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

HDS29-P01 Room:Poster Time:April 28 18:15-19:30

Dendrochronology of a fossil log from the dammed lake deposit by Dondokosawa rock avalanche, the Southern Japanese Alps

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Large-scale rock avalanche deposits (Dondokosawa rock avalanche deposits; DRAD, V=1.9×10^7 m^3) are present in the east side of Mount Jizo, the Akaishi Range. The age of DRAD has been determined by a ^{14}C-method as AD780-870 or as AD778-793 (with help of wiggle matching). However, precise age determination of DRAD is further required as the some uncertainties remain in the previous age data. Therefore, we performed dendrochronology of a fossil wood log of Japanese cypress (*Chamaecyparis obtusa*) with 226 tree rings and bark obtained from the dammed lake deposits formed by DRAD. As a result, the fluctuation pattern of tree ring width of the sample log (DDK-A) clearly coincided with the pattern during a period from AD662 to AD887 of the 2705-year-long standard curve (705BC-AD2000) established from some tree ring samples of Japanese cypress. Statistical analysis showed that a degree of agreement between DDK-A's tree ring curve and the standard curve (t) is 7.9. Generally, it can be judged that there is high agreement between two tree ring patterns when t-value is more than 3.5. We also observed cell structures of the outermost tree ring for determining the kill season of DDK-A. The early wood ring was completely formed and the late wood ring was almost invisible. Therefore we concluded that DDK-A was dead in the late summer of AD887.

The old Japanese documents *Nihon-Sandai-Jitsuroku* and *Fuso-Ryakki* described the mega earthquake(M 8-8.5) , the *Goki-Shichido* earthquake, in AD887 August. This earthquake was considered to occur along the Suruga and Nankai Troughs off central Japan. Slope movement related to DRAD would be caused by this historical earthquake.

Keywords: dendrochronology, large landslide, Gokishichido earthquake, Akaishi Range

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HDS29-P02 Room:Poster Time:April 28 18:15-19:30

Occurrence of large landslides in past 40 years and sediment supply in the southern Japanese Alps

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Many large landslides are distributed in the southern Japanese Alps which consists of high relief and steep slopes. A lot of sediments deposited in dams suggest that sediments are produced actively in upper streams. To evaluate the sediment supply from landslides, this study addressed the mapping of landslides (>10000 m^2) in Ooi River and Hayakawa River (total area is 862 km^2) using aerial photographs and orthophotographs in 1970s and 2000s (partly including 2010s). In addition, we computed the volume of sediment supply in several large landslides based on the difference between DEMs from LiDAR data in multiple shooting periods. One hundred eighty landslides were extracted from photographs in 2000s to 2010s. The comparison between the distribution maps of landslides in 1970s and 2000s indicated that an initial large landslide (>100000 m^2) had not occurred since 1970s. In contrast, some landslides had enlarged gradually. Erosion rate computed from LiDAR data indicated the order of 10^{-1} to 10^{-2} m yr^{-1}. Such erosion rate suggests that the bare grounds after landslides are important as sediment supply area.

Keywords: large landslide, sediment supply, aerial photograph, GIS, the Southern Japanese Alps

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HDS29-P03 Room:Poster Time:April 28 18:15-19:30

Cause and age of the Yabusawa Gravel in the northern foot of Mount Senjo, the Akaishi Range, Japan: a reappraisal

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The Yabusawa gravel (YG) consists of poorly-sorted thick angular clasts of sand stone, mud stone, and hornfels, forming a geomorphic feature like fluvial terraces along Yabusawa River from Mount Senjo. The previous authors had considered that YG was of glaciofluvial or large landslide origin. However, there is no clear consensus as to the origin and age of YG. We therefore carried out new analysis of geology, geomorphology, and geochronology of YG. The following results were obtained. On the outcrop walls of YG, rock clasts clearly exhibit jigsaw crack structures, although specific sedimentary facies reflecting fluvial processes such as lamination and imbrication are not observed at all. A lithotype of rock clasts in YG is almost restricted to single geology at a given outcrop locality. Surficial topography of YG has hummocks and levee-like terrain. Terrestrial cosmogenic nuclide dating of sandstone fragments obtained from three localities apart from each other gave 10.3-8.4 ka, 10.0-8.1 ka, and 9.4-7.6 ka (in ^{10}Be scale). On the basis of these facts, we concluded that YG was produced by catastrophic rock slide (rock avalanche) in the early Holocene as single event. Although the previous authors stressed degradation of mountain permafrost for landslide occurrence, we invite attention to paleoearthquakes caused by nearby active faults or convergent plate margins as well as early Holocene pluvial climate and long-term gravitational rock deformation. A multidisciplinary study for better understanding of basic factors, onset triggers, kinematic behavior of landslide is further required

