

DRIFTING VELOCITY OF SOUTHWEST JAPAN INFERRED FROM PALEOMAGNETISM AND K-Ar DATING¹

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Miocene volcanic rocks have been sampled from the San'in district in the central part of Southwest Japan, in an attempt to evaluate the drifting velocity of Southwest Japan. Twenty nine localities have reliable data of both paleomagnetic direction and K-Ar dating. A declination value of 40.6° is observed in the Kawai Formation of 16.1 ± 1.4 Ma, whereas a northerly direction ($D = 1.8^\circ$) is in the Omori Formation of 14.3 ± 0.6 Ma. The Matsue Formation of 11.3 ± 0.3 Ma shows northerly declinations. These data indicate that Southwest Japan rotated clockwise 40° between 16.1 ± 1.4 Ma and 14.3 ± 0.6 Ma. Compared with the amount of rotation of Southwest Japan estimated on the basis of the Cretaceous paleomagnetic data (Otofuji and Matsuda, 1987), more than 80% of the clockwise rotation of Southwest Japan occurred later than 16.1 Ma (Fig. 1).

The large rotational motion of 40° has spanned as little as 1.8 ± 1.5 Myr. The angular velocity of Southwest Japan about the rotation pivot of 129°E , 34°N reached $22^\circ/\text{Myr}$ at about 15 Ma. We thus conclude that the eastern part of Southwest Japan moved at a rate of 23 cm/year. The high drifting velocity implies that the low viscous asthenosphere of the order of 10^{17} - 10^{19} Poise prevailed beneath the area of the Southwest Japan-Japan Sea system about 15 Ma. Presence of low viscous asthenosphere with about 10^{17} - 10^{19} Poise should be a necessary condition for rifting of a microplate at continental margin.

REFERENCE

- Otofuji, Y. and Matsuda, T., 1987. Amount of clockwise rotation of Southwest Japan – fan shape opening of the southwestern part of the Japan Sea. *Earth Planet. Sci. Lett.*, **85**, 289-301.

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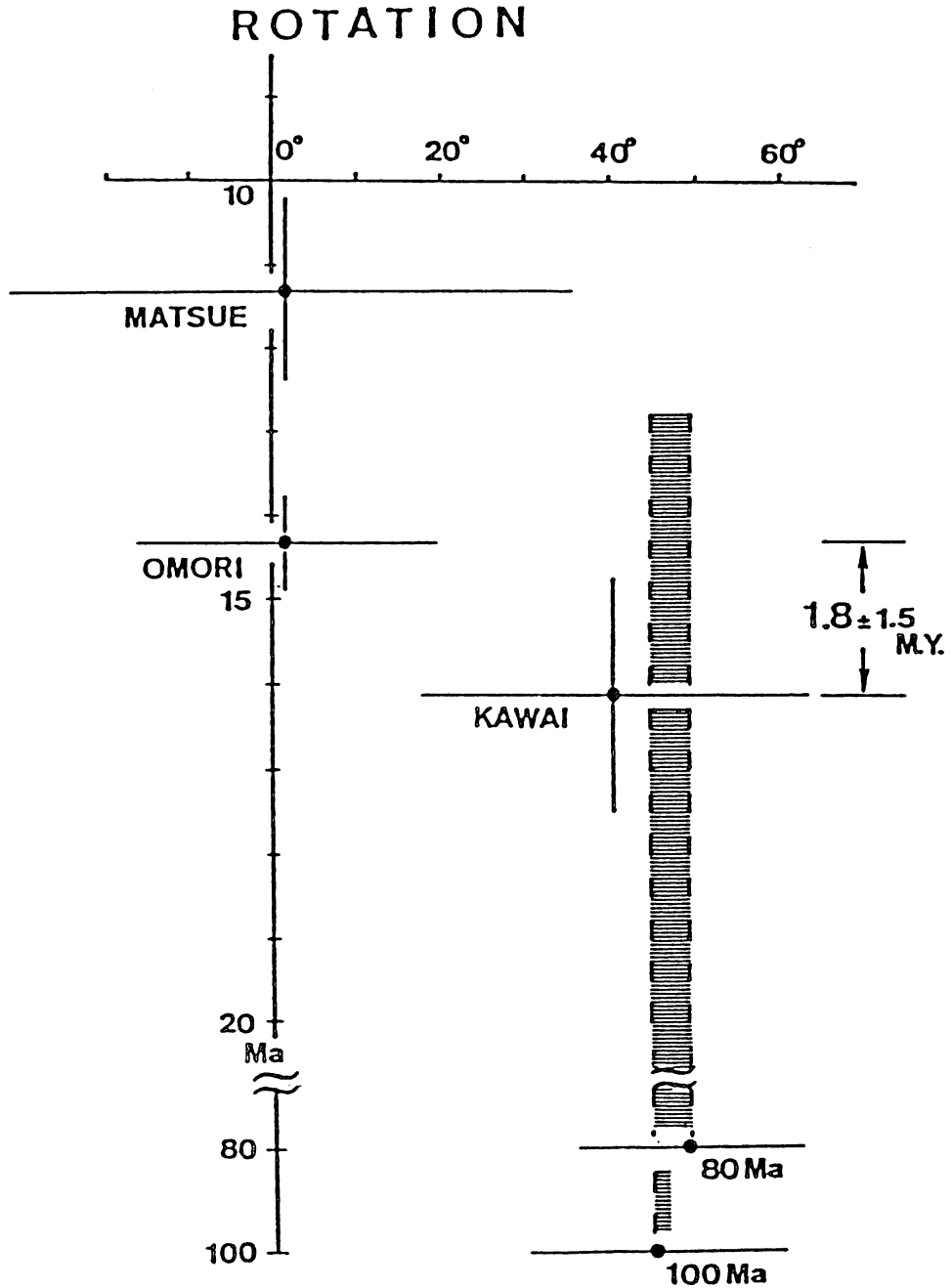


Fig. 1 Rotation with respect to eastern part of Eurasia versus age for geologic unit in the San'in district of Southwest Japan. The rotation error bars are the $R = \sin^{-1} (\sin \alpha_{95} / \cos I)$ where I and α_{95} are inclination and radius of 95% confidence about the mean direction. The age error bars are the 95% confidence limit. Shaded rotation zone is amount of clockwise rotation of Southwest Japan with respect to eastern part of Eurasia estimated on the basis of the Cretaceous (80-100 Ma) paleomagnetic data (Otofuji and Matsuda, 1987).