Pleomagnetic study of the Amatsu Formation, the Awa group, distributed in the Boso peninsula, central japan

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After Japan Sea opening, four massifs belong to the Izu-Bonin Arc, are thought to have collided with the Honshu Island arc in the South Fossa Magna region; Kushigatayama at 15-13 Ma, Misaka at 9-7 Ma, Tanzawa at 5-3 Ma and Izu Blocks at 1 Ma (Amano, 1991). Paleomagnetic data from the Middle Miocene to the Pleistocene sedimentary sequences in the Boso Peninsula indicated that a clockwise rotation took place due to the collisions of the Tanzawa and Izu massifs since 5 Ma (Kotake et al., 1995, ex).
Okada and Okamura (2005), constructed a paleomagnetic study for the group in the northern region from the Mineoka Mountain belt, reported that the average paleomagnetic declination from the upper Amatsu Formation is approximately 50°. The data showed that a clockwise rotation occurred at around 5 Ma in the Boso peninsula which was supposed to be due to the collision of the Tanzawa Massif to the Honshu Island. But there was no data from the lower Amatsu Formation and was a possibility that secondary components remained on those data even from the upper Amatsu Formation°C. Therefore, it is necessary to re-examine paleomagnetic data from this area to extract primary components by means of refined demagnetization and measurement methods. Here, we report a reliable magnetostratigraphy and try to discuss about the tectonic rotation suggested by Okada and Okamura (2005). Additionally, there are differenceally developed fold systems in the central part of the Boso peninsula. This study discuss that influence of those folds on the tectonic rotation.
This study obtained paleomagnetic data from the entire Amatsu Formation exposed along the Aikawa River, the Shikoma River, the Minato River, and the Kanayama River reservoirs along the Kamogawa river in the Kamogawa city. This study performed paleomagnetic measurements with progressive alternating field (AFD: up to maximum field of 80mT) and thermal (ThD: up to a maximum temperature of 600℃) demagnetizations, and a combination of a thermal demagnetization at 300°C and following a progressive AFD (300°CThD+AFD). From the 300°C+AFD, Characteristic remanent magnetization (ChRM) thought to be primary components were obtained. Demagnetization results suggested that most of samples include magnetic minerals consisting of high coercivity and low Curie temperature (ex. greigite). Rock magnetic experiments suggest that the remanent magnetization is carried by magnetite. It could be divided into eastern area and wester area from amount of rotation. Therefore, the reversal test (McFadden and McElhinny., 1990) was conducted on results combined those data and data of Okada and Okamura (2005) by each area. That result passed as the class C, indicating that the polarities are reliable. So, the directional data can be used to investigate magnetic polarity stratigraphy and tectonic rotation.
Each polarity in the upper Awa Group were correlated with the geomagnetic polarity time scale of Ogg (2012) based on radioactive age, microfossil biostratigraphy. This magnetostratigraphic correlation shows that the Awa Group is younger than base of Chron C5Ar (13.0 Ma) and older than top of C2An.2n (3.1Ma). The boundary between the Miocene and the Pliocene is thought to be between Am78 and Ky4.
A rotation versus age plot for the upper Awa Group indicates that the clockwise rotation started after the deposition of the Kiyosumi Formation (5Ma) and ceased before start of deposition of the Anno Formation at around 4Ma, in the western area. But, in eastern area, because of there no data of the Anno Formation, this study is not able to discuss about the timing of ceasing for the clockwise rotation.
The paleomagnetic orocline test was applied to a data set for the entire Amatsu Formation. The result demonstrates that the surface trace direction of the fold axes was straight at around the boundary

between the Miocene and the Pliocene (5.3Ma)

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Keywords: the Amatsu Formation, the middle Miocene–Pleistocene sedimentary, Neogene tectonic rotation, Paleomagnetism