Japan Geoscience Union Meeting 2013
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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

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

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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

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

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

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

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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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Relationship between landslides and wetland configurations in Hachimantai volcanic group

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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

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

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

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

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

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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

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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

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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

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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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HQR24-P14 Room:Convention Hall Time:May 23 18:15-19:30

The Development of Tenjogawa (the Raised Bed River) and Human Impacts in the Lower Reach of Kizugawa River

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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

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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

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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.

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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

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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.

Acknowledgements

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