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

HQR23-01 Room:202 Time:May 24 09:00-09:15

Comprehensive investigation of the liquefied layers in the downstream basin of the Tone River

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We conducted the drilling survey and core analysis, trenching survey, boring data analysis and the microtopographical classification to clarify the characteristics of the liquefied layers in the downstream basin of the Tone River, central Japan. It is supposed that the sandy layers younger than 1 ka : the upper part of the alluvium were likely to be liquefied.

Keywords: liquefied layer, drilling survey, trenching survey, alluvium, microtopographical classification, downstream basin of Tone River

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

HQR23-02 Room:202 Time:May 24 09:15-09:30

Liquefaction-fluidization horizons in subsurface strata at The 2011 off the Pacific coast of Tohoku Earthquake in Tonega

Osamu Kazaoka[1*], kiyohide Mizuno[2], Takeshi Yoshida[1], Susumu Tanabe[2], Atsushi Kagawa[1], Masaaki Morisaki[1], Shinji Nozaki[1], Mihoko Kanno[1], Kunio Furuno[1], Yutaka Sakai[1], Michio Kimura[1]

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Eastern japan had serious damage by the and after shocks. Liquefaction-fluidization phenomena with few tens centimeter to one meter subsidence occurred widely around paleo-river channel at this earthquakes on Tonegawa lowland area along the Kashiwazaki-Cyoshi tectonic line. The phenomena with few centimeter subsidence occurred in narrow part of the paleo-river channel on there at the 1987 east off Chiba prefecture earthquake. Authors have investigation by continuous borings and trenches around the liquefaction-fluidization part. Liquefaction-fluidization horizons and stratigraphy after the last glacial epoch by continuous borings on Kozaki-shinnjyuku in Kozaki town in the Tonegawa lowland area are showed as follows. The strata after glacial epoch consist of Sawara formation and Man-made Strata. Sawara formation have more than 55 meter thick. The formation is composed of lower member, middle member and upper member. Lower member mainly consists of medium sand bed and pebbly dense fluvial sand bed. Middle member mainly consists of brackish coarse silt bed with flaser and wavy bedding and brackish to fresh clayly silt bed. Upper member mainly consists of clean loose fluvial fine sand bed with cross bedding and plant fragments. Man-made Strata consists of mainly clean very loose medium sand by hydraulic fill with about 5 meter thick. Liquefaction-fluidization horizons are Man-made Strata and upper member of Sawara formation. It is possible that the upper member of Sawara formation had been liquefied and fluidized at 1923 Kanto earthquake and 1703 Genroku earthquake.

Keywords: Liquefaction-Fluidization, The 2011 off the Pacific coast of Tohoku Earthquake, Tonegawa lowland, Man-made Strata, Holocene strata

Japan Geoscience Union Meeting 2013
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HQR23-03 Room:202 Time:May 24 09:30-09:45

Trench survey of the Liquified soil from Lower basin of the Tone River due to the 2011 Tohoku Earthquake

Yoshinori MIYACHI[1*], Osamu Kazaoka[2], Kiyohide Mizuno[1], Taku Komatsubara[1], Atsushi Urabe[3]

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There were liquified soil from Lower basin of the Tone River due to the 2011 off the Pacific coast of Tohoku Earthquake. Result of the trench survey, the sand dike apeared not only 2011, but 1987 Chiba-Ken-Toho-Oki Earthquake.

Keywords: The 2011 off the Pacific coast of Tohoku Earthquake, Liquiefaction, Sand dike, Lower basin of the Tone-Gawa River

Japan Geoscience Union Meeting 2013
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HQR23-04 Room:202 Time:May 24 09:45-10:00

Factors of liquefaction damage in the Hinode district, Itako, Ibaraki Prefecture, central Japan

Atsushi Urabe[1*]

[1]URABE,Atsushi

Serious Liquefaction phenomena happened on Hinode, Itako, Ibaraki Pref., middle to downstream region of the Tone River, at the 2011 off the Pacific coast of Tohoku Earthquake. Those damaged area were on reclaimed land by dredge. The stratum of the damaged area consists of the sediment of lowland sand the dredge sandy sediment as a result of the drilling survey. Judging from the facies of sediment and grain size composition, liquefaction is presumed to have occurred in the dredge sandy sediment.

