Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HSC24-P01 Room:Convention Hall Time:May 23 15:30-17:00

Detection criteria for tsunami-inundation area of the Tohoku earthquake, based on air-photo stereo-pair interpretation

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Air-photos revealed tsunami damages vast and serious, which were taken immediately after the 2011 off the Pacific coast of Tohoku earthquake, northeast Japan. For quick and intensive, rescue and recovery activities, we conducted their stereo-pair interpretation to release '1:25,000-scale tsunami damage map' online 17 days after the earthquake. The latest '2011 final' edition was released on December 11, 2011. Stereo-pair air-photos enable us to identify tsunami-inundation areas when interpreted from the following points of view: landforms, elevations, land conditions, geomorphic histories, land uses, and man-made infrastructures, in addition to tsunami-flow courses. We describe our identified tsunami-inundation evidences, hints, and problems in the mapping, to manage future devastating tsunamis.

Keywords: tsunami, landform, air-photo, stereo-pair analysis, 2011 off the Pacific coast of Tohoku earthquake

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HSC24-P02 Room:Convention Hall Time:May 23 15:30-17:00

Comparison between Liquefaction Area Associated with the 2011 Tohoku earthquake and Interferometric SAR Coherence Change

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Preface: In this study, we demonstrate that reductions of coherence values, which obtained from interferometric analyses using SAR data acquired before and after the occurrence of liquefaction, have good spatial correlations with the liquefaction area investigated from field surveys. Associated with the 2011 Tohoku earthquake, liquefaction occurred in Kanto District, mainly in Chiba and Ibaraki prefectures. After liquefaction occurred, serious ground surface changes due to sand boiling etc. are expected to culminate in significant coherence reduction. So far, there have been some reports in which incoherent phase areas in an interferogram have been regarded as liquefaction area. However, it is not necessarily appropriate that the incoherence in an interferogram is used as an indicator of liquefaction area, because the incoherent area does not necessarily reflect the liquefaction in the case that the scattering condition easily varies owing to inherent bad ground condition (e.g., arable land). Thus, in this study, we attempt to make use of a reduction of coherence value as an indicator of identification of liquefaction area. This is why it is presumably expected that coherence values largely decrease associated with serious ground condition changes due to liquefaction and for inherent bad ground condition area there is no significant coherence change.

Analysis procedure: To identify the liquefaction area, we generate a differential image of two coherence images. One coherence image is obtained from an interferometric analysis using SAR data acquired before the 2011 Tohoku earthquake, and the other is from SAR data before and after the earthquake. We here subtract the coherence values of the former image from those of the latter one. We compare the liquefaction areas to the areas where the coherence values decrease. Our studied areas are around the lower Tonegawa River and along Tokyo Bay, where serious liquefaction occurred associated with the 2011 Tohoku earthquake. For the analysis, we use ALOS/PALSAR data acquired on December 28, 2010, February 2, 2011 and March 20, 2011 for the lower Tonegawa River (path 404) and January 4, 2011, February 19, 2011 and April 6, 2011 for Tokyo Bay (path 405).

Result: We find good spatial correlations between the area showing decrease of coherence values and the liquefaction area for both the studied areas. For the lower Tonegawa River, in particular, significant reduction in coherence values can be recognized in Hinode District in Itako City, Sawara District in Katori City, and Nishishiro District in Inashiki City. Especially, we can recognize a high spatial correlation between the two in Hinode District where serious liquefaction in residential area has occurred. For Tokyo Bay, reduction of coherence values distributes along the coastal zone from the city of Urayasu to Narashino. In and around Urayasu City, the reduction of coherence values can be recognized in the coastal zone from metropolitan express way. However, in Tokyo Disney Land and in seaside zones of Minato, Takasu, Akemi, and Hinode Districts, there is no remarkable reduction on coherence. These features observed from the differential coherence image are consistent with the field survey results.