Keywords: Shimanto group, Rock avalanche, Terrestrial cosmogenic nuclides, Holocene

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HDS29-P04 Room:Poster Time:April 28 18:15-19:30

Gravitational rock deformation since the late Pleistocene on the Hounose-dendeiro Ridge, the southern Kanto Mountains

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We describe the geology and geomorphology related to gravitational rock deformation on the Hounose-denndeiro Ridge(HB), the upper Tama River Basin. HB is a broad ridge line 200 to 300 m wide running from northwest to southeast, and its altitudinal range spans from 1050 m to 1180 m ASL. The bedrock geology of HB is Cretaceous sedimentary rocks of Shimanto Group that generally show NE-SE strike and east dip at 60 to 80 degrees.

Linear depressions and step-like slopes both parallel to HB are present on and around the ridge-top. Depth and length of depressions are usually less than 20 m and several tens to hundreds meters in many cases. Features of valley bulging with downhill-facing scarp and gentle slopes are also found from valley side slopes immediately below ridge-top linear depressions and step-like slopes . In the area of gravitational slope deformation where bulging features occur, rock deformation caused by toppling and buckling can be observed.

We recovered sediment drill cores in the linear depressions on HB (P1 and P2). The bottom of surficial humic soil gave 4.1-4.3 cal ka (P1, -64 cm) and 9.5-9.8 cal ka (P2, -162 cm). Also a vitric ash layer Aira-Tanzawa (30 ka) was found from -153 cm (P1) and -325 cm (P2). In addition, a patch of pumice grain of Ontake-Ina (93 ka) was discovered at -709 cm of P2. These facts indicate that linear depressions as depositional sinks on HB were already formed before 30 ka at P1 and before 93 ka at P2.

Keywords: Shimanto Group, Linear depression, Toppling, Buckling, Tephra, 14C age

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HDS29-P05 Room:Poster Time:April 28 18:15-19:30

Relief, bell-shape and distortion indexes as critical topography of creep deformation due to mountain gravity

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1.Introduction

Double ridges or up-hill facing scarplets distributed on mountain ridge in high relief are known as indicators that mountain bodies are undergoing gravitational creep deformation and as signs of landslide in large scale. However, such micro topographies on ridges in Japan Alps has developed since 30 ka before. That is presumably attributed to one of the para-glacial phenomena. Trench study in Southern Japan Alps clarified that they have intermittently developed in a time scale of 10000 year and the last event, but a slight deformation occurred about 500-600 years ago. It is quite gradual movement. Consequently dense distribution of the up-hill facing scarplets is not always a pre-causious sign of sudden collapse of the mountain body in near future, though the earthquake occurs near the mountains. Other causative factors are required to induce landslide for hazard susceptibility mapping. We analyzed topographic features of mountain around Mt Shichmenzan and Ooyakuzure, which locate along the marginal mountains in Shizuoka Pref, and where huge co-seismic landslides occurred in 17th and 18th century, using DEM of 10m grid scale and more precise scale.

2.Topographic feature of mountain collapsed by earthquakes

Mountain ridges around Mt. Shichimenzan and Ooyakuzure show gentle and round and are fringed by distinct break of slopes. Mountain profiles of high contrast between steep lower slope and gentle ridge ridge tops are similar to a bell-shaped mountains of high relief. In another word, the bell-shaped profile is one kind of the concavity in ridge profiles.

3.Critical topography of creep deformation

Dense distribution of uphill facing scarplets are observed along the main ridges of the study area by aerial photograph interpretation. However, co-seismic landslides occurred only at Mt. Shichimenzan and Ooyakuzure. We analyzed relief of ridges, considering those of the surrounding slopes and ridge scale over the study area. We call it the relief index. Also we analyzed degree of bell-shape, weighting the area of convex part of the profile. These two indexes are highly scored around Mt. Shichimenzan and Ooyakuzure, but not so high along the main ridge from Mt. Yambushi-toge to Mt Dainichi-toge where the uphill facing scarplets are densely distributed. These are considered as very convenient indexes to know the high susceptibility of landslide induced by earthquake. And distortion index that is calculated ratio of total length of up-hill facing scarplets to a original slope length is also introduced as critical topography of creep deformation due to mountain gravity.