Keywords: The 2011 off the Pacific coast of Tohoku Earthquake, Liquefaction, Dredging sand layer, Itako

Japan Geoscience Union Meeting 2013
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HQR23-05 Room:202 Time:May 24 10:00-10:15

LiquefactionFluidization and Geo-stratigraphic units in reclaimed land

hisashi nirei[1*], Osamu Kazaoka[2], Kiyohide Mizuno[3], Tomoyo Hiyama[4], Shoichi Uesuna[5]

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Man-made strata are often regarded as too randomly deposited and inter-mixed to be classified into a hierarchy. But that is not always so. These deposits are often formed of a material deposited in one or more stages or a group of materials deposited in several stages several stages. For example, man-made strata (MMS) in the reclaimed land we can approximately indentify three material types, upper stream deposits, e.g. coarse, middle stream deposits, e.g. medium and dawn stream deposits, e.g. fine and see the former stream deposits near the slack mouth of dredged materials from sea bed by a dredging machine and the later stream deposits in stagnant area so far from the slack mouth. Middle stream deposits, e.g. from medium sand to very fine sand, are developed between the former deposits and the later deposits. Liquefaction-Fluidization almost have occurred in the middle stream deposits in reclaimed land.

Keywords: Liquefaction-Fluidization, man-made strata (MMS), upper stream deposits, middle stream deposits, dawn stream deposits, reclaimed land

Japan Geoscience Union Meeting 2013
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HQR23-06 Room:202 Time:May 24 10:15-10:30

Dense grain size analysis for acquiring basic statistics and its utilization for the identification of liquefied horizon

Tomio INAZAKI[1*]

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The conventional grain size distribution analysis technique, standardized as JIS A 1204 and widely used in geotechnical engineering field, is inappropriate for the geological study of sediments. Because the technique can only provide sparse and irregularly spaced distribution data displayed as accumulation curves. Moreover, there is no insurance of traceability, due to the flushing-out of entire specimen from sieves after the analysis. Regretfully, geotechnical engineers do not aware its inaptness, and are still wasting their efforts for grasping grain size characteristics of soils by means of the technique. In contrast, Laser diffraction and scattering method, and optical measuring tools, which can provide dense grain size data, have been widely utilized by sedimentologists.

We have been adopting a Laser diffraction and scattering particle size analyzer for the fine particles smaller than 3phi, and conventional sieving method for the coarser particles but at 1/4phi intervals. Individual data are merged to form not only accumulation but also frequency distribution data from 13phi to -3phi at equal 1/4phi intervals. This dense and equally spaced data of grain size distribution enable us to simply calculate basic statistics, such as sorting, skewness and kurtosis. We applied this analytical technique to the core specimen sampled from liquefied sites. The core specimen were first cut into disks at 2.5 to 5.0 cm in thickness, and processed under the above grain size analysis procedure. As a result, liquefied horizon showed specific features in the basic statistics. Namely, sorting indices were usually below 2.0, and kurtosis indices showed usually larger than 7.4, characterized as very leptokurtic. The characteristic feature is one of the effective indicators for identifying liquefied horizon.

Keywords: Grain size analysis, Sieving, Laser diffraction and scattering, Basis statistics

Japan Geoscience Union Meeting 2013
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HQR23-07 Room:202 Time:May 24 11:00-11:15

Beach ridges and prograded beach deposits as palaeoenvironment records: a review

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[1]Geological Survey of Japan, AIST

