Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

HQR24-01 Room:201B Time:May 23 09:00-09:15

Climate changes over the last 2-3 kyrs recorded from the lake sediments in the lowland of the Maya, Guatemala

Kazuyoshi Yamada[1*], YOSHITSUGU SHINOZUKA[2], Hitoshi Yonenobu[3], Koji Seto[4], Toshiyuki Fujiki[5], Katsuya Gotanda[6]

[1]Waseda University, [2]Hokkaido University, [3]Naruto University of Education, [4]Shimane University, [5]Fukuoka University, [6]Chiba University of Commerce

We present time-series geochemical and pollen records from sediment cores taken at Lake Quexil in middle part, and Lake Petexbatun and Lake Las Pozas in south part of of the Maya lowland, Guatemala, to reconstruct the climate and vegetation history of the region over the last two or three thousand years.

Three lakes as Lake Quexil, Lake Petexbatun and Lake Las Pozas, are on the Maya Lowland and possess sediments that preserve a highly sensitive record od past environmental changes related to ITCZ migration (e.g. Hodell et al., 2001) and human impacts concerned with the Maya Civilization (Johnston et al., 1998). In Feb 2011, we collected ten ca.4-m-length sediment cores from these three lakes by the Mackeleth core sampler.

Using the cores, we had firstly undertook a series of analysis, e.g., lithological observation, C-14 dating and sequential measurements of physical properties and paleomagnetism. By these analysis, we could build up the stratigraphy and chronology all for the core. Core chronology show that the age of bottom of sediment core of Lake Quexil, Lake Petexbatun and Lake Las Pozas reach up to 2,800, 3,600 and 1,450 cal. Years, respectively.

For reconstructing past climate changes, we measured total organic carbon (TOC), total nitrogen (TN), and total sulfur (TS) contents by CNS element analyzer as well as major and trace elements by ICP-AES with 2.3-cm interval bulk samples through the core. We use the total sulfur (TS) contents and the aluminum (Al) contents as an indicator of relative changes in the ratio of evaporation to precipitation (E/P), and total amount inputs of detritus minerals from the surroundings.

Basically, the fluctuation of TS and Al content for all sediment core has a negative correlation. These proxy records of Lake Quexil and Lake Las Pozas shows that lake level drop were observed at 300-400, around 500, 1700-1900, 2100-2300, 2400-2700 and 3000-3200 cal. years in both lakes, however, around 800 to 1,200 cal. years was occurred only at Lake Quexil. This discrepancy of such periods suggests that climate drought may not affect high evaporation in the south region. It is also clarified that drastic deforestation was observed around 10th century near Lake Las Pozas.

Keywords: lake sediments, Lake Quexil, Lake Petexbatun, Lake Las Pozas, drought, Maya Civilization

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HQR24-02 Room:201B Time:May 23 09:15-09:30

Cambodia, Sedimentary Environment Change at Site of Sambor Prei Kuk

Akiteru Yamasaki[1*], Tsuyoshi Haraguchi[1], Hitoshi Yonenobu[2], Ichita Shimoda[3]

[1]Graduate School of Sciences, Osaka City University, [2]Graduate School of Education, Naruto University of Education, [3]Faculty of Science and Engineering, Waseda University

The ruins of Cambodian Sambor Prei Kuk are ancient city of the seventh century equal to the capital of the Chenla dynasty heyday, and the Chenla dynasty is placed in a development process of the Khmer civilization that built an Angkor Wat for ”the pre-Angkor period”. In these ruins discovered from a dense forest in 1894 by the French, it is performed comparing and drawing conclusions of by epitaphs being the ancient city Isanapura of the Chenla dynasty.

However, the documents are poor about the change that ruins followed to date, and there are many any questions because there is not the study from the field of natural science. In this paper, the ruins of Sambor Prei Kuk which was main site of the pre-Angkor period, I gathered the sediment around the ruins of Sambor Prei Kuk with a core sampler(B-trench spot, SS5 spot, SP5 spot) for the purpose of the paleoenvironmental change of the area after the pre-Angkor period and, tried to reveal from magnetic susceptibility, color, water content, XRF(X-rays fluorescence).

The B-trench spot was originally in the water area, but I was in the middle of becoming the land area, and reaching it at the present, Isanapura was constructed. The SS5 spot did not understand the details of the bottom layer, but the organic matter of wetlands deposited at constant speed, but phosphorus was supplied abundantly on the way and promoted a rise of the bioproductivity strongly. The SP5 spot was thought to be the bathing pond associated with the temple, and there was soil-stratum building soil when it was constructed 1400 years ago and it was maintained as a bathing pond and was water rich through the season. Meanwhile, there was a factor to bring a change in bioproductivity several times and, in the pond, was covered in a short term afterwards.

On the other hand, there were not clear comparison relations and was not able to evaluate the environmental change of the ruins of Sambor Prei Kuk area between the cores of three spots comprehensively. It was thought that sedimentation environment varied according to three core collection spots, and this simply discussed the local sedimentary environment change in this paper.

Keywords: paleoenvironment, sediment, Cambodia

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HQR24-03 Room:201B Time:May 23 09:30-09:45

Formation of networked flow channels in the early Holocene at Lake Tonle Sap, Cambodia

Tsuyoshi Haraguchi[1*], Hitoshi Yonenobu[2], Tomochika Tokunaga[3], Shimoda Ichita[4], Yoshinaga Yuichi[5]

[1]Graduate School of Sciences,Osaka City University, [2]Graduate School of Education, Naruto University of Education, [3]Department of Environment Systems, University of Tokyo, [4]Faculty of Science and Engineering, Waseda University, [5]CTI Engineering Co., Ltd.

Lake Tonle Sap is located at the central part of Cambodia, South-East Asia. The water body swells and shrinks at an annual cycle with the water depth ranging from 1 to 10 meters, affected by a seasonal water supply from the Mekong River. Thus, the lake plays an important role as a natural reservoir protecting the region from flooding. A question arises in the paleolimnological context as to how the lake has manifested the function controlling water balance. In this study, we undertook an extensive sonic survey at the lake in order to clarify the subsurface structure of Lake Tonle Sap. In consequence, we discovered deposited valleys forming a complex network of past flow channels in the early Holocene.

The survey was conducted mainly in rainy seasons from 2009 to 2012. Sediment cores were collected at three sites in dry season. Echo sounding was undertaken over the whole part of the lake using a single-channel sub-bottom profiling system (Stratabox, SyQwest Inc.). A prominent sound frequency of 10 KHz was selected in order to observe structure of reflectance planes up to the 40-m depth. The results showed that the subsurface structure of the lake bed was mostly flat with a strongly reflecting plane (#1) observed at the depth of 1-2 meters. The sediments consisted of loose mud up to the #1 plane. At the depth of 10-14 meters, a number of valley-shaped reflecting planes (#2) were observed. A 3-dimensioal reconstruction of the #2 plane presented a complex network of deposited flow channels. Radiocarbon dates suggested that the valleys were formed around 10 ka calBP.

Keywords: networked flow channel, Holocene, Lake Tonle Sap

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HQR24-04 Room:201B Time:May 23 09:45-10:00

Floodplain development along the lower Stung Sen River, the Tonle Sap tributary

Naoko Nagumo[1*], Toshihiko Sugai[1], Sumiko KUBO[2]

[1]Graduate School of Frontier Sciences, University of Tokyo, [2]School of Education, Waseda University

The Stung Sen River, the biggest influent tributary to Lake Tonle Sap in central Cambodia is influenced by Asian monsoon climate, and seasonal precipitation changes controls hydrologic and geomorphic environment in the region. Interpretation of aerial photography showed that the Stung Sen River floodplain consists of two geomorphic units: meander belt along the meandering river channel and back marsh. Observations of outcrops and six sedimentary cores across the floodplain at Kampong Chheuteal and Kampong Thom reveal that floodplain environmental changes at c.11 ka, indicated by sand layers at Kampong Chheuteal and abundant plant materials at Kampong Thom, were associated with the Holocene onset of the southeast Asian monsoon and probably with the emergence of Lake Tonle Sap. The present back marsh-meander belt system was established about 5.5 ka along with the initiation of seasonal flow direction change of the Tonle Sap river. The meander belt materials are replaced as the river channel shifts on a decadal to centennial timescale. Back marsh sediments had a constant accumulation rate of about 0.5 mm/yr during the Holocene, contrasting with rates of 0.1 mm/yr during the late Pleistocene, at least since c.36 ka. These evidence indicate that the floodplain development of the Stung Sen River is dependent on the changes of Holocene monsoon intensity and water level changes of the most downstream Lake Tonle Sap.

Keywords: floodplain, drill core, Lake Tonle Sap, Mekong River, Cambodia

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HQR24-05 Room:201B Time:May 23 10:00-10:15

Last 2 ka climate change at Ilgaz site North Anatolian fault systems

Toshihiko Sugai[1*]

[1]Graduate School of Frontier Sciences, Unv. of Tokyo

At the central part of the North Anatolian Fault systems, across the 1943 rupture segment, surface sediment at around 1500 m asl was obtained from Ilgaz trench wall (Sugai et al.,2000). Pollen analysis and AMS 14C dating coupled with facies analysis and geomorphic investigation revealed last 2k paleoclimate change. At Medieval Warm Period (9C-11c AD), alternation of well-sorted reverse grading thin gravel bed with lots of pine cones and thin humic silt bed developed well, suggesting that conifer forest was dominant land cover and a sheet flood of melted snow occurred repetitively under warm humid climate conditions. In contrast, in Little Ice Age (17c-19c AD) peat layer with poor sorted angular gravels deposited and herbaceous pollen was dominat. This implies that the study site was under periglacial environment and above or near the timber line.

Keywords: paleoclimate, Medieval Warm Period, Little Ice Age, polen analysis, North Anatolia, AMS radiocarbon dating

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HQR24-06 Room:201B Time:May 23 10:15-10:30

Holocene sand dunes activities and climate changes in Central Asia

Akio Sato[1*], Toshihiko Sugai[1], Kunihiko Endo[2]

[1]Graduate School of Frontier Sciences,The University of Tokyo, [2]Nihon University

In Central Asia, there are deserts and semi-deserts under the inter-continental arid and semi-arid climate. Saryyesik-Atyrau Desert is located as a sandy desert within the sand dunes around Lake Balkhash and Ili River delta in Southeast Kazakhstan. This research aims to clearly the relationship between the sand dunes development and regional or global environmental changes in Saryyesik-Atyrau Desert. In our previous study, the types of sand dunes in Saryyseik-Atyrau Desert were classified into three types (Dune I, II and III) that based on the wavelength, the height and the patterns (Sato et al, 2012a). Dune I and Dune II are seemed to classify Draa (known as the unit of mega-linear dune) in the Last Glacial Age. Dune III, the smallest dune unit including variety of dune type (linear, parabolic, vegetated and blow-out), covers the morphology of Dune I and II. In addition, Sato et al (2012b) suggest the development phase of Dune III during Mid-Holocene in Saryyseik-Atyrau Desert by the OSL dating results (Kondo et al (2011). Otherwise, The analyses of lake sediment core (0901core, 0902core) from Lake Balkhash shows the records of the past 8000 ka, and suggest the lake-level regression and the aridification in around Lake Balkhash (Sugai et al, 2011; Endo et al, 2012). And the some other paleoenvironmental records, from the lake sediment (Chen et al, 2008) or the alluvial sediment (Li et al, 2011) in Central Asia, suggest the sifting from humid to dry phase after the Holocene Climatic Optimum (HCO). Therefore, The sand dunes activity of Saryyesik-Atyrau Desert also seemed to be affected by the aridification in Central Asia that a part of the global climate changes from Mid to Late Holocene (Wanner et al, 2008). The climate changes (the sifting of North Atlantic Oscillation (NAO), the westerlies and Siberian high) probably forces to sift the frequency and the direction of regional previous wind and the annual precipitation in Central Asia.

