Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

HSC24-P01 Room:Convention Hall Time:May 24 18:15-19:30

Background of shallow landslides triggered by the 1971 torrential rain in the village of Kawauchi, Fukushima Prefect

DAIMARU, Hiromu[1*] ; MURAKAMI, Wataru[1] ; SAITO, Hitoshi[2]

[1]Forestry and Forest Products Research Institute, [2]Kanto Gakuin University

Many shallow landslides were triggered by torrential rain on 31 August and 1 September in 1971, which reached to 571mm at the Shimo-kawauchi Met. Station. Most of the landslides have occurred on slope of the valleys cutting into the low-relief granitic mountains that received deep weathering. Mountain forest cover at the period is estimated to be rather sparse than present time. A digital photogrammetric survey has suggested that tree height at 1975 was smaller than half of that in present time which was estimated from air bone LiDAR data in this area. Some previous studies have suggested that forest vegetation in this area was seriously destroyed by migrants after the restitution of communal forest in 1912. The 1971 shallow landslides were affected by not only brittle granitic soils, but also past excess forest utilization.

Keywords: shallow landslide, natural disaster, deforestation, communal forest

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HSC24-P02 Room:Convention Hall Time:May 24 18:15-19:30

Correlation between liquefaction areas in Kanto region and the time-series changes of distribution of gravel pits

AOYAMA, Masafumi[1*] ; KOYAMA, Takushi[2]

[1]Japan Map Center, [2]Oita University

Geomorphological condition and land history of liquefied sites in Kamisu and Kashima cities caused by the 2011 off the Pacific coast of Tohoku Earthquake were evaluated by means of aerial photos and old edition maps. Liquefied sites in this region were identified based on the field survey and Google Earth images interpretation. In this area, a large number of the liquefied sites were identified in reclaimed area of former pond and gravel pits. These gravel pits were developed since the late of 1960s, and many places of these gravel pits were reclaimed. In Kanto region, a large number of liquefied sites were identified in gravel pits in the basin of Kuji, Naka, Kokai and Kinu River. In Japan, a large number of man-made soil deposits are distributed in densely inhabited district. Therefore, the information of time-series changes of distribution of gravel pits is important for evaluate of a liquefaction potential.

Keywords: liquefaction, gravel pits, land history, aerial photo, liquefaction potential estimation, 2011 off the Pacific coast of Tohoku Earthquake

Japan Geoscience Union Meeting 2015
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HSC24-P03 Room:Convention Hall Time:May 24 18:15-19:30

Factors of Damage of Temples and Shrines caused by the Taisho Kanto Earthquake: Case study of south-central Fujisawa

SHIBAYAMA, Ai[1*] ; YAMAZAKI, Haruo[1]

[1]Depertment of geography, Tokyo Metropolitan University

In recent years, the occurrences of earthquake which caused extensive damage at the capital function have been concerned. To reduce building damage caused by the earthquake, it is necessary to understand the area shake stronger. Many previous studies had been discussed the relationship between building damages and topographical and geological conditions. However, few studies had considered the factors which divided the degree of damage with each building on similar conditions (i.e. soft ground). In addition, it is important to discuss the building damage including the several factors, for example, topographical,geological and engineering factors, land use, and so on.In this study, we focused on the damages oftemples built on the alluvial lowlands in south-central Fujisawa city, Kanagawa Prefecture, to examine the factors which divided the extent of building damage at the 1923 Kanto Earthquake.

Taisho Kanto Earthquake occurred at 11:58 September, 1923, and measured Magnitude 7.9, maximum seismicintensity 6, 25km depth. We researched the damage records managed by Kanagawa Prefecture with fieldwork to add the records,investigated the construction age of temple, made the map of sectionalized geographical surface and sectionalized micro topography classification, and estimated the subsurface structure.

