HQR24-01 Room:313 Time:May 1 14:15-14:30

Seismic history of the last 5500 years reconstructed from the topographic development of the Furen-ko barrier system

NANAYAMA, Futoshi[1*] ; SHIGENO, Kiyoyuki[2] ; HASEGAWA, Takeshi[3] ; WATANABE, Kazuaki[1] ; ISHIWATA, Kazuto[5] ; IKEDA, Yasuo[4] ; UCHIDA, Yasuhito[6]

[1]Geological Survey of Japan, AIST, [2]Meiji Consultants Ltd., [3]Ibaraki University, [4]Kushiro Branch, Hokkaido University of Education, [5]Betsukai Museum, [6]Geological Survey of Hokkaido, HRO

There are some active barrier (island) systems in eastern Hokkaido. Since 2011, we have been investigating the Hashirikotan barrier spits in the northern part of Furenko barrier system facing the Sea of Okhotsk/ Nemuro Strait because five branches of spits (BR1-BR5) are clearly observed. According to GPS topographic survey, GPR exploration, hand drilling survey, grain size analysis, AMS 14C dating and tephra chronology, we already got some important geomorphological results as bellows.

As a first point, the Furenko barrier system has been established since 5.5 ka, and there were two lagoon-expanding stages at 5.2 and 4.0 ka estimated by volcanic ashes, Ma-e and Ma-d from Mashu volcano. As a second point, the youngest BR5 has occurred after the 17th century and BR4 caused by the last seismic up rifting in the 17th century because it was covered with two historical volcanic ash layers, Ta-a and Ko-c2 from Tarumai and Komagatake volcanoes. BR2 caused by the seismic up rifting in the 9th century because it was covered with B-Tm from Baitoushan volcano in AD 929. BR3 and BR1 were undated clearly, but we are able to assume that BR3 rifted in the 12-13th century and BR2 rifted at 4.0 ka. These two BRs were covered with large eolian dune layers just after emerging each BR.

Since 2003, it was clearly that the great earthquakes (Mw8.5~) have been occurred at an interval of 500 years along the southern Kuril subduction zone. Especially coastal area raised almost 1 or 2m just after the great earthquakes due to the post-seismic displacements. But conversely land subsidence has been continuing at a rate 8.5mm/year since the 17th century until now. We express that geomorphological evolution of the Furenko barrier system has been controlled by the seismotectonics along the southern Kuril subduction zone.

This work was supported by JSPS KAKENHI Grant Number 23540539.

Keywords: Lake Furen-ko, barrier spit, topographic development, Nemuro Strait, sea-level change, seismic history

HQR24-02 Room:313 Time:May 1 14:30-14:45

Late Quaternary tephras and basin fill sediments under Ukinuman, Murayama city in the north part of Yamagata basin, Nort

SUZUKI, Takehiko[1*] ; KASAHARA, Amao[1] ; YAGI, Hiroshi[2] ; IMAIZUMI, Toshifumi[3] ; YOSHIDA, Akihiro[4]

[1]Tokyo Metropolitan University, [2]Yamagata University, [3]Tohoku University, [4]Meiji University

Yamagata basin, one of the tectonic basins aligning along the west part of Ou Backbone Range, Northeast Japan Arc, exists between hills and mountains. Active faults concentrate along the west margin of the Yamagata basin. In the north part of the basin where more active faults were recognized than the south part of the basin, not only marginal faults bordering hills and mountains but also isolated faults in central part of the basin were recognized by Yagi et al. (2001). In order to establish the history of fault activity and landform development in the basin, chronological and sedimentological studies on the basin fill sediments beneath the ground surface is necessary. In this study, an all-core boring (MR-13-1) with a depth of 101.00 m was carried out at Ukinuma (81.40 m a.s.l.), Murayama City, Yamagata Prefecture in October to November, 2013. Preliminary results are as follows.

Stratigraphy

Fine sediments dominate less than 64.60 m in depth, composing of silt to organic silt except three sand and gravel layers with thickness of $<$1.65 m. Sediments between 64.60 and 101.00 m in depth consist of an alternation of silt, sands, and gravels. Depths of tephras already identified are 3.34-3.47 m, 35.34 m, and 75.86-76.24 m.

Tephra

A gray to white ash-fall deposit with a depth of 3.34-3.47 m contains hornblende (n_2=1.670-1.673) and orthopyroxene (gamma=1.709-1.714). Refractive indices of glass shards is n=1.499-1.500. These characteristic properties show that this ash is correlative to Hijiori-Obanazawa Tephra (Hj-O, 11-12 ka; Machida & Arai 2003).