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Keywords: Kazakhstan, After Holocene Climatic Optimum, Lake Balkhash

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HQR24-07 Room:201B Time:May 23 10:30-10:45

Paleoenvironmental study of the late Quaternary. based on diatom analysis of a sediment core from Lake Biwa, Japan

Koichi Nagayasu[1*], Fujio Kumon[2]

[1]Faculty of Science, Shinshu University, [2]Department of Environmental Sciences, Faculty of Science, Shinshu University

To reconstruct paleoenvironment in a mid-latitude region during the late Quaternary, fossil diatom abundance and assemblage character were examined for the BIW08-B core taken from Lake Biwa.BIW08-B core is 100.3m in length and consists mainly of homogeneous silty clay except for 20-m-thick sandy sediments in the core bottom. According to an age-model based on the marker tephra beds, this core can cover over the last 300,000 years. Based on the diatom assemblage characters, the following 7 zones were distinguished stratgigraphically.

Zone 1: Planktonic diatom *Stephanodiscus suzukii* is dominant.
Zone 2: Benthoic diatoms such as *Navicula* spp. and *Achnanthes* spp. are dominant.
Zone 3: *Aulacoseira nipponica* is dominant.
Zone 4: *Cyclostephanos* sp. is dominant.
Zone 5: *Stephanodiscus suzukii* is dominant.
Zone 6: *Aulacoseira nipponica* is dominant.
Zone 7: *Stephanodiscus suzukii* is dominant.

These stratigraphic changes of diatom assemblage are consistent with the results of diatom analysis in the other cores. Therefore, quasi-periodic changes of aquatic environments have been occurred commonly in the whole Lake Biwa. The abundance of diatom valves also fluctuates quasi-periodically, and corresponds roughly with the temporal variation of the East Asia summer monsoon strength in periodicities of tens of thousands of years.

In order to investigate the causes of diatom assemblage change, detailed diatom analysis was performed in interval of 300 years for the sediment of the last 25,000 years, when *S. suzukii* and *A. nipponica* occupy 80% of the total diatom. Abundance of diatom valves is ordinarily poor (1.0×10^8valves/g) until 7,000 years ago. It has much increased only after 7,000 years ago. This fluctuation is inconsistent with precipitation change or intensity variation of the East Asian summer monsoon. Diatom valve concentration may respond to climate change late, or not reply straight to rapid warming and precipitation increase.

Then, to search diatom survival strategy, the diameter of *S. suzukii* , which were dominant species in this period, was measured and its frequency distributions were analyzed for the last 25,000 years. Between 25,000 years and 12,000 years ago, total number of diatom was constantly low and frustule sizes were small (7-12 micrometer). On the other hand, the proportion of individuals of larger valves (20-30 micrometer) increased between 12,000 and 7,000 years, even though frustules abundance is still low. Diatom (*S. suzukii*) took the survival strategy to change cell size for the transitional period from the LGM to the Holocene. That is to say, *S. suzukii* changed its size in response to rapid warming and survive the competition with other diatom such as *A. nipponica* . Diatom valves variation might respond tardily to the climate change, because it takes time to shift the survival strategy.

Keywords: Lake Biwa, Late Quaternary, Diatom, Frustule size, Stephanodiscus suzukii

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HQR24-08 Room:201B Time:May 23 11:00-11:15

Potential of summer temperature reconstruction using tree-ring chronology of Japanese beech at the Shimokita Peninsula

Yasuharu Hoshino[1*], YONENOBU, Hitoshi[2], YASUE, Koh[3], NOBORI, Yoshihiro[4], MITSUTANI, Takumi[1]

[1]NRICP Nara, [2]Naruto University of Education, [3]Shinshu University, [4]Yamagata University

Various archives such as tree rings, ice cores, varves and historical documents have provided effective proxy data for unraveling the past climatic variability. Tree rings have given annually-resolved quantitative reconstructions of the past temperatures, precipitation, drought indices and other climatic parameters. Although there have been recent efforts to improve the coverage of dendroclimatic reconstructions in the East Asian region, tree-ring records are still sparse in Japan. It is worth developing tree-ring chronologies for investigating the dendroclimatic potential. The purpose of this study is to investigate temporal stability of climate-growth relationship for Japanese beech (*Fagus crenata*) for the northernmost Honshu Island and to investigate its potential to reconstruct past climate.

We used a tree-ring record of Japanese beech at the Shimokita Peninsula, the northernmost part of the Honshu Island. The standard techniques of dendrochronology were employed for chronology building. The climate-growth relationships were estimated using boot-strapped response function analysis. The response function shows that the ring width correlates positively with previous warm-season temperature. This suggests that the optimal growth of Japanese beech depends on an above-average hot summer in the previous year. The summer temperature was preliminary reconstructed, using a multiple linear regression model. The performance of the calibration model was validated by the standard cross calibration-verification method. As a result, the calibration model shows that the Japanese beech chronology have enough potential to reconstruct the past climatic variability.

Keywords: dendroclimatology, summer temperature reconstruction, *Fagus crenata*

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HQR24-09 Room:201B Time:May 23 11:15-11:30

Sedimentary environment during 3000 years recorded in the piston core sediments of Beppu Bay, central Kyushu, Japan

Keitaro Yamada[1*], Keiji Takemura[2], Ken Ikehara[3], Michinobu Kuwae[4], Masanobu Yamamoto[5]

[1]Division of Earth and Planetary Sciences, Graduate School of science, Kyoto University, [2]Beppu Geothermal Research laboratory Institute for Geothermal Science, [3]Institute of Geology and Geoinformation, AIST, [4]Senior Research Fellow Center, Ehime University, [5]Faculty of Environmental Earth Science, Hokkaido University

Beppu Bay is located at the northeast end of the region called the Beppu-Shimabara graben (Matsumoto, 1979) in the central Kyushu, Japan. According to Itoh et al. (1998), the formation process of Beppu Bay region is divided into two stages (Stage 1 and 2); especially pull apart basin started in Stage 2 after 1.5Ma and has been subsiding. Therefore continuous thick sediments of terrigenous, chemical/biogenic and cosmogenic/volcanogenic origin were deposited. The continuous analysis at the close interval is important to recognize a change of the sedimentary environment and the event sediment which affects the age depth model. We examined sedimentary environment of the bay using piston core (BP09-3) which were obtained in the southern part of head of the bay. In the southern part of the bay, high accumulation rate and high preservation potential are expected because here is the place the deepest part in the bay and is reductive sedimentary environment.

Piston core was about 9m length, and firstly soft X ray CT scanning, a magnetic susceptibility measurement and a color profile measurement were carried out. We cut piston core into pieces every 2cm and got 457 samples. The samples were fractionated by a mesh cloth. The particle composition was considered using the particle of very fine sand (3-4phi) under the polarization microscope. The particle was classified in heavy mineral, light mineral, volcanic glass, diatom, plant particle, rock fragment and others and were counted more than 200 particles. The age depth model used the model in Kuwae et al.(2012) which was decided using the multiple cores in the same point.

The core mainly consisted of mud, and accumulation rate was 230-300cm/ky. Marine diatom particles were observed in all samples and occupied more than 90% in some cases. The abundance ratio of diatom decreased and rate of particle excepted diatom increased at some horizons, and the composition changed abruptly. We call a series of samples with abrupt change of composition ”event sediment”. ”Event sediment” was commonly revealed as increasing of abundance of coarse sediment, and some case without the change of a particle size. ”Event sediments” has different grain composition.

Many diatom particles are included in the sediment, and diatom is main deposits in the very fine sand fraction in a common bay environment. It is considered that the decrease of abundance of diatom grains was diluted by ”event sediment” because the abundance of diatom has a negative correlation with that of volcanic glass. Since the event sediment is detected from a sample without a remarkable particle size difference, not only the particle size but also the composition is important to examine the event sediment. The difference in the composition of each ”event sediment” is related to source of particles, and also vertical change by particle type may be reflected the behavior of each particle type in transportation and sedimentary process. The frequency of the event sediment is different during 3,000 years. We need discuss on the type of ”event sediment” from the viewpoint of type of event such as earthquake, flood, volcanic fall, turbidite and etc.

Keywords: Beppu Bay, sedimentary environment, event sediment, holocene, grain composition

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HQR24-10 Room:201B Time:May 23 11:30-11:45

Relationship between active fold and slope collapse by earthquake in Shinano River Tectonic Zone

Mamoru Koarai[1*], Taku Komatsubara[2], Takayuki Nakano[1], Takaki Okatani[1], Takahito Kuroki[3]

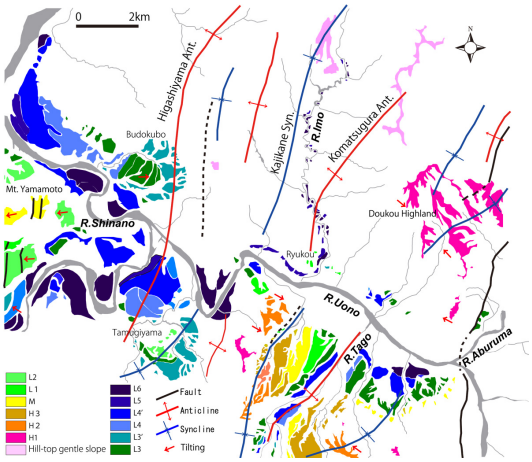
[1]GSI of Japan, [2]AIST, [3]Fukuoka University of Education

We discuss the relationship between active fold and slope collapse in Shinano River Tectonic Zone. Fig.1 shows the distribution of terrace and geological structure around Uono River. The oldest terrace H1 which was formed over 300ka covered by Iz-Kt tephra is distributed in Doko highland. The terraces from over 300ka (H1 terrace) to resent (L6 terrace) are distributed on the left bank of Uono River, however, new terraces (L3-L6 terrace) are only distributed near the junction of Uono River and Shinano River. Since the amount of uplift of this area was large, about 1m uplift was measured in the 2004 Niigata-ken Chuetsu Earthquake. As the axial of Higashiyama anticline is located in this area, we considered the growth of active fold was occurred by this earthquake. In the Imokawa River basin, the terrace covered by Ab-t1 tephra (Imokawa 3 terrace) was identified with L5 terrace, and the terrace not covered by loam (Imokawa 5 terrace) was identified with L6 terrace.

