A geomagnetic record of the Gauss-Matuyama polarity transition recovered from an Osaka Bay sediment core

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We performed detailed paleomagnetic analysis around the Gauss-Matuyama boundary using the 1700 m core sample from Osaka Bay, southwest Japan. Based on the magnetostratigraphy throughout the core, the main Gauss-Matuyama boundary was located at 1320 m (Biswas et al., 1999). we carried out paleomagnetic analyses with shorter sampling intervals at depths between 1400 and 1270 m.

Most of the samples (133/151) showed the normal overprint, which was cleaned by alternating field (AF) demagnetization at 30 mT. After AF demagnetization above 30 mT, two types of demagnetizing behaviors were observed. Linear high-coercivity components were extracted by principal component analysis from 64 samples. From 83 samples, linear high-coercivity component could not be isolated by principal component analysis, but each sample showed random scattering or clustering behavior around a center point which is obviously different from origin.

A possible explanation for the difference in AF demagnetization behavior is difference in rock-magnetic properties, but this explanation was rejected by the following rock-magnetic evidences. No significant rock-magnetic characteristics, that is, low-field magnetic susceptibility values, intensity and AF demagnetizing behavior of laboratory-induced magnetization, was observed between the samples with different high-coercivity demagnetization behaviors. The intensity and demagnetization behavior of the low-coercivity overprint also showed no significant difference.

The positions of the samples with random-scattering or clustering AF behaviors were continuously allocated around the main Gauss-Matuyama boundary. Therefore, we considered that such behaviors were due to weak primary components acquired when the geomagnetic field was weak during the polarity transition. The allocation of the samples with such behaviors begins at 28 m below the main Gauss-Matuyama boundary, the period of low geomagnetic field in the Gauss-Matuyama transition could have started 80 kyrs (assuming the constant sedimentation rate between the Kaena event and the main Gauss-Matuyama boundary) before the main polarity transition.