Acknowledgment: PALSAR data are provided from Earthquake Working Group under a cooperative research contract with JAXA (Japan Aerospace Exploration Agency) and are the products that GSI purchased through ”Joint Cooperative Agreement between GSI and JAXA for observation of geographic information using Advanced Land Observing Satellite (ALOS) data”. The ownership of PALSAR data belongs to JAXA and METI (Ministry of Economy, Trade and Industry).

Keywords: the 2011 Tohoku earthquake, Liquefaction, InSAR, Coherence reduction

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HSC24-P03 Room:Convention Hall Time:May 23 15:30-17:00

Consideration on the distribution of liquefied sites in relation to the micro-topography and land history

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The occurrences of liquefaction damage in the Tone River lowland and Osaki plain induced by the 2011 off the Pacific coast of Tohoku Earthquake were observed and mapped on the basis of field survey and Google Earth images interpretation. The results of GIS analysis and old edition maps which have been published since the Meiji era indicate that a large number of the liquefied sites are located on reclaimed land of former river channels and lakes, and flood plain (backmarsh). In the Tone River lowland, many liquefied sites located on the former river channels and lakes had been reclaimed during 1950 to 1970. We should pay attention to micro-topography and detailed land history in case of mapping the hazard risk of liquefaction damages.

Keywords: liquefaction damage, micro-topography, land history, Tone River lowland, Osaki plain, 2011 off the Pacific coast of Tohoku Earthquake

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HSC24-P04 Room:Convention Hall Time:May 23 15:30-17:00

Liquefaction-Fluidization phenomena in Chiba on Kanto Basin at the 2011 Earthquake off the Pacific Coast of Tohoku

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Outline of liquefaction-fluidization phenomena on the Boso peninsula in the Quaternary Kanto Basin and characteristics of liquefaction-fluidization disaster on Tokyo bay reclaimed land by the 2011 Earthquake off the Pacific Coast of Tohoku are reported in this paper.

OUTLINE OF LIQUEFACTION-FLUIDIZATION PHENOMENA ON BOSO PENINSULA: 1) Liquefaction-fluidization disaster distribute on reclaimed land by Man-made strata. 2) Liquefaction-fluidization phenomena distribute mainly on JMA intensity 5+. 3) Liquefaction-fluidization phenomena distribute mainly on northern Boso peninsula. Because the strength of shaking increase to north of Boso peninsula. 4) Liquefaction-fluidization phenomena are more serious and widely at this earthquake than at 1987 east off Chiba prefecture earthquake. 5) Seriousness of damage by liquefaction-fluidization are different in reclaimed land. The seriousness may depend on facies and thickness of Man-made strata and Holocene formation.

CHARACTERISTICS OF LIQUEFACTION-FLUIDIZATION DISASTER ON SOUTHERN CHIBA CITY IN TOKYO BAY RECLAIMED LAND: 1) Liquefaction-fluidization damage zones with few hundred meters wide distribute on this reclaimed land. Large part of the damage zones distribute on the thick part of the Holocene formation. 2) Liquefaction disaster distribute on sandy strata of Man-made strata, but the disaster distribute little on muddy strata of it (Kazaoka et al.,2000;2003). Liquefaction-fluidization part with one hundred meters wide may depend on the litho-facies lateral change of Man-made strata. 3) Intensity of liquefaction-fluidization phenomena is recognized by deformation of ground surface and amount of subsidence. 4) Jetted sand distribute under 2 meter height, from road surface, in artificial hill. This shows the groundwater table to rise to 2 meters height from road surface. 5) Strong shaking might decrease on liquefaction-fluidization part, because tall furniture toppled little in there. Same phenomena happened at the 1995 Hanshin-Awaji Earthquake (Nirei et al.,1996).