Beach ridges are ubiquitous landforms developed on prograded coastal plains with beach shorelines. They are formed within or adjacent to the beach by a range of processes, and are subsequently isolated from active nearshore process as further beach progradation occurs, at which point they are preserved as relict elongate mounds parallel to subparallel to the shoreline. Beach ridges and their subsurface deposits thus record past coastal processes, and are indicators of past shoreline position and shape, and sea level. A sequence of beach ridges and intervening swales provides a relative chronological palaeoenvironmental record, which is analogous to tree rings and stratigraphic succession. Methodological advances in field surveying and chronology applicable to beach ridges especially over the last two decades have led to detailed palaeoenvironmental reconstructions to be derived from such sequences. Reviewing various applications of beach ridges and their deposits for palaeoenvironmental reconstruction, certain basic aspects of beach ridges are often interpreted inconsistently, which resulted in various degrees of reliability of such palaeoenvironment reconstruction. This presentation reconsiders the basic aspects of beach ridges and deposits, which need to be properly understood for their comprehensive interpretation in a palaeo-environmental context. It also reviews case studies in which beach-ridge sequences have been used to unveil past sea-level history, catastrophic events, and climate changes.

Japan Geoscience Union Meeting 2013
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HQR23-08 Room:202 Time:May 24 11:15-11:30

Delta progradation and variation in sediment and carbon storage of the Kiso River delta, central Japan

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Delta formation began in many places mainly between 8500 and 6500 yr BP when the Holocene sea-level rise has decelerated. However, the timing of delta initiation and the rate of delta progradation are controlled by not only the rate of sea-level change but also sediment supply. Deltas are important sinks of sediments and carbon in coastal and fluvial systems. We calculated sediment and carbon storage of the Kiso River delta (Nobi Plain) for successive 1000-year time slices by analyzing existing borehole columns and radiocarbon ages, reconstructing the three-dimensional stratigraphic architecture and measuring organic carbon content of borehole core sediments. The deltaic deposits were divided into three layers: middle mud (MM), upper sand (US), and top mud (TM) in ascending order. Total sediment and carbon storage in the delta area of only 822.8 km^2 was estimated at 22892 Tg and 190 Tg, respectively. The mass ratio of each layer to the total mass was calculated to be 36.5% for MM, 48.0% for US and 15.5% for TM. The stored carbon ratio of each layer to the total stored carbon was calculated to be 40.5%, 42.9% and 16.7%, respectively. The progradation rates of the delta during the last 6000 years were estimated at 5 m/yr (6000-5000 cal BP), 8 m/yr (5000-4000 cal BP), 4 m/yr (4000-3000 cal BP), 7 m/yr (3000-2000 cal BP), 6 m/yr (2000-1000 cal BP) and 9 m/yr (after 1000 cal BP). The rate of sediment and carbon storage during the last 6000 years has increased especially after 1000 cal BP. Additionally, the increase was found notably at TM. This is probably due to increase in sediment supply to the delta caused by human impact on the catchment area and expansion of delta plain accompanied with delta progradation.

Keywords: sediment storage, carbon storage, progradation, mass, GIS, Nobi Plain

Japan Geoscience Union Meeting 2013
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HQR23-09 Room:202 Time:May 24 11:30-11:45

Geological structure interpreted from tephras in boring core and vicinity of the Tachikawa Fault Zone, Tokyo, NE Japan

Takehiko Suzuki[1*], Haruka Saito[2], Masanori Murata[1]

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In order to clarify the activity of the Tachikawa Fault Zone during Quaternary, an all-core boring survey (95 m in depth) was conducted at Enoki in Musashi-Murayama City. Sediment with a depth 28.70 to 95.00 m is composed of the alternation of gravels, sands and silt, correlative to the Kazusa Group. These sediments contained many tephra layers. Two pumice fall deposits with depths of 61.82 to 61.85 m and 62.42 to 62.89 m have unique characteristic properties. The upper pumice layer mainly comprises pumice (sponge) type of glass shards (maximum diameter: 3 mm) and hornblende, and their refractive indices are n=1.509-1.511, n_2=1.667-1.685. Chemical composition of the glass shards are SiO_2: 75.6 wt.%, Al_2O_3: 13.8 wt.%, FeO: 1.8 wt.%, CaO_2: 2.4 wt.%, K_2O: 2.5 wt.%. The lower pumice layer comprises hornblende, titano-magnetite, orthopyroxene and cummingtonite and their refractive indices are 1.703-1.708 (gamma) for orthopyroxene, 1.668-1.676 (n_2) for hornblende and 1.658-1.661 (n_2) for cummingtonite. These data indicate that upper and lower pumice layers can be correlated with Byobugaura Ob4b-4 and Ob4b-1 Tephras, respectively, in the Obama Formation, Inubo Group, Byobugaura, Chiba Prefecture. Ob4b-5 immediately above Ob4b-4 and Ob4b-1 were dated at 1.62 Ma and 1.63 Ma, and Ob4b-1 was correlated to 1st Horinouchi Tephra in the Oyamada Formation, Kazusa Group in the Tama Hills by Suzuki and Murata (2011).

