

Japan Geoscience Union Meeting 2011

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HQR023-P01

Room:Convention Hall

Time:May 24 14:00-16:30

Holocene sediment of cores from Lake Rara, western Nepal

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Five cores are collected from Lake Rara basin and terrace using piston coring system. These cores are consisted of light gray colored mud and sandy turbidite layers. Sandy turbidites are intercalated periodically among the cores which cover 7500 years by ¹⁴C dating. Constant sedimentation rate of cores shows 50cm/kyr among these 7500 years interval. The average occurrence rate of the turbidites have 800 years interval.

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HQR023-P02

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The Holocene lake level changes at Lake Qarun and Lake Hamura, Egypt

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The joint research project for the inland saline lakes has started with Kyushu university, University of Tokyo and Menoufia University in Egypt. The project is a multidisciplinary research program, focused on the environmental history of the Neolithic and later periods in this region. More in detail, our research is aimed at a high resolution environmental reconstruction in order to make clear the climatic development during the Holocene, and its impact on human societies. We undertook field surveys at inland lakes and Lake Qarun at Fayoum Basin and Lake Hamura at Wadi Natrun in northern Egypt.

The warming and very dry climate could be observed in the data from all our drillings in the early Holocene in Egypt. The three times of fluctuation between arid ? humid environment have occurred after then. The cyclic fluctuation of humidity was also observed in Lake Qarun in Egypt. The lake level of the lake was fell down after the 2200 years BP in the Ptolemaios period , and fluctuated its level with hundreds years intervals.

The above-noted recovery of humidity and its regional variability in the Holocene presumably was one of the major causes for the archaeological events, especially with regard to water availability.

Keywords: Inland Saline Lake, Lake Level Changes, Holocene, Egypt, Diatom, River Nile

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HQR023-P03

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Interactions between human activity and natural environment in arid and semi-arid regions in Central Eurasia

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¹RIHN

The purpose of this paper is to propose the new perspective for the studies on the historical changes of the interaction between human and natural environment in the Central Eurasia.

The Central Eurasia belongs to the arid and semi-arid regions. The ecological environment of this region is characterized by the uneven distribution of the water resources and potential land productivity. When discussing about the historical changes of the interaction between human activity and natural environment in the Central Eurasia, we should give careful consideration to those uneven distribution.

During the 20th century, Central Eurasian people experienced drastic change in their surroundings. Agricultural and industrial development in the Soviet Union had a particularly great influence on the way of use of the natural resources, such as water and land. In this paper, we try to clarify the actual situations of the agricultural development during the Soviet era, in the Ili river basin in the Almaty oblast, Republic of Kazakhstan.

The methods employed in this study included document analysis and interviews. At first, through document analysis, the outline of the formation process and historical changes of the kolkhoz and sovkhos organization are described. Second, that outline is given body and substances through the landscape analysis based on the interview.

Finally, we examine to understand the interaction between human activity and natural environment in arid and semi-arid regions in Central Eurasia, from the view point of the 'possibilism'.

Keywords: Central Eurasia, arid and semi-arid regions, human activity, landscape, environmental history

HQR023-P04

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Middle Holocene abrupt water-level drop of Lake Balkhash revealed by mineralogical analysis of the lake sediments

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Lake Balkhash located in Kazakhstan in the dry area is a terminal lake of the maximum waters area in Central Asia. It is important to evaluate climatic change and the human activity to restore the environment of old Lake Balkhash.

The paleoenvironment of Lake Balkhash of about 10000 years is being restored because through core analysis and acoustic profiling analysis in the Lake Balkhash (Endo et al.,2010).

However, there is only limited study related to mineralogy. In the restoration of the paleoenvironment around the lake, it is important to understand the mineral deposit in Lake Balkhash. In addition, it will be able to supplement the place without microfossils such as pollens and diatoms in mineral analysis.

Powdery diffractometry was used in the present study. Up to now, the mineral analysis has been done to 80 samples (0901 core 40 samples and 0902 core 40 samples) in total for the crushed sample.

Present result showed the presence of quartz, feldspars, calcites, aragonites, dolomites, micas, and chlorites were contained in 0901 cores. It was also confirmed that 0902 cores contained hydro-magnesite, magnesite, and gypsum present in addition to all minerals of 0901 cores. In the present study, attention is paid to quartz, feldspars in 0901 cores, and magnesite and gypsums in 0902 cores.

