A detailed paleomagnetic record during the Matuyama-Brunhes polarity transition from the Chiba composite section, a candidate for the L-M Pleistocene boundary GSSP

*Makoto Okada[1], Yusuke Suganuma[2], Yuki Haneda[3]

1. Department of Earth Sciences, Faculty of Science, Ibaraki University, 2. National Institute of Polar Research, 3. Graduate School of Science and Engineering, Ibaraki University

We report a high-resolution paleomagnetic record from a continuous marine succession in the Chiba composite section of the Kokumoto Formation, Kazusa Group, Japan. The Chiba composite section is a candidate for the Lower-Middle Pleistocene boundary GSSP. Our record reveals detailed behaviors of the virtual geomagnetic poles (VGPs) and relative paleointensity changes during the Matuyama-Brunhes (M-B) polarity transition. The resultant relative paleointensity and VGP records show a significant paleointensity minimum near the M-B boundary, which is accompanied by a clear “polarity switch.” A high-resolution oxygen isotope chronology for the Chiba composite section indicates that the M-B boundary is located in the middle of Marine Isotope Stage (MIS) 19 and yields an age of 771.7 ka for the boundary. This age is consistent with those based on the latest astronomically tuned marine and ice core records and with the recalculated age of 770.9 ±7.3 ka deduced from the U-Pb zircon age of the Byk-E tephra. To the best of our knowledge, our paleomagnetic data especially for the relative paleointensity represent one of the most detailed records on this geomagnetic field reversal that has thus far been obtained from marine sediments and will therefore be key for understanding the dynamics of the geomagnetic dynamo and for calibrating the geological time scale.

Keywords: L-M Pleistocene boundary GSSP, paleomagnetism, geomagnetic reversal

©2017. Japan Geoscience Union. All Right Reserved.

Planktonic foraminiferal faunal changes around the Matuyama–Brunhes boundary and its paleoceanographic implications in the Kuroshio domain off Honshu, Japan

*Kizuku Shikoku[1], Hiroki Hayashi[1], Minoru Ikehara[2]

1. Interdisciplinary Graduate School of Science and Engineering, Shimane University, 2. Center for Advanced Marine Core Research, Kochi University

This study conducts a paleoceanographic reconstruction of the Kuroshio domain around the Matuyama--Brunhes boundary by means of planktonic foraminiferal assemblages. In our previous paper (Shikoku et al., 2016JpGU), we carried out a faunal analysis of planktonic foraminifera from the sediment core TB2 obtained near the Chiba section, which has been focused as a candidate site of GSSP for the early--middle Pleistocene. As a result, warm species such as *Globoconella inflata* sharply increased at approximately 0.77 Ma in MIS19. It suggests that the faunal change might be caused by a latitudinal migration of the Kuroshio front at this horizon. However, such faunal change might also be caused by some of local factors including tectonic barriers of water mass. We need additional datasets of other sections in and around Japan to reconstruct the time-space distribution of the faunal change.
In this study, we used core samples of IODP Site C0001 drilled off the Kii Peninsula. The present oceanographic setting at the study site is nearby the northern edge of the Kuroshio domain associated constantly with a cold eddy. A total of 47 samples were collected for this study from cores 6H-2 to 5H-6 at an interval of 10 cm (about 1.7 ka in time resolution). Age of each sample was determined by the oxygen isotope stratigraphy. According to the results, we have significantly observed two peaks of *G. inflata* in MIS19. The temporal distribution pattern in relative abundance of *G. inflata* at Site C0001 is similar to that at TB2. With respect to the current age model of Site C0001, the faunal change of this site might be slightly delayed from that of TB2.

Keywords: planktonic foraminifera, paleoceanography, Pleistocene, MIS19

©2017. Japan Geoscience Union. All Right Reserved.

Oxygen isotope stratigraphy in the lowest part of the Higashinagata Formation, Toyofusa Group, southernmost part of the Boso Peninsula

*Hasegawa Daisuke[1], Makoto Okada[1], Yuki Haneda[2], Yousuke Hiraoka[1]