SURVEY POINT FROM NOW: It is very important the next surveys for urban planning against liquefaction-fluidization disaster. 1) Recognition of lateral change of seriousness of damage and ground deformation by liquefaction-fluidization. 2) Recognition of lateral change and vertical change of litho-facies in the Holocene formation and Man-made strata. 3) Recognition of correlation between amplification characteristic of shaking and geological structure. 4) Recognition of groundwater flow and table in each aquifer.

FOR FUTURE RESTORATION AND RECOVERY: 1) Against liquefaction-fluidization damage: It is very important to recognize the geological diversity and sustainable use on each site. It is necessary to consider as follows on damage control, damage situation of this earthquake, land use, geological environment, decrease effect of sheer wave by liquefaction. 2) Importance of groundwater: It is necessary to use daily the disaster prevention well and to monitor groundwater table and quality of the well. 3) Continuous landsubsidence after jetted sand. 4) Disaster education: Most of disaster is earth science field of the science. It is necessary to teach Man-made strata, the Holocene formation and the Neogene strata which disaster occur often on, and to teach geological disaster, Earthquake, Tunami, Landsubsidence, Slope failure and Geo-pollution. Further it is necessary to teach sustainable use of Geo-resources, such as Land and Groundwater.

Keywords: Liquefaction-Fluidization, The 2011 Earthquake off the Pacific Coast of Tohoku, Boso peninsula, Man-made strata, Tokyo bay reclaimed land, Urban Geology

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HSC24-P05 Room:Convention Hall Time:May 23 15:30-17:00

Distribution of Geplogical Disaster by Liquefaction-Eluidizatio Phenomena on Boso peninsula at The-2011 off the Paclfic

FURUNO, Kunio[1*], KAZAOKA, Osamu[1], KUSUDA, Takashi[1], KAGAWA, Atsushi[1], Yuataka Sakai[1], YOSHIDA, Takeshi[1], KATO, Akiko[1], Mari Yamamoto[1], Yuji Takaknashi[1]

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Liquefaction-fluidization phenomena were occurred by the 2011 off the Pacificcoast of Tohoku Earthquake in Tokyo Bay reclaimed land area. Tone River lowland area and Kujyukuri plain in Chiba prefecture. In Tone River lowland.liquefaction-fluidization disaster distributed on man-made strata. In the lower Tone River Plain. some marshes and lakes were reclaimed for paddy fields. Other ponds and lakes resulted from river improvement work were fil led by riverbedfine grained sand for paddy fields and houses. Liquefaction-fluidization disaster are more serious and widely at this earthquake than at 1987 off Chiba prefecture earth quake. Seriousness of damage by liquefaction-fluidization is different in reclaimed land. It supposed that the reason of the difference is the difference of the man-madestrata and the Holocene deposits. The ground wave "Jin a m i" were found in some areas.

Kujukuri Plain characterized over ten of sand dunes are distributed in Kujukuri Plain. Marshes and ponds distributed between the dune lines were filled by fine grained sand of dune sand and the Shimosa Group collecting for houses lots. Along the coast. sand dune was dug for iron sand. Then the sites were fil led up again by the iron removed sand. In past this area suffered the liquefaction-fluidization hazards caused by earthquake at Oecember 17. 1987. These artificial beds also liquidized by the 1987 East Off Chiba Prefecture Earthquake (Nirei. et al.. 1990). The hazards were more extensive than that of the past same scale earthquakes (Nirei. et al.. 1990). The liquefaction-fluidization hazards caused by the 2011 off the Pacific coast of Tohoku Earthquake. on the northern part Kujukuri plain seen more widely and seriously than the 1987 East Off Chiba Prefecture Earthquake. But the phenomena could not observe southern part of Togane city.

In Asahi city. located northern part of Kujukuri plain. the liquefaction-fluidization phenomena occurred more extensive than the 1987 East Off Chiba Prefecture Earthquake. Also the Iiq uefaction-fluidization hazards were more serious. But the degree of damage varies by location. It is considered the impact of the differences in the thickness of the soft sand. Along the coast, sand dune was dug for iron sand. Then the sites were fil led up again by the iron removed sand from many local residents -there was testimony that the Iiq uefaction-fluidization hazards occurred. At Komatsu/ Hasunuma-Hira. Sanmu city. located near the Kido-gawa river mouth. the severe Iiq uefaction-fluidization hazards occurred. It is considered the impact of the differences in the thickness of the Holocene sediments and to configure the type of strata.

