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Correlation of the Alluvial bed based on drilling core in the northern Chiba Prefecture along Tokyo bay

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Keywords: Northern Chiba, Alluvial bed, drilling core, incised valley

Distribution of postglacial incised-valley fills beneath Kujukuri Plain, central Japan

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Kujukuri Plain, Chiba Prefecture, eastern Japan, is formed as beach ridges prograding during and after Holocene highstand (Moriwaki, 1979). Subsurface strata which is 20m thick from the ground level is composed of beach sand, and topographic relief including incised valleys buried under the sands. The buried topographic relief of offshore in this area has been revealed to some extent by sonic prospecting (Maritime Safety Agency of Japan 2000), whereas those in the land area is almost unknown, except for the southernmost part of the plain (Mobara Area). The topography of buried valley is estimated based on boring log data, which is from Information Bank of Chiba Prefecture (open data) and from local governments (open/closed data). Several axes of incised valleys are located roughly along present rivers. The northernmost one is most wide and deep, which is about 40 m deep at the coastline, and seem to connect with the largest valley offshore. We have the plan of stratigraphic boring surveys in this area for estimation of tectonic movement and geographic development in late Quaternary.

Keywords: Kujukuri Plain, Chusekiso, postglacial incised-valley fill, Holocene

3D analysis of a sandy point bar in the Yahagi River, central Japan, using GPR survey

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We conducted a ground-penetrating radar (GPR) survey of a sandy point bar in the Yahagi River, central Japan, to clarify the three-dimensional (3D) depositional facies. The survey was conducted in January 2015 using a 250-MHz antenna. Surveyed bar, which is 725 m long, 160 m wide, is composed of two or more rows of bars. Three-dimensional dunes characterize the surface of middle- lower downstream parts. We identified inclined reflections, horizontal reflections, and trough-shaped reflections in the bar. Inclined reflections are predominant in longitudinal sections, and horizontal reflections and trough-shaped reflections are common in transverse sections. These reflections represent downstream migration of the bar, developments of three-dimensional dune, chute channel during floods.

Keywords: GPR survey, sandy point bar, Yahagi River, Japan

Holocene subsidence estimated by depositional process of the Rikuzentakata plain, northeast Japan

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Time-dependent inconsistency of crustal movement is suggested in the Sanriku coast, northeast Japan. Coseismic subsidence up to 1.3 m of the 2011 M=9.0 Tohoku-oki earthquake and a century-long subsidence rate of $1 \sim 10$ mm/yr is reported in the previous study. In the north part of the Sanriku coast, this short-term subsidence apparently contradict to long-term uplift rate of 0.3-0.5 mm/yr estimated from a flight of Pleistocene marine terraces. In the south Sanriku coast, long-term crustal movement is unknown because of fragmentary distribution of marine terrace and lack of age data.

This study detected predominance of subsidence during the Holocene from total five core data of the Rikuzen-takata plain, the southern Sanriku coast. On the basis of feature of core sediment, sedimentary facies was divided into braided river, tidal influenced environment, delta, and terrestrial marsh, from lower to upper, in ascending order. Age-depth curve was described based on twenty-five ¹⁴C ages. For the estimation of Holocene vertical movement, observed relative sea-level (RSL) was compared with theoretical RSL. RSL at 10 to 9.0 ka was estimated at the altitude of -30 to -27 m by using altitude of depositional surface of tidal deposits shown by both age-depth curve and molluscan shells in intertidal zone. Estimated RSL is lower than theoretical RSL without tectonic effect. Probable cause of this discrepancy is Holocene tectonic subsidence of the studied area.

Geologic cross-section with one thousand year isochrones on the basis of about fifty radiocarbon ages shows that sediment stacking pattern is retrogradational at 10 to 8 ka whereas aggradational after 8 ka. Depositional landform at 6 ka, when relative sea-level without tectonic effect is same or slightly higher than present sea-level, shown as isochrone at 6 ka is buried under the present delta system. This indicates predominance of subsidence during the past 6 ka. Detected subsidence is consistent with coseismic subsidence of the 2011 event and a century-long submergence.

