An integrated chronostratigraphy in the lower Pleistocene Obama Formation, Inubo Group, distributed in the Choshi district, Chiba Prefecture, central Japan, based on data from paleomagnetic and oxygen isotopic analyses

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The Kazusa, Inubo and Toyofusa Groups, distributed in the Chiba prefecture, are the Lower –Middle Pleistocene marine successions. It is possible to reconstruct spatial paleoenvironmental variations during the Early Middle Pleistocene Transition (EMPT) by comparing of those formations. Since the present sea water off the Choshi area consists of the Mixed water of the Oyashio and Kuroshio currents. This area is thought to be a sensitive region against the northern and southern shifts of the Kuroshio front responding to the climate change.

In the Inubo Group, distributed in the Choshi area, lithostratigraphy, magnetic stratigraphy, oxygen isotope stratigraphy, biostratigraphy of calcareous nannofossil and radiolarian and tephrostratigraphy were constructed (Sakai, 1990; Fujioka and Kameo, 2004; Kameo et al., 2006). However, an integrated chronostratigraphy has not been constructed below the most upper part of the Obama Formation where EMPT is corresponded. The purpose of this study is to reconstruct an integrated chronostratigraphy based on data from paleomagnic and oxygen isotopic analyses and the local climatic changes through EMPT from the Obama Formation based on the stable isotope analysis using foraminiferal fossils.

Rock-magnetic experiments and paleomagnetic measurements were performed in the laboratory at Ibaraki University. In this study, three demagnetization methods were used : a progressive alternating field demagnetization (pAFD); a progressive thermal demagnetization (pThD); a hybrid demagnetization of thermal demagnetization at 300℃ and pAFD. As the result of those demagnetization treatments, reliable Characteristic Remanent Magnetization (ChRM) were extracted from 30 horizons, which indicates a normal polarity zone at the horizon between 71.5 m and 74.9 m. This normal polarity zone was not detected in Sakai (1990). Based on the correlation of the tephras in Fujioka and Kameo (2004) and the correlation of oxygen isotope curve in Yamamoto (2018 MS), this normal polarity zone should be the Jaramillo subchronozone, however, the upper limit of the Jaramillo subchronozone in the Obama Formation might correspond to horizon between 76.0 to 79.0 where reliable ChRMs were not extracted. I carried out oxygen isotope analysis by using planktonic foraminifera, *Globorotalia inflata* and benthic foraminiferas, *Uvigerina* spp., *Bulimina* spp., *Melonis* spp. In order to construct an age model for the Obama Formation, the resultant oxygen isotopic curve was correlated with the LR04 benthic stack curve (Lisiecki and Raymo, 2005) referring to oxygen isotopic curves from other sections (Kameo et al., 2006 and Nozaki et al., 2014), tephrostratigraphy and biostratigraphy of calcareous nannofossil (Fujioka et al., 2003; Fujioka and Kameo, 2004), tephrostratigraphy by Suzuki and Murata (2008) and Murata and Suzuki (2011). As the result, the range of age of this studied sequence was deduced as a period between 1732.5ka and 952ka. Based on the age model in this study, the start of the Jaramillo subchron is detected to be 1072.0 ka, and the end is to be between 964.0 ka and 1007.2 ka. According to the Geomagnetic Polarity Time Scale (Ogg, 2012), the start of the Jaramillo subchron is assumed to be 1072 ka and the end is to be 988 ka. The start timing is completely consistent with this research and the end timing also consistent with this research in the error range. The sedimentation rates were calculated as 56.7cm/kyr in

the maximum and 4.25cm/kyr in the minimum.

Keywords: oxygen isotope stratigraphy, magnetstratigraphy

