

HQR022-01

Room:201A

Time:May 24 14:15-14:30

An experimental imaging of lateral facies change of unusual tsunami deposits on the Ground-Penetrating Radar profile und

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Ground penetrating radar (GPR) is a geophysical profiling method based on propagation and reflection of electromagnetic waves. This method is recently used for geomorphological and geological survey under the marsh, because it is effective for the imaging of the shallow underground less than 10 m depth. In June 2008, the mega-trench excavated in the central part of Nanbuto marsh with the cooperation of Nishio (Construction Ltd.) in Nemuro, then we identified huge erosional surfaces with peat clasts and 16 layers of giant tsunami deposits in the peat bed was deposited on the past since 5500 years BP and tsunami stratigraphy was confirmed here. In November 2009, we observed lateral facies variation of giant tsunami deposits on the mega-trench wall (100m width) of Katsuragi quarry in the southwestern part of Nanbuto lowland with the cooperation of Daiichisangyo (Construction Ltd.). In November 2010, we set the ground penetrating radar survey lines on the top of mega-trench walls and tried to image the lateral sedimentary facies change of giant tsunami deposits. In this exploration, we used two GPR systems, pulseEKKO100 (200 MHz) and Noggin 250MHz produced by Sensors & Software Inc. The interval of observation of pulseEKKO100 was 0.25 m and its Noggin 250MHz was 0.05m, and the exploration depth was shallower than about 6m but we got high-resolution images (15-20cm). In our presentation, we show experimental imaging of sedimentary facies under the Nanbuto marsh in Nemuro lowland using our GPR method, and also we show GPR imaging is a good method to identify giant tsunami traces under the marsh.

Keywords: ground-penetrating-radar, marsh, unusual tsunami deposit, lateral facies change, experimental imaging, Nemuro lowland

HQR022-02

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Developmental processes of Holocene barrier system based on borehole data for a case of Akkeshi bay area

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A Holocene barrier system is situated around Akkeshi-ko lagoon separated from Pacific Ocean by two sand-spits. There is a tidal inlet between lagoon and sea, and also a typical tide flood delta with modern oyster reef in the center of the lagoon. However, the developmental processes of the Akkeshi barrier system during the Holocene transgression have not well understood, because the postglacial sea-level research has stalled in this area since Maeda et al. (1992). In cooperation with the Hokkaido Regional Development Bureau and Akkeshi Town, we tried to compile Holocene borehole data from coastal lowland areas and also analyzed the offshore drilling cores taken in February 2009 and 2010 by using sedimentological methods, spectrometry measurement, grain size analysis, pH and EC measurements, radiocarbon dating and paleontological techniques. We were able to get some new knowledge about development processes of the barrier system.

A transgressive surface recognized at -50m below sea level around Akkeshi Bay estimated to have been formed about 11,000 years ago. Moreover, thick sandy deposits upper than the horizon of -16m below sea level suggest that barrier sand spit began to be formed about 7,000 years ago by longshore sediment transport around Akkeshi Bay. The tidal flat deltas was also generated during the establishment of this barrier system.

Keywords: eastern Hokkaido, Akkeshi bay area, Holocene, barrier system, sea level change

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HQR022-03

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Sedimentological study of the subsurface strata of the Kushiro Plain, northern Japan

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To clarify the heterogeneity of the subsurface strata of the Kushiro Plain, the core samples were analyzed by sedimentological method (e.g. facies analysis, grain-size analysis, measurements of total sulfur, and measurements of electric conductivities of stirred muddy sediments)

Kushiro Group was inferred to be mainly composed of bay and delta sediments. In particular, the seaward part, the bay sediment consists of thick silt layers. On the other hands, the landward was interpreted as a fluvial dominated delta body. It was considered that progradation of the delta into the bay from upstream rivers.

"Chuseki-so" deposits which is an incised valley fills during post last glacial maximum period, is divided into three parts: seaward part, central part, and landward part. The seaward part consists of braided fluvial, meandering fluvial, salt marsh, drowned valley, central basin, flood tidal delta, and beach-shoreface deposits, in ascending order. The central part is composed of braided fluvial, meandering fluvial, salt marsh, drowned valley, central basin, mud flat, minor river channel and back marsh deposits, in ascending order. The landward part consists of swamp, minor river channel, and back marsh.