Additionally, we reexamined tephras in two boring cores (MTB1 Core and Musashi-Murayama Core) at Mitsugi in Musashi-Murayama City (2.7 km northwest of Enoki) and in the Sayama Hills, previously reported by Suzuki et al. (2008). MTB1-9 to -10L Tephra with basal depth of 56.08 m (67.93 m asl) in the MTB1 Core and MM-8 to -8.2 Tephra with basal depth of 36.36 m (88.01 m asl) in the Musashi-Murayama Core have been correlated to SGO Tephra in the Sayama Hills. These tephras have characteristic properties similar to those of Ob4b-1 (=1st Horinouchi Tephra), suggesting their correlation.

Basal altitudes of the Ob4b-1 and its correlative tephras are as follows, Mikatairi, Sayama Hills: 128 m, Musashi-Murayama Core: 88.01 m, MTB1 Core: 67.93 m, Enoki: 37.78 m, Fujimicho-3 chome, Tachikawa: 59 m, Tama River: 70m, Naganuma Park, Tama Hills: 150 m. Changes in these altitudes indicate the uplifting of the northeast side of Tachikawa Fault Zone and the general trend of the geological structure of the Kazusa Group. The altitude at Enoki is 30.15 m lower than that at Mitsugi. This can be explained by the geological structure of the Kazusa Group or the local deformation cause by the Tachikawa Fault Zone.

This boring survey was financially supported by the Ministry of Education, Science, Sports, and Culture (Intensive Survey and Observation on the Tachikawa Fault Zone).

Keywords: Tachikawa Fault Zone, Underground geology, Early Pleistocene, Boring core, 1st Horinouchi tephra, Byobugaura Ob4b-4 tephra

Japan Geoscience Union Meeting 2013
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HQR23-10 Room:202 Time:May 24 11:45-12:00

3D geological model based on the parameters of the lateral continuity of sedimentary bodies using a borehole database

Yoshiro Ishihara[1*], Chihiro Koga[1], Susumu Tanabe[2], Junko Komatsubara[2]

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Three-dimensional geological models of plains in urban areas developed from borehole data are very useful for clarifying shallow-subsurface geological processes. There are several possible techniques for constructing these geological models; these techniques include a 3D boundary correlation procedure for boreholes or 3D grid-node configurations of geological or geotechnical parameters based on borehole logs. The former is considerably more time consuming because the procedure demands researchers to conduct a subjective determination of bed-by-bed correlations, whereas in the latter procedure the grid-node values are automatically estimated by spatial averages or statistical characteristics. The 3D boundary correlation method is effective when borehole data are limited. The recent development of borehole databases with sufficient log data makes the 3D grid-node method increasingly effective. However, some errors relating to the description of the borehole logs can be associated with this procedure. In this study, we considered statistical information such as the lateral continuity of a sedimentary body and its anisotropy, the orientation of the continuity and stratigraphic patterns in the lithological data in borehole database before constructing the 3D geological model.

The lateral continuity of a sedimentary body and its anisotropy can be expressed in terms of an existence probability in a lateral direction based on borehole data as previous studies. This information reveals the geometry of the sedimentary body. Stratigraphic patterns provide information regarding the sedimentary facies or their stacking patterns. Our results suggest that the spatial information that can be obtained from borehole databases is very useful for constructing a grid-based 3D geological model, because the information constrains the estimations of the grid values in the models.