Keywords: Liquefaction-Fluidization, Tone River, 2011 off the Pacific coast of Tohoku Earthquake, 1987 off Chiba prefecture Earthquake, digging of iron sand ore deposit, Kujyukuri plain

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HSC24-P06 Room:Convention Hall Time:May 23 15:30-17:00

Optimized shape design of gravel drains in liquefaction countermeasures

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Liquefaction countermeasures are roughly categorized into two methods, one is the gravel drain method, the other is the sand compaction pile method. These methods mainly aim the reduction of excess pore water pressure in underground during earthquakes. We focus on the gravel drain method in terms of optimal shape design of the gravel drains having a superior drainage performance.

To detect such optimized drain shape, we convert the practical problem into
a mathematical programming problem involving the partial differential equations concerning seepage flow.
Then an efficient mathematical programming technique in conjunction with the finite element method (FEM) is employed.

The problem solving process consists of three operations:
(1) Solve the partial differential equation for seepage flow by the FEM.
(2) Perform the sensitivity analysis based on the adjoint variable method.
(3) Solve the mathematical programming problem to update the design variable.
These operations are continued until the convergence with respect to the objective function value and robustly detect the optimized drain shape within a reasonable CPU time.

The tendencies and remarks of the obtained optimal drain shapes are clearly found that those optimized shapes are similar to the roots of plants in the underground and dramatically reduce the mean of hydraulic head as compared with those of the normal gravel drains. Moreover, it is also found that the fractal dimension of the optimal drain shape is measured as D=2.3, which corresponds to those measured in blood capillary systems inside the living creatures.

Keywords: liquefaction, gravel drain method, finite element method, optimization

Japan Geoscience Union Meeting 2012
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Rough forecast damage just after earthquake

KAMIYA, Izumi[1*], KOARAI, Mamoru[1], Kosei Otoi[1], NAKANO, Takayuki[1]

[1]GSI of Japan

Rapid grasp of damages is very important for emergent countermeasures of large disaster in government level. However, outline of damage is not easy to grasp immediately after the big earthquake. For example, the outline became clear by live TV picture in case of the Southern Hyogo prefecture earthquake in 1995; it was 2 hours after the shock. The whole aspect of damage of Yamakoshi village became clear in the next morning in case of the Mid Niigata Prefecture Earthquake in 2004.

Lack of information is probable even now by darkness, bad weather, complication of information, and damage on communication line. In this case, rough forecast of damage based on seismic intensity and regional characteristics must be serviceable just after earthquake.

Early Estimation System (EES) of Disaster Information Systems (DIS), which cabinet office operates, quantitatively forecasts buildings and human damages. This study targets on geo-disasters, which EES do not target; slope collapse, landslide (as narrow sense), and soil liquefaction. We try to automatically calculate and send rough forecast information to related authorities within 30 minutes. The calculation uses real time information such as estimated seismic intensity distribution map by Japan Meteorological Agency, and existing geospatial information such as Digital Terrain Mode (DTM), geomorphologic data, geological data. The system also automatically output some overlay maps of real time information and existing geospatial information. The system provides environment to exchange ideas between assembled and non-assembled staff referring the rough forecasts and the overlay maps.

Automatic calculation of rough forecast is workable triggered by the real time information at the time of writing this manuscript. But it the calculation results are not in practical-use level. Other functions of the system are in developing. Calculations are in 1 km grid, and now improving to 250 m grid.