Keywords: Chuseki-so, Kushiro Group, Incised valleys

HQR022-04

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Evaluation of the recent activity of Kakuda-Yahiko fault based on S-wave Land Streamer reflection survey and drill core

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We have been conducting high-resolution S-wave seismic reflection surveying using Land Streamer at Akatsuka district, Niigata City. A 900-m long S-wave survey line had successfully detected off-fault deformation structure, but only a part of the main faulted zone was delineated due to short line length. We then extended the survey line to cover the main faulted zone, and added an additional 900-m long seismic line parallel to the previous line. A 75-m deep drilling survey was also appended on the line. Detailed sedimentological analysis and ¹⁴C dating were applied to the drilled core. The purpose of the combined survey was to image on- and off-fault deformation structure in a flexure zone and to evaluate the recent activity of Kakuda-Yahiko Fault, which runs at the western margin of the Echigo plain.

As a result, CMP stacked migrated sections clearly profiled off-fault primary faultings as well as the major on-fault flexure structure at the near surface down to 150 m in depth. Correlation of seismic profiles with the drilled cores and logging data obtained at drill sites enabled to distinguish the recent paleoseismic events and to assess their ages and recurrence intervals. Slip rate for the delineated flexure zone was estimated about 1.4 mm/yr in a vertical component, but its fraction to the on-fault zone was at most 60 %. This indicates the conventional paleoseismic approach as typified by the combination of trenching and arrayed drilling is inadequate to understand the gross deformation of a faulted zone. In contrast, high-resolution seismic reflection surveying is capable to delineate on- and off-fault deformation structure in a faulted zone.

Keywords: concealed fault, Echigo Plain, Kakuda-Yahiko fault, Land Streamer, seismic reflection surveying, drill core analysis

HQR022-05

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Accumulation curves of the incised-valley fills in the Echigo Plain, central Japan

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1.Introduction

The Echigo Plain faced on the Japan Sea coast is a sedimentary basin governed by subsiding effect of the Echigo Plain Western Margin Fault Zone. The incised valley under the Echigo Plain is filled with the sediment of the Shinano and Agano Rivers as the sea level rose during the last deglacial. The thickness of the sediment is up to 160 m. The plain is still interseismically subsiding at a rate of about 3mm/yr at the coast. In this study, we illustrated the accumulation curves based on the radiocarbon data of 27 boreholes taken from the Echigo Plain. Then, we discuss the sedimentary environment and accumulation rates.

2.Shinano River lowland

The Shinano River lowland consists of the western part of the Echigo plain, located on the downthrown side of the fault. In this area, the fluvial and marine sediments aggraded from the last glacial maximum to early Holocene. During this period, the accumulation curve of each borehole site documented similar trend. After 9 cal kyr BP, the barrier-lagoon system documented relatively high accumulation rates (average: 10mm) and prograded seaward with several times interation of transgression and regression.

The western edge of the plain consists of the uplifted side of the fault and the Kakuta-Yahiko Mt. The estuarine sediments covered the late Pleistocene sediments without fluvial sediments. They are located at -20 to -10 m in elevation and the accumulation rate is less than 2 mm/yr. The Kakuta-Yahiko Mt. leads to the Yotsugoya anticline on seafloor. The accumulation rate of the core taken from Yotsugoya anticline is about 2.5 mm/yr. It illustrates a gentle curve indicating less subsiding effect and distance from the depositional center.

3.Agano and Kaji River lowland

In the Agano River lowland, the eastern part of the plain, delta system has prograded since 8 cal kyr BP instead of the barrier-lagoon system. The accumulation rate of the delta sediments are about 8 mm/yr. The Agano River's incised valley was almost filled with the deltaic sediments by the middle Holocene, while the most of the Shinano River lowland remained inundated.

The northern part of the Echigo Plain consists of Kaji River lowland. In this area, the accumulation rates of the incised valley-fills are about 3 mm/yr and much smaller than the Shinano River and Agano River lowland. This is because the thick alluvial-fan related sediment deposited before Pleistocene filled sedimentary basin and limited the accommodation space.