Keywords: Chuseki-so, 3D geological model, discriminant analysis, sedimentary facies, incised-valley fills

Japan Geoscience Union Meeting 2013
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HQR23-11 Room:202 Time:May 24 12:00-12:15

Subsurface geologic structures of the Fukuoka Plain

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The borehole database including about 2,438 digital borehole data have been build up for constructing the subsurface structure of the Fukuoka Plain, in corporation with local government offices and the Kyushu Ground Information Association.

The 3D geologic model of the Fukuoka Plain based on the borehole database offers a good example to display the strike-slip basin structure bounded by the Kego active fault on its southwest side. The basin is characterized by west to southwestward tilting of the basement covered by the Middle Pleistocene to Holocene deposits. The basement rocks consist of Paleogene sedimentary rocks and Cretaceous granite. The basin fills are divided into four stratigraphic units, that is, and the Nakabaru gravel member, the Suzaki member, the Aso-4 pyroclastic flow deposits, the Otsubo sand-gravel member, and the Holocene incised-valley fills (called the Chuseki-so), in ascending order.

Keywords: subsurface structure, Fukuoka Plain, Kego Fault, borehole data

Japan Geoscience Union Meeting 2013
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HQR23-P01 Room:Convention Hall Time:May 24 16:15-17:30

Geomorphological evolution of Furenko barrier system controlled by scismotectonics

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In general, there is no clear barrier system around Japan because it is currently marine regression or stable stage due to hydro-isostasy effect since 5000-6000 years BP. However, there are a few barrier (island) systems in eastern Hokkaido. We have been investigating Hashirikotan barrier spits in the northern part of Furenko barrier system facing the Sea of Okhotsk because five branch of spits (BR1-BR5) are clearly observed. According to our results, 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 from Mashu volcano. On the other hand, the youngest BR1 has occurred after the 17th centuries and BR2 was caused by the last seismic up-rifting in the 17th centuries because it is covered with historical volcanic ash layers from Tarumai and Komagatake volcanoes. BR3 and BR4 were undated clearly, but BR3 was assumed the seismic rifted barrier in the 12-13th centuries, also BR4 was caused in the 9th centuries. These two barriers associated with large sand dune just after emerged each time. Since 2003, it was clearly giant 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. But conversely it has been settling at a rate 8.5mm / year after the last great earthquake until now. We believe the Furenko barrier system has been strongly controlled by the seismotectonics in this region.

Keywords: geomorphological evolution, Furenko barrier system, scismotectonics, outhern Kuril trench, eastern Hokkaido

Japan Geoscience Union Meeting 2013
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HQR23-P02 Room:Convention Hall Time:May 24 16:15-17:30

Sedimentary facies and radiocarbon dates of the Alluvium in the lower reaches of the Tone River

Susumu Tanabe[1*], Kiyohide Mizuno[1]

[1]AIST

To identify the depth of the origin of the liquefaction and to reveal the stratigraphy of the Alluvium, GSJ made borehole research in the lower reaches of the Tone River. This area had severe liquefaction during the 2011 Tohoku earthquake. In this presentation, we report the sedimentary facies and radiocarbon dates of six sediment cores obtained from the north bank of the Tone River in Inashiki and Itako Cities, Ibaraki Prefecture and Katori City, Chiba Prefecture.

Keywords: Tone River, Alluvium, sedimentary facies, radiocarbon date, flood tidal delta

Japan Geoscience Union Meeting 2013
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HQR23-P03 Room:Convention Hall Time:May 24 16:15-17:30

Application of X-ray computed tomography to the three-dimensional structure analysis of liquefied core samples

Yoshito Nakashima[1*], Susumu Tanabe[1], Yoshinori MIYACHI[1], Kiyohide Mizuno[1], Junko Komatsubara[1], Taku Komatsubara[1]

[1]AIST

Geo-samples often have complex internal structure. Thus, a three-dimensional imaging method is needed to analyze such samples. X-ray computed tomography (CT) is one of the most promising tools to meet the purpose (e.g., Nakashima et al., 2011). We applied medical X-ray CT apparatus to the core samples obtained from the sites liquefied by the 2011 Great East Japan Earthquake. The obtained three-dimensional CT images clearly show the complex structure of the sand dykes (Fig. 1) and strata deformation. Although X-ray CT technique has disadvantage that the apparatus is expensive and high performance computers are needed, it is advantageous in terms of the non-destructivity, quickness, three-dimensionality, and spatial resolution as compared with the conventional soft X-ray radiography of slab samples.