Rough forecast of slope collapse is based on the Rokko formula, which is developed by National Institute for Land and Infrastructure Management. The Rokko formula is depending on maximum acceleration, slope, and curvature. Maximum acceleration is estimated using seismic intensity. The Rokko formula is separated into acceleration part and slope/curvature part. Therefore slope/curvature part is calculated and histogram of the part within each cell is obtained before earthquake using 10 m grid DEM; its decrease amount of calculation at earthquake.

Rough forecast of land slide is calculated by table operation of seismic intensity and land slide area ratio, which is ratio of transportation and sediment area over the whole area of the grid cell.

Rough forecast of soil liquefaction is calculated by table operation of seismic intensity and geomorphologic data. We use Wkamatsu's geomorphologic data, because the data was produced by same method over whole Japan.

Keywords: realtime damage forecast, earthquake

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Grasping damage situation by accessibility to internet servers

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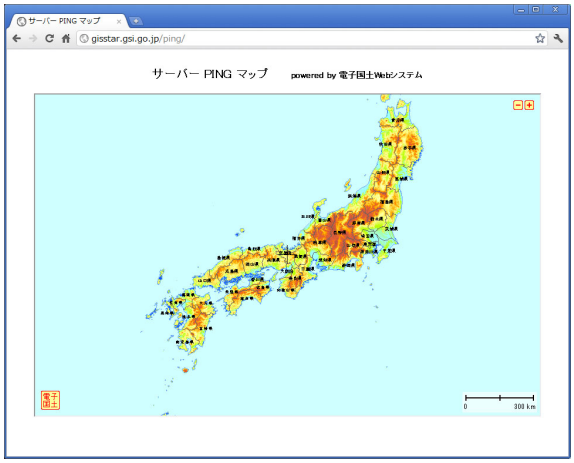
Rapid grasp of damages is very important for emergent countermeasures of large disaster. However communication to damaged area may not be available. Accessibility to servers via internet may be useful as a source of grasping damaged area. Therefore, a system to check servers and to map the result using cyber Japan web system is developed. The system employs 3 kinds of check method: replay of ping (replay of ICMP echo request), replay of TCP connection request, and replay of HTTP request via proxy server.

Reasons of no response except damage of the server or location of the server are following; server down not caused by the disaster, damage on internet backbone network, access implosion to server or internet, damage on power plant or power transmission backbone network. On the other hand, a server in earthquake resistant building with emergency power supply may respond even the area suffered serious damage. Furthermore, a server may not be at building of server owner but at data center. Selection of servers and interpretation of result are farther problems.

Keywords: Grasping damage situation, ping



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HSC24-P09 Room:Convention Hall Time:May 23 15:30-17:00

Relief energy of slope failures area affected by the Mid Niigata Prefecture Earthquake in 2004

KUROKI, Takahito[1*], KOARAI, Mamoru[2], KOMATSUBARA, Taku[3], OKATANI, Takaki[2], NAKANO, Takayuki[2]

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The Mid Niigata Prefecture Earthquake in 2004 caused various scales many slope failures in the Chuetsu area. The distribution of them was interpreted by aerial photographs and the disaster condition maps of the earthquake were published by the Geospatial Information Authority of Japan. In this study, we investigated the characteristics of the relief energy at the slope failures using polygon or polyline data indicating them in the disaster condition maps. The large scale slope failures indexed by polygon data are considered landslides and the small scale ones indexed by polyline data are considered surface failures.

For analysis on the relief energy, elevation data of 10m-mesh digital elevation model in the fundamental geospatial data were used. Two kinds of relief energy were calculated. The first relief energy is defined as the elevation difference between maximum elevation and minimum elevation in the unit area whose sizes are 0.01km^2, 0.25km^2 and 1km^2. The second relief energy is defined as the elevation difference between the two landform models of summit level and valley level. In the calculation on the models, we set the minimum watershed area whose sizes are 0.04km^2, 0.09km^2 and 0.25km^2. We overlaid the scarps of the large scale slope failures, the landslide masses of them and axes of active folding with these relief energy maps by GIS. We clarified two results in the calculation cases of 1km^2 of the unit area or 0.25km^2 of the minimum watershed area. It seems that the relief energy is larger at the area between anticlinal axis and synclinal axis, and it is easy to confirm that the relief energy tends to be larger at the area where the large slope failures occurred in comparison with the surrounding areas.