In the 2011 Nagano Niigata Border Earthquake, the slope collapse and road deformations were concentrating by the hanging wall side of a reversed fault. Since these distributions of deformations are dominated by anticline and syncline structure and GPS data shows uplifting of the shape of a dome by the side of a hanging wall, a possibility of the growth of active fold in this earthquake can be suggested.

Fig.1 Distribution of terrace and geological structure around Uono River

Keywords: active fold, slope collapse, Imokawa River basin, Chuetsu Earthquake, Nagano Niigata Border Earthquake



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HQR24-11 Room:201B Time:May 23 11:45-12:00

Reconsideration of the Age of Zenkoji Debris Avalanche Deposits

Hisashi Fujine[1*], Kunihiko Endo[2], Shigeru Suzuki[1], Kentaro Nakamura[1], PaleoLabo AMS Dating Group[1], Masaaki Suzuki[3], Mitsuhiro Yoshimoto[4], Akira Goto[5], Tatsuro Chiba[6]

[1]PaleoLabo Co.,Ltd., [2]Nihon University, [3]Graduate School of Science Sience and Technology, Nihon Unversity, [4]Faculty of Science, Hokkaido University, [5]Nihon University, [6]Asia Air Survey Co., Ltd.

A great number of hummocks of the Zenkoji debris avalanche are distributed over the southern slope of Usu volcano, south Hokkaido. The hummocks are divided into two types: one is composed of lava blocks of the earlier stage of Usu volcano, and the other of Toya pyroclastic flow deposits(Soya et al., 1981). In previous studies, it has been suggested that the age of the Zenkoji debris avalanche deposits was around 7,000 - 8,000 years ago, because archeological sites of the Early Jomon Period were found on the Zenkoji debris avalanche deposits(Katsui et al, 1973 ; Katsui, 1988 ; Kosugi, 2007).

Several alluvial lowlands distribute among the hummocks. We took two boring cores from the lowland between hummocks of Toya-type, near the coast, east of Arutori Misaki. The cores about 10 m long, mostly consist of peat and organic clay, showing continuous sequence. At the bottom of the core, hard pumiceous deposit having the same chemical composition of the Toya pyroclastic flow was found. In the lowest horizon, small pumiceous blocks were intercalated in organic clay.

At least two tephras, Ko-g (from Komagatake, 7,000 y. BP) and Ng (from Nigorikawa caldera, 15,000 y.BP) are identified in the upper and the lower organic clay of the cores. Age determination of the peat and organic clay samples were done by AMS C-14 method. The result shows about 20,000 cal. BP. for the organic clay of - 8.7 m. Pollen analysis for the peat and organic clay clarified that the subarctic coniferous forest was dominant in the lower half of the core, and the Younger Dryas event can be detected from - 6.6 m to - 6.7 m.

Therefore , these facts suggest that the age of the Zenkoji debris avalanche deposits and the collapse of the Usu volcano must have been LGM (the last glacial maximum).

References:

Katsui , Y. et al. (1973) Geological map of Usu Volcano (1:25,000) ; Katsui, Y. (1988) Geological Evolution and Historical Eruptions of Usu Volcano ; Kosugi, Y. (2007) Post-glacial environmental changes and human adaptations in the area along the bay of Volcano ; Soya, T. et al. (1981) Geological map of Usu volcano (1/25,000).

Keywords: Usu Volcano, Zenkoji Debris Avalanche, Drilling, AMS Dating, Tephra

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HQR24-12 Room:201B Time:May 23 14:15-14:30

Heavy metal pollution in Ancient Nara, Japan, during the 8th century

Hodaka Kawahata[1*], Shusuke Yamashita[1], Kyoko Yamaoka[2], Takashi Okai[2], Gen Shimoda[2], Noboru Imai[2]

[1]Atmosphere and Ocean Research Institute, The University of Tokyo, [2]AIST

We quantitatively investigated 8th century heavy metal pollution in Heijo-kyo (Ancient Nara), the first large capital of Japan. In this city, mercury, copper, and lead levels in soil were increased by urban activity and by the construction of the Great Buddha statue, Nara Daibutsu. Mercury and copper pollution accompanied the construction of the statue, with a great influence on its immediate area but a much lesser influence on the wider city environment. Accordingly, we reject the hypothesis that severe mercury pollution brought about by the construction of the Nara Daibutsu made it necessary to abandon Ancient Nara. High lead pollution was detected at several sites. The isotopic composition of the lead indicated that it originated mainly from the Naganobori mine.

Keywords: Hg pollution, Cu pollution, Pb pollution, Heijo-Kyo, the Great Buddha, Naganobori mine

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HQR24-13 Room:201B Time:May 23 14:30-14:45

An 802-year tree-ring chronology from Hatchobori 3-chome Site, Chuo-ku, Tokyo

Motonari Ohyama[1*], Shinya Suzuki[2], Mitsuo SUZUKI[2]

[1]Botanical Gardens, Tohoku University, [2]JSPS Research Fellow, Tokyo Metropolitan University

Dendrochronology is the science of dating tree rings, widely used to address environmental and historical issues. Despite the recent advance in chronology building, long tree-ring chronologies are still sparse in East Asia, including Japan. The purpose of the present study is to build a new long ring-width chronology of cypress species, from wooden remains recovered from an archaeological site in eastern Japan.

A large number of tub-shaped and box-shaped wooden coffins were excavated from Hatchobori 3-chome Site, Chuo-ku, Tokyo. The site dates the early half of the 17th century. The tub-shaped wooden coffins were mainly made of Chamaecyparis pisifera (Sawara cypress). According to wood identification, along with pollen and historical records, Suzuki and Noshiro (2004) deduced that the timbers were imported from the Kiso and Tenryu valleys.

71 boards from the tops, bottoms, or sides of the coffins were selected for tree-ring measurement. Of the 71 samples, 38 were visually and statistically crossdated based on standard procedures in dendrochronology. An 802-year raw ring-width chronology (from the 9th century to the 17th century) was successfully constructed. Mean t-value between the chronology and samples was 10.5, indicating high coherency among the tree-ring series.

The chronology was successfully crossdated with other chronologies from archaeological sites in Tokyo, indicating high t-values. For example, t = 13.8 with the chronology from the Mirokuji site, early Edo period, also consists of coffin boards mainly made of Sawara cypress. This result may indicate that timbers from those sites were imported from a certain limited area.

Further efforts should concentrate on obtaining fully continuous chronologies covering the last 2,000 years for tree-ring dating and climatic reconstruction.

Keywords: dendrochronology, chronology development, Sawara cypress, Edo period

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HQR24-14 Room:201B Time:May 23 14:45-15:00

Revealing the History of Akita-sugi forest by Pollen Analysis on Lake Ichi-no-Megata, Akita Japan

Junko Kitagawa[1*], MORITA, Yoshimune[2], MAKOHONIENKO, Miroslaw[3], GOTANDA, Katsuya[4], kazuyoshi yamada[5], Hitoshi Yonenobu[6], YASUDA, Yoshinori[7]

[1]IRCJS, [2]Okayama University of Science, [3]Adam Mickiewicz University, [4]Chiba University of Commerce, [5]Waseda University, [6]Naruto University of Education, [7]Tohoku University

Akita-*sugi* (Akita Japanese cedar: *Cryptomeria japonica*) forest is considered to be one of the most beautiful forests in Japan. It has a long history of utilization and during the history, the forests were exploited severely and now a part of forests is conserved. It is said that the forest of the Tohoku area including Akita prefecture had been logged by AD1700. Deforestation was caused not only for timbers but also for reclamation of land. Although the coverage of forest in Akita prefecture is over 60%, natural forests of Akita-*sugi* cedar forests are now remained and preserved in small areas, e.g. Nibetsu in Akita city. Recently annual laminated sediments have drawn attention and the analyses of them have made possible to understand the detail of environmental changes. In this study, the pollen of annually laminated sediment core from Ichi-no-Megata Lake in Oga peninsula, Akita was analysed to understand the history of Akita-sugi cedar forest.

Lake Ichi-no-Megata is located in Oga peninsula, Akita prefecture. The climate of the region is on the boundary of cool temperate and warm temperate region. The vegetation of natural forest is summer green broad-leaf forest dominated by *Fagus crenata*, but now it is substitutional community in *Fagus crenata* region and the area is mainly occupied by secondary forest of *Quercus serrata*, plantation of *Pinus densiflora*, *Cryptomeria japonica* (*sugi* cedar), *Chamaecyparis obtusa* (*hinoki* cypress) or cultivated land due to the human activity from the old time. Over 150 archaeological sites from Jomon to Yayoi period has been identified in Oga peninsula. An oral tradition and historical records indicate that human beings have been involved in the vegetation change around the area from the ancient time.

Coring campaign was conducted in 2006. An absolutely continuous core (IMG06) was taken. About 30,000 years of sediment was recovered. Age-depth model was drawn based on 74 plant macrofossil samples dated by an accelerator mass spectrometer (AMS) at the Poznan Radiocarbon Laboratory and tephra. Pollen samples taken every about 5-10 years excluding turbidite layers. We focused on the top part, about last 4000 years in this study. Pollen was extracted and was examined and then, the percentages of these pollen sums were calculated based on the total of terrestrial pollen and then percentage pollen diagrams were constructed. Pollen concentration (grains/cc) diagrams were also constructed based on the added and counted marker grains.

Dominant pollen taxa were *Cryptomeria* and *Fagus crenata* type by AD1150. The first increase of *Cryptomeria* was detected around 1500BC. Akita-sugi forest has been established from this time. At that time, the vegetation was mixed with deciduous trees, mainly *Fagus crenata*. *Cryptomeria* pollen was the most abundant in AD100-AD1000. During 12th century, the main deforestation activity was observed. Gramineae and *Artemisia* pollen increased in both percentages and concentration. It indicates that land reclamation for rice paddies occurred. Still *Cryptomeria* forest was mixed with deciduous trees and in 16th century, forest resources were exhausted. Entering Edo period, mine development was active. These were recorded in pollen. After that, forest was conserved by law. However until 19th Century, *Cryptomeria* pollen was low in both percentages and concentration. There was severe famine caused by Little Ice age during 18th century. In addition, trees were harvested when big fires occurred in Edo. These events seemed to prevent from the recovery of forests. After the severe famine periods, conservation activity was high and plantation of *Cryptomeria* occurred, but deciduous elements in the forests have much less than before. The landscape has changed completely by deforestation and plantation during the historical time.