Keywords: gravitational creep, critical topography, relief index, bell-shape index, distortion index, large scale landslide

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HDS29-P06 Room:Poster Time:April 28 18:15-19:30

Development of Lake Shibire and its geomorphological relationship with landslides in Misaka Mountains, central Japan

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Geomorphological classification mapping and geological investigation were carried out to reconstruct the development of Lake Shibire (890 m ASL, max depth 9.5 m, perimeter 1.2 km) in Yamanashi Prefecture. Lake Shibire was formed on a closed depression of the hilly mound with antislopes that was produced by landslide on the steep slopes adjacent to the lake. Other smaller landslide bodies were also identified next to Lake Shibire. Lacustrine deposits with plant macro fossils and a thin vitric ash layer (Aira-Tanzawa, 30 cal ka) were discovered from the side slope of a small channel close to Lake Shibire. Radiocarbon age of a plant macro fossil sampled from the bottom of the lacustrine deposits was 47-46 cal ka. The paleo Lake Shibire was likely to consist of independent two or more basins in the late Pleistocene and only one basin has survived to the present-day Lake Shibire. It is also likely that a single basin was decoupled into two or more basins due to occupation of landslide masses caused by secondary landslide activities adjacent to the basins, and only the certain basin linked to the present-day Lake Shibire has endured.

Keywords: landslide, lacustrine deposit, Aira-Tanzawa tephra, 14C dating, late Pleistocene

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Geological implication of the lahar disaster by Typhoon Wipha on October 16, 2013 in Izu Oshima Volcano

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Heavy rain (over 800mm per 24 hours) triggered by Typhoon Wipha on October 16, 2013, caused many slope failures and associated lahars in the western part of Izu Oshima Volcano, Japan. Tephrostratigraphic study revealed a mechanism of the slope failures and history of similar lahars for the past 700 years. Seven fallout ash or scoria layers, which were ejected during the 7 eruptions since the early 14th century, are distributed in the study area. These tephra layers are interbedded with eolian dust (loess) layers, each of which was deposited during a 10-200 years dormant period. Stratigraphic horizons of the slope failures concentrated at the boundaries between ashes and underlying loess layers. This means that more permeable ash layers were saturated with rainwater and slid down along the upper surface of less permeable loess layers. We newly found that three lahars (Lahar A, B, and C) occurred in historic time. Lahar A and B are correlated to the disaster documents of 1856 (or 1932) and of the late 16th century, respectively. Lahar C overlies directly on the Y5.2 scoria and associated Motomachi Lava and thus occurred in the early-middle 14th century.

Keywords: Izu Oshima, volcano, eruptive history, lahar, Typhoon Wipha (2013), slope failure

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Preliminary report on the landslides, Oct. 2013, Izu-Oshima Volcanic island, central Japan: Shallow landslide, landforms

SUZUKI, Takehiko[1*] ; TMU GROUP FOR, Izu-oshima typhoon wipha (1326) disaster[1]

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Before dawn of 16th October 2013, the heavy rain associated with Typhoon Wipha (1326) caused landslides disaster in Izu-oshima volcanic island, 120 km south of Tokyo. Many shallow landslides occurred on the west slope of the Younger edifice of Pre-caldera volcano, facing Moto-machi Town. Several reports (e.g. Ministry of Land, Infrastructure, Transport and Tourism; http://www.mlit.go.jp/river/sabo/h25_typhoon26/izuooshimagaiyou131112.pdf) have suggested that the distribution of the landslides overlap the area of lava flow effused 14 Centuries (AD1338?). For examine this relation between landslides and the geomorphological and geological conditions, we preliminary surveyed shallow landslides, landforms and geology along the Gojinka Sky Line on the slope of the Younger edifice of Pre-caldera volcano, 7th and 8th of December and 4th to 6th of January. In presentation, we will report results of field survey for shallow landslides, landforms and geology in detail.

Keywords: Izu-Oshima, Typhoon Wipha (1326), Shallow landslide, Fall-out tephra, Lava flow

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Landslides of granite porphyry induced by Typhoon Talas 2011 around Mt. Myoho at Nachikatsuura, Wakayama, Japan

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Typhoon Talas brought heavy rain in Kii Peninsula, Japan on September 2-5, 2011, causing a large number of rock-avalanches and debris flows in the southeastern part of Kii Peninsula. We mapped the landslide scars on aerial photographs at the scale of 1:20000, made rainfall distribution maps by using the rainfall data analyzed by radar-AMeDAS, and compared position of landslides with rainfall distribution and the geological map by Geological Survey of Japan. The result shows that almost all of the landslides occurred in both over 80 mm/h of rainfall zone and Kumano granite porphyry area. In order to clarify the geological topographical background of the landslides, we also made field investigation around Mt. Myoho at Nachikatsuura, Wakayama Prefecture, where the landslide disaster concentrated.