The coordinates of the centroid, the distance from the epicenter and the two kinds of relief energies at the centroid on scarps, landslide masses and the small scale slope failures were analyzed by GIS. Many graphs plotted with relief energy on their landforms and random points for as the vertical axis and the distance from the centroid as the horizontal axis were prepared. By analyzing these graphs, it was clarified that the occurrence of the landslides concentrated within about 11km distance from the epicenter. This trend appeared more clearly on the large slope failures. We clarified two results by the comparison of their landforms and random points. The slope failures tend to occur in the area where is larger than some value of the relief energy and to be difficult to occur in the area where is smaller of the relief energy at far distance from the epicenter. The latter trend appeared more clearly on the small slope failures. It is easy to understand these characteristics from the graphs on larger unit area or watershed area in the calculating relief energy.

Consequently, we pointed out a possibility that the basic factor of the slope failures induced by the earthquake is not only the erosion by rivers but also the active folding and that the incentive of them is the seismic ground motion by the overlay analysis between various kinds of relief energy and landforms such as large landslide, etc.

Keywords: relief energy, DEM, slope failure, landslide, The Mid Niigata Prefecture Earthquake in 2004

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HSC24-P10 Room:Convention Hall Time:May 23 15:30-17:00

Geomorphic characteristics of landslides caused by the Northern Nagano Prefecture Earthquake of Mar. 12, 2011

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A lot of landslidings were caused by the Northern Nagano Prefecture Earthquake (M=6.6) of Mar. 12, 2011. Based on the air-photo interpretation, the characteristics of landsliding localities were classified into five types, i.e. 1)crest slope surrounding slopes of which had collapsed in the past; 2)upper end of some old landslide scarp; 3)steep slope along small stream which is lower than the apparent knick line; 4)undercut slope of Chikuma River and 5)inner area of moving mass of old landslide. From the geomorphological point of view, these are all unstable part of slopes.

Keywords: earthquake, slope failure, air photo, knick line, unstable slope, geomorphology

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HSC24-P11 Room:Convention Hall Time:May 23 15:30-17:00

Effects of school education for disaster prevention -An evaluation through the experience of the Tohoku Earthquake-

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[1]Yamagata University

The author had involved in education for disaster prevention in some schools in Sendai and Yamagata before the Tohoku Region Pacific Coast Earthquake in 2011. The practices were as follows;

- August to September in 2007 at Sendai City Kitarokubancho Elementary School: Twelve school hours of Integrated Studies for fifth-grade children including special lecture by the author and workshop (town watching and mapping).
- June in 2010 and February in 2011 at Yamagata City Dai-yon and Dai-san Junior High Schools respectively: Two school hours of Home Economics for seventh-grade students including special lecture by the author.

Questionnaire surveys were conducted to the students who had attended the class in July to September in 2011. According to the result of the surveys, the effects of the practices are positive in general. However, some students express they have forgotten the contents. School education for disaster prevention should be embedded in the curriculum, so that the children and students learn systematically along the developmental stages.

Keywords: earthquake disaster, education for disaster prevention, evaluation, the Tohoku Region Pacific Coast Earthquake

Japan Geoscience Union Meeting 2012
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HSC24-P12 Room:Convention Hall Time:May 23 15:30-17:00

”100 Active fault-scape in Japan” movement and its implication in reduction of disaster risk

TOYOKURA, Isamu[1*], AZUMA, Takashi[2], OKADA, Atsumasa[4], OTA, Yoko[3], Yuzo Katsura[5], Jun Tajika[6], Takashi Nakata[7], Akio Harada[8], Minoru Hoshino[9], HOSOYA, Takashi[10], MATSUDA, Tokihiko[11], MUKOYAMA, Sakae[12], WATANABE, Mitsuhisa[13]

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The Active fault 100 selection subcommittee of Japanese Society for Active Fault Studies will present our activities of ”100 views of active faults in Japan” movement and its implication in reduction of disaster risk.

