Matuyama-Brunhes boundary age constrained by SHRIMP U-Pb zircon dating of a widespread tephra

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The youngest geomagnetic polarity reversal, the Matuyama-Brunhes boundary (MBB), provides an invariant datum plane for sediments, lavas, and ice cores. An accepted age of 780 ka for MBB was determined by the marine sedimentary records using astrochronology (Shackleton et al., 1990). The consistent age of MBB at 781–784 ka was reported from Hawaiian lavas measured by the $^{40}Ar/^{39}Ar$ geochronology (Coe et al., 2004) with a new age calibration (Kuiper et al., 2008; Renne et al., 2010). However, the proposed age of MBB has been challenged by the recent reports, showing younger astrochronological ages from marine oxygen isotope stratigraphy in high sedimentation rate records (Channell et al., 2010; Valet et al., 2014) and records of cosmogenic nuclides in the sediments and those of an Antarctic ice core (EPICA Dome C)(Dreyfus et al., 2008; Suganuma et al., 2010). Here, we present a high-precision U-Pb zircon age of 772.7 ± 7.2 ka for MBB from a tephra (Byk-E) intercalated ca. 1.0 m below the MBB in the sedimentary sequence from a forearc basin in Japan. This allows a direct comparison of the U-Pb age to the astrochronological records in the marine sediments. The result shows that the MBB age from the latest astrochronology is consistent with the U-Pb radiometric timescale. This result provides, for the first time, the basis for immediate comparisons between astrochronology, U-Pb dating, and magnetostratigraphy for MBB, which is a key for the important geological timescale.