Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SGL38-01 Room:102B Time:May 25 10:00-10:15

The Chiba composite section (a candidate of the L-M Pleistocene GSSP): recent advances and future perspectives

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In the Chiba composite section, along the Yoro, Yanagawa, and Kogusabata rivers in the Bozo Peninsula, the Kokumoto Formation (Kazusa Group) represents an expanded and well-exposed sedimentary succession across the Lower-Middle Pleistocene boundary. The predominant silty beds of the Chiba composite section are intensely bioturbated and lack evidence of episodic deposition such as slumps or muddy turbidites, which interpreted to be hemipelagite formed by deposition of fine-grained suspended material under stable and calm bottom-water conditions. High-resolution oxygen isotope stratigraphic studies for the Kokumoto Formation reveal that a continuous sedimentary record from MIS 21 to MIS 18, with extremely high sedimentation rates up to 200 cm/kyr. The Matuyama?Brunhes boundary (MBB) is clearly observed at immediately above the widespread Byk-E tephra bed. A high-precision U-Pb zircon age of 772.7 $\pm$ 7.2 ka for the tephra coupled with the oxygen isotope chronology provides a highly accurate MBB age of 770.2 $\pm$ 7.3 ka. This MBB age is consistent with the latest MBB ages from high-resolution marine sediments and an Antarctic ice core. Because the MBB customarily serves as the primary guide for the Lower?Middle Pleistocene Subseries boundary, the Chiba composite section is considered an excellent candidate for its global boundary stratotype section and point (GSSP). For a better chronological constraint and global correlation of the section, more detailed magneto- and oxygen isotope stratigraphy will be obtained. And also, analyses of Mg/Ca in foraminifera and pollen assemblage will be carried out for a high-resolution paleoclimatic reconstruction during MIS 19.

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SGL38-02 Room:102B Time:May 25 10:15-10:30

Litho-stratigraphy and sedimentary environment of upper part of Kokumoto Formation with the L-M Pleistocene boundary

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The Lower-Middle Pleistocene Kazusa Group, deposited on bathyal-shelf in the Pacific Ocean with micro fossil, distributes widely in Boso peninsula. The group exposes continuously along Yoro river, Chiba section. The Kazusa group consists of Kurotaki formation (mainly tuffaceous gravelly sandstone), Katsuura formation (mainly alternation of sandstone with slump bed), Namihana formation (mainly siltstone with slump bed), Ohara formation (muddy alternation of sandstone and siltstone), Kiwada formation (muddy alternation of sandstone and siltstone with slump bed), Otadai formation (alternation of sandy alternation and muddy alternation of sandstone and siltstone), Umegase formation (mainly sandy alternation of sandstone and siltstone), Kokumoto formation (alternation of thick siltstone and sandy alternation of sandstone and siltstone), Kakinokidai formation (sandysiltstone with sandstone), Chonan formation (alternation of thin sandstone and thin siltstone) in ascending order. Total thickness of the Kazusa Group is over 2,000 meters with over 50 marker tephra. Depositional rate of it is rapid, about 2 m/kyr. So Chiba section have high potential for international stratotype section.

Kokumoto formation, about 350 meter thick, is composed of lowermost part, lower part, upper part and uppermost part in ascending order. Lowermost part, about 60 meter thick, consists of thick siltstone with thin sandstone bed and marker tephras, Ku6 and ku5. Lower part, about 120 meter thick, consists of sandy alternation of sandstone and siltstone with Ku3 tephra. Upper part, about 80 meter thick, consists of thick siltstone without slump bed and with thin sandstone and marker tephra (Byakubi zone (Byk-E, Byk-D, Byk-C, Byk-B, Byk-A), Tap-B, Tap-A, Tas-C, Tas-B, Tas-A, Ku2). The Matuyama?Brunhes boundary is in Byk zone. Uppermost part, about 90 meter thick, consists of sandy alternation of sandstone and siltstone with Ku0.1 tephra.

The upper part, thick siltstone, is interbedded with thin, 1-3cm thick, sandstone every 0.3-3 m thick and thin, 1-5 cm thick, sandysiltstone every 0.1-0.25 m thick without slump bed and thick mudflow bed. The siltstone have bathyal and sublittoral benthic foraminifera and many trace fossils. Grain size distribution in the siltstone have bimodal grain group. Main grain group is composed of fine silt and sub group consists of very fine sand. These characteristics show hemipelagic sedimentary environment in deep sea and very fine sand flow often into, namely deep sea slope.