As a result of consolidating these data, it revealed that the difference of damage overlapped the multiple factors on each temple. It might be able to be the factors of building damage as follows;macro-scale geography (depression contour), surface soil layer is thick, alluvium is thick, groundwater height is high, the building is old, and characteristic geology (mud and thick sand layer deposit). On the other hand, it might not be the factors which work for the building damage as follows; micro topography classification (fine highlands), the distance from the hills is near (that engineering foundation layer thickness is thin),groundwater height is low, the building is new, and characteristic geology (shallow region composed of gravels and hard rock).

It is expected to become a significant data for performing the disaster prevention measures at the individual level by combined topographical and geological factors with engineering factors. Considering and analyzing the factors which cause the building damage, as big date, it is possible to evaluate the degree of shaking at individual buildings, and then perform more effective disaster prevention in the future.

Keywords: Taisho Kanto eatthquake, Fujisawa, temple and shrine, microtremor

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HSC24-P04 Room:Convention Hall Time:May 24 18:15-19:30

Characteristics of failure landform and incised valley in Shirasu area in Southern Kyushu

IGARASHI, Ryusuke[1*] ; SUGAI, Toshihiko[1] ; IMURA, Ryusuke[2] ; NISHIZAWA, Fumikatsu[3]

[1]Graduate School of Frontier Sciences, The University of Tokyo, [2]Graduate School of Science and Engineering, Kagoshima University, [3]Graduate School of Urban Environmental Sciences, Tokyo Metropolitan University

In Southern Kyushu, covered with pyroclastic flow deposits named as“Shirasu” , slope failure disasters have occurred repetitively during rainy and typhoon seasons with a return period of several decades. In Kagoshima Prefecture, in particular, the cliff overlain by “Shirasu” deposits has undergone repeated slope failures during a period of several decades, which is an extremely short timeframe for such activity (Tsukamoto, 1993). Ito pyroclastic flow deposits are part of a huge pyroclastic flow that occurred approximately 29,000 years ago (Machida and Arai, 2003); these deposits span an area of approximately 90 km from Aira Caldera, which was the source of Shirasu deposits (Yokoyama, 2000).

This study examined the relationships between the slope failure and the long-term development process of the erosional landform in the Shirasu distribution area. We focused on the plateau cliff which occurred in the erosion-denudation processes such as slope failure and erosion of Shirasu with the running water. Morphometric analyses the measurement of permeability and strength of Shirasu deposits were performed. The strength of Shirasu deposits was relatively homogeneous and showed a weakness comparable to the unconsolidated conglomerate and unconsolidated sandstone. The very high permeability of 0.02-0.05 mm/s is consistent with the low density of the incised valleys and suggests very low groundwater level. Probably because of this, there are fossilized shallow valleys ceasing their own growth on the Shirasu plateau among the valleys engraving the plateau. Landslides are densely distributed in the steep, uniform linear type slopes surrounding the plateau edge. To summarize in Shirasu area, surface failure occurs on the uniform linear type slope of the incised valley wall by the influence of the transient elevated groundwater level due to heavy rainfall. And besides, a fine, low-density failure materials can so easily be removed by a river that the parallel slope retreat continues. From a long-term perspective, it can be said that the failure potential is high for current incised valleys dominated by width enlargement processes.

Keywords: Shirasu, Incised Valley, Slope Failure, Records, Geomorphological Development, Southern Kyushu

Japan Geoscience Union Meeting 2015
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HSC24-P05 Room:Convention Hall Time:May 24 18:15-19:30

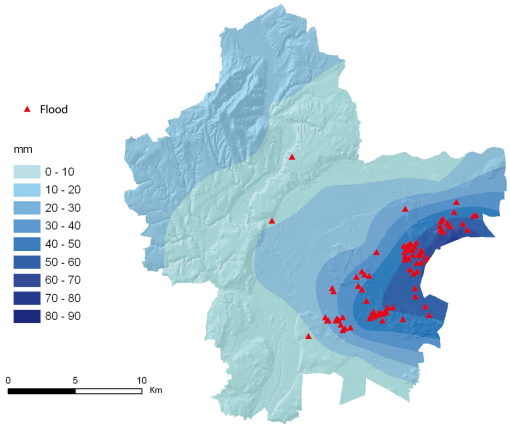
A multi-disciplinary management of flood risk based on rainfall interpolation, impact database and hydrological modeling