Magnesite is generated from the environment with an extremely high Mg/Ca ratio in water (Last,1992). That is, the maximum peak of the magnesite confirmed by 0902 cores suggests the decrease under the evaporation environment in the lake level. In addition, the gypsum confirmed by the same depth is one of the typical evaporites generated with the evaporation environment. It provides an evidence to support the drawdown. 0901 cores also have the coarse-grained sediment. It was confirmed that a lot of quartz and feldspars existed from the mineral analysis in the same depth. In a word, it is suggested that this coarse-grained sediment be a land source material. Moreover, there are white silt in upper and lower 0901 cores and 0902 cores. When this sedimentary facies is compared, the gypsum horizon in 0902 cores is corresponding to the coarse-grained sedimentary facies of 0901 cores. Concerning that the AMS-14C ages of the shell and plant material within the coarse sedimentary unit of 0901 show around 5.5 ka (Sugai et al., 2010), We conclude that the water level of Lake Balkhash markedly decreased in the middle Holocene.

Keywords: Lake Balkhash, X-ray Diffraction, sediments mineralogy, Holocene, lake level fluctuation

HQR023-P05

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Sand dunes formation and development in Ili-River delta and Lake Balkhash area, Kazakhstan

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1. Research background

The Subjects of this study is about the relationship between environmental change and sand dune formations in Saryyesik Atyrau Desert, South-East Kazakhstan. Environmental change of the desert is closely related to those in Lake Balkhash and Ili River delta. The 'ILI-PROJECT' members have been studying environmental changes in Lake Balkhash and Ili River delta during Pleistocene to Holocene (Kubota,2010;Endo et al,2010a;Endo et al,2010b). Some researches, acoustic survey and boring in Lake Balkhash (Haraguchi et al, 2010), analysis of lake sediment (Sugai et al, 2010), diatom (Chiba et al, 2010), river terrace sediments and the ¹⁴C dating at Lepsy River (Sugai et al, 2010), analyses for meander wavelength of Ili River and the paleochannel (Shimizu et al, 2010), and ¹⁴C dating about the sediments (Shimizu et al, 2011) have been conducted. Dune formations and patterns show important factors about paleoclimate and paleoenvironment in arid area (e.g. Lancaster, 1995). In case of this study, research for sand dune patterns, stratigraphical relation of sand dunes and fluvial sediments, and age determination of those, are investigated. On the basis of the results we will discuss the lake level change, arid condition about paleo ili River delta, paleoenvironment and paleoclimate in central Asia.

2. Classify of Ili River delta and Sand dune pattern

In this study area, the annual precipitation is about 150mm. Ili River delta are classified into alluvial plain and some paleo-delta plain(T1: high terrace covered with sand dunes, T2 and T3: paleochannels running to north) (Shimizu et al, 2011). In T1 delta, main sand dune pattern are running NW-SE and also NE-SW direction (crossed pattern). These are composed of Draa(mega-linear dune: length:30km over, height:50m over, wavelength:1km over) are developed in the south desert. At the estuary of Aksu River, the southern coast of Lake Balkhash, there are NE-SW linear dunes partially submerged. Sand dunes in T2 paleo-delta covered paleochannel. Small vegetated Sand dunes in T3 paleo-delta before 13th C are developed (Shimizu et al, 2011).

3. Prevailing wind directions at present

Surface wind direction (influenced by the prevailing wind) is principal factors of the sand dunes pattern. The observatory data in wind direction indicate mainly NNE-NE(55%) and SW-SSW(12%) at Balkhash city (Northern coast of Lake Balkhash), NNE-NE-ENE(71%) at Bakanas(center of Ili River delta). In winter season, the temperature and wind direction shows strong cold air supplied from NE-NNE, and the origin of the wind is considered to be 'Siberian high'. We need more researches for understanding about the relationship between present wind direction and sand dunes pattern.