Ref:
Nakashima et al. (2011) Water Air & Soil Pollution, 214, 681-698. http://dx.doi.org/10.1007/s11270-010-0473-2

Keywords: liquefaction, non-destructive analysis, X-ray CT, three-dimensional imaging, core analysis

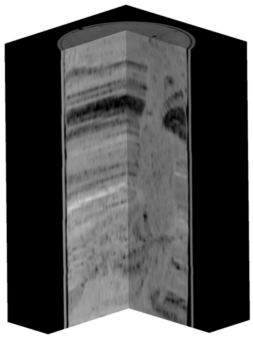

Fig. 1. Example of a three-dimensional CT image of a liquefied core. The diameter of the core is about 64 mm. A sand dyke penetrates the horizontal bedding throughout the image.

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HQR23-P04 Room:Convention Hall Time:May 24 16:15-17:30

Depositional environment of the early Pleistocene Inagi Formation, northern edge of the Tama Hills, central Japan

Masaaki Shirai[1*], Akiho Imamura[2]

[1]Tokyo Metropolitan University, [2]Navitime Japan

The late Pliocene-early Pleistocene Kazusa Group distributing southern Kanto District occurs the Tama area, SW Tokyo. Depositional environment of the Inagi Formation, upper Kazusa Group has been estimated as delta front or foreshore, which is distinguished from lower formations in Kazusa Group at the Tama area.

Although exposure of the Kazusa Group around the Tama area is limited now, a good exposure remains on the northern edge of the Tama Hills. Above the ca. 1.5 Ma volcanic ash, well laminated tuffaceous sand layer is observed. Northward?westward dipping cross lamination means landward paleo-current and lenticular bedding means temporal changes in direction and velocity of current. These sedimentary structures suggest existence of barrier-island. Intensely bioturbated sand layer below the laminated tuffaceous sand layer is interpreted as estuarine deposits.

The barrier-island deposits of the Inagi Formation is significant because barrier island deposits has not been reported from the Kazusa Group in the Tama area despite of common occurrences of back-barrier deposits.

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Keywords: Kazusa Group, Tama Hills, Inagi Formation, depositional environment, barrier?island

Japan Geoscience Union Meeting 2013
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HQR23-P05 Room:Convention Hall Time:May 24 16:15-17:30

Correlation of tephras in the Kazusa Group core from Setagaya and Fuchu areas, Tokyo, central Japan

Akira Goto[1*], Kunihiko Endo[2], Ayako Funabiki[3]

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Three sediment cores were collected in Setagaya Ward and Fuchu City in Tokyo, Kanto Plain. For these core, sedimentary facies, physical properties, microfossil, chemical composition, magnetostratigraphy were studied (Funabiki et al, 2012, Ueki et al, 2012). In this study, in order to determine their stratigraphical position, we analyzed the petrographical properties of tephras included in the horizon of the Kazusa Group.

The upper part of NUCHS-1 core drilled at the college of Nihon University, Setagaya ward, is composed of terrace gravel, On-Pm1, and Musasino-Tachikawa loam Formations, from -12.7 m to the top (Kurihara et al, 2012). The lower part from -12.7 to 80.0 m, composed mainly of thick sandy deposits of the early Pleistocene Kazusa Group by magnetostratigraphy (Ueki et al.,2012). Based on the analysis in mineral composition, major element compositions and refractive index of glass, the glassy tephra in depth 59.98m is correlated with Nishikubo tephra of the Iimuro Formation in Tama Hills(Suzuki and Murata, 2011). This suggests that the sediment corresponds to the Iimuro Formation in Tama Hills, and to the Higashikurume and Kita-Tama Formations.

