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SHRIMP U-Pb zircon dating for Byakubi tephra: implication for refined chronology for the Matuyama-Brunhes boundary

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Paleomagnetic records from marine sediments have contributed to improved understanding of variations in the Earth's magnetic field and have helped to establish age models for marine sediments. However, lock-in of the paleomagnetic signal at some depth below the sediment-water interface in marine sediments through acquisition of a post-depositional remanent magnetization (PDRM) adds uncertainty to synchronization of marine sedimentary records (e.g., Roberts and 2004; Suganuma et al., 2011; Roberts et al., 2013). Recently, Suganuma et al. (2010) presents clear evidence for a downward offset of the paleointensity minimum relative to the ^{10}Be flux anomaly at the Matuyama-Brunhes (M-B) geomagnetic polarity boundary, which they interpret to result from a 16 cm PDRM lock-in depth. This indicates that a certain age offset probably occurs when a paleomagnetic record is used for dating marine sediments. This phenomenon also suggests that the accepted ages for the geomagnetic polarity boundaries, including the M-B boundary, should be revised (ca. 10 kyr younger in case of the M-B boundary). Contrary, two recently proposed revisions of the age of the ^{40}Ar/^{39}Ar Fish Canyon sanidine (FCs) standard (Kuiper et al., 2008; Renne et al., 2010) would adjust ^{40}Ar/^{39}Ar ages of the M-B boundary from Maui (Singer et al., 2005) to 781 $\pm$ 2 ka and 784 $\pm$ 2 ka, respectively.

Plio-Pleistocene marine sedimentary sequences are widely distributed in the Boso and Miura Peninsula, central Japan. Because these sequences have a significantly high sedimentation rate with well-preserved platonic and benthic foraminifera fossils, it is possible to reconstruct a detailed geomagnetic behavior along the polarity boundaries such as M-B with high resolution oxygen isotope records. In addition, a number of tephra layers are accompanied with these sedimentary sequences, which make it possible to provide absolute age constrains for the boundaries. The Byakubi tephra, located few tens of cm above the M-B boundary, has been investigated based on SHRIMP (Sensitive High Resolution Ion Microprobe) U-Pb dating of single zircon crystals from the tephra. The initial U-Th ratio is also corrected by using ICP-MS (Inductively Coupled Plasma Mass Spectrometer) analysis of volcanic glasses of the tephra. The ^{206}Pb/^{238}U ratio corrected by ^{207}Pb assuming ^{206}Pb/^{238}U-^{207}Pb/^{235}U age concordance from 20 grains are equivalent with a weighted mean of 761.1 $\pm$ 7.6 ka. Although this M?B boundary age is ˜23 kyr younger than previously accepted ^{40}Ar/^{39}Ar ages, this is almost consistent with a younger ice core derived age of 770 $\pm$ 6 ka (Dreyfus et al., 2008), marine sediments age of 770 ka based on ^{10}Be anomaly (Suganuma et al., 2010), and ^{40}Ar/^{39}Ar age of 761 $\pm$ 2 ka adjusted by the K-Ar based FCs standard ages (27.5 Ma: Mochizuki et al., 2010).