4. Paleoenvironment changes from sand dune studies

The Crossed Draa patterns covering T1 paleo-delta, suggests shift of paleo-wind directions after T1 paleo-delta. The OSL dating result, from the upper part of a linear dune partially submerged at the estuary of Aksu River, shows about AD 200 (Endo et al, 2010a), matching to the reduced phase of Lake Balkhash from studies of the lake sediments. In the lake shrinking phase, dry-up lake bottom might have provided aeolian sand to form the linear dunes. The small dunes in T3 paleo-delta, show that the condition in dune formation has continued after 13th C. But most of sand dunes are 'inactive' or 'vegetated' at present. It suggests that those inactive or vegetated dunes had been formed under the past conditions of higher aridity and stronger wind. The presentation will discuss using more climate data and analysis of geomorphology.

Reference..Chiba et al (2010):Abs.JAQR.40.16-17..Endo et al(2010a):Abs.JGUM. HQR010-12.. Endo et al (2010b):Ili Project, 93-104.. Haraguchi et al (2010):Abs.JGUM.HQR010-10.. Kubota et al(2010): Abs.JGUM.HQR010-09.. N.Lancaster (1995):228-254.. Shimizu et al(2010):Abs.JAQR.40.14-15..Shimizu et al(2011):Abs.AJG.100240.. Sugai et al (2010): Abs.JAQR.40.82-83..

Keywords: sand dunes, Draa, wind direction, Ili-River delta, Lake Balkhash

HQR023-P06

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Optically stimulated luminescence dating of sediments from the Lake Balkhash area, Kazakhstan

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The lake level of Lake Balkhash of Kazakhstan has been fluctuated by the changes in the hydrological and/or climatic environments through the Late Quaternary. It is thought that some landforms have been formed in response to the lake level changes of the Balkhash. However, only a few numerical ages have been obtained from the landforms and sediments from the area, and the lack of the age constraint has prevented studies of precise geomorphic development and terrestrial paleoenvironmental reconstruction. This study applied the optically stimulated luminescence (OSL) dating to fluvial terraces, sand dunes, and gravel bars around Lake Balkhash in order to establish their chronology. Twenty samples for OSL dating were taken from nine localities. The emerged gravel bars are especially important landforms, because they are the direct indicators of higher lake levels than the present Lake Balkhash. Along the lower reach of the River Repsy which flows into southeast shore of Lake Balkhash, fluvial terraces are classified into at least three surfaces (lower, middle, higher terraces). The middle surface occupies the broadest area among these terraces.

Fine grain quartz was extracted from all samples. The OSL measurements of these quartz samples were conducted by using the single aliquot regenerative-dose (SAR) protocol to calculate equivalent dose (D_e) values. The dose rates of the samples were calculated from U, Th and K concentrations which were obtained by neutron activated analysis.

The results of the OSL dating indicate that one of the gravel bars from the lakeshore was formed at 24.5 ka, and the formation of the fluvial middle terrace had occurred at 9.1 ka. Three OSL ages obtained from the lower and the middle fluvial terrace deposits were in agreement with calibrated AMS¹⁴C ages from nearby the OSL samples, which supports that the OSL ages in this study are reliable. In addition, the age of emerged gravel bar (24.5 ka) indicates that the lake level of the Balkhash had been higher during the Last Glacial Maximum. All these chronological data will contribute significantly to the reconstruction of the paleoenvironment in the Lake Balkhash area.

Keywords: Lake Balkhash, gravel bars, fluvial terraces, sand dunes, OSL dating

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A trial of grasping development of fluvial terraces and hills using OSL dating in Hanno area, Saitama Prefecture

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In Hanno area of Saitama in eastern Japan, fluvial terraces and hills distribute broadly, but detailed dating data and information corresponded with climatic change are only a few. The aim of this study is classification of the river terraces, and establishment of the stratigraphy to elucidate the development of terraces of Late Quaternary in Hanno area. In this area, aeolian deposit known as Kanto Loam, covered terraces and hills thickly. Therefore we applied the OSL dating to aeolian deposit to establish the chronology of Kanto Loam and fluvial landforms. Recently, OSL dating has been expected and applied to elucidate the age of various sediments. We tried to clarify the development of terrace and hill topography using OSL dating in Hanno area, Saitama Prefecture, Japan.