Keywords: Ichi-no-Megata, pollen analysis, deforestation

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HQR24-15 Room:201B Time:May 23 15:00-15:15

Analysis of 14C age calibration data sets based on tree rings from Japanese wood

Toshio Nakamura[1*], MASUDA, Kimiaki[2], MIYAKE, Fusa[3]

[1]Center for Chronological Research, Nagoya University, [2]Solar-Terrestrial Environment Laboratory, Nagoya University, [3]Solar-Terrestrial Environment Laboratory, Nagoya University

Radiocarbon (14C) dating is widely applied to archeological materials and cultural properties that are sometimes closely related with historical events. In particular, 14C dating is utilized to decide whether the materials are really related with the historical events, and highly accurate dating of the samples is required to judge the real from the false for history-related materials. Accuracy of 14C dating results is determined largely by appropriateness in sample preparation and measurements of 14C abundance of the prepared targets, but it is also related with the procedures to obtain reliable calendar age in calibration of sample conventional 14C age. For 14C age calibration, the IntCal09 data sets are normally used for terrestrial samples whose carbonaceous fractions were synthesized from atmospheric CO2 in the Northern Hemisphere, while the SHCal04 data sets are used for those in the Southern Hemisphere.

The accuracy of calendar age that was obtained by calibration of 14C age with IntCal09 data sets (Reimer et al. 2009) is, however, sometimes questioned because of the possibility that 14C concentration in atmospheric CO2 may vary spatially (Imamura et al. 2007). The calibration data sets IntCal09 are established on the basis of 14C data for tree rings grown in North America and Europe, but do not include those for the tree rings grown in other areas, for example, in Japan, although 14C data for plant residues from the bored cores at Lake Suigetsu, Fukui Prefecture, Japan, will be incorporated in the age range of 11.2-52.8 ka BP in the latest calibration data sets (Bronk Ramsey et al. 2012). The Japanese archipelago is located at the eastern margin of the Asian continent in the middle or a bit lower latitude region, and the 14C concentration in atmospheric CO2 over Japan may be lower than that at inland areas and northern locations as in North America or Europe, as the result of CO2 release to the atmosphere from the near-by ocean surface which has a lower 14C concentration, or air-mass delivery over the Pacific Ocean by East Asian monsoon in summer season when the plants grow quickly.

To investigate the 14C concentration of atmospheric CO2 in the past few millennia over Japan, we measured 14C ages of annual rings on a single year basis from three Japanese trees whose calendar dates range from ca. 2000 years old to present, and compared the tree-ring 14C ages with corresponding 14C ages of IntCal09. It was revealed that 14C ages of annual rings from Japanese trees are not consistent with IntCal09 data sets. Many 14C ages of tree rings are older than those of IntCal09, but younger than those of SHCal04 data sets. The average shifts of Nagoya 14C ages from IntCal09 ones and one-sigma errors were obtained to be +26+/-36, +24+/-30, +16+/-22, +5+/-21 and +14+/-22 14C years, for the intervals of AD72-382, AD589-1072, AD1413-1615, AD1617-1739 and AD1790-1860, respectively. IntCal09 data sets are usually preferred for calibration of 14C ages from Japanese samples, but it is revealed that SHCal04, or maybe a modified intermediate version of IntCal and SHCal, is rather suitable for Japanese samples in some cases. The Japanese archipelago is situated near the boundary of the Inter-tropical Convergence Zone in summer season, and the 14C concentration of atmospheric CO2 over Japan can be influenced by air masses of the Southern Hemisphere with lower 14C concentrations during the period of higher solar activities and magnified East Asian summer monsoon. Our results suggest that the Japanese archipelago is located in the critical zone where it is difficult to calibrate the 14C ages of tree ring samples collected with existing calibration data sets. At the moment, it should be noted that calibration of 14C dates of Japanese samples with IntCal09 may induce additional systematic shifts of calibrated ages toward older ages by about 30 years, from the sample optimum calendar ages.

Keywords: 14C age, calendar date, calibration to calendar date, tree ring, solar activity, Pacific high barometric pressure

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HQR24-16 Room:201B Time:May 23 15:15-15:30

Transition of timber usage in 17-19th century deduced from materials of coffin boards at Sugen-ji graveyard site, Tokyo

Shinya Suzuki[1*], HOSHINO, Yasuharu[2], OHYAMA, Motonari[3], NOSHIRO, Shuichi[4]

[1]JSPS: Tokyo Metropolitan University, [2]NRICP Nara, [3]Botanical Gardens, Tohoku University, [4]FFPRI

Over the large part of the Japan's main islands, the use of forest resources had changed in Edo period. During the early half of the17th century, timbers were produced from natural forests for constructing castles and cities, resulting in depletion of wood throughout Japan. Later on, felling activities were banned by law associated with efforts to regenerate forests by plantation. The enhanced measure of forest protection might have greatly affected to the pattern of timber consumption in cities. However, lack of documented records makes it difficult to reconstruct the historical change of timber use during the time period. Wood artifacts from urban archaeological sites can be a promising material to overcome this issue. In this study, we collected coffin boards used in the graveyards for commoners at the Sugen-ji archaeological site, Tokyo. The samples were dendrochronologically dated and the species were identified. The results will show the transition of timber use in the city of Edo during the 17-19th century.

This work was supported by JSPS KAKENHI (23:5811, 23240116).

Keywords: Tree-ring dating, Edo, timber usage, coffin, wood species

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HQR24-17 Room:201B Time:May 23 15:30-15:45

Regional variability on the 'Southern Route' of modern human dispersal into Eurasia

Atsushi Noguchi[1*], Yorinao Shitaoka[2], MALLAH, Qasid H.[3], VEESAR, Ghulam M.[3], SHAIKH, Nilofer[3], KONDO, Hideo[4]

[1]Meiji University Archaeological Investigation Unit, [2]Kyoto University Institute for Geothermal Sciences, [3]Shah Abdul Latif University, Department of Archaeology, [4]Tokai University, School of Letters

The "Southern Route"- from East Africa to South Asia, via the Arabian Peninsula- is now most popular hypothesis on modern human dispersal into Eurasia (better-known as 'Out of Africa', ca.120˜50ka (Petraglia et al. 2010). Survey and excavation of archaeological sites in both Arabia and India have been rapidly progressing over the last decade, while timing and frequency of 'Out of Africa' is under controversy. The major discoveries are as follows: 1) Nubian industry in Southern Arabia which is similar to that of North and East Africa (ca. 100ka.: Rose et al. 2011); 2)Leptolithic industry which is subsequent to the Nubian in Southern Arabia (40˜8ka: Hilbert et al. 2012); 3)Levallois-like industry in Eastern and Southern Arabia (e.g. FAY-NE Assemblages B and A, ˜30ka: Armitage et al. 2011; SD1, 55ka: Delagnes et al. 2012), 4)Microlithic Rostamian industry in Southwestern Iran (41˜35ka.cal.BP: Conard and Ghasidian 2011), 5)various mode III assemblages of South Asia (90?˜40ka: Petraglia et al. 2012), 6)scraper dominant assemblages in Pakistan and Central, West India (e.g. 16R dune: ˜26ka: Misra 1995), 7)South Asian microlithic industry in Central, South India and Sri Lanka (36ka˜: Perare et al. 2011). However fossil records are recovered only from Sri Lankan and South Indian sites associated with microlithic industry. Those microlithic industry has typical artifacts which are considered as indicators of modern human behavior, such as backed blades, stone or ostrich egg-shell beads, ocher fragment with geometric engraving, as well as bone-antler objects. The oldest dating of South Asian microlithic industry shows is around 3.6ka (cal BP) and appears to be younger than fossil records or archaeological remains of modern human from Southeast Asia and Oceania. On the other side, there is no clear evidence of microlithic technology on the way from East Africa to South Asia for the moment, with exception being Rostamian industry in Southwestern Iran. A regional patchy pattern of archaeological evidences becomes apparent with sorting of recent discoveries into tempo-chronological sequences and the distributional pattern of microlithic/ non-microlithic industries seem to correspond well to regional differences of palaeoenvironment (see Petraglia et al. 2010: fig.3). The modern human is considered to have adapted to diverse ecological niches before Out of Africa. Therefore it is also possible to consider that the patchy pattern on distribution of microlithic/ non-microlithic industries from Arabia to South Asia would indicate mosaic of different behavioral phenotypes of modern human in various environments rather than coexistence of different human groups in parallel. Recently authors have been studying Palaeolithic sites in Veesar Valley, Sindh, Pakistan, with the above-mentioned perspective (Noguchi et al. 2012). The sites are located in crescent dunes of the western fringe of the Thar Desert. Assumed Middle/ Upper Palaeolithic assemblages excavated from the strata likely correspond directly to the site surface during the formation of the dune. Dating, palaeoenvironment and geomorphology of the sites are expected to lead to further understanding of adaptive strategies of the modern human in diverse ecological niches on the 'Southern Route'.

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Keywords: Out of Africa 2, Southern route, Middle/ Upper Palaeolithic, Patchy distribution of lithic industries, Ecological niches, Adaptive strategy

Japan Geoscience Union Meeting 2013
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HQR24-18 Room:201B Time:May 23 15:45-16:00

The lithic raw material network of the coast of the Japan sea region in the early upper palaeolithic

Yoshikatsu Nakamura[1*]

[1]Nojiri-ko Museum

The early Upper Palaeolithic is characterized by the presence of the Palaeolithic stone axe (PSA), which has its calibrations 14C age are ca. 38,000-29,000 cal yB.P. On Japanese islands, the layers in which this axe is found lie below the Aira-Tn tephra (AT) layer. Eight hundred or more PSAs have now been reported throughout the entire country.

The following examinations of each of the available 342 PSAs were made:

a) stereomicroscope observation, b) measurement of specific gravity, c) a magnetic test, and

d) a measurement of magnetic susceptibility. The results may be summarized as follows.

The lithic raw material of the Palaeolithic stone axe (PSA):

The Chiba area- The vast majority of the stones called serpentinite are greenstone (basaltic tuff origin and basalt origin) and amphibolite. The coast of the Japan sea region- The vast majority of the stones called serpentinite are tremolite rock (nephrite and semi-nephrite). In comparison to serpentine, the tremolite is a denser and hard, tough, and less magnetic mineral, which lends itself better to the making of these axes.

Place of origin of tremolite rock:

Tremolite rock is produced on the following four serpentinite rocks of the Omi-Renge area: 1) along the Himekawa main stream; 2) in the Omi area, 3) along the upper stream of the Oodokoro river ˜ Mt. Asahidake, and 4) in the Hakuba-happou area. Large stones of tremolite rock with an unevenness in the surface used as the material of the stone tool can be found in the Matsukawa Valley in the Hakuba-happou area.

The lithic raw material network of the Coast of the Japan Sea region:

The PSAs from tremolite rock of the Omi-Renge area spread to the Coast of the Japan Sea region, including the Toyama area (the Uwadaira I site and the Shiraiwa-Yabunoue site), Nojiri-ko sites (the Hinatabayashi B site, Kannoki site, and Nakamachi site), Iiyama city (the Taishibayashi site), Shibata city (the Sakanosawa C site), and Akita city (the Jizouden site).