RENARD, Florent[1*] ; ALONSO, Lucille[1] ; CHAPON, Pierre-marie[1]

[1]University Jean Moulin Lyon 3, UMR 5600

The Greater Lyon (1.3 million inhabitants 650 km 2), located in south-east France, is subjected to recurring floods, with numerous consequences. From the perspective of prevention and management of this risk, the local authorities, in partnership with multidisciplinary researchers, have developed since 1988 a database built by the field teams, which specifically identifies all floods (places, date, impacts, damage, etc.). At first, this historical database is compared to two other databases, the emergency services and the local newspaper ones, in georeferencing these events using a GIS. It turns out that the historical database is more complete and precise, but the contribution of the other two bases is not negligible, and a useful complement to the knowledge of impacts. Thanks to the dense rain measurement network (30 rain gauges), the flood information is then compared to the distribution of rainfall for each episode (interpolation by ordinary kriging, fig. 1). The results are satisfactory and validate the accuracy of the information contained in the database, but also the accuracy of rainfall measurements. Thereafter, the number of flood on the study area is confronted with rainfall characteristics (intensity, duration and height of precipitated water). It does not appear here clear relationship between the number of floods and rainfall characteristics, because of the diversity of land uses, its permeability and the the types of local sewer network and urban water management. Finally, floods observed in the database are compared spatially with a GIS to flooding from the sewer network modeling (using the software Canoe). A strong spatial similarity between floods observed in the field and simulated flood is found in the majority of cases, despite the limitations of each tools. These encouraging results confirm the accuracy of the database and the reliability of the simulation software, and offer many operational perspectives to better understand the flood and learn to cope with the flooding risk.

Keywords: flood risk, rainfall interpolation, database, modeling, Lyon, France



Spatial distribution of the 06/30/1997 rainfall event and consecutive floods

Japan Geoscience Union Meeting 2015
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HSC24-P06 Room:Convention Hall Time:May 24 18:15-19:30

Liquefaction sites and distribution of alluvium

SUGAI, Toshihiko[1*] ; HONDA, Keita[2]

[1]Graduate School of Frontier Sciences, the University of Tokyo, [2]Musashi high school and junior high school

The 2011 off the Pacific coast of Tohoku Earthquake liquefied large areas of the Kanto plain. The eastern coast of Tokyo Bay was liquefied intensively along with the lower reaches of Naka River (Furutone River) and Tone River. A former body of water filled artificially as a reclaimed land has begun to be considered as a place of especial vulnerability. Much larger landfilling than the human-induced one has occurred after the postglacial transgression to form alluvial plains along the lower reaches of major rivers in Japan. The thickness and softness of alluvium which is sandwiched between the present river-profile (PRP) and the last glacial river-profile (LGRP) is one of the most important factors to control liquefaction. Alluvial plains along the lower reaches are identified as depositional surfaces of the alluvium named as coastal prism (CP). LGR developed basal gravel layers (BG) in Japan and thick CP with BG lengthens the secondary seismic wave period and its duration because of a slow s-wave velocity and multi-reflection, resulting in increased internal water pressure and liquefaction of the upper sandy layer of the CP.

Historic liquefaction sites compiled by Wakamatsu (2011) showed close relationships with the distribution of the CP. The inland limit of the liquefaction area roughly coincides with the upstream edge of the CP. Subduction-zone large earthquakes caused repeated liquefaction in an alluvial plain where the CP was more than 30 m thick. Post glacial marine transgression enlarged inner bay area along the valley incised by last glacial river in the low sea level period. Deeper valleys tend to have thicker inner bay mud, and river valleys deeper than 30 m mostly contain inner bay mud in CP. This may reflect the deceleration of sea-level rise at around 9 ka when the sea-level reached 25-30 m below present sea-level under the active fluvial sedimentation during the Holocene. Because Holocene inner bay mud contains much water and is one of the softest natural deposits, inner bay mud probably makes alluvial plain more vulnerable to liquefaction. Along the Naka River (Furutone River) plain, the Great East Japan Earthquake liquefied inland areas almost 100 km distant from the river mouth. This is partly because the river has the longest CP with inner bay mud in Japan.