Keywords: GSSP, The Lower-Middle Pleistocene boundary, Kokumoto Formation, Kazusa Group, Tabuchi section

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SGL38-03 Room:102B Time:May 25 10:30-10:45

Ichnofossils and ichnofabrics of the Kokumoto Formation, Kazusa Group: Depositional environment and benthic paleoecology

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In the Tabuchi section, along the Yoro river in the Boso Peninsula, the Kokumoto Formation (Kazusa Group) represents an expanded well-exposed, continuous marine succession across the Lower-Middle Pleistocene boundary. Since the Tabuchi section contains the Matuyama-Brunhes boundary whose age was highly accurately constrained, it is considered as a candidate for the Global Boundary Stratotype Section and Point (GSSP). In addition, due to the high sedimentation rate and continuous deposition, the Kokumoto Formation is suitable for high-resolution paleoenvironmental studies. However, paleoecological studies of the formation are very few, responses of marine organisms to paleoenvironmental changes remain unclear. Therefore, this study systematically described the trace fossils and ichnofabrics of the Kokumoto Formation of the Tabuchi section. Twelve ichnogenera and another indeterminate U-shaped burrow were recognized from the silty beds of the formation, which are typical components of ichnofacies characterizing the bathyal zone (i.e. *Zoophycos* ichnofacies). In addition, no graphoglyptid trace fossils, which commonly occur in abyssal plain environments, were observed. Based on the trace-fossil assemblage combined with other sedimentological features, it is most likely that the silty beds of the Kokumoto Formation were deposited in a continental slope setting. Furthermore, two types of ichnofabrics were identified, which are *Phycosiphon*-dominated ichnofabric (*Phy* ichnofabric) and *Chondrites-Planolites-Thalassinoides* ichnofabric (*Ch-Pl-Th* ichnofabric). Observation of the thin-sliced slabs revealed the distinctive stratigraphic changes of these two ichnofabrics; namely, both the *Phy*-ichnofabric and *Ch-Pl-Th* ichnofabric occur in the lower and upper part of the Tabuchi section, whereas the *Ch-Pl-Th* ichnofabric is exclusively recognized in the middle part. The vertical change in ichnofabrics is not correlated with changes in sedimentation rate. Instead, the ichnofabrics are well correlated with changes in benthic-food contents, which are estimated by the results of high-resolution XRF analysis. In particular, the lower and upper parts of the Tabuchi section, which are characterized with the presence of *Phy*-ichnofabric, are synchronized with food-poor intervals. Since the *Phycosiphon*-producer is regarded as a grain-selective deposit feeder, which may have effectively ingested organic matter, it is reasonable that the *Phy*-ichnofabric occurs only in food-poor intervals.

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SGL38-04 Room:102B Time:May 25 11:00-11:15

Lower - Middle Pleistocene Boundary at Chiba Section and istribution situation of Byk zone, central Japan(part2)

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Kazusa group distributed in the Ichihara City southern part, Chiba Prefecture, is composed of Umegase formation, Kokumoto formation, Kakinokidai formation. Kokumoto formation in the geological structure of N67-69E 7- 9N, and the tilt direction falling direction of Yoro River is substantially coincident. Kokumoto formation is 4 divided by facies, massive mud layer, sand layer rich sand layer and mud layer alternated layers (sand layer:mud layer=10:1-6:4), equivalent sand and mud alternated layers(mud layer:sand layer =4:6-6:4), mud layer rich sand layer and mud layer alternated layers(mud layer:sand layer=10:1-6:4), massive sand layer. And Kokumoto formation is divided 4 parts (uppermost part: sand layer rich sand layer and mud layer alternated layers, upper part: massive mud layer,middle part: sand layer rich sand layer and mud layer alternated layers, lower part: massive mud layer). The Brunhes / Matuyama chron boundary (B / M boundary) is confirmed in Byk zone, at upper part base of Kokumoto formation. This location is Chiba section. Byk zone is divided 5 tephras (Byk-A: off-white silt grain volcanic ash and fine sand grain scoria, Byk-B and Byk-C and Byk-D: medium sand grain scoria, Byk-E: white silt grain volcanic ash). Byk-E is identified as a conventional TNTT. Byk zone (Byk-A - E) has also been confirmed in Koshikiya River east of Yoro River, and Byk zone is distance Byk-A and Byk-E with a deposition rate change of the side. Distance of Byk-A and Byk-E is 3.5m at Yoro River location(Tabuchi Section of Chiba Section), and distance of Byk-A and Byk-E is 3.0m at Koshikiya River location(Koshikiyagawa section of Chiba section). From the measured value, Tabuchi section is faster deposition rate than Koshikiyagawa section in Chiba section.

