A reliable paleointensity record across the Matuyama-Brunhes boundary from a marine succession at the Chiba section, a Lower-Middle Pleistocene GSSP candidate

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We report revised paleomagnetic records of the Matuyama-Brunhes boundary (MBB) from a continuous marine succession at the Chiba section of the Kokumoto Formation, Kazusa Group. The Chiba section is the one of the candidate sites for the Lower-Middle Pleistocene Boundary GSSP. In the section, a wide spread tephra bed named as Byk-E is intercalated just 80 cm below the MBB [1].

In order to provide globally comparable VGP (virtual geomagnetic pole) and paleointensity (past geomagnetic field intensities) records from the Chiba section, we have taken oriented mini-cores from a 13 meters succession with 10-cm intervals across the Byk-E tephra bed. Thermal magnetic experiments suggest that the samples include iron sulfides, magnetites but no hematite as a natural remanent magnetization (NRM) carrier. Measurements of magnetic hysteresis indicate that the magnetic domain state is supposed to be pseudo single domain (PSD). Progressive alternating field demagnetization (pAFD) indicate a reversed to normal polarity transition boundary is at around 1.5 meter below the Byk-E bed as well as previous studies [2], however the transition boundary is observed at around 0.8 meter above the Byk-E bed in thermal demagnetization (ThD) results. Therefore, the reversed to normal polarity transition boundary seen below the Byk-E bed is thought to be overprint. This overprint, which might be carried by iron sulfide, is particularly observed in a transitional interval. Since iron sulfides generally decompose and oxidized into magnetites due to heating during ThD, the yielded magnetites in the demagnetization furnace have no magnetic signal but provide an over estimate for amount of magnetic grains which prevents to estimate paleointensities.

To provide a reliable paleointensity record, we applied to use a combined demagnetization technique consisting of a 300°C ThD and a regular pAFD sequence. After the 300°C ThD, most of the overprint has been removed but the magnetic susceptibility has not changed even in the air condition, indicating that iron sulfides just lose magnetic signals due to the ThD but not to change the amount of magnetic grains. The VGP latitudes and preliminary derived paleointensities using the combined demagnetization technique from the Chiba section quite match well with the other MBB records. To use the both independent techniques of oxygen isotope and paleointensity will provide a further reliable stratigraphic correlation across the Lower-Middle Pleistocene Boundary.

References:

[1] Suganuma et al. (2015) Geology 43(6): 491-494
[2] Kazaoka et al. (2015) Quaternary International 383:116-135