The field investigation showed that the landslides had different attributes at inside area of granite porphyry mass and at the edge of the mass. Mt. Myoho consists of the Kumano granite porphyry around the top and the Kumano group (sedimentary rock) of Miocene age which occupies at the lower part of surrounding slope and below plain land. Slope is gentle around the top and gets steeper from the surrounding slope break, and eventually becomes gentle again below the boundary between granite porphyry and the Kumano group. The granite porphyry shows typical spheroidal weathering with corestones in the surface layer of gentler slope. The corestones were included in deposits caused by the landslides. Accordingly, landslides within granite porphyry area had scarps at the slope breaks, where weathered and/or reworked material of granite porphyry seemed to have collapsed. At landslides near the boundary between granite porphyry and the Kumano group, the shale of the Kumano group was altered to dark gray clay. Talus deposit of the saprolite and corestones on the clay seemed to have collapsed there.

We estimated volumes of some rock-avalanches around Mt. Myoho to be range from 10^2 to 5×10^5 cubic meters, and their equivalent friction coefficients were 0.20-0.46 on the basis of positions from the rock-avalanches and following debris flows plotted on topographical maps at the scale of 1:25000. These landslides of granite porphyry were similar to those of granite in Hiroshima Prefecture induced by heavy rain on June 1999 in terms of volume and equivalent friction coefficient. In the case of weathered granite in Hiroshima, however, corestones were formed slightly and it was a different type of landslide that saprolite collapsed and transformed into debris flows.

Keywords: landslides, Typhoon Talas, granite porphyry, Nachi Katsuura

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Interpretation of landslides triggered by 1944 Tonankai earthquake around Owase City using U.S. military aerial photos

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Shallow landslides were interpreted around Owase City, Mie Prefecture using U.S. military aerial photographs (1/16,000 in scale) taken on 7 December 1944, just three days after Tonankai earthquake (M7.9). It is thought that some of landslides were triggered by the earthquake. Result of the interpretation will be reported.

Keywords: landslide, slope failure, Tonankai, earthquake, U.S. military, reconnaissance

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Long-traveling conditions for the rock-on-snow landslide: insights from the field and lab evidence

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On March 12, 2011, the M 6.6 earthquake hit the typical deep snow area of Niigata and Nagano prefectures. This earthquake (2011 north Nagano Earthquake) induced a lot of landslides, and some of them travelled on snow moving long distance. We are studying that type of landslides which named rock-on-snow landslide by field observations and lab experiments. The rock-on-snow rock avalanche differs from other conventional earthquake-induced landslides because of high mobility, and slash avalanche because water before the event does not drive rocks. Then its high mobility is important to consider earthquake disaster prevention for deep snow area.

The physical properties of snow under the moving mass could affect long-travelling property. We investigated the Tatsunokuchi landslide induced by the earthquake and found temporal liquefaction zone which lay between landsliding mass and autochthonous snow (Yamasaki et al., 2013). The condition of snow getting liquefaction depends on temperature and pressure. Snow also has effect of friction reducing as skiing. However, all rock-on-snow landslides including small rock falls on snow do not travel long-distance, rather most of them stop shorter distance from the origin than normal rock falls. Thus, condition of the long-travelling could be limited. We conducted lab experiments that miniature rock fragments slides on snow slope which tilt angle is 20 degrees, the width is 20 cm and the length is 300 cm, and then we try to understand basic properties of relation between rock and snow and processes during the sliding. The results and our field observations gave us insights to understand larger phenomena.

Reference

Yamasaki, S. Nagata, H. and Kawaguchi, T., Long-traveling landslides in deep snow conditions induced by the 2011 Nagano Prefecture earthquake, Japan, Landslides, 2013 Online available.

Keywords: landslide, snow, earthquake, avalanche, debris avalanche

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Definition of the database fields for landslide hazard database by NIED

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The history of natural hazard at a certain place is greatly related to the current risk there. It provides indispensable information to the hazard and the risk assessment. The Research Institute for Earth Science and Disaster Prevention (NIED) is building a comprehensive database of natural hazard events over the historical period in Japan, and distributing these information with Web API. Such a hazard event database is, however, no more than an index with a limited amount of information about the reality. Therefore, especially for the large natural hazards that had big social impacts, it is important to provide specific databases classified with types of hazards such as earthquake, volcano, storm, flood, slope, snow and ice disasters. We discuss about the database for slope disasters in particular here.

Keywords: landslide hazard database, database field, definition of fields