Keywords: Byk zone, Lower-Middle Pleistocene Boundary, Kokumoto Formation upper part, Yoro River, Chiba Section

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SGL38-05 Room:102B Time:May 25 11:15-11:30

Discrimination of primary remanent magnetization during Matuyama-Brunhes polarity transition

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We report preliminary results of magnetostratigraphy from an outcrop in Boso Peninsula, which is considered to record Matuyama-Brunhes polarity transition. The outcrop is ?4m height, facing west and situated along a roadside in Terasaki, Chiba Prefecture, Japan. The sediment mainly consists of massive silt of Kokumoto Formation, Kazusa Group. The outcrop shows several tephra layers including TNTT (Byk-E) residing close to Matuyama-Brunhes polarity transition (Okada and Niitsuma, 1989).

In order to identify the polarity of primary remanent magnetization recorded, we have taken 55 paleomagnetic drill cores at intervals of 1?10 cm. Progressive alternating field demagnetization (PAFD) was conducted on all the sub-samples taken from the drill cores. The higher coercivity (>?20 mT) magnetization component has mostly positive inclination (normal polarity) and shows a swing to negative inclination (reversed polarity) at 76-91 cm below TNTT. Preliminary results of progressive thermal demagnetization shows sharp drop in remanent magnetization by heating up to 175 ℃. By heating above 175 ℃, magnetization decreases gradually up to 300-350 ℃ and becomes unstable above 300-350 ℃.

In order to understand the origin of instability during heating to 30-350 ℃, we have conducted progressive thermal demagnetization in combination with isothermal remanent magnetization acquisition. The results suggest the presence of (titano-)magnetite and greigite, and the production of magnetic mineral during heating above 200-350 ℃ in the laboratory.

Combination of thermal remanent magnetization up to 200 ℃ and further AF demagnetization was conducted in order to extract primary remanent magnetization hidden by the strong secondary magnetization and thermal instability, however, the extraction of primary remanent magnetization was not successful. Further improvements in demagnetization might be pursued to clarify the magnetization at the time of deposition free from later diagenesis.

Keywords: Matuyama-Brunhes polarity transition, thermal demagnetization, alternating field demagnetization, low temperature demagnetization, primary remanent magnetization, greigite

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SGL38-06 Room:102B Time:May 25 11:30-11:45

Matuyama-Brunhes magnetic polarity transition from a sequence of the Kokumoto Formation drilled at Tabuchi, Ichihara

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A detailed Matuyama-Brunhes transition was revealed from a 54-m oriented core of the Kokumoto Formation drilled at Tabuchi, Ichihara, Chiba Prefecture, central Japan. The core mainly consists of silts except the lowermost part intercalated with thin sand layers. For magnetic analyses, we prepared one meter long u-channel samples from 3 to 52 m depth, and discrete samples of 10 cc cube at 10 cm to 1 m intervals. Magnetizations were measured every 1 cm using a 2G cryogenic magnetometer for u-channel samples and subjected to alternating field demagnetizations (AFD), while both AFD and thermal demagnetizations were used for discrete samples. Preliminary oxygen isotope data on planktonic foraminifera (*Globorotalia inflata*) suggest that the main MB polarity boundary, just underlain by the Byakubi-E tephra layer, lies between the sea-level highstand of marine isotope stage (MIS) 19.3 and the MIS 19.2 lowstand. Characteristic remanent magnetizations of u-channel samples calculated by principal component analysis reveal a rapid reversal interval (RRI), a very important feature characteristic of the final stage of the MB transition, which lies between depths correlated with the MIS 19.3 highstand and MIS 19.2 lowstand. The RRI spans about 1.7 m in depth, during which the virtual geomagnetic pole crossed the geographic equator 11 times. A preliminary astronomical age model suggests that the RRI was ca. 2 kyr in duration, predating 776 ka and postdating 779 ka. The RRI can be correlated with similar intervals observed in the Osaka Group, Chinese loess-paleosols, and deep-sea sediments. The RRI incorporates both the MB boundary and the Byakubi-E tephra in the Chiba section. This has important implications for the definition of the Early-Middle Pleistocene boundary. Other MB transition features, including paleointensity variation, will be discussed together with the results from discrete samples.