Keywords: river long-profile, inner bay mud, marine transgression, coastal prism, Holocene, histrical earthquake

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HSC24-P07 Room:Convention Hall Time:May 24 18:15-19:30

A new typhoon bogussing scheme and its application for assessment of impacts of the possible maximum storm surges in Ise

SHIMOKAWA, Shinya[1*] ; MURAKAMI, Tmokazu[1] ; IIZUKA, Satoshi[1] ; YOSHINO, Jun[2] ; YASUDA, Takashi[3]

[1]NIED, [2]Gifu Univerisity, [3]Aichi University of Technology

We developed a new typhoon bogussing scheme to obtain the possible maximum typhoon approaching any region under any climatic conditions by using a potential vorticity inversion method (Shimokawa et al., 2014). Usually, to evaluate the impact of typhoon with a specific strength (e.g., strength of Isewan Typhoon) on another region (e.g., Tokyo bay), it is needed to select a typhoon with the strength approaching to the region. However, an adequate example of such a typhoon does not always exist (does not rather exist in most cases). One of the ways to resolve this problem is to remake the environment field of the typhoon (e.g., Isewan Typhoon) by some methods to adapt to the region. It is possible by using the new typhoon bogussing scheme with the potential vorticity inversion method.

Numerical simulations with the new typhoon bogussing scheme are conducted for assessment of storm surges by possible maximum typhoons under the present-day and global warming climatic conditions in Ise and Tokyo Bays in Japan. Totally, 200 cases are conducted. The results suggest that the storm tide higher than the maximum storm tide in recorded history can occur in Ise and Tokyo Bays even for the present-day climate and the storm tide higher than the design sea level can cause severe damage to Nagoya and Tokyo megacities.

In particular, for the global warming climate in Ise Bay, the storm tide reaches the maximum among our results. This is because Ise Bay maintains the following conditions to amplify the storm surge: broad mouth of the bay (around 35 km) and shallow depth of the bay (average depth of around 19 m). In addition, low height shore protections on the coast of Ise Bay can amplify damage due to storm surge. On the other hand, in Tokyo Bay, mouth of the bay is narrow (around 20 km). Moreover, in Tokyo Bay, the average depth of the inner bay is shallow (around 17 m), but the depth at mouth of the bay reaches 700 m. In addition, higher mountains near Tokyo Bay have a tendency to decrease the strength of typhoons and, therefore, the height of the storm surges caused by the typhoons.

These results will affect port facilities in Ise and Tokyo Bays, for example, the airports (i.e., Chubu and Haneda International Airports). In particular, at Chubu International Airport, storm tide reaches 3.54 m. In addition, when the mean monthly highest water level of T.P. +1.22 m and mean sea level rise due to global warming (A1B scenario, IPCC, 2007) of T.P. +0.48 m are added to the storm tide at at Chubu International Airport (i.e., 3.54 m), maximum sea level in Ise Bay reaches T.P +5.24 m. This is higher than not only the ground level of the runway and airport facilities in Chubu International Airport, T.P. +3.29 m, but also the highest shore protection around the airport, T.P. +4.79 m. In addition, the effect of a high wave above 6.0 m in this model is not considered in this estimation. When the effect of a high wave is added to it, catastrophic damage can be caused to Chubu International Airport.

These results suggest that the new typhoon bogussing scheme we developed is useful for assessment of impacts of storm surge by the possible maximum typhoons because it can make possible to assess impacts of possible maximum storm surge in any region and under any climate conditions.

References:

S. Shimokawa, T. Murakami, S. Iizuka, J. Yoshino, and T. Yasuda, 2014, A new typhoon bogusing scheme to obtain the possible maximum typhoon and its application for assessment of impacts of the possible maximum storm surges in Ise and Tokyo Bays in Japan, Natural Hazards, 74, 2037-2052 (doi:10.1007/s11069-014-1277-2).