A thin white vitric tephra (4 mm in thickness) at 35.34 m in depth characterized by bubble-wall to stripe types of glass shards (n=1.496-1.500; SiO_2: 78.44 wt.%, Al_2O_3: 12.05 wt.%, CaO: 1.08 wt.%, FeO: 1.12 wt.%, K_2O: 3.21 wt.%, Na_2O: 3.40 wt.%) (containing a small mount of quartz) is correlated to Kikai-Tozurahara Tephra (K-Tz, 95 ka; Machida & Arai 2003).

An ash-fall deposit with a depth of 74.86-75.17 m was detected. This tephra contains orthopyroxene (gamma=1.724-1.730), quartz, and sponge to fiber types of glass shards (n=1.498-1.502), and is possibly originated from volcano in the vicinity.

In presentation, chemical compositions of glass shards in tephras mentioned above and ages by carbon 14 dating will be reported.

Keywords: Yamagata basin, Underground geology, Tephra, Late Quaternary, Boring core

HQR24-03 Room:313 Time:May 1 14:45-15:00

Late Quaternary tephras and basin fill sediments under northeast part of Yonezawa basin, Northeast Japan

KASAHARA, Amao[1*] ; SUZUKI, Takehiko[2] ; KITAMURA, Akihisa[2] ; KATO, Shinji[4]

[1]Graduate student, Tokyo Metropolitan University, [2]Tokyo Metropolitan University, [3]Shizuoka University, [4]NEXCO East

We report tephras distributed under the northeastern part of the Yonezawa Basin, in the southern part of the Northeast Japan Arc.The Yonezawa Basin is the one of the inland tectonic basins along the backarc side of the Ou Backbone Mountains. There is a wetland which delimited by the small fans in the southern and western margins and by the mountains in the northern and eastern margins around the Lake Hakuryu in the northeastern part of the Yonezawa Basin, which called Oyachi (Yoshida, 1955). We observed two cores, B7-1-2 and B7-1-14, both drilled at Fukanuma , Takahata Town at the southern margin of the wetland. Both core obtained at distance of about 200 m, and about 90 m long.

Both B7-1-2 and B7-1-14 cores have well developed peat deposit. Silt and peat deposit contains about 1-20 cm thick thin sand layers repeatedly. Well sorted granule thin layers and pebble thin layers which contains max 4 cm in diameter are observed at the middle and lower part of the sediments, but poorly lateral continuities. In addition, both cores are not drilled through the Quaternary deposit under the Yonezawa Basin.

In the B7-1-2 core, Numazawa-Kanayama tephra (Nm-KN; 62-65 ka: Suzuki and Soda, 1994) is in 31.59-31.655 m depth, Aso-4 tephra (Aso-4; *ca.* 87 ka: Aoki et al. 2008) is in 44.16-44.23 m depth as a blocky form, and two-pyroxene crystalline ash (B7-1-2L) is in 79.14-79.16 m depth, are observed.

In the B7-1-14 core, Nm-KN is in 27.33-27.34 m depth, two-pyroxene crystalline ash (B7-1-14E) is in 75.47-75.485 m depth, and glassy ash contains babble-wall type of glass shards (B7-1-14G) is in 83.97-84.07 m depth, are observed. Furthermore, a beige ash patch observed in 39.385-39.39 m depth would correlate to Ontake-Nagawa tephra (On-NG; 85.1 ka: Nagahashi et al., 2007).

We could not observed a AT bed in the both cores, however, we detected babble-wall type of glass shards from correlate to AT in the gray silt bed in 21.62-21.63 m depth between a peaty silt bed in the B7-1-2B core (not sequential sampled). In addition, B7-1-2L and B7-1-14E are correlate to each other because of its height above sea level and petrographic features.

It is concluded that height above sea level of Nm-KN and B7-1-2L/B7-1-14E indicate sediments in the both cores deposited almost horizontal form. Deposition rate simply calculated and estimated from age and depth of Aso-4 in the B7-1-2 core is about 0.5 m/kyr, which shows slightly larger value than 0.22-0.35 m/kyr (Suzuki et al., 2013) based on tephrochronology obtained in the Aizu Basin to the south of the Yonezawa Basin recently. This deposition rate is generally reconciling rate if it is assumed that deposition rate of the Yonezawa Basin floor depends on the activity of the Yonezawa Basin Western Margin Fault which slip rate is 0.4-0.5 m/kyr.