In light of the lithic raw material of the stone axe, the origin of the stone network with the coast of the Japan Sea region was the early Late Palaeolithic.

Keywords: upper palaeolithic, the coast of the Japan sea region, the lithic raw material, stone axe, tremolite rock

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HQR24-P01 Room:Convention Hall Time:May 23 18:15-19:30

Eruption history of Tarumae volcano and tephras since 17th century found in Shiraoi-Tomakomai lowlands

Akihiro Yokota[1*], Masaaki Suzuki[2], Kunihiko Endo[1]

[1]Department of Geosystem Sciences, College of Humanities and Sciences, Nihon University, [2]Dohto University / Graduate School of Sience and Technology, Nihon Unversity

The Tarumae volcano has been active since the eruption in 1667 after the dormant more than 2,000 years (Furukawa and Nakagawa, 2010, etc). During this duration, sixteen volcanic ash layers were found in this study at outcrops of the Shiraoi-Tomakomai lowlands, south of Tarumae volcano. Volcanic activities since 17th century have been documented more than 70 times for about ten events. However the correlation between the tephras and the documents has not been performed, excluding 1667, 1739 and 1874 tephras.

In this study, the sixteen tephras, named as Nis-1 - Nis-5, Nis-6-1 - Nis-6-4, Nis-7, Nis-8-A - D, Nis-9 - Nis-13, were analyzed in mineral characteristics and refractive index, and were examined in relation to the source volcanoes and chronological sequence along with eruption documents.

As a result. Nis-11 and Ko-a, Nis-8 and 1874, Nis-4 and Ta-a, Nis-3 and Ko-c2, Nis-2 and Ta-b, and Nis-1 and Us-b are correlatable respectively. Nis-10 and 1926, and Nis-9 and 1909 are probably correlatable. Nis-7 may be Tarumae-1864 or Ko-c1. Nis-6-1 - Nis-6-4 can be Tarumae1804-1817, but Nis-6-4 may be Usu 1822. Nis-5 may be Tarumae or Usu 1769.

At the outcrop in the lower slope of Tarumae volcano near Shiraoi-Tomakomai lowlands, a pyroclastic flow deposit was found, including a carbonized tree trunk which was dated by 14C wiggle matching method to be 1926 as same eruption as Nis-10.

These results and new findings during the latest stage of Tarumae volcano must be significant for the revision of volcanic eruption history and future prediction of natural hazards.

Keywords: Tarumae volcano, tephra, stratigraphy, Shiraoi-Tomakomai lowlands

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HQR24-P02 Room:Convention Hall Time:May 23 18:15-19:30

pIRIR dating of marine terraces along the Sea of Okhotsk coast area, northern Hokkaido, Japan

Reisuke Kondo[1*], Sumiko Tsukamoto[2], Kunihiko Endo[3], Tatsuhiko Sakamoto[4]

[1]Meiji University, [2]Leibnitz Institute, [3]Nihon University, [4]Mie University

In Hokkaido Island, nothrern Japan, it has been difficult to construct a detailed chronology of marine terraces, due to the lack of the marker tephra layers and to the deformation of original landforms by strong past periglaciations. The lack of age constraint has prevented studies of precise geomorphic development and palaeoenvironmental reconstruction in this area.

This study applies an elevated temperature post-IR IRSL (pIRIR; Buylaert et al., 2009) SAR protocol using polymineral fine grains to marine terraces along the Sea of Okhotsk coast area in northern Hokkaido (Fig 1).

In Hamatonbetsu town, northern Hokkaido, the pIRIR ages from the higer marine terraces are ca.340 -370 ka, which yielded ages corresponding to MIS 9, respectively.

Keywords: pIRIR dating, marine terraces, the Middle Pleistocene, northern Hokkaido

Japan Geoscience Union Meeting 2013
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HQR24-P03 Room:Convention Hall Time:May 23 18:15-19:30

pIRIR dating for marine terraces along the Kesennnuma Bay in Sanriku coastal area, Japan

Ryuhei Murakami[1*], Reisuke Kondo[2], Kunihiko Endo[3], Tatsuhiko Sakamoto[4]

[1]College of Humanities and Sciences, Nihon University, [2]Meiji University, [3]Nihon University, [4]Mie University

Kesennuma Bay is located in Sanriku coastal area characterized by a rias coastline. This area was regarded as having five marine terraces (Miura, 1966). Miura (1966) mentioned Iwatsuki terrace was formed in the high sea level time of the last interglacial period because of the weathering condition of deposits and bed rocks. In Koike and Machida (2001), Iwatsuki terrace was formed in Marine Isotope Stage (MIS) 5e, after Miura (1966). Kaizuka et al. (1985), however, suggested a possibility that marine terraces in the southern part of Sanriku coastal area are submerged below the sea level.

In this study, we tried to determine the age of the terraces using pIRIR dating (Buylaert et al., 2009) which is the latest luminescence dating method.

Studied sites are located in Iwaizaki area, southern area of the Kesennuma Bay coast where the terrace topographies are well preserved, and marine and eolian deposits are overlying the bed rocks. The marine terraces in this area have been regarded as Katahama terrace (MIS 5c) and Iwatsuki terrace (MIS 5e). Eolian loess (loam) and marine silt were sampled from the outcrops for pIRIR dating. As a result of pIRIR dating, three marine terraces, one is strath and the others are fill strath type, are suggested to have been formed during the MIS 7. One of these marine terraces is emerged nearby the coastline. This suggests the marine terrace of MIS 5e might be below the sea level like an idea of Kaizuka et al. (1985).

Keywords: Sanriku coast, marine terraces, pIRIR dating, loess, Iwatsuki terrace, Katahama terrace

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HQR24-P04 Room:Convention Hall Time:May 23 18:15-19:30

pIRIR dating of Tokorozawa terrace in the northwest Musashino Upland of Kanto Plain, Japan

Shohei Maruyama[1*], Reisuke Kondo[2], Yusuke Komuro[3], Takashi Suzuki[4], Kunihiko Endo[1], Tatsuhiko Sakamoto[5]

[1]Nihon University, [2]Meiji University, [3]Meiji Consultant co.,Ltd, [4]Ome City, [5]Mie University

In Tokorozawa and Kaneko terraces of the northwest Musashino Upland, those gravels have been thought to deposit during MIS 5e, because the Shimosueyoshi loam formation covered those gravels after Kaizuka (1957) and others. Based on the intercalation of the Brown Loam horizon underlying the Shimosueyoshi loam, however, the chronological position was revised as MIS 6 after Sugihara (1973), Ueki et al. (2007) and others, though there are no key tephras and dating data.

In this study, in order to obtain the direct ages of those gravels and the overlying loam of the Tokorozawa terrace, we applied elevated temperature post-IR IRSL (pIRIR; Buylaert et al., 2009) SAR method luminescence dating using polymineral fine grains.

Firstly we examined pIRIR dating of On-Pm1, AT and other tephras in the Kanto plain for checking the availability of the technique. As a result, pIRIR age values were consistent with known ages of On-Pm1, AT and other tephras.

Secondly in the Tokorozawa terrace, through the analysis of sand content of the Brown Loam horizon underlying the Simosueyoshi loam (including SIP at the bottom), the Brown Loam horizon was divided into two units; the upper is aeolian loam, and the lower is flood loam. The pIRIR age for the upper part (loam) of the Brown Loam horizon is about 130 ka.

Based on the result and other measurements, the deposition of the Tokorozawa gravel had occurred until MIS6, and the Tokorozawa terrace had finally emerged about 130 ka.

Keywords: pIRIR dating, Tokorozawa terrace, chronology, Kanto Loam, tephra

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HQR24-P05 Room:Convention Hall Time:May 23 18:15-19:30

Reconstruction of the recent flood history from oxbow lake sediment, Ishikari Floodplain, northern Japan

Yuji Ishii[1*], Kazuaki Hori[1]

[1]Graduate School of Environmental Studies, Nagoya University

Oxbow lakes are often observed in meandering river systems. Oxbow lakes are formed when a meander loop get cut off from the main stream. After initial cutoff event during a flood, plug bars are formed quickly at the channel entrances. Ultimately, an abandoned meander can become a disconnected oxbow lake in the floodplain. The channel fill deposits generally show a fining upward trend (Toonen et al. 2012), and this is autogenic processes. But, they may contain the sedimentary record influenced by allogenic processes. It is possible to reconstruct the recent flood history by analyzing the core sediments in detail.

The purpose of this research is to understand the sedimentation history in the oxbow lake since it has been formed. A core (called the TK core) was taken at the thalweg of the Tuki Lake in the Ishikari Floodplain. We conducted ^{14}C dating on plant materials to estimate sediment accumulation rate. Additionally, the ^{137}Cs content of the TK core were measured at 4 cm intervals. TK core was analyzed at c. 2.2 cm intervals for water content (WC), grain size, and loss on ignition (LOI) and at 2 cm intervals for color parameters $L*$, $a*$, and $b*$.

Borehole sediments can be divided into six depositional units from bottom to top of the core on the basis of various physical properties and sedimentary facies. Details of the depositional units are described below.

Unit 1 (depth in core: 11.8-10.8) is composed of sand and gravel. Although the radiocarbon age is not obtained from Unit1, the unit occurs at almost the same depth of the basal gravel found in the other cores located near the TK site. The age of 650-560 cal BP was obtained from a plant fragment (depth in core: 10.3 m) in Unit 2. This sand and gravel layer may contain younger strata than the basal gravel.

Unit 2 (depth in core: 10.8-10.1 m) mainly consists of sandy silt. Unit 2 shows lowest WC and LOI in TK core except for the Unit1, and WC is approximately 25% and LOI is around 5%.

Unit 3 (depth in core: 10.1-10.0 m) is characterized by clay with high organic content. WC is about 35-55% and LOI is around 10-20%.

Unit 4 (depth in core: 10.0-5.0 m) mainly consists of silt. LOI fluctuates between approximately 5 and 10%. Four layers composed of very fine to fine sand are thickly interbedded at 6.0-5.0 m depth in core and the thickness of each layer is around 3-10 cm.

Unit 5 (depth in core: 5.0-2.3 m) is characterized by upward increasing of WC from approximately 35% to 45% throughout the unit. In the lower part of the unit (5.0-4.5 m depth in core), grain size show upward fining from 7 phi to 8 phi. Grain size show approximately 8 phi in the upper part of the unit (4.5-2.3 depth in core). LOI is stable around 9% as a whole.

Unit 6 (Depth in core: 2.3-0 m) shows upward increasing in LOI and WC. In particular, LOI in the middle of the unit (1.3-0.8m depth in core) is very high. The peak of magnetic susceptibility is observed at 1.8 m depth in core. This is probably correlated to Tarumae-a tephra (Ta-a, AD1739).