As a result of the trench survey, upper formation of the Tachikawa Loam and fluvial sandy deposits were cropped out. Near the top horizon, Upper Grassy Ash (UG, 12ka) was found out. The result of OSL dating shows linear trend and parallel to an age-depth line determined tephrochronologically. However the difference between two lines is about 8ka. We need to examine the effect of the source and emplacement process of fine-grained quartz, for example volcanic origin, reworking process, etc.

Keywords: Iruma river, fluvial terraces, hills, aeolian deposit, OSL dating, tephra

HQR023-P08

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Exposure age of cirque wall and cirque bottom of Nogaïke Cirque and Komakainoike Cirque: estimates from cosmogenic Be-10

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This study revealed exposure ages of blocks on cirque wall and cirque bottom of Nogaïke Cirque and Komakainoike Cirque near Mt. Kiso-komagatake in Central Japanese Alps, using TCNs (Terrestrial Cosmogenic Nuclides). TCNs enable us to know how long rock surfaces have been exposed on the ground. Formation age of cirque has been estimated from TCN exposure ages of glacial deposits, but disappearance of glacier is not clear. We measured the concentration of ¹⁰Be and ²⁶Al in rocks, using Micro Analysis Laboratory, Tandem Accelerator (MALT), The Univ. of Tokyo. As a result, the concentration of ¹⁰Be ranged from 10⁴ to 10⁵ atoms g⁻¹ (¹⁰Be) and ²⁶Al ranged from 10⁵ to 10⁶ atoms g⁻¹. Calculated results showed that the upper part of Nogaïke Cirque (NOG-7B and NOG-8B) exposed 4.1-4.7 ka, the lower part (NOG-2B, NOG-3B and NOG-4B) exposed 2.3-6.0 ka, the lower bedrock of Komakainoike cirque (KC-1) exposed 11.8-12.9 ka, the upper bedrock (KC-2) exposed 6.0-7.6 ka, considering with the production rate of ¹⁰Be is 31.6-34.4 atoms g⁻¹ yr⁻¹ and ²⁶Al is 194.2-210.0 atoms g⁻¹ yr⁻¹). These results imply that the cirque glacier had also existed in both cirques between Neoglaciatiion and Younger Dryas Period, not only during Last Glacial Period.

Keywords: cirque, Terrestrial Cosmogenic Nuclides (TCN), exposure age, Accelerator Mass Spectrometry (AMS)

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HQR023-P09

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Sensitivity change of TL signal of quartz extracted from the Lake Biwa1400 m Core sample, Japan.

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Quartz is one of the most common minerals on the Earth and thermoluminescence (TL) signal of quartz is widely used for Quaternary dating in Earth science and Archeology. TL signal in quartz are also used for purposes other than dating. For example, variety of sensitivity change of TL signal of quartz is recorded for quartz crystals of different origins (Takada, 2010), suggesting the possibility for rough estimates of the provenance of sediments. In this study we analyzed TL sensitivity change of quartz grains from the Lake Biwa 1400 meter Core sample, to discuss their chronological background.

(Reference)

Takada M. (2010): Characteristics of 110 degrees Celsius TL signal in quartz from a variety of rocks and sediments: a clue to sediment provenance. *Studies in Geography and Regional Environment Research*, Nara Women's University, VII, 105-112.

Keywords: the Lake Biwa1400 m Core sample, quartz, thermoluminescence signal, sensitivity change

HQR023-P10

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DNA analysis of a single *Pinus* pollen grain in Belukha glacier, Altai Mountains, Russia

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Pollen is a regular component in mid- and low- latitude glaciers since most of them are located within a few ten km from vegetation. In addition, many of the pollen grains contain protoplasm, this suggests that DNA information of the pollen preserved for long periods can be obtained. Modern pollen analysis is used to classify pollen taxon from pollen morphology. Thus, the classification of related species based on the morphology is difficult and limited primarily to plant genus or family. Obtaining DNA information from each single pollen grain in glaciers should allow classification below genus level. It is therefore extremely useful for reconstructions of past vegetation, climate and environment in ice core study. However, no studies have ever tried the detailed classification by obtaining DNA sequence from pollen in glaciers. This study attempted to analyze DNA of a single *Pinus* pollen grain extracted from surface snow taken in Belukha glacier of Russia's Altai Mountains in July 2003. A 149 bp *rpoB* fragment from the chloroplast genome in each *Pinus* pollen grain was amplified using polymerase chain reaction and the DNA products were sequenced in order to classify them at section level. *Pinus* is recognized with approximately 111 species in two subgenera, four sections, and 17 subsections. From the obtained sequences, the pollen grains were classified as sect. *Quinquefoliae* and sect. *Pinus* within four sections namely *Quinquifoliae*, *Parrya*, *Trifoliae* and *Pinus*. *Pinus sibirica* in sect. *Quinquefoliae* and *P. sylvestris* in sect. *Pinus* are currently distributed on the surrounding of the glacier. The consistent results for the section may suggest that the source of the pollen in the glacier is *Pinus* trees found on its surroundings.