We run the 2011 photo-contest of active faults in Japan as an activity of aiming the popularization of active fault. In addition, we carried out one day excursion to 3 of 100 views of active faults in Japan, in order to promote further understanding of active fault.

1. Result of the 2011 active fault photo-contest

-Number of applicants and photos; 20 and 61 respectively

-Types of photos; surface earthquake fault, view from sky, outcrop of active fault or tectonic geomorphology, views including trench

-Prize winner: Mr. H. Kurosawa (outstanding performance award), Mr. Y. Kohriya, Dr. H. Goto, Mr. J. Tamura, Dr. M. Watanabe

The photographs are uploaded in the homepage of the society.

2. Excursion of the active faults

We carried out one day excursion of Neodani fault just after the 120th memorial symposium of the 1891 October 28th Nobi earthquake, Miura-Hanto fault group on November 27th after the annual autumnal academic meeting and Tachikawa fault 28 January next day of its lecture. The followings are a few more details.

-Types of excursion; one day trip for mainly professionals by bus to Neodani fault and Miura-Hanto fault group, and one day on-site explanation for non-professional visitors or citizens of Tachikawa city.

-Participants of three excursion; 35, 25, and 190. ratios of member to non-member, 1:2 for the former two and 1:10 for the third.

-Positions of non-member participants: prefectural and city assembly members, disaster-prevention division’s staffs of local governments, disaster-prevention leader and volunteers, teachers, meteorological observatory staff, university students, geotechnical engineers, media reporters or TV crews.

3. The implication of photo-contest and excursions for reduction of earthquake disaster risk and its expectation

In diffusion of information of active fault and tectonic geomorphology, it will be very important for not only professionals but also non-professionals to participate such events.

As for photo-contest, many of photos of surface earthquake faults of Idosawa and Yunodake fault formed during the Fukusima Hamadori earthquake(Mjma 7.1) on 11 April 2011 were applied by non-member citizens, where not a few non-professional as well as many professionals were told to visit the areas of the surface faults. Four of seven prize winners’photos were selected from non-member non-professional. Both results seem to be a favorable tendency to lead citizens to understand non-divisible relationship between active fault and earthquake, especially under the present special circumstances after the great 2011 Tohoku earthquake. It may be suggested that both the applicants and winners will be expected to become good promoters of understanding or storyteller of active fault. Field excursions of such surface earthquake faults must be one of suitable events for citizens as well as professionals to understand the importance of active fault triggering earthquakes and reduce the risk of earthquake disaster.

Based on the results of the two excursions and on-site explanation of active faults, there were characterized by participants of peoples who were responsible for preparations for disaster-prevention measures or were presumed to be deeply involved in reduction of disaster risk. We will present some suggestive facts for reducing the risks of earthquake disaster, which are drawn from analyses of on-site questions and the questionnaire of excursion.

Keywords: active fault, active geomorphology, active fault 100, 100 views of active faults, earthquake disaster risk, Science and disaster education

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Liquefaction-Fluidization phenomena in the 2011 Tohoku Earthquake : Tokyo bay reclaimed land in Urayasu area

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Large scale Liquefaction-Fluidization phenomena was caused by the 2011 off the Pacific coast of Tohoku Earthquake in Tokyo bay reclaimed land areas. Serious liquefaction disaster is recognized as the boiled sand, ejection of sandy water, deformation ground surface, land subsidence and floating underground tanks.