We are able to estimate sedimentation rate using ^{14}C ages. Average sedimentation rate are approximately 70 mm/yr through Unit 2-Unit4, and 8 mm/yr through Unit 5-Unit6.

The 1963 peak ^{137}Cs concentration was probably detected at the depth of 92-93 cm. Therefore, sedimentation rate are 19.4 mm/yr in AD1963-present (0.93-0 m depth in core).

TK core generally show upward fining trend as a whole, but four sand layers are not subject to the trend. These sand layers may suggest large flood events. Additionally, the increased LOI in upper part of the Unit 6 (depth in core: 1.3-0 m) is human-induced, and the sedimentation rate is also increased with this change.

Keywords: oxbow lake, lake sediments, reconstruction of flood history, Ishikari River, Holocene

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HQR24-P06 Room:Convention Hall Time:May 23 18:15-19:30

Relationship between landslides and wetland configurations in Hachimantai volcanic group

Natsuki Sasaki[1*], Toshihiko SUGAI[1]

[1]Graduate School of Frontier Sciences, the University of Tokyo

1. Introduction

Large-scale disturbances like landslide create the diversity of landscape and biology. Wetland is one of the most important factors which make mosaic structures across landscapes in humid areas. Wetlands in landslide bodies appear, develop and disappear by intermittent landslide activities. While these movements are suspended, they are assumed to continue to change their figures because of the earth flows from its unstable circumference. Wetlands are known to exist in landslide. However, few researchers have discussed its properties and development processes associated with landslide. Takaoka *et al*. (2012) points out that landslide activities affect the origin and distribution of alpine ponds in the northern area of the Northern Japanese Alps. Not only there, landslide activities are widely considered to play an important role in formation of mountain wetlands, and it is necessary to accumulate researches on it in other areas with many mountain wetlands. In this presentation we characterize the wetlands on the landslide masses and discuss their development process in Hachimantai volcanic groups.

2. Properties of landslides and wetlands in Hachimantai

Hachimantai area is in the northern part of Ou Mountains, the backbone of Tohoku district, Japan. There remains about 3 m of snow still in April (Daimaru *et al*., 2000). Hachimantai volcanic group is a collection of Quaternary complex stratovolcanoes, and their bodies are being collapsed in landslides characterized by variety of body size and structures: some have deformed into several numbers of sliding blocks. Wetlands occur in almost all large scale landslide bodies. Many wetlands are also located in such as the volcanic craters and the nivation hollows.

3. Distribution and development process of wetland in landslide

The wetlands on the original surface of the volcanoes mainly stand in the craters, on the saddles with much snow accumulation, and on the lava terraces, on the other hand those in the landslides tend to stand just below scarps. In the northwest of Hachimantai volcano, a large-scale landslide has also some wetlands. It is considered to be a rotational slide and has many cracks parallel to the scarp. At the upper section of the body, the individual depression is large in size because back-tilted blocks have not substantially been dissected. Some poorly drained depressions become the wetlands, Bushiyachi, Naganuma, and Oyachi. By dating and analysis of the sediment of Oyachi we show its evolutional history. It was formed as a depression made by large disturbance primary, then was buried by multiple earth flows from its unstable circumference, and finally became the moor through the pond. Koizumi(1982) pointed out that the beginning of peat deposition in nivation hollows in the snowy mountains of Japan Sea side is influenced by the increase in snowfall since late Last Glacial Age. The formations of peat lands in the landslides are also expected to be associated with the landslide activities and the consequential topographic patterns.

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Keywords: mountain wetland, landslide mass, landslide depression, spatial distribution, development process

Japan Geoscience Union Meeting 2013
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HQR24-P07 Room:Convention Hall Time:May 23 18:15-19:30

Dendroarchaeological study of the medieval dwelling site (Moriyoshiienomae A) in northeastern Japan

Yasuharu Hoshino[1*], OHYAMA, Motonari[2], YONENOBU, Hitoshi[3]

[1]NRICP Nara, [2]Tohoku University, [3]Naruto University of Education

Dendrochronology provides valuable insight into the history of wooden remains by assigning accurate calendar dates, allowing the inference of past human activities in the context of environmental and societal conditions. In this study, we attempted to date wooden remains excavated from a dwelling site of the medieval age in northeastern Japan.

Samples of 53 wooden remains excavated from the medieval dwelling site (Moriyoshiienomae A) were provided from the Akita Prefectural Archeological Center. Most of the samples were from well frames. The species of the samples were identified as Japanese cedar (*Cryptomeria japonica*). Crossdating trials were performed between the individual samples. Eventually, tree-ring dates were confidently determined for 39 samples. A well replicated raw chronology spanning 439 years was newly constructed as an ensemble mean of the successfully crossdated series for the wooden remains. The raw chronology was crossdated with a reference chronology in the medieval period. Each of the sample series was then examined using both the reference and the raw chronologies as an additional check. The dated samples included bark (waney edge) or sapwood, which enabled us to recognize several phases of the past human activities lasting around 100 years.

Keywords: dendroarchaeology, crossdating, chronology development

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HQR24-P08 Room:Convention Hall Time:May 23 18:15-19:30

Development of bedrock rivers dissecting the Middle to Late Pleistocene marine terraces at North Sanriku Coast, NE Japan

Takashi OGAMI[1*]

[1]Fuculty of Science and Engineering, Chuo University

Development of longitudinal river profiles are investigated based on geomorphological features of marine terraces and analysis of digital elevation models at northern Sanriku coast, Northeast Japan. The rivers are cross cutting the Middle to Late Pleistocene marine terraces at right angle and some of them have sharp and distinctive river knick point which should be generated at cliffs of the terraces. In the study area, convex longitudinal river profile is common at lower reach of the rivers. Sharpness of knickpoint varies amongst the rivers, and causes of such difference in the longitudinal profile are expected as following. One possibility is difference of erosional intensity, which should have worn out sharp knickpoints to blunt ones. Another possibility is that marine terrace landform controls evolution of river profiles. In the study area, differences of erosional intensity are regarded as negligible or adverse agent. Effect of marine terrace forms on development of longitudinal river profile is discussed.

Keywords: the Middle Pleistocene, digital elevation model, marine terrace, longitudinal river profile, knickpoint

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HQR24-P09 Room:Convention Hall Time:May 23 18:15-19:30

Discussion on the conditions of liquefaction sites caused in The 2011 off the Pacific coast of Tohoku Earthquake

Hiroki Wakayama[1*], Toshihiko Sugai[1]

[1]The University of Tokyo, Department of Natural Environmental studies

1. Introduction

Liquefaction, one type of seismic phenomenon, tends to occur in the lowland where a lot of people live. It occurs at unconsolidated sand ground with high groundwater level. The study of liquefaction started after two earthquakes struck Alaska earthquake and Niigata earthquake, which occurred in 1964.

Many studies of liquefaction have focused on the relationships between liquefaction sites and micro topography, in order to predict the risk of liquefaction. However, The 2011 off the Pacific coast of Tohoku Earthquake (Tohoku Earthquake) revealed that the present study was not able to make an accurate prediction. Among such situations, the liquefaction study focusing on landform changes or landform history was done after the Tohoku Earthquake.

Thus, this study clarifies the liquefaction sites in Tohoku earthquakes and tries to evaluate the influence of artificial landform changes on liquefaction occurrence. The previous study 3.11 after the Tohoku Earthquake focused on surface geology. In addition, this study focused not only on surface geology but also on incised river valley filled with thick (over several ten meters) soft sediments deposited since the Last Glacial stage, ca. 20 ka.

2. Study Area

This study focused on two study sites in the Kanto plain, reclaimed land of the Tokyo bay area (Tokyo bay area) and the lower reaches of the Tone river lowland (Tone river lowland). At these typical liquefaction sites during Tohoku earthquakes, artificial landform changes can be seen.

3. Method

To determine out the area of artificial landform, this study utilized aerial photo interpretation and bibliographic survey. To identify the sites of liquefaction, this study used previous literature sources and Google Earth which has the advantage of being able to observe damaged wide areas soon after the occurrence of the liquefaction associated with Tohoku Earthquake even if we can not assess the damaged areas. The thickness of the sedimentary fill was calculated from the geologic column and the N-value.

4. Result and Discussion

In Tokyo bay area, construction method of landfills have two steps. The first step was to fence the bank, and second was filling of the fenced areas with the sand pumped up from the adjacent sea floor. The areas built by these steps have been densely developed along the Tokyo bay. There is no clear relation between the liquefied site and the landfill age. In contrast, if the thickness of sedimentary fill is over 50m or valley area, liquefaction tends to occur.

The artificial change of the landform in Tone river lowland was confirmed from former river channels,former ponds, former lakes, former coastal sand dunes and former river bank dunes. Liquefaction has occurred in former river channels,former ponds, former lakes, margins of former sand dunes, margins of natural levee and cutting of sand dune. There is no clear relation between the liquefied site and the thickness of sedimentary fill. In contrast, if sand layer got into mud layer, liquefaction tends to occur.

Keywords: Earthquakes, Liquefaction, landform change, sedimentary fill

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HQR24-P10 Room:Convention Hall Time:May 23 18:15-19:30

Possibility of tsunami inundation in Tokyo and Nakagawa Lowlands on the basis of surface deposits and tsunami simulation

Midori Takahashi[1*], Hori Shinzaburo[2], Kunihiko Endo[1]

[1]Nihon University, [2]Disaster Privention Technology Co., Ltd,

Tsunami prediction of Tokyo and Nakagawa lowlands is so important that some trials in Tokyo has been done (Hatori, 2006; Tokyo Metropolitan Government, 2012. etc). In both lowlands, however, there are few tsunami data, both geological evidence and historical documents.

In Soka City in Nakagawa lowland, located about 25km north of the present coasts, an event deposits formed by strong energy such as tsunami after 1400 years ago was reported (Kurosawa and Kosugi, 1996).

We carried out a tsunami inundation simulation in Tokyo Bay, and reexamine the tsunami deposits in Tokyo and Nakagawa lowlands, and then consider the possibility of tsunami inundation in the past and the present by comparing the simulation results and geological evidence.

We conducted the tsunami inundation simulation in Uraga Strait and Tokyo Bay using 50 m DEM basically, giving a rise of 6m in sea level by the entrance of Uraga Strait. As a result, the maximum water level in the northern Tokyo Bay is 3-5 m, in the southern Tokyo Bay and the Uraga Strait is 4-9 m.

At present, Tokyo Bay is mostly surrounded by higher reclaimed land and dikes than the maximum water level by the simulation in the Tokyo coastal zone. Behind those, however, the lowlands are occupied with very low altitude area. Thus, elevated water would run up through rivers and small waterways.

The water level resulted from the simulation is almost consistent with tsunami heights of the historical documents in the southern Tokyo Bay and Uraga Strait. But there is no enough evidence in the northern Tokyo bay.

There is quite few geological evidence in Tokyo and Nakagawa lowlands, so far, except the site in Soka. However, the paleogeographic condition in 1400 years ago to around the Genroku is greatly different from the present. For instance, the shoreline was located 10-15 km north of the present one.