Keywords: glacier, pollen analysis, DNA, ice core

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HQR023-P11

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Last glacial vegetation in Kamishiro, north Nagano, Japan

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Plant fossil assemblages in last glacial stage between 35,240yBP and 29,630yBP from Kamishiro, north Nagano, central Japan were studied. Plant macrofossil assemblages from 5 horizons include *Larix kaempferi*, *Picea jezoensis*, *Picea* sect. *Picea*, *Tsuga*, *Abies veitchii*, *Pinus* subgen. *Haploxylon*, *Betula ermanii*, *B. platyphylla*, and *Alnus hirsuta* with herbaceous plants as *Carex*, *Chrysosplenium kamtschaticum*, and *Stellaria alsine* var. *undulata*. In pollen assemblages, *Pinus* subgen. *Haploxylon*, *Abies*, *Picea*, *Tsuga diversifolia* type and *Betula* were dominant. The composition represents typical composition in LGM in central and northeast Honshu. Occurrence of seeds of *Chrysosplenium kamtschaticum* with pollen of *Abies homolepis* type indicates that the refugia of temperate plants had been distributed in mesic places in subarctic coniferous forest under cold and dry climate in last glacial maximum inland Honshu.

Keywords: plant macrofossil, last glacial, refugia, pollen analysis

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HQR023-P12

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Environment and paleobiology based on diatom analysis in Kanto plain during Jomon Transgression

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In the Kanto plain, sea water entered into the area of Tokyo Lowland about 10,000 years ago. Around the maximum stage of the Jomon Transgression the coastline was 60km inner than the present. On the basis of diatom analysis, environmental change was investigated mainly using cores in Misato city. This area around Misato at about 9,000 cal.y.BP were tidal to shallow inner bay, then changing to wide inner bay, Oku-Tokyo bay, corresponds to Jomon transgression. About 8,500 cal.y.BP marine plankton species of *Paralia sulcata* was dominant to show from outer bay to inner bay. From 8,500 to 7,500 cal.y.BP, *Crassostrea gigas* of Oyster reef formed, showing wider inner bay. From 7,500 to 5,500 y.BP, Oku-Tokyo Bay was in the maximum stage, and from 5,300 y.BP the regression stage started (Endo *et al.*,1983;Kosugi,1992). Around 4,000 ~ 3,500 cal.y.BP, the coastline situated near Misato, and tidal flat distributed.

Keywords: Jomon Transgression, Diatom, Oku-Tokyo bay

HQR023-P13

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Holocene relative Sea-level Changes in Sekiyado lowland, Japan

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Paleo Kinu bay has formed on lowlands located along the middle to lower reaches Tone river during the Holocene transgression (called the Jomon transgression) period (Endo et al., 1983). Moreover, in Holocene, many shell mounds were made by Jomon and Yayoi people in coastal areas of this bay. So far Kashima lowland (Kikuchi, 1969; 1988), Takagami lowland (Ota et al., 1985; Kashima et al., 1985), Kinosaki lowland (Sugihara et al., 1997; 2000) and lake Kasumigaura (Saito et al., 1990) were surveyed for paleo environmental changes by the Jomon transgression. However, timings and details of paleo sea level changes by the Jomon transgression is not emerged in paleo Kinu bay during Holocene.

In order to reveal the timings and details of sea level changes in paleo Kinu bay during Holocene, we have basically analyzed 4 cores, and drawn Age-depth and sea level curve. The results are as follows;

Stage 1 (about 12000-7000 cal yrBP) : the Jomon transgression occurred and the sea level rose from -25m to +2.5m (Masubuchi 2010). In this period, however, two small regressions (about 8500 cal yrBP and 7500 cal yr BP) are recognized.