The leveling between the surface bench mark and the 10m piled bench mark indicates that compaction of the shallow strata reached about 14cm. The measuring upward displacement of the piled buildings reveal the serious liquefaction subsidence area. The value of upward displacement is harmonious with liquefaction degree. The maximum displacement reached 95cm more over. Heavy Liquefaction-Fluidization zones correspond to the distribution of thick Holocene formation and/or deep trench of dredge under Artificial formation.

On reclaimed land area, most buildings were existing in the residence area, however, comfortable life are destroyed. Liquefaction-Fluidization phenomena is an exceptional event, however, it is a big problem for low lying and reclaimed land areas because of the immediate heavy damage caused.

Keywords: Liquefaction-Fluidization Phenomena, Tokyo bay reclaimed land, land subsidence, upward displacement, leveling, piled bench mark

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HSC24-P14 Room:Convention Hall Time:May 23 15:30-17:00

Development of a tunable differential absorption lidar using a mid-infrared laser to detect toxic gasses

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Shinshu University is cooperating with RIKEN to develop a differential Absorption LIDAR (DIAL) using a mid-infrared laser to detect toxic gasses with a high sensitivity. The gasses have the individual absorption spectrum in mid-infrared region. So we are developing a tunable laser with the spectral range of 6˜10 micro m. In this talk, we present the detail lidar system, especially with a data acquisition system.

Keywords: lidar, DIAL, mid-infrared laser, toxic gass

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Tropical cyclone activities and their impacts on greenhouses under Agricultural Disaster Compensation System

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In recent studies, the specific anomalous tendency of steering flow to control a tropical cyclone track and stronger influences of tropical cyclones on subtropical East Asia have been pointed out in the western North Pacific. There is a viewpoint that this phenomenon is related with the global warming, and it is concern with the possibility of continuous tendency in future. In this study, to recognize the impacts of such a climate variation on a regional agriculture, we discuss the institutional issues including the business deployment of agricultural mutual aid associations as a specific example by the damage of horticultural facility in Okinawa.

The best track data, compiled by the Regional Specialized Meteorological Center Tokyo (RSMC Best Track Data), were used to clarify the interannual variation of the frequency distribution of tropical cyclone centers near the shore area of Okinawa Prefecture in late years. The result showed that the frequency of tropical cyclone center from June to October significantly increased around the west of Okinawa Island in the 2000s, and this was observed corresponding to the increasing damage of the horticultural facility in Okinawa.

Based on the results mentioned above, the major factors of damage to horticultural facilities and the business deployment of agricultural mutual aid associations in the agricultural disaster compensation system were analyzed in Okinawa Prefecture. Then the regional difference of damage to horticultural facilities and its influences on the agricultural disaster compensation system were discussed in the case within the jurisdictional district of the agricultural mutual aid association in Kunigami County, the northern part of Okinawa.

There is the continuity and a certain regularity of occurrence in the damage to horticultural facilities over the whole country, and Okinawa Prefecture has a high damage ratio. The occurrence of damage depends on the locations and existence time in passing typhoons, the wind direction and speed, and the form of green house covered by the mutual aid system. In the case of the jurisdictional district of agricultural mutual aid association in Kunigami County, that has the especially high ratio of damage to horticultural facilities in Okinawa Prefecture, the strong wind with typhoons and green houses with low resistance to wind cause the extent of damage. There are also the regional differences both of participation rate and of the damage ratio in each municipality within the district, related to the distinctions of implementation contents in the grant-aided project of the national and local governments to the construction of horticultural facilities, and to those of dominant crops. Therefore, the damage of horticultural facilities combines the aspect of natural disaster by typhoon and that of social disaster reflected in the grant-aided projects to the facilities and to encourage producing centers. These regional differences cause the conflicts of coverage options between areas.

It can be considered that the risk management of agricultural mutual aid association will have two types of change, that is, the correspondence with individualization, and the realignment of jurisdictional districts with the reorganization of agricultural mutual aid associations.

Keywords: tropical cyclone, typhoon damage, Okinawa, grenhouse, agricultural mutual aid association