1. Ibaraki University, 2. Graduate School of Science and Engineerring Ibaraki University

The Kazusa, Inubo and Toyofusa Groups, distributed in the Chiba prefecture, are Lower –Middle Pleistocene marine successions. It is possible to reconstruct spatial paleo environmental variations during the Early-Middle Pleistocene period by comparing of those formations.
The present sea water off the Boso Peninsula area consist of the Mixed water of the Oyashio and Kuroshio currents. Therefore, this sea area is thought to be a sensitive region against the northern and southern shifts of the Kuroshio front responding to the climatic change.
The Toyofusa Group is distributed in the southernmost part of the Boso Peninsula. Magnetic stratigraphy and biostratigraphy of planktonic foraminifers were constructed at the Toyofusa Group (Kotake et al.,1995). Some tephra beds of the Toyofusa Group were correlated to those of the Kazusa Group (Kotake et al.,1996, Urabe,1997).
However, Oxygen isotope stratigraphy has not been constructed. The lowest part of the Higashinagata Formation, the lower most Formation of the Group, is especially important to investigate, because the Matuyama –Brunhes geomagnetic reversal boundary situated at the bottom of the Formation will provide a direct correlation with the Kazusa Group.
The purpose of this study is reconstruction of oxygen isotope stratigraphy in the lowest part of theHigashinagata Formation. In addition I reconstruct paleo environments based on the analysis using planktonic foraminiferal assemblages.
I carried out oxygen isotopic analyses by using benthic foraminiferas, *Uvigerina* spp. and planktic foraminiferas, *Globigerinoides ruber* and *Globorotalia inflata*. The resultant oxygen isotopic curve was correlated with that of Kokumoto Formation, Kazusa Group (Haneda et al.,2016). As a result, the age of this studied sequence was deduced to correspond to a period between 776ka and 756ka. At the correlation point, the Benthic foraminiferal oxygen isotopic ratio in the Higashinagata Formation was 0.49‰ heavier than that in the Kokumoto Formation. In terms of water temperature, the Higashinagata Formation was deposited under 2.0 ℃ lower than the Kokumoto Formation. This means that the paleo-depth of the Higashingata Formation is deeper than that of the Kokumoto Formation.
The average oxygen isotopic ratio of *Uvigerina* spp. is 4.23‰ heavier than that of *G.ruber* in the Higashinagata Formation, indicating that the bottom water temperature was 16.9℃ lower than the surface water at the depositional time. Assuming that the past vertical structure of sea water temperature, when the Higashinagata Formation was deposited, was same with the current one, the paleo-depth can be estimated as about 1000m
I described planktonic foraminiferal assemblages, in which 18 species and 7 genera were recognized from the 7 samples. I reconstructed the sea surface temperature (SST) by using the assemblage data with the Transfer Function PFJ-125 (Takemoto and Oda, 1997, Niimura et al., 2006). The annual mean SST exhibits a fluctuation between 16.9℃ and 20.5℃, which is slightly lower than the present water temperature around the Boso Peninsula. The reconstructed SST shows a decreasing at the horizon of 3m due to a Kuroshio weaking
As a future study, it is possible to reconstruct a spatial shift of the water masses by conducting similar studies in the Kazusa and Inubo Groups.

©2017. Japan Geoscience Union. All Right Reserved.

©2017. Japan Geoscience Union. All Right Reserved.

Biostratigraphy of calcareous nannofossils and inferred sea surface conditions around the Brunhes–Matuyama Boundary of the Kokumoto Formation, Kazusa Group, distributed in the Boso Peninsula, central Japan

*Koji Kameo[1], Yuki Haneda[2], Yoshimi Kubota[3], Yusuke Suganuma[4], Makoto Okada[2]

1. Department of Earth Sciences, Faculty of Science, Chiba University, 2. Graduate School of Science and Engineering, Ibaraki University, 3. National Museum of Nature and Science, 4. National institute of Polar Research

A Pleistocene formation, the Kokumoto Formation of the Kazusa Group, widely distributes in the middle part of the Boso Peninsula, central Japan. The formation exposed in the Chiba composite section is one of the GSSP (Global Boundary Stratotype Section and Point) candidate for the lower/middle Pleistocene boundary as same as two other candidates, Montalbano Jonico and Valle di Manche sections (e.g., Ogg et al., 2016). The Kokumoto Formation in the section includes a clear boundary of the Brunhes-Matsuyama geomagnetic boundary (MBB) and thus, a lot of chronologic and/or chronostratigraphic studies in the formation have been done (e.g., Suganuma et al., 2015). Recently, paleoenvironmental and paleoceanographic studies have also performed in order to clarify past sea surface conditions, land vegetation, and related paleoclimatic changes during this time around the Northwestern Pacific region (e.g., Haneda et al., 2016). This study added some new calcareous nannofossil data to Kameo et al. (2016) and discusses nannofossil events around the MBB and sea surface conditions, especially temporal and spatial changes of the Kuroshio Current, one of the major sea surface currents around Japanese Islands. Approximately 60 mudstone samples were examined in the middle part of the Kokumoto Formation and well-preserved, abundant calcareous nannofossils were obtained. At least fifteen genera and 16 species are observed throughout the examined section but no characteristic changes of nannofossil occurrences are observed. Even though any last and/or first occurrences of specific species were not detected, larger *Gephyrocapsa* specimens are characteristically found in the upper part of the examined formation. Their occurrences might correspond to the presence of larger specimens of *Gephyrocapsa* sp. C (Matsuoka and Okada, 1990), and/or *Gephyrocapsa* sp.3 (Rio et al., 1990). It means that the base of occurrence of larger forms of *Gephyrocapsa* sp. 3. can be a possible biohorizon near the MBB. At the same time, some environmental nannofossil indicators near the Japanese islands, were characteristically found. *Florisphaera profunda*, a lower photic taxon that preferred stable sea surface conditions (Ahagon et al., 1993), and *Umbilicosphaera sibogae*, a Kuroshio water taxon (Tanaka, 1990) became abundant after the boundary of the MIS 20/19. It suggests that the northward penetration of the Kuroshio Current occurred after 790 ka. Moreover, some local upwelling events in the basin might be estimated because an upwelling indicator, *Coccolithus pelagicus braarudii*, was occasionally observed after the boundary of MIS 20/19.

References

Ahagon et al., 1993, Marine Micropaleontol., 22, 255-273., Haneda, Y., 2016, Abst., Paleosciences Soc., 2nd annual meeting, 24., Ogg et al., 2016, A Concise Geologic Time Scale 2016, 236 pp., Kameo et al., 2016, Abst. 166th Regular Meeting, Palaeotological Soc., Japan, 39., Rio et al., 1982, Int. Repts. DSDP, 68, 325–343., Suganuma et al., 2015, Geology, 43, 491-494., Tanaka, Y.,1991, Sci. Rep., Tohoku Univ., 2nd ser. (Geol.), 61, 127-198.

Keywords: Calcareous nannofossil biostratigraphy, Chiba composite section

©2017. Japan Geoscience Union. All Right Reserved.

©2017. Japan Geoscience Union. All Right Reserved.