Keywords: Matuyama-Brunhes polarity transition, Kokumoto Formation, Eraly-Middle Pleistocene boundary, Chiba Section, GSSP

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SGL38-07 Room:102B Time:May 25 11:45-12:00

Revised Matuyama-Brunhes polarity transition record from a marine succession at the Chiba composite section

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We report revised paleomagnetic records of the Matuyama-Brunhes (M-B) polarity transition from a continuous marine succession at the Chiba section of the Kokumoto Formation, Kazusa Group. The Chi-ba section is the one of the candidate sites for the Lower-Middle Pleistocene Boundary GSSP. An age model for the section, provided by newly obtained oxygen isotopes of benthic foraminifera from a 100 meters succession across the M-B boundary, indicates that the boundary is situated in the interglacial per-iod of MIS19. We have taken 130 oriented mini-cores from a 13 meters succession across the Byk-E tephra bed at the Chiba section and the Yanagawa section. Thermal magnetic experiments suggest that the samples include iron sulfides, magnetites but no hematite. Measurements of magnetic hysteresis indicate that the magnetic domain state is PSD. Progressive alternating field (AF) demagnetization indicate a re-versed to normal polarity transition boundary is at around 1.5 meter below the Byk-E bed as well as pre-vious studies, however the transition boundary is observed at around 1 meter above the Byk-E bed in thermal demagnetization results. Therefore, the reversed to normal polarity transition boundary seen be-low the Byk-E bed is thought to be overprint. This overprints, which might be carried by iron sulfide, are particularly observed in a transitional interval. The virtual geomagnetic pole (VGP) latitudes and prelimi-nary derived paleointensities using thermal demagnetizations from the Chiba section quite match well with the U1308 records. We will show globally comparable VGP and paleointensity records during the M-B polarity transition at the Chiba section.

Keywords: Chiba section, M-L Pleistocene boundary GSSP, Paleomagnetism, Matuyama-Brunhes boundary

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SGL38-08 Room:102B Time:May 25 12:00-12:15

Mg/Ca-based temperature variations across the L-M Pleistocene Boundary in the Chiba composite section, central Japan

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The Kuroshio Current, a western boundary current in the North Pacific, transport warm saline waters from low- to high-latitude and thus plays a crucial role in heat transport in the mid-latitude. Around 0.8 Ma, near the L-M Pleistocene boundary corresponding to the Matuyama-Brunhes boundary (MBB), is the one of the key time period to understand initiation of 100-kyr glacial-interglacial climate cycle. The Chiba composite section, including the Tabuchi section as a L-M Pleistocene boundary GSSP candidate, is a continuous marine sedimentary succession exposed in the Boso peninsula, central Japan. The MBB is well defined based on virtual geomagnetic pole (VGP) latitudes in this section and an age model is determined based on benthic foraminiferal oxygen isotope record. The site of this section (35^{o}N) is located in the mixing zone (35^{o}N - 40^{o}N at present) of warm Kuroshio and cold Oyashio waters. Thus, temperature changes in the site can be interpreted as reflecting the latitudinal shift of the Kuroshio-Oyashio boundary, which could be related to the Kuroshio variations and also impact on the heat transport in the mid-latitude. Here, we present Mg/Ca records of planktic foraminifera *Globigerina bulloides* and *Globorotalia inflata* in the Chiba section and reconstruct surface and subsurface water temperatures across the Matuyama-Brunhes Boundary. Preliminary results suggest that the average surface temperature was 18-19 ℃ during the time interval from 780-740 Ka. The higher time resolution (∼0.5-1 ky) surface and subsurface water temperatures will be presented and discussed by comparison with the oxygen isotope data.

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SGL38-09 Room:102B Time:May 25 12:15-12:30

A vegetation change reconstruction at around the L-M Pleistocene boundary from a pollen record of the CHOSHI core

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Because the Tabuchi section consisting of the middle part of the Kokumoto Formation is a Lower-Middle Pleistocene (L-M) boundary GSSP candidate, to reconstruct high-resolution pollen records at this part of the formation is quite important. However, Onishi (1969) reported pollen assemblages of the Kokumoto Formation in which that the pollen density is substantially thin and the assemblages were severely distorted as to exhibit a pelagic condition where conifer trees pollens tend to be artificially overrepresented. The objective of this study is to reconstruct a high-resolution pollen records by using the Choshi core, which represents a good pollen data as reported by Okuda et al. (2006) at upper than the L-M Pleistocene boundary. The Choshi core, drilled at Morito-Cho, Choshi City in the Chiba Prefecture, is composed of five formations, the Katori Formation and the Inubo Group consisting of the Toyosato, Kurahashi, Yokone, and Obama Formations. The formations cover Marine Isotope Stages (MISs) from 11 to 25, which across the L-M Pleistocene boundary corresponding to the middle part of the Yokone Formation (Kameo et al., 2006). The position of the L-M boundary in the Yokone Formation can be determined precisely, because stratigraphic correlation between the Yokone Formation and the Kokumoto Formation were studied well. We plan to report a high-resolution pollen record from samples of the core at depths between 150 and 170m, corresponding to MIS 20-18, and will provide a vegetation changes at around the L-M Pleistocene boundary.

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Keywords: Lower-Middle Pleistocene boundary, pollen analysis