumaru Itaya[2]; Kazunori Hisai[3]; Kiyonori Yoshida[3]; Masayuki Hyodo[4]

[1] Geoscience, Shimane Univ; [2] RINS, Okayama Univ. of Sci.; Earth Planet. Sci., Kobe Univ.; [3] Fac. Sci. & Engin., Shimane Univ.; [4] Kobe Univ. R. C. Inland Seas

The Miocene type section in the west San'in district comprises the Hata, Kawai-Kuri, Omori, Fujina, and Jinzai (Matsue) Formations (Fms), in ascending order. Hata Fm had previously been considered to be lower Miocene in age. However, Sawada and Itaya (1987) reported K-Ar whole rock, hornblende and biotite ages of Hata Fm volcanic rocks and associated plutonic rocks of 16-15 Ma. Subsequent ages of the Hata Fm and correlatives were reported as mainly middle Miocene rather than lower Miocene (Kano et al., 1993; Inoue et al., 1999; Matsuura et al., 2005).

Otofuji et al (1985, 1991) and Torii et al (1985) proposed that Southwest Japan had been rotated clockwise about 50 degree by 15+-1 Ma., based on Tertiary chronology and paleomagnetism. The following aspects were investigated for determination of the age of the Hata Fm. (1) Detailed geological mapping around the boundary between the Hata and Kawai Fms; (2) Paleomagnetic study of volcanic and plutonic rocks dated by K-Ar, and the relationship between their magnetic direction and K-Ar age. The results show:

1. No stratigraphic and structural gaps between the Hata and Kawai Fms are recognized.

2-1) Yoshida plutonic mass : K-Ar ages (Hb:14.4+-0.3Ma; Bt:16.1+-0.3Ma)(Wh: whole rock; Hb:hornblende; Bt:biotite)Paleomagnetic direction**[n=4; D=190.2; I=-53.4; 95=9.3; k=98](**with tilting correction, **without tilting correction)Nadayama plutonic mass : K-Ar age (Hb:16.7+-1.0Ma; Bt:14.8+-0.3Ma)

2-2) Hata Fm : Lower andesite lava : K-Ar (Wh:15.8+-1.1Ma) ; Paleomagnetic direction *[n=6; D=185.5; I=-56.7; alpha95=5.0; k=180];Middle andesite : K-Ar age (Wh:14.9+-0.8Ma) ; Paleomagnetic direction *[n=4; D=357.2; I=34.5; alpha95=5.7; k=258];Upper andesite lava:K-Ar(Wh:14.9+-0.8Ma),Paleomagnetic direction *[(1)n=4; D=6.8; I=33.4; alpha95=10.6; k=77 ;(2)n=2; D=354.5; I=39.1] : Upper dacite welded tuff : K-Ar age (Hb:14.5+-0.8Ma) ; Paleomagnetic direction *[(1)n=9; D=175.6; I=-40.8; alpha95=6; k=74;(2)n=3; D=182.4; I=-35.9; alpha95=7.6; k=267; (3)n=6; D=179.8; I=-41.3; alpha95=7.1; k=91; (4)n=4; D=357.2; I=34.5; alpha95=5.7; k=258; (5)n=3; D=8.5; I=31.7; alpha95=11.9; k=109]3-3) Andesite lava (Kawai Fm) (1)K-Ar age (Wh:19.3+-1.1Ma) Paleomagnetic direction *[n=5; D=62.3; I=-46.1; alpha95=10.8; k=51] ; (2)K-Ar (Wh:17.7+-1.6Ma) Paleomagnetic direction *[n=3; D=60.5 ; I=40.6; alpha95=6.5; k=357].

Conclusions: K-Ar ages of the volcanic rocks of the Hata Fm and associated plutonic rocks are 16-15 Ma, regardless of the material (whole rock, hornblende, or biotite). Paleomagnetic directions of volcanic and plutonic rocks with 16-15Ma K-Ar ages are similar to modern direction or are the reverse of it, indicating that they are not rotated, and thus formed after rotation of SW Japan. Geological evidences of the boundary between the Hata and Kawai Fms are consistent with K-Ar ages and paleomagnetic results. We conclude that the age of the Hata Fm is middle Miocene, rather than lower Miocene.

Some andesite lavas previously assigned to middle Miocene Kawai Fm. show declination of 60 degrees east and inclination of 41-46 degrees, and have a whole rock K-Ar age of 19-18 Ma. These andesite lavas should be excluded from the Kawai Fm, and should be renamed and redefined.