Keywords: Holocene, Sanriku coast, subsidence, Rikuzentakata plain

Liquefaction-fluidization mechanism in man-made strata along Tone River at the 2011 off the Pacific coast of Tohoku Eq.

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Many sand volcano distributed on reclaimed land by hydraulic fill around Yodaura Marsh along Tone river on the 2011 off the Pacific coast of Tohoku Earthquake. One of the sand volcano was excavated after falling off groundwater level by well point method. The large relief peels were took from the large trench section. Detailed stratigraphy of man-made strata was cleared and mechanism of liquefaction-fluidization was evidenced.

Keywords: Liquefaction-fluidization, man-made strata, Tone River, The 2011 off the Pacific coast of Tohoku Earthquake, trench survey

A hypothesis regarding their generation and storage process about tsunami traces due to 7.3 ka Kikai caldera eruption

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Many researchers have noted that Yakushima may have been struck by a huge tsunami before the Koya pyroclastic flow at the time of the Kikai Caldera eruption about 7.3 ka, but there is currently no clear evidence of this. We studied traces of the tsunami in the northeastern part of Yakushima, in southwestern Japan. Holocene marine terraces were observed after the Jomon transgression near the Miyanoura lowland. From local observations, we assumed that the highest sea level phase (9.7 m) occurred between 7.3 and 5 ka. We re-examined a previously studied outcrop near the Onagawa river mouth at the Koseda coast, and interpreted it as follows. A wave cut bench (WB-4) emerged before 7.3 ka. There is a 30-cm thick pyroclastic flow deposit that was unaffected by wave action; the lowest elevation of the bottom of the pyroclastic flow deposit is 8.4 m. We therefore inferred that the sea level height 7.3 ka was 8.4 m or less, and that a transgression of 1~2-m continued after 7.3 ka. In addition, a poorly sorted, 30-cm thick gravel bed was observed between the surface of WB-4 and the pyroclastic flow deposit. This gravel bed has a very similar composition to modern gravels distributed around the Onagawa river mouth. The pyroclastic flow deposit is covered by a fluvial reworked deposit and a 2-m thick gravel bed. The maximum annual tidal range is about 1.5 m in this region; the elevation of the upper surface of the gravel bed is 11.0 m. From this, we infer that the gravel bed was deposited during the highest sea level phase. Therefore, we conclude that the 7.3 ka tsunami moved gravel from the Onagawa river mouth to the surface of WB-4 in a stony debris flow before the pyroclastic flow reached the Koseda coast.

Keywords: Tsunami traces, 7.3 ka Kikai Caldera eruption, Koya pyroclastic flow, Koseda coast, Yakushima Island, storage process

Radiocarbon and dendro-dates of buried woods excavated from lowland archeological sites in Japan

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There are many wetland archeological sites in Japan, because the land consisted of small islands with rather high precipitation. Such sites preserve wooden remains, and woods are one of the very important remains that provide the ages of the sites. In excavation of wetland sites has revealed a huge number of wooden substances used by ancient people as materials for the construction of residential houses, fences as well as wooden tools. To determine chronology of the sites, wood materials are normally analyzed by radiocarbon dating of the outermost part of tree rings, or in some cases a wiggle-matching analysis is applied. Another age estimation is tried by dendrochronology if disk samples can be collected from them. Even if precise age estimation of the woods is not possible by dendrochronology, cross-dating analysis of wood samples would be useful. In fact, more than 80 wooden poles excavated at the Aota site, Niigata Prefecture, were grouped temporally into two parts, and tree-ring age relations were established between the two groups by comparing the ring-width data for almost all wood poles collected. The age difference of the two groups was estimated to be 91 years by cross-dating the ring-width patterns of the two groups by connecting them to a ring-width pattern of one natural tree that seemed to cover the full age range extended by the two groups. Recently, by applying 18O/16O patterns of the cellulose fraction from annual rings, instead of ring width, the accurate age of the two groups was successfully determined.