Keywords: Yonezawa basin, Underground geology, tephra, Late Quaternary, Boring core

HQR24-04 Room:313 Time:May 1 15:00-15:15

The age of the Inubou Group in the Choshi district, Chiba Prefecture, Japan, based on tephra correlation

TAMURA, Itoko[1*] ; YAMAZAKI, Haruo[1] ; MIZUNO, Kiyohide[2]

[1]Dep. Geography, Tokyo Metropolitan Univ., [2]AIST, GSJ

Numerous widespread tephra layers of late Pleistocene and Holocene age have been known since the early 1970s and greatly contribute to paleoenvironmental reconstruction in the Japan islands and adjacent seas. This study has identified a new widespread tephra using the trace element composition of volcanic glass determined by ICP-AES analysis and the stratigraphy.

In1 tephra is found at lowest part of the Naarai Formation in the Inubou Group, Choshi district, Chiba Prefecture, accumulated during Pliocene to Early Pleistocene. Ikg1 tephra is found in upper Ikego Formation in the Miura Group, Kanagawa Prefecture, accumulated during Pliocene. B25 tephra is found at Horinouchi Formation in the Kakegawa Group, Shizuoka Prefecture, accumulated during Pliocene to Early Pleistocene.

In1, Ikg1 and B25 tephras are white and fine grain. The thickness of these deposits range from cm(Ikg1) to 22cm(B25). These tephras mainly consist of glass shards of bubble-wall type. The glass shards of these are poor in K_2O (<2 %) and La (<15 ppm) and rich in Y(>40 ppm), which give low La/Y (about 0.3) and high Ba/La (about 30). These characteristic chemical compositions of glass in tephras erupted from the Tohoku area (Mizuno, 2001).

The age of In1 tephra is estimated at about older than 3 Ma based tephrochronology in Choshi area (Tamura et al.,2007). The age of Ikg1 is estimated at about older 3.1Ma based biostratigraphy and magnetostratigraphy (Utsunomiya et al, 2012 and Utsunomiya, 2013). The B25 tephra is estimated at about older 2.9Ma based on tephrochronology (Tomita and Kurokawa, 1999 and Kurokawa and Tomita, 2000).

This tephra correlation indicates that the age at lowest part of the Inubou Group is estimated older than 3.1 Ma.

Keywords: Plio-Pleistocene, Tephra correlation, Inubou Group, Depositional age, Marker Tephra

Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

HQR24-05 Room:313 Time:May 1 15:15-15:30

Underground electrical resistivity and soil water content on the surface around former river channel of Tone River

NAKANO, Takayuki[1*] ; KOARAI, Mamoru[1]

[1]GSI of Japan

Land liquefaction occurred in a land reclaimed water area such as former river channel induced by the 2011 off the Pacific coast of Tohoku Earthquake. The land liquefaction was a biased distribution even in former river channel. We assumed that groundwater level and/or shape of former river bed (depth of former river) have a significant influence though the factor of this phenomenon is various. Therefore, we conducted electrical prospecting (2-D electrical resistivity prospecting) on former river channel of Tone River around Kozaki Town, Chiba Prefecture, to estimate a distribution of groundwater level and/or shape of former river bed from underground distribution of electrical resistivity. In addition, we considered a relationship between underground distribution of electrical resistivity and soil water content on the surface by measuring soil water content on the surface along the electrical prospecting line. In this survey area, there are data of layer profiles (trench survey profiles) and boring core stratigraphes by the National Institute of Advanced Industrial Science and Technology (AIST) and the Chiba Prefectural Environmental Research Center (CERC) (Mizuno et al., 2013; Miyaji et al., 2013).

Electrical prospecting was performed by the pole-pole array in 280m length, electrode intervals of 1m and until 15m deep. Measurement of soil water content was performed by volumetric soil water content sensor (by the method of responding to changes in the apparent dielectric constant) and weight water content sensor (by alternating current two electrode method). These measurements of soil water content were performed intervals of 10m on the electrical prospecting line, and three times in each measurement points and each sensors. We used these average values.

Electrical resistivity profile indicated clearly difference between reclaimed soil in the former river channel with relative high electrical resistivity (more than 20-30 ohm-m) zone and a ground out of former river channel with relative low electrical resistivity (less than 20-30 ohm-m) zone. The position where the boundary of these zones reaches near the surface was correspondent with a boundary of land liquefaction (sand volcano) area by the 2011 off the Pacific coast of Tohoku Earthquake. It is possible that the underground distribution of electrical resistivity is affected by a soil property more than soil water content. Distribution of groundwater level was unclear though it was estimated to be 1.5m in depth from that usual electrical resistivity of saturated sand is 80-100 ohm-m (The Japanese Geotechnical Society, 2003). As a groundwater level near this survey area by the boring survey (Mizuno et al., 2013) was 0.7m in depth, it is possible that electrical resistivity near the groundwater level is higher than 80-100 ohm-m.