Keywords: Typhoon bogussing scheme, Maximum Potential Intensity, Global warming, Storm tide, Airport

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Checked dangerous point on the evacuation route -using a GIS map with a parent and child.

FURUTA, Noboru[1*] ; KAWASE, Kumiko[3] ; KOBAYASHI, Ikunori[2] ; CYUJYO, Yoshiteru[1]

[1]Faculty of Letters,Tokushima Bunri Univ., [2]Faculty of Science and Engineering,Tokushima Bunri Univ., [3]Faculty of Education,Ehime Univ.

This is the report of a seminar ”Kagawa Kodomo Daigaku” that is the Hazard map for schoolchildren and their parents.The working date were September of last year and at Kagawa campus of Tokushima Bunri Univ.

The target was made schoolchild upper grades.they are living at Kagawa.They watched an old map and confirmed the topography of the those days. And to make sure of the older situation, they watched air photo taken at 1948.They understood where a dangerous part was by Hazard map.When they ran away with elderly or person with disabilities, they knew how to do.We had them try emergency rations actually.Then they knew with what kind of emergency rations I should run away.While discussing by a parent and child an aim of this seminar is at the place which deepens understanding.

Keywords: Evacuation route, Dangerous spot, Elementary school, GIS, Parent and child

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Preliminary approach of probabilistic tsunami hazard assessment for the Japan trench earthquakes

OSADA, Masaki[1*] ; HIRATA, Kenji[1] ; FUJIWARA, Hiroyuki[1] ; NAKAMURA, Hiromitsu[1] ; OHSUMI, Tsuneo[1] ; MORIKAWA, Nobuyuki[1] ; KAWAI, Shin'ichi[1] ; AOI, Shin[1] ; YAMAMOTO, Naotaka[1] ; MATSUYAMA, Hisanori[2] ; TOYAMA, Nobuhiko[2] ; KITOH, Tadashi[2] ; AKIYAMA, Shin'ichi[3] ; KORENAGA, Mariko[3] ; ABE, Yuta[3] ; HASHIMOTO, Norihiko[3] ; MURASHIMA, Yo'ichi[4] ; MURATA, Yasuhiro[4] ; INOUE, Takuya[4] ; SAITO, Ryu[4] ; TAKAYAMA, Junpei[4]

[1]NIED, [2]OYO corporation, [3]ITOCHU Techno-Solutions Corporation, [4]Kokusai Kogyo Co., Ltd.

National Research Institute for Earth Science and Disaster Prevention(NIED) has started an research project on probabilistic tsunami hazard assessment(PTHA) around Japanese coastal area since 2012(e.g. Fujiwara et al., 2013JpGU, Hirata et al., 2014JpGU). In this presentation, we shortly report preliminary results on PTHA study for a set of the possible tsunami-genic earthquake along the Japan Trench.

Outline of our PTHA scheme is as follows: I) Occurrence probabilities set for all of possible tsunami-genic earthquakes under appropriate assumptions, such as "Evaluation of occurrence probability of earthquakes" by the Headquarters for Earthquake Research Promotion(HERP, 2011), Japan. II) Characterized earthquake fault models(referred as tsunami source models, hereafter) for hypothesized earthquakes are built up, in which we take account heterogeneities on slip distributions. III) Terrain on land and subsea is modeled with the finest resolution of 50 meters. IV) Coastal tsunami height is estimated numerically through surface deformation by Okada's formula (Okada, 1992) and finite-deference scheme based on non-linear shallow-water equation. In calculation, land-ward inundation is allowed, and transparent boundary condition is applied for sea-ward boundaries. V) Thirty-years exceedance probabilities on tsunami height are estimated at every coastal grid with event occurrence probabilities and areatory uncertainties due to numerical assumptions and limitations (Abe et al., 2014JpGU, Korenaga et al., 2014JpGU).