Stage 2 (7000-4000 cal yrBP) : sea level fell from +3m to 0m gradually.

Stage 3 (4000-2500 cal yrBP) : sea level fell and reached its the lowest stand (about -2m) during 3000-2500 cal yr BP.

Stage 4 (2500 cal yrBP-) : sea level rose from -2m to 0m

These three regression events (about 8500, 7500, and 3000-2500 cal yrBP) consistent with the colder stage in 8200 cal yrBP, the colder stage in 7400cal yr BP, and the Yayoi regression, respectively (Koizumi and Sakamoto, 2010). In addition, the tide range in this bay is estimated at least a range of plus/minus 4m from diatom analysis during Holocene.

Keywords: Relative sea level change, Holocene, Paleo kinu bay, Sekiyado lowland, Diatom analysis

HQR023-P14

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Variation in magnetic susceptibility of latest Pleistocene to Holocene succession at Kiso river delta, central Japan

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Applicability of magnetic susceptibility for shallow marine and fluvial sediments is examined based on analysis of latest Pleistocene to Holocene succession. We measured thousands of magnetic susceptibility and grain size distributions for seven drilling cores obtained at Kiso river delta, central Japan.

The cores are drilled at fluvial and delta plains. Deltaic succession contained in the cores is classified into following sedimentary facies, in ascending order: A, braided river; B, flood plain, tidal river and tidal flat; C, bay floor and prodelta; D, delta-front slope and delta-front platform; E, delta plain.

Magnetic susceptibility is measured at 5 cm depth interval using portable magnetic susceptibility meter (SM30, ZH Instruments). Grain size of facies B, C, D and E was measured using laser diffraction particle size analyzer (SALD3000S, Shimadzu Corp.). Detailed age-depth curves of these cores are reconstructed based on densely measured radiocarbon dating.

Profile of magnetic susceptibility change indicates that magnetic susceptibility roughly changes according to sedimentary facies though magnitude of the susceptibility differs among cores. The susceptibility is high at facies B and D, moderate at facies E and low at facies C. Such change appears to be controlled by grain size distributions. It is also recognized that there are lags in timing between change of grain size and magnetic susceptibility.

To evaluate effect of grain size control on magnetic susceptibility, we classified sediments into several clusters by grain size distribution. Ward's method is chosen for clustering operation. Distribution of magnetic susceptibility of each cluster was examined and compared. The median values of magnetic susceptibility increase as median values of grain size increase in case median values of grain size smaller than 0.25 mm (2 phi). In case median values of grain size bigger than 0.25 mm, the values of susceptibility decrease as that of grain size increase.

Variation in magnetic susceptibility among cores and core depth remain in each grain size cluster. These extracted differences should be results of sedimentary processes and backland settings.

Keywords: magnetic susceptibility, grain size, Holocene, Kiso river delta

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Landform development in Tedori river basin and Togatani limestone cave

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*

Keywords: Tedori river, Limestone cave, Landform development, Deepening

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Marine terrace distribution and tectonic geomorphology around the source region of the Rumoi Nanbu earthquake in 2004

Toshinori Sasaki^{1*}, Keiichi Ueta¹, Yasuhira Aoyagi¹, Daiei Inoue¹, Takenobu Tanaka², Masaru Sato², Makoto Yanagida², Norihisa Goto², Hideki Amano³

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To reveal the relation between active fault and earthquake source fault, we have investigated geomorphological and geological survey around the source region of the Rumoi Nanbu earthquake in 2004. In this presentation, we provide the results of high resolution topographic investigation by LiDAR DEM and air photo, and we conclude activity on active fault of this region by boring survey. As a result of topographic survey, we found consecutive tectonic topography which is reverse scarplets on the marine terraces along the coastal line in the 25 km long in N-S direction. The boring survey reveal that the active fault which is formed the reverse scarplets displaces the wetland deposit in the last glacial age.

Keywords: 2004 Rumoi-nanbu earthquake, marine terrace, tectonic geomorphology, DEM investigation, aerial photo investigation, active fault