As a result of compared the soil water content on the surface with the electrical resistivity beneath the surface, there was a correlation that weight water content is low in a high electrical resistivity. However, there was not a correlation between volumetric soil water content and electrical resistivity. Also, it was not able to confirm the relationship between soil water content and groundwater level because of the groundwater level was not able to estimate from the distribution of electrical resistivity.

This result indicated a detection of the shape of former river bed and a correlation between the soil water content on the surface and the electrical resistivity beneath the surface. We would like to find out an index with land liquefaction in former river channel due to perform a ground penetrating radar survey in the same field.

Keywords: former river channel of Tone River, Kozaki Town, electrical prospecting, distribution of electrical resistivity, soil water content

HQR24-06 Room:313 Time:May 1 16:15-16:30

Geological survey for liquefaction-fluidization phenomena: damage and survey by PD-CPT

KAMEYAMA, Shun[1*] ; KAZAOKA, Osamu[1] ; SHIGENO, Kiyoyuki[2] ; SUZUKI, Yoshiyuki[2] ; FUKUMA, Tetsu[3] ; MORISAKI, Masaaki[1] ; YOSHIDA, Takeshi[1] ; KAGAWA, Atsushi[1] ; SAKAI, Yutaka[1] ; KIMURA, Michio[1] ; OGURA, Takayuki[1]

[1]Research Institute of Environmental Geology, Chiba, [2]Meiji Consultant Co., Ltd, [3]ACE Sisui Kogyo Co.,Ltd

2011 off the Pacific coast of Tohoku Earthquake and the aftershock brought heavy damage in the various places in East Japan. At a public high school in Mihama ward, Chiba city, remarkable liquefaction - fluidization phenomena occurred in a part of the bicycle place. Sand spouted out the surface of the ground and the ground level sank partially 30 - 40cm height.

In the part that the level of the ground surface changed, we investigated portable dynamic cone penetration test every 1.5 - 2m densely horizontally.
As a result of investigation by portable dynamic cone penetration test, the situation of the subsidence of the ground surface and relations with geological structure became clear.

We can grasp the hardness of the layer in exact depth by portable dynamic cone penetration test, but it is only hardness. We cannot confirm a particle size and the sedimentation structure of the stratum by portable dynamic cone penetration test.
It becomes the high investigation into precision more by comparing geological survey with portable dynamic cone penetration test. Because stratum sample may expand and contract when we pull up stratum in geological survey, this is because it can correct depth by comparing it with the result of portable dynamic cone penetration test.

Keywords: Liquefaction-Fluidization, The 2011 off the Pacific coast of Tohoku Earthquake, Chiba city, Man-made Strata, Geological survey, Portable Dynamic Cone Penetration Test

HQR24-07 Room:313 Time:May 1 16:30-16:45

Geological survey for liquefaction-fluidization phenomena: New method of geological survey by new ACE liner

SHIGENO, Kiyoyuki[1*] ; SUZUKI, Yoshiyuki[1] ; FUKUMA, Tetsu[2] ; KAZAOKA, Osamu[3] ; KAMEYAMA, Shun[3] ; MORISAKI, Masaaki[3] ; YOSHIDA, Takeshi[3] ; KAGAWA, Atsushi[3] ; SAKAI, Yutaka[3] ; KIMURA, Michio[3] ; OGURA, Takayuki[3]

[1]Meiji Consultant Co., Ltd, [2]ACE Sisui Kogyo Co.,Ltd, [3]Research Institute of Environmental Geology, Chiba

Thinking about origin by collecting the stratum in the alluvial lowland that is the main living surface of us is very important. Liquidizing-fluidizing phenomenon occurs mainly in man-made strata distribution area in Chiba Prefecture, surface subsidence local area of more than 50cm occurs in the Tohoku-Pacific Ocean Earthquake in 2011. As one of the causes liquidizing-fluidizing, greater potential impact of geological structure of the deep alluvium and man-made strata of shallow has become high (Kazaoka et al., 2012). This improved ACE liner ((Japanese patent application No.3669495) in order to clarify the mechanism and certification of liquidizing-fluidizing point in the layer , and man-made strata deeper and man-made strata that has been soil filled with the dredged sand in shallow underground in this study because it was able to taken the state of the oriented and non-disturbing, observe various structures of the layer, and reports a research method.