These analyses suggested that radiocarbon dating, dendrochronology based on ring-width patterns as well as 18O/16O patterns of annual rings should be connected one another, to get a precise chronology of the woods excavated from the archeological sites.

Keywords: radiocarbon age, dendrochronology, calendar date, cross-dating, 18O/16O chronology, 14C wiggle matching

Eutrophication trends of Japanese mountain lakes inferred from sedimentary diatom assemblages

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In recent years, atmospheric pollution caused by fossil fuel burning is growing due to economic development in East Asian countries. Japan, which is located downwind, concerns about the transboundary atmospheric pollution which causes human health damage and environmental and ecosystem deteriorations. However, studies on effect on mountain lake ecosystems are very rare in Japan. We have studied temporal changes in Japanese mountain lake ecosystems based on paleolimnological approach to elucidate long-term effects on the transboundary atmospheric pollutant depositions on mountain lake ecosystems. Recent analyses in mountain lake sediments from Tohoku, Hokkaido, and Hokuriku indicated that phytoplankton and zooplankton communities have changed in 1980s together with increasing coal burning in china and enhanced accumulation of coal-derived heavy metals in the studied lakes (Kuwae et al., 2013; Tsugeki et al., 2012). However, it is still unclear what hydrological factors associated with enhanced atmospheric pollutant depositions to the lakes have induced the changes in the plankton communities.

In this study, we examined diatom assemblages in core sediments collected from mountain lakes of Niseko-Ohnuma and Lake Rausu in Hokkaido, Mikuriga-Ike in Toyama prefecture to elucidate changes in nutrient level and pH in the lake waters associated with enhanced atmospheric pollutant depositions. In Niseko-Ohnuma diatom analysis showed changes in assemblages from acidophilous and oligotrophic taxa to neutrophil and mesotrophic taxa in 1980s. In Mikuriga-ike, the result shows that oligotrophic taxa decreased and mesotrophic taxa increased after the 1990. Meanwhile, in Lake Rausu, diatom assemblages showed minor changes around 1980s.

These observations indicated that the increases in phytoplankton and zooplankton in mountain lake ecosystems reported previously resulted from increased levels of nutrients in lake waters. Our results supported the hypothesis that enhanced atmospheric nutrient depositions after 1980s may result in eutrophication in the mountain lakes and impact the lake ecosystems.

Keywords: eutrophication, Japanese mountain lakes, diatom assemblages, recent past

Longitudinal river profiles crossing marine terraces at northern part of western Osado coast, Sado Island, central Japan

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Marine-terrace development of the Middle to Late Pleistocene and Holocene at coast of Osado, northern part of Sado Island, central Japan, indicating tectonic uplift has been described (Ota, 1964; Tamura, 1979). At northern area of the western Osado coast, series of Pleistocene marine terraces are identified (MIS 13, 11, 9 and 5e) and Holocene marine terrace is also recognized. Here, based on drainage analysis using high-resolution DEM, river knickpoints are identified on detailed longitudinal river profiles crossing the marine terraces. At 9 out of 10 rivers, major river knickpoints develop within 500 m upstream of river mouths, those likely formed together with sea cliffs eroded during post-glacial sea-level rise and following high stands.

Retreat of sea cliffs and river knickpoints associated with coastal erosion would have finished when the Holocene marine terraces emerged. After the emergent, the river knickpoints retreated by fluvial incision. Distances between sea cliffs and river knickpoints could be distance of knickpoint retreat. The distances are detected as 100-150 m based on 1:25,000 topographic maps and DEM analysis. Assuming that the emergent occurred during 7-8 ka, the rates of knickpoint retreat range 12-21 m/ky. These rates could be high enough to dissolve old river knickpoints, formed on or before the Last Interglacial period (MIS 5e).

Keywords: river knickpoint, uplift, rocky coast, coastal erosion, digital elevation model, Pleistocene