We consider subduction type earthquakes (inter-, intra-plate earthquakes and tsunami earthquakes) at the Japan Trench, in which include both earthquakes described in the long-term evaluation for the Japan Trench by HERP (2011) and those without evaluations. All of tsunami source models consist of background slip area and one or two large slip zone (LSZ), where LSZ is defined as area where slip amounts is two times larger than average slip. If LSZ would be modeled at very shallow zone of subducting plate, quad-time slip zone will be added into slip model. Areas of LSZ and quad-time slip zone are 30% and 10% of the total fault area, respectively. For models with Mw8.3 and more, we take account several slip distribution scenarios on one source because slip distribution would be not always the same even in same fault area. Tsunami sources with moderate to relatively small size are modeled that fault is distributed uniformly on the surface of subduction plate up to about 60km, and single LSZ is set at center part of each fault. Source size and its seismic moment are estimated through an empirical relationship (Toyama et al., 2014JpGU). Finally, we have conducted tsunami forward calculations for 1890 scenarios whose earthquake magnitude had ranged from Mw7.0 to Mw9.4.

We adopt two sort of probabilistic earthquake occurrence models; first is a hybrid model of BPT (Brownian Passage Time) process and Poisson process. Second model is the Poisson model, in which all scenarios would assume to be occurred at random temporally. In both cases, return periods for earthquakes with HERP's long-term evaluations are the same as the HERP, and frequencies for earthquakes without HERP's evaluation are taken from G-R law with b=0.9. Resultant hazard curves for the Pacific coast in eastern Japan show that low probabilities but very tall-height tsunami due to the maximum-size and fore-facing large events are evident in the southern part of the area, on the other hand, the Sanriku-Oki-hokubu earthquakes would much contribute to the local hazard in northern part of the area.

In order to show up over-all feature of the probabilistic tsunami hazard around Japan, we now go on the assessment for adjacent seismically active regions, such the Nankai Trough. Meanwhile, it is clear that we have a several point to be improved on our approach technically and that a system for publicizing our products shall be developed.

Keywords: tsunami, probabilistic tsunami hazard assessment, Japan trench

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Diversity of the awareness for natural disasters by the local peoples lives in basic self-governing body

AOKI, Tatsuto[1*] ; HAYASHI, Kiyomi[1]

[1]School of Regional Development, Kanazawa University

In Japan, an area of basic self-governing body became wider by the merger known as ”the big merger of Heisei” after 2000’s. As a result of this merger, various natural environments related to the natural hazards involved within one basic self-governing body.

Information from the local government is quite important for local people to think the measures for natural disaster. The information from the local government, however, became cyclopedic after merger because various disasters are predicted within the area. After that, the local people have to choose the information for their settlements. If this presses are not enough, they can’t correspond the disasters.

In this study, we carried out the a questionnaire survey in Hakusan city to observe the diversity of the awareness for natural disasters by the local peoples. Hakusan city ,exists in Ishikawa prefecture, established in 2005 with merger of 1 city, 2 towns and 5 villages. The area is 755.17 sq. km (largest in Ishikawa pref.), the population is 109,134 (second largest in Ishikawa pref.).

The area of this city is almost equals to the watershed of the Tedori River, which make floods frequently. Source area of this river is the active volcano named Hakusan (2,702m asl) which frequently erupted before 1500s. The area of this city reaches to the sea. The coastal area are affected the flood tide some times and worried about the Tsunami disaster after the Tohoku Grate Earthquake in 2011. The active fault called Morimoto-Togashi Fault Zone exists in the foot area of the hilly land. This fault zone is quiet during last 2000 years, but it is well known as one of the most dangerous faults in Japan and will occurs over M7 earthquake. As shown above, the natural disasters in Hakusan city have various frequency, intensity and history. The estimated damages are not uniform within the area of the city.

A questionnaire survey are carried out in 3800 households in 6 area of Hakusan city. The results will be reported in the poster.

Keywords: basic self-governing body covers wide area, local peoples, awareness for natural disasters, questionnaire survey, Hakusan city