Keywords: incised-valley fills, Echigo Plain, accumulation curve, maximum flooding surface, radiocarbon dates

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Stratigraphy of the alluvial sediments in the Kashiwazaki Plain, Niigata Japan

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The alluvium sediments of the Kashiwazaki Plain in the Kashiwazaki City, Niigata Prefecture show maximum thicknesses about 50-60m. This sediment mainly consists of clay and silt, and thin sand layer. The stratigraphy has been divided into the lower part which mainly consists of clay and silt, the middle part which consists of the sand and upper part which consists of clay, silt and peaty sediment. However, it must examine in stratigraphy and sedimentation age, because there are no data such as tephra and ¹⁴C dating. For the purpose of the elucidation of fundamental stratigraphy and facies of the alluvium, facies division and dating, etc. were carried out using boreholes. On the basis of the boring database, the basis landform of the alluvium was restored. As this result, the estimation of fundamental stratigraphy and in sedimentation's in the inland was possible. The sand dune develops in coast parallel of the Kashiwazaki urban area. It was confirmed that Yasuda Formation (Pleistocene) is distributed under the dune sand sediment by the borehole. Along present coastal dune, it became clear that the Yasuda Formation showed the narrow mound landform. By this landform, the distribution of the marine sediments was narrow area in the inland. The alluvium in the Kashiwazaki Plain were deposited by estuary system in which the sea invades from the narrow inlet and progradation of the river system.

Keywords: Alluvial sediment, Stratigraphy, Kashiwazaki Plain, Niigata

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Sedimentary facies and environments of the latest Pleistocene to Holocene core (GS-KSO-1) in the Arakawa Lowland

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Sedimentary environments in a sediment core GS-KSO-1 (Kawagoe City, Saitama Prefecture) are reconstructed based on sedimentary facies analysis and radiocarbon dating.

The Arakawa Lowland, where GS-KSO-1 was taken, is a long and narrow alluvial plain, about 5 km wide, located between the Musashino and Omiya highlands. It is a branch of the Tokyo Lowland. The Tonegawa River, which is a largest drainage in the Kanto Plain, was passing through the other branch Nakagawa Lowland into the Tokyo Bay before the artificial rerouting of a stream in Edo era. However, it had been passed through the Arakawa Lowland until 4000 years ago (Kikuchi, 1981 Urban Kubota; Hirai, 1983, Geographical Review of Japan). Due to a large amount of sediment supply during most time of a post glacial sea-level rise, valley fills in the Arakawa Lowland is supposed to be sandier than the Nakagawa Lowland.

GS-KSO-1 is located near the upstream end of sea water incursion during the Jomon Highstand, so that it may provide important information about the reconstruction of valley fill processes. Sedimentary facies analysis and radiocarbon dating reveal that the paleo-coastline reached the most inland of the Arakawa Lowland around 8000 years ago. It does not agree with the peak of relative sea level curve in the area around the Tokyo Bay, possibly due to a large amount of sediment supply into the lowland that prevented the transgression.

Keywords: Arakawa Lowland, latest Pleistocene to Holocene, boring core, sedimentary facies, Jomon Transgression, Kawagoe City

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Visualization of river geometry using borehole database: an example of incised valley fills under the Arakawa Lowland

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Relatively sandy incised-valley fills deposited during the latest Pleistocene to Holocene distribute under the Arakawa Lowland, central Japan. These coarse deposits, mainly composed of transgressive river sediments are formed by the Paleo-Tonegawa River, now located in the Nakagawa Lowland. Sedimentary facies, radiocarbon ages, and some geochemical properties of those incised valley fills in the Arakawa Lowland have been revealed by the Urban Geological Survey Project of Geological Survey of Japan. The incised valley fills have thick wedge-shaped gravel-rich river sediments deposited in the lowstand stage, thick sand-dominated river sediments deposited in the transgressive stage, muddy delta-plain and delta-front sediments fills an inner-bay in the highstand stage, and thick salt-marsh deposits draping delta-plain sand in the head of the bay in ascending order. In this study, we attempt to visualize the river deposits using the borehole database of the Urban Geological Survey Project. The visualization is based on the evaluation of the sandy-river deposits of 3D-geological models using the borehole database. Visualized transgressive-river sand body shows an accumulative and weakly meandering sand-ribbon confined in the basement, reflecting the transgressive river geometry.

Keywords: Arakawa Lowland, 3D-geological model, sand ribbon, sandy river, incised valley fill