The TAT-1 and TAT-2 cores drilled at the college of Tokyo University of Agriculture and Technology in Fuchu City. The upper parts of those cores, from 8.9m to -11.5m, are composed of terrace deposits and Tachikawa loam Formation.The lower parts, from -11.5m to 50.0m, are composed of silt and sand with gravels of the early Pleistocene Kazusa Group. One glassy tephra, from the depth of 36.85m of the TAT-1 core, and from the depth of 41.56m of the TAT-2 core, is correlated with O21 tephra of Otadai Formation, Kazusa Group. Another tephra from the depth of 43.75m of the TAT-2 core is correlated with O22 tephra of the Otadai Formation. O21 and O22 tephras were sampled from Yoro River floor, Boso Peninsula. These results suggest that the lower part of the both cores was deposited at the same time of the Otadai Formation in Boso Peninsula and also the Toneri Formation in Tokyo.

References:
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Keywords: Kazusa Group, tephra, Kanto Plain, Musashino Upland

Japan Geoscience Union Meeting 2013
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HQR23-P06 Room:Convention Hall Time:May 24 16:15-17:30

Construction of subsurface geological structures using a drilling database: A case study for the Osaka Plain

Minao Sakurai[1*], MASUDA, Fujio[1]

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Subsurface geological cross sections of 0-200 m depth were constructed using a dense drilling database of the Osaka Plain in the intra-arc Osaka Basin of the Japan island arc, an active plate margin. The cross sections revealed the subsurface geological structures and the geometry of folding and faulting in the basin. The comparison between the constructed subsurface cross sections and the seismic sections of the basement and basin fills at a depth of 1,500-2,000 m showed that the basement and shallow subsurface structures are similar; however, the shallow cross sections were of higher resolution than the deep seismic profiles.

We used the drilling database that has been operated by the Kansai Geoinformatics Network and includes about 50,000 drilling log data points for civil engineering projects. The database only includes information on lithofacies such as gravel, sand, silt and clay, N-value, and other geotechnical engineering data. Its usefulness lies in the large number of subsurface geological data that it contains.

The boundaries of the lithofacies were traced in the cross sections on the basis of sedimentological concepts. More specifically, the base of the marine clay beds with a transgressive erosional surface (i.e., ravinement surface) is shown by straight lines; the top of marine clay beds overlaid by a progressive delta or fan is shown with lightning-stroke-type ”shazam lines”; the base of gravel beds with a sequence boundary is shown by valley-shaped curve lines, and dashed lines mark uncertain boundaries.

The following are our conclusions: 1) The subsurface geological structures from the drilling database and the deep basement structures generally match. Therefore, it is possible to understand the basement structures through detailed analysis of the subsurface geological structures. 2) The subsurface geological sections from the drilling database show geological structures that are not clearly discerned in the seismic profile. Therefore, the subsurface geological section is of higher resolution than the seismic profile. 3) The structural features in the west?east section are a flexure in the northern Uemachi Plateau, which is the structural high of the inner basin, the Uemachi fault that is a major structural gap at the western margin of the flexure, and the basin-shaped structure on both sides of the flexure. 4) The features in the north?south section are the southward-dipping monocline structure in the northern part, the asymmetrical basin-shaped structure in the central part, and the northward-dipping flexure and fold in the south.

Keywords: intra-arc basin, Osaka Plain, subsurface geological structure, basement structure, drilling database, ravinement surface

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3D subsurface sturcutre of the Fukuoka Plain

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The borehole database including about 2,438 digital borehole data have been build up for constructing the subsurface structure of the Fukuoka Plain, in corporation with local government offices and the Kyushu Ground Information Association.

The 3D geologic model of the Fukuoka Plain based on the borehole database offers a good example to display the strike-slip basin structure bounded by the Kego active fault on its southwest side. The basin is characterized by west to southwestward tilting of the basement covered by the Middle Pleistocene to Holocene deposits. The basement rocks consist of Paleogene sedimentary rocks and Cretaceous granite. The basin fills are divided into four stratigraphic units, that is, and the Nakabaru gravel member, the Suzaki member, the Aso-4 pyroclastic flow deposits, the Otsubo sand-gravel member, and the Holocene incised-valley fills (called the Chuseki-so), in ascending order.

Keywords: 3d subsurface structure, Fukuoka Plain, borehole data, surface model, anaglyph