Therefore, we have to consider different condition for the next tsunami simulation, using reconstructed topography and shoreline of 1400 years ago to the Genroku. This enables us to compare the simulation and geological evidence, and to examine the tsunami inundation possibility in Tokyo and Nakagawa Lowlands.

On the other hand, it is necessary to increase geological evidence of tsunami in this area. About the Soka case, i.e., sedimentary and dating data of the event sand deposit are obtainable, and the distribution of the sand layer is examined by boring data in Soka.

Finally, in Tokyo and Nakagawa lowlands, geological evidence and historical documents of tsunami are quite scarce. Our future purpose is to integrate geological approach and the tsunami simulation, and to make progress in examining possibility of tsunami inundation.

Keywords: Tsunami deposits, Tsunami simulation, Tokyo Lowland, Nakagawa Lowland

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Age of Kyodogawa fan deposits in southeastern Kofu basin, central Japan

Yusuke Arai[1*], Reisuke Kondo[2], Hidetsugu Yoshida[2], Yosuke Miyairi[3], Yusuke Yokoyama[3]

[1]Graduate student, Meiji Univ., [2]Meiji Univ., [3]Univ. of Tokyo

Many alluvial fans formed terraces in the Kohu basin after Late Pleistocene. Previous studies have examined the relationships among alluvial fan deposits and Kurohuji pyroclastic flow (0.6 Ma), Nirasaki mud flow (0.3 Ma), and On-PmI tephra (100 ka). However, the age of alluvial fans formed after the fallout of On-PmI tephra has not been determined yet. Thus, this study aims to clarify the age of fan deposits on the Kyodogawa fan, as a representative one in the southeastern Kofu basin.

In this study, we analyzed aerial photographs and topographic maps at a scale of 1/5000. Then, we described fan deposits and collected for tephra samples analysis and AMS^{14}C dating.

The Kyodogawa fan is divided by the younger, then lower alluvial fan surface at the downstream and the older alluvial fan surface. The fluvial terrace is distributed on the upstream of the older alluvial fan, topographically correlated with each other because of their continuity of geomorphic surfaces.

From the above geomorphic interpretation, we considered that the older fan deposits and the terrace deposits are the sequential ones. The older fan deposits and the fluvial terrace deposits are covered by volcanic ash. These volcanic glasses are identified as Aira-Tanzawa tephra (AT; 30 ka) on the basis of refraction index. In addition, the ^{14}C age of organic material in the layer covering the fan deposits supports that the fan deposits dates back to at around 30 ka.

Therefore, we conclude that the older alluvial fan and fluvial terraces were formed around 30 ka.

Keywords: Kofu basin, alluvial fan, Aira-Tanzawa tephra (AT), Late Pleistocene, AMS^{14}C dating

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Solifluction processes in the Holocene, observed at the northwestern slope of the Mount Akaishi, Southern Alps of Japan

Yudai Sugasawa[1*], Yusuke Arai[1], Reisuke Kondo[2], Hidetsugu Yoshida[2], Yosuke Miyairi[3], Yusuke Yokoyama[3], Takehiro Masuzawa[4]

[1]Graduate Student, Meiji Univ., [2]Meiji Univ., [3]Univ. of Tokyo, [4]Shizuoka Univ.

It can be observed periglacial landforms such as periglacial smooth slope, patterned ground and solifluction lobe in alpine zone and arctic area. These landforms are formed by freezing and thawing action under the cold climatic condition. Because they are the geomorphic markers indicating past and current environment of alpine zone and arctic area, it is important to understand distribution of these periglacial landforms. The purpose of this study is to clarify the depositional structure and the timing of formation of solifluction lobes at the northwestern slope of Mt Akaishidake (c. 3,120m a.s.l), Southern Alps of Japan. On this slope, a distribution of periglacial smooth slope ranges from 2550 m to 2850 m a.s.l., and that of patterned grounds and solifluction lobes are limited upper part than 2800 m a.s.l. Based on the stratigraphic observation and AMS^{14}C dating of paleosol buried by the solifluction lobes, we obtained the tentative result that the solifluction lobes were active also in the Late Holocene. According to Veit (1993), solifluction activity became a widespread from 1,800 yr B.P. to 800 yr B.P. Thus, the solifluction lobes at Mt. Akaishidake are possibly, too, active in the same period.

Keywords: solifluction lobe, buried soil, AMS^{14}C dating, Holocene, Southern Alps of Japan

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Late Holocene environmental changes of the inter-ridge marshes in the western Hamamatsu strand plain

Yoshiki Sato[1*], Osamu Fujiwara[2], Eisuke Ono[3]

[1]Graduate School of Sciences, Kyushu Univ., [2]GSJ/AIST, [3]Faculty Of Education, Niigata Univ.

In the western Hamamatsu strand plain, beach ridges are well developed and divided into six bars, which are named the BR 1 to 6 from landward to seaward by Matsubara (2004). While Matsubara (2007) suggested that BR1 emerged at ca. 4000 yr BP and the other series of beach ridges (BR2 to BR6) were formed during regressive stage, however, paleo-enviromental change in the inter-ridge marshes closed by the beach ridges was not clear. We performed geological survey, diatom analyses and radiocarbon dating to reconstruct the Late Holocene environmental change of the inter-ridge marshes in the western Hamamatsu strand plain.

The inter-ridge marsh between the BR1 and 2 is distributed at ˜3.5 km inland from the present coastal line. Surface geology of the site A, located at the northern margin of this marsh, consist of a sand layer and a mud layer in ascending order. In the mud layer, peaty mud layer between T.P. -1.0 to -1.7 m and T.P.-0.1 to -0.4 m, Amagi-Kawagodaira tephra (Kg, 3126-3145 cal BP) at T.P.-1.0 m and some sandy layers are found. The lower part of sediment of site A between T.P. -1.23 to -1.76 m is characterized by dominance of fresh-brackish water diatom species such as *Staurosira construens* and *Synedra tabulata* and accompanying a few brackish-marine water diatom species such as *Amphora ventricosa*. These diatom taxa indicate that this zone deposited at the brackish water condition such as a river mouth. In the range of between T.P. -1.08 to -1.18 m, *Cyclotella striata*, brackish-marine water planktonic species, increased up to approximately 20% and showed temporal salinity increase. Sediment above T.P. -1.02 m is characterized by abundant fresh water diatom species such as *Pinnlaria* spp. and *Eunotia* spp., suggesting fresh water marsh. Radiocarbon datings and Kg tephra of the site A indicated the transition from brackish to fresh water event occurred at ca. 3200 cal BP.

The inter-ridge marsh between the BR3 and 4 is distributed at ˜2 km inland. Surface geology is composed of sand layer, massive clay layer and peaty layer. Some sandy layers ranging from a few millimeters to 25 cm thickness are recognized in the clay and peaty layer. Diatom assemblages from the clay layer and the lower part of the peat layer at Site B and C were different from those in the lower part of the peaty layer. Fresh-brackish water diatom species such as *S. construens* and *S. tabulata* were often found in the clay layer and the lower part of the peat layer with some fresh water diatom species, *e.g. Navicula radiosa*. In contrast, the upper part of the peaty layer were characterized by fresh water diatom species such as *Aulacoseira granulata*, *A. ambigua* and *Fragilaria* spp. Timing of this transition from brackish water to freshwater pond was estimated ca. 3100-3200 cal BP based on radiocarbon datings.

Timings of development of fresh water pond/marsh at the two inter-ridge marshes were almost simultaneously. In the western Hamamatsu strand plain, tidal area changed to fresh water marsh/pond around 3200-3400 cal BP in two drowned lowlands (Sato *et al.* 2011, Sato and Kashima, 2012) and synchronous with those in the inter-ridge marshes. Formation of the fresh water pond at the inter-ridge marsh between BR3 and 4 and wide distribution of the BR4 suggests that emergence of the BR4 caused this environmental change. Further, temporal salinity increase before the fresh water pond/marsh formation around 3200-3400 cal BP was synchronous among site A and the two drowned lowlands. These results suggest that sea-water flowing into lagoons before 3200-3400 cal BP occurred commonly in the plain.

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Keywords: Hamamatsu lowland, beach ridges, inter-ridge marsh, Holocene, diatom assemblages

Japan Geoscience Union Meeting 2013
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The Development of Tenjogawa (the Raised Bed River) and Human Impacts in the Lower Reach of Kizugawa River

satoshi ishikawa[1*], SUGAI, Toshihiko[1]

[1]Department of Natural Environmental Studies, The University of Tokyo

I Introduction

Tenjogawa in Japanese means a raised bed river that has higher bed than the surrounded plain. Tenjogawa often has developed in Japan along artificially fixed river with embankments because of the convergence and deposition of sediment on the river bed.

II Background and Objective

Development of Tenjogawa relates to flood process, environmental changes in historical age and civil engineering techniques in the past. Understanding Tenjogawa contributes to river improvement in the future and studies on development of alluvial lowland. Therefore, studies on Tenjogawa are important because in Japan so many natural disasters occur and most of people live on alluvial lowland. However, there are few geomorphologic studies on Tenjogawa because it develops under artificial conditions. It is not clear that why the deposition of sediment occurs and when Tenjogawa was formed and where it is located on alluvial lowland.

There are some studies on the reason of the development of Tenjogawa. For example, extension of river(Saito and Ikeda 1998) or lower water level (Ishihara et al. 1962) caused the sedimentation. There are a few studies on the form age of Tenjogawa by analysis of sediment and their age is around 1300(Togo et al. 2002, Nakatsuka et al. 2010). And Ohya (2006) classified Tenjogawa in 4 but he did not discuss the development of Tenjogawa. There are few studies on the relation between development of Tenjogawa and alluvial lowland.

This study aims to clarify the development of Tenjogawa discussing the changes of the amount of sediment, climate changes, human impacts and the relation between the alluvial lowland and Tenjogawa.

III Target Areas and Methods

We will focus on several rivers including the Kizugawa River located the south of Kyoto Prefecture in Japan. Many Tenjogawa concentrate along the tributaries of the Kizugawa River and there are so many engineering data and research results.

We will measure geomorphic parameters of rivers, such as catchment area, length, width and long profiles, and analyze sediment including radioactive dating.

We made a geomorphological map using aerial photographs, topographical maps, DEMs, and drilling core data. And we sampled at Bogagawa River that is tributary of Kizugawa River and under destruction, and are measuring date of a chip of wood in the river bed of Tenjogawa.