Survey results, as well Geoslicer (Nakata et al., 1997) and, without having to be re-liquefaction during drilling the sand hard cohesive soil soft to subsurface 8m, new ACE liner became recoverable in undisturbed sample. Survey results, as well Geoslicer (Nakata et al., 1997) and, without having to be re-liquefaction during drilling the sand hard cohesive soil soft to subsurface 8m, new ACE liner became recoverable in undisturbed sample. On the other hand, there is the core shrinks during drilling and fall of the sand layer at the bottom device to prevent falling of the sample does not operate, loose sand layer is dehydrated deformation during press-fitting part. I believe you require improved by updating technology and experience accumulated in the future.

Keywords: Liquefaction-Fluidization, The 2011 off the Pacific coast of Tohoku, Chiba city, Man-made Strata, Geological survey, ACE liner

Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

HQR24-08 Room:313 Time:May 1 16:45-17:00

Geological survey for liquefaction-fluidization phenomena: Geological cross section of man-made strata and mechanism

KAZAOKA, Osamu[1*] ; KAMEYAMA, Shun[1] ; MORISAKI, Masaaki[1] ; SHIGENO, Kiyoyuki[2] ; SUZUKI, Yoshiyuki[2] ; KAGAWA, Atsushi[1] ; YOSHIDA, Takeshi[1] ; KIMURA, Mitsuo[1] ; SAKAI, Yutaka[1] ; OGURA, Takayuki[1]

[1]Research Institute of Environmental Geology, Chiba, [2]Meiji Consultante Co., Ltd

Terrible liquefaction-fluidization phenomena happened partially with subsidence, 10-50 m width and 20-100 m length, less than 1m height in northern Tokyo bay reclaimed land on the 3011 off the Pacific coast of Tohoku Earthquake. Large amount of sand and groundwater spouted out in the terrible subsided parts. But there are little subsidence and jetted sand outside of the terrible subsided part (RIEGC, 2011).

Continuous box core samples from surface to 5-7 m depth could be taken at the each 3-5 m length from little subsided part to terrible subsided part in Chiba city. Detailed litho-stratigraphy and liquefaction-fluidization parts were studied on the continuous box core samples and large relief peel on the core samples. These data indicate as follows.

1. The thickness of man-made strata is 5-7 m. The thickness increases to subsided part.

2. Man-made strata is composed of Dumped Association, Upper Filling Association and Lower Filling Association. Two Filling Associations were made by sand pump method from bottom sediments in the Tokyo bay. Upper Filling Association consists of lowermost, lower, upper and uppermost bandle.

3. Litho-facies of each man-made strata is as follows.

Dumped Association: This association is composed of 1.5-2.2 m thick sandy silt to silty fine sand layers with siltstone brocks and rock gravels. Sand dike with yellowish brown sand and gray sand distribute rarely

Uppermost Bandle of Upper Filling Association: this bandle is composed of 0.2-0.8 m thick yellowish brown laminated fine-medium sand layers. Upper part of this bandle lost primary sedimentary structures and loose. The base of this bandle consists of laminated coarse-very coarse sandy shell fragment layers.

Upper Bandle of Upper Filling Association: This bandle is composed of 0.4-1.8 m thick gray medium sand layers. Shell fragment layers often interbeded in this sand layers. The sand layers lost primary sedimentary structures and very loose.

Lower Bandle of Upper Filling Association: This bandle is composed of 0-1.8 m thick gray silt layers. Lower part of the silt layer sometimes show slump structures.

Lowermost Bandle of Upper Filling Association: This bandle is composed of 0.7-1.8 m thick gray shelly medium sand layers. Shell fragment layers often interbedded in the shelly sand laters. Top of this bandle consists of loose medium sand without primary sedimentary structures. The medium sand injected in the upper silt layers.

Lower Filling Association: This association is composed of 0.5-3.5 m thick yellowish gray laminated relatively dence matrix free good sorted fine-medium sand layers. This association may deposited removed filling sand by wave action on shoreface.

4. Liquefaction-fluidization parts are in man-made strata, top of the lowermost bandle, upper bandle and uppermost bandle of the Upper Filling Association.

5. Subsidence part distribute in thin part of lower bandle and thick part of upper bandle of the Upper Filling Association. The aboves show that subsidence concern with the liquefaction-fluidization part of the upper bandle of Upper Filling Association.

Keywords: Liquefaction-Fluidization, The 2011 off the Pacific coast of Tohoku Earthquake, Tokyo bay reclaimed land, Man-made Strata, Geological survey by continuous box core, Mechanism