Millennial to sub-millennial scale features of the Matuyama-Brunhes geomagnetic polarity transition in a core from Osaka Bay

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A high-resolution magnetic record of the Matuyama-Brunhes reversal transition was obtained from a homogeneous fine clay layer in a 1700-m core from Osaka Bay. The main Matuyama-Brunhes polarity boundary (MBB) lies at a depth of 400.22 m, in the transition zone extending over 6.8 m in depth. The polarity reversal accompanies four conspicuous short reversal episodes, two of which underlie the MBB, and the other two overlie it.

Various rock magnetic measurements confirm the magnetic uniformity and suitability of sediments for paleointensity study. Paleointensity decreased to a minimum of 15-20 % of the post-reversal mean at 2.5-3.0 m below the MBB, and recovered up to 60-80 % at the MBB, followed by complete recovery at 0.6 m above the MBB.

The transition zone occurs in a marine clay layer deposited during a high sea level period corresponding to the marine oxygen isotope stage 19. We made diatom analyses on the sediment sequence to estimate relative sea level changes. An age model was constructed by matching a proxy curve of the sea level change with the astronomically calibrated isotope curve of Bassinot et al. (1994). The model provides an average sedimentation rate of 57 cm/kyr. The MBB lies between Stages 19.3 and 19.2, and is dated to be 777 ka. This result is consistent with the previous 40Ar/39Ar dates from transitionally magnetized lava flows. The paleointensity decrease zone spans 11 kyr, and the minimum occurred at 783 ka, about 6 kyr before the MBB, between Stages 20.0 and 19.3. The four short reversal episodes, with durations less than 1000 yr, occurred every 4000-5000 yr, and coincided with sharp paleointensity changes.

Convolution integral of the transition field change from this study accounts for the transition records from deep-sea sediments.