IV Results and Discussions

The geomorphological map shows the tributaries of Kizugawa River became Tenjogawa after construction of artificial levee and fixing channel along with the mainstream of Kizugawa River. And it shows that there are Tenjogawa that has no alluvial fans and that has valley plain. These results differ those of Mizukami(2003). On the right bank of Kizugawa River, there are terraces that were formed by tributaries of Kizugawa River(Ikeda and Uemura 1980) and most of the rivers become Tenjogawa from the top of the alluvial fan. Most of the little high parts along Tenjogawa are large. On the other hand, on the left bank of Kizugawa River most of the little high parts along Tenjogawa are small without Susutanigawa River, and some rivers become Tenjogawa from the middle or bottom of the alluvial fan. These differences may depend on the amount of sediment in the upper stream of tributaries of Kizugawa River. We will present our results at the meeting of The Association of Japanese Geographers in March.

V Future Plans

And we will make long profiles of tributaries with the method of Ohmori(1991) To make the long profiles, we will use ArcGIS and 5m mesh DEM data of Geospatial Information Authority of Japan. And discuss the development of the tributaries with the approximation functions of the long profiles and separated segments at each landforms.

Keywords: raised bed river, civil engineering history, environmental changes, development of landform history, human activities, embankment

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The active fault distribution and their origin based on sonic prospecting in Beppu Bay, Japan

Keitaro Yamada[1*], Keiji Takemura[2], Tsuyoshi Haraguchi[3]

[1]Division of Earth and Planetary Sciences, Graduate School of Science, Kyoto University, [2]Beppu Geothermal Research Laboratory, Institute for Geothermal Sciences, Graduate School of Science,, [3]Haraguchi Tsuyoshi Department of Geosciences,Graduate School of Science,Osaka City University

Beppu Bay is located at the northeast end of the region called the Beppu-Shimabara graben (Matsumoto, 1979) in the central Kyushu, Japan. According to Itoh et al. (1998), the formation process of Beppu Bay is divided into two stages (Stage 1 and 2); especially pull apart basin was initiated in Stage 2 after 1.5Ma and has been subsiding. Therefore thick Quaternary sediment is preserved and many normal faults develop in the bay. The active fault trace and activity level was discussed using sonic prospecting and piston core in the shallow part (Okamura et al., 1992; Ooita prefecture, 1999), and the structure and tectonics was discussed using reflection survey and gravity prospecting in the deep part (Yusa et al., 1992). However, the relationship between the deep part structure and the shallow part structure are not discussed.

The sonic prospecting used Strata Box manufactured by SyQwest Company which was a portable high resolution sediment imaging instrument. Using frequency was 10 kHz and position was recorded by GPS at the same time. Sonic prospecting was carried out 468 km in total with a focus on reflection survey line in Yusa et al. (1992) on April 2nd, 4th, 13th, 14th, 15th and 16th, 2012.

As a result, the clear faults which cut a reflection surface were confirmed in 120 points in the bay. These faults were concentrated in the north central and western part of the bay. The normal faults around northwest of the bay were several kilometers long indicating parallel distribution including listric fault. Dip direction of these normal faults was opposite to each other. According to reflection survey data in Yusa et al. (1992), these normal faults reached about 300m depth and were located on the anticline topography of the lower unit. The southwest part of the bay was the deepest part, and fault traces are not clear. The indistinctness part attributable to the dispersion with the gas was pointed out by Allis et al. (1989). According to reflection survey data in Yusa et al. (1992), the indistinctness part existed to about 300m depth. In central part of the bay, there was Central Beppu Bay Fault (CBBF) and the indistinctness part along this fault. Folded structure which develops along CBBF was confirmed by distribution and depth of the Kikai-Akahoya tephra (K-Ah). These folded structures reach about several kilometers depth by Yusa et al. (1992). In the western part of CBBF, Many normal faults were distributed on this folded structure. In the mouth of the bay, many normal faults were confirmed. However, the detailed structure distribution did not become clear because of bad weather and the surface strong reflection layer composed of thick sand.

The distribution of the normal fault in the northwest of the bay is similar to active fault distribution of Kuenohira-yama (Chida, 1979) located in the west of the same tectonic province. Therefore, the normal fault in the northwest part is regarded as fracture that developed in the anticline formed Hiji volcano which was estimated around Beppu Bay (Ishizuka et al, 2005). Normal faults on the fold structure in the central part of the bay are fracture which reflected the rollover structure which pointed out by Takemura et al. (1992), because the fold structure reflects the deep part structure. On the other hand, CBBF is related to earthquake which generated in this area because CBBF accords with Beppu Bay Tectonic Line and reaches to the deep part. Lastly, the information of gas distribution is important to consider to tectonic movement in the bay because the indistinctness part attributable to the dispersion with the gas in the layer exists to several hundred meters depth and is distributed along CBBF.

Keywords: Beppu Bay, sonic prospecting, active fault, rollover, pull apart basin

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Developing process of the erosional landform and the developmental mechanism of slope failure in Shirasu area

IGARASHI, Ryusuke[1*], SUGAI, Toshihiko[1], IMURA, Ryusuke[2]

[1]Graduate School of Frontier Sciences, The University of Tokyo, [2]Graduate School of Science and Engineering, Kagoshima University

Shirasu(Ito pyroclastic flow deposits) generated in Aira caldera located at Kagoshima bay approximately 29,000 years {14C : 26-29ka(calendar year correction value):Machida and Arai, 2003} before present. Previous studies have clarified the failure mechanism of Shirasu slope (Matsukura, 1987; Shimokawa et al., 1989) or the historical development of landform in southern Kyushu (Moriwaki et al., 2002; Okuno, 2002). On the other hand, Kirino(1988) indicated that few studies focus on the deposited layer containing gravel, sand and younger volcanic ash in the erosional feature of Shirasu. Moreover, the developing process of the erosional landform and the developmental mechanism of slope failure were not made clear former enough from the historical viewpoint of geomorphological evolution of land-surface.

In this study the landform classification map was made by aerial photo interpretation with respect to the circumference of a former site of slope failure which occurred in the area over which Shirasu deposits is distributed. Moreover, cliff morphology surrounding the Shirasu plateau was observed and the strength of the Shirasu deposit were measured with the Schmidt hammer in the field. Grain size, water content and major element of the deposits were also analyzed. From the obtained results, the relationship of the history of a macroscopic landscape evolution and the failure occurring place in Shirasu plateau is discussed in this presentation.

Keywords: Shirasu, Slope Failure, Records, Geomorphological Development, Southern Kyushu

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Sedimentological studies of the relationship between human activities and environmental changes, northern Okinawa.

Katsuya Gotanda[1*], Kazuyoshi Yamada[2], Tsuyoshi Haraguchi[3], Koji Seto[4], Hitoshi Yonenobu[6], Akira Hayashida[5]

[1]Faculty of Policy Informatics, Chiba University of Commerce, [2]School of Human Sciences, Waseda University, [3]Department of Geosciences,Graduate School of Science,Osaka City University, [4]Research Center for Coastal Lagoon Environments, Shimane University, [5]Department of Environmental Systems Science, Doshisha University, [6]Graduate School of Education, Naruto University of Education

The beginningof agriculture in Ryukyu Islands goes back to the 10th-12th century(Takamiya and Itoh, 2011). As usual in many parts of the world,historical deforestation in Japan’s main islands were associated with crop cultivation, e.g. rice, wheat, barley, and millet, which accelerates soil flowage into water systems. Particularly in closed bays, finer-grained clasticscan remain sub-merged for long periods, resulting in adverse in fisheries

In this study, we obtained sediment cores from Hanechi inner bay, north-western Okinawa Island,to reconstruct the past environmental changes and human activities. Hanechi inner bay is surrounded by the YagachiIsl. and the OkubuIsl.Its maximum water depth is ˜10m with the area is 10kmˆ2. The bay is connected to the East China Sea at its northern and eastern parts. The coral reef develops around Yagachiand OkubuIslands. In the, NasataRiver flows into the bay.

The cores were obtained from the center of Hanechi inner bay in 2010. The 286-cm long core,is mainly composed of clay, with shell flagment layer at the 100-cm, 190cm and 230cm depths. The 14C age of a plant flagmentat the 253-cm depth is 1810 +/- 40 yr BP.

Subsamples were corrected from the core at an 2.3-cm interval for measurements of organic elements (CNS)and magnetic susceptibility. A change in magnetic susceptibility was recognized from 150cm to 40cm in depth. It is considered that the change was caused by an increasedinflow of finer-grained clastics around the Hanechiinner bay. From CNS analysis, TOC slightly decrease from 150cm in depth, suggesting that the deforestation induced by agricultural activities began since 1000 yr BP in this region.

Keywords: Hanechi inner bay, CNS analysis, magnetic susceptibility, human activity

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Grain size variations and climatic fluctuation during last 130 ka in the marginal area of the Japan Sea

Michiru Takizawa[1*], Toshihiko Sugai[1], Ryo Matsumoto[2]

[1]Depertment of Natural Environmental Studies, The University of Tokyo, [2]Organization for the Strategic Laboratory of Research and Intellectual Properties, Meiji University

1. Introduction

The sedimentation rate and the grain size of Aeolian dust in the marine sediment show glacial-interglacial scale variations and D-O cycles in the This tendency also can be seen in the central area of Japan Sea. Nevertheless the sediments of Japan Sea are contributed not only by Aeolian dust derived from the intercontinental arid area but also by the fluvial discharge and volcanic product derived from the marginal areas of Asia continent and the Japanese Arc. The marine cores of Japan Sea on MD179 were extracted mainly at the Umitaka spur at the Japanese arc margin, about 25 km northwest of Takada Plain. Thus it is supposed that these cores to be contributed by discharge from some rivers running throughout Takada Plain and Toyama Bay. Separating Aeolian dust and fluvial sediment from these cores, it is expected that the link between variations in aeolian sediments and fluvial sediments to be revealed.

2. Study Cores

MD10-3296, of which measured depth is 39.34m, were extracted at the depth of 914m on the Umitaka spur, and its sedimentation time is estimate to be about 90,000 years. MD10-3304, of which measured depth is 34.35m, were extracted at the depth of 896m on the Umitaka spur, and its sedimentation time is estimate to be about 130,000. These marine cores have silty or muddy sediments, and some tephra. Thus their sedimentation rate and age models have been established by tephrochronology (Nakamura et.al., 2013).

3. Study Method

The grain size of the raw and wet samples of these cores was analyzed by SALD3000S (Laser diffraction particle size analyzer). In the marine sediments, the biogenic matters, such as organic matters, foraminiferal shells and diatomaceous shells contain. In order to reveal the grain size fluctuation of terrigenous matters, the biogenic matters must be removed.

4. Result

The median grain size variation of the marine sediment has such trend that to be coarser in the relatively colder period and finer in the warmer period during from MIS 5 to 3. Compareing the median grain size fluctuation of the cores and oxygen isotope ratio cycle of SPECMAP and NGRIP, the grain size variation has the same trend with prior research before 30ka, but opposite trend after 30 ka. Removing biogenic matters from samples of each core, Aeolian dust and fluvial discharge will be divided from the marine sediment. In this presentation, the linkage between variation of fluvial discharge and geomorphic environmental change is discussed.

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Keywords: MD179, Umitaka Spur, grain size analysis, eolian dust