Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)


HSC25-01 Room:301A Time:May 20 14:45-15:00

# Tsunami disaster and geographical risks

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In this paper, from the multidisciplinary perspective of physical and human geographies and sociology, we discuss the concept of geographical risk based on our researchs on the interrretionships between hazard, building damage and human death in tsunami disasters, comparing between the cases in Banda Aceh that was most severely affected in the 2004 Sumatra Earthquake, and several municipal districts of Miyagi Precture in the 2011 Tohoku Earthquake. As concluding remarks, we argue the necessity of conceptually identifying natural impact and social vulinerability causing/consisting in damages of each geographical location.

Keywords: tsunami disaster, geographical risk, location, vulnerability, scale of space

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HSC25-02 Room:301A Time:May 20 15:00-15:15

# A preliminary simulation of water demand of the people walking home after Tokyo epicentral earthquake

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Because of the Great East Japan Earthquake, over 5 million people could not return home in the day of the earthquake around the Tokyo Metropolitan Area. The Tokyo Metropolitan epicentral earthquake in the future will probably cause much more people to stay in the city center and traffic jams by the people returning home by walking in many streets. To avoid serious lack of necessities such as potable water, it is important to prepare enough stockpiles. On September in 2012, the final report of the council of countermeasure for the people unable to return home showed the action guidelines, such as preparation of the temporary shelters to stay and support facilities. However, the spatial distribution and its temporal change of the water demand due to the movement of people have not been clear. To achieve effective and enough preparation, it is important to consider the flows of the victims.

In this research, we conducted a multi-agent based simulation of people walking home after the earthquake in the Tokyo Metropolitan Area. The population distribution when the earthquake occurs and their home were estimated from the person trip data by the Planning Association of Traffic in the Tokyo Metropolitan Area. We assumed the agent walks the shortest path to home through national roads and major prefectural roads. Also, the speed of agents depends on the density of population in the road. The agents consume carrying water with them at the specified rate, and they search shelters and obtain new water after they drink it up. For the geographical information for roads and shelters, digital road map by Sumitomo Denko was used.

The simulated results showed that the water demand was concentrated within the specific period. This is caused by the following reasons. The initial amount of carrying water is constrained by the standard of the bottle size. Then, almost all agents demand new water when the amount of water consumption reaches common multiple of bottle sizes if all agents consume waters at the same rate. In that period, the walking population was dense at 10-20km away from the city center while the traffic jams at the city center ceased. These results imply that enhancing the preparation in these areas or controlling time lags of the start of walking are necessary.

Keywords: people unable to return home, water stockpile, returning home by walking, Tokyo epicentral earthquake

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HSC25-03 Room:301A Time:May 20 15:15-15:30

# Utilization of Disaster Reduction Technology Database for Disaster Reduction Education

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Disaster Reduction Hyperbase (DRH) is a web-based database to disseminate appropriate disaster risk reduction (DRR) technology and knowledge. The implementation technology contents are described and opened in the web-system. The main targets of this database are the executor of disaster management (e.g., policy makers, community leaders, practitioners and motivated researchers). The DRH contents include the specific information for implementation, such as resources (cost, manpower) and application examples. In addition, this database has not only the contents based on science and technology but also process technology (Know-how for implementation and practice, capacity building and social development for knowledge ownership) and transferable indigenous knowledge (Traditional art of disaster reduction that is indigenous to specific region(s) but having potential to be applied to other regions and having time-tested reliability).

For the purpose of development of disaster management practitioner, we investigate the process of developing of practical educational materials from DRH contents. The elements of resources and application examples are needed for DRH contents because they are practical one. On the other hand, educational materials need the elements of representation and environment information, such as stakeholder, concept and media style. We developed the template that expresses information of technology-education linkage. The necessary elements for educational materials become clear by filling the template.

The attempts to develop educational materials by graduate students based on the DRH contents were conducted as the practice of disaster reduction education materials development. The process is as follows:

1) Implement the lectures on basics of disaster reduction education, examples of educational materials, DRH contents and practical information on disaster reduction technologies.

2) Access DRH website and touch the actual contents and learn the practical disaster reduction technologies.

3) Select the contents for referring to develop educational materials from DRH database, fill the template, and develop educational material(s) actually.

4) Conduct presentation on the developed educational material(s), and make improvements based on the comments.

The template and educational materials will be published and opened at the website with DRH contents.

Keywords: Disaster Reduction Hyperbase(DRH), Disaster Reduction Education, Educational Materials Development, International Development

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HSC25-04 Room:301A Time:May 20 15:30-15:45

# Awareness toward Disaster Risks of the Youth and the Government's Efforts - Zagreb, Croatia

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This is a qualitative research on the awareness of the youth in Zagreb toward disaster risks through questionnaires and semi-structured interviews. City of Zagreb, the capital of Republic of Croatia, experienced a huge flood in 1964 due to a heavy rainfall and a breakage of the river bank. Since the Government developed infrastructures after the flood, there have not been outstanding disasters in Zagreb. However, the city now concerns a probability of a hit by an earthquake in future as well as other disasters that might be occurred concurrently, for example, flood and landslide. The Governments have made efforts for awareness-raising among citizens using websites and produced various materials. They also put some weight on education for disaster risk reduction and awareness-raising. To what extent has their efforts been disseminated to citizens in Zagreb? How do the youth perceive their environment and historical disasters in their city? This research answers to these questions by showing the results of two questionnaires to the youth in Zagreb: 1) the youth has rather optimistic view on their reactions facing a disaster case, 2) nearly 70% agree with possibility of a flood in Zagreb in 10 years, but not many have preparation nor know what to do in a case of disaster emergency, and 3) their knowledge about the resources disseminated by the Government is hardly observed. We end with a discussion on use of computational tools for awareness-raising, and then conclude that a holistic approach is necessary to found a link between citizens and the Government's efforts toward disaster risk reductions in future.

Keywords: disaster risk reduction, awareness, youth, education, Croatia

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# Reactions of a local residents for preservation of remnants of a disaster

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Keywords: remnants of a disaster, spatial isolation, temporal isolation, Eeducation for disaster prevention ducation for disaster

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HSC25-06 Room:301A Time:May 20 16:15-16:30

# Classification of slope failures caused by the Mid Niigata Prefecture Earthquake by using composed satellite data

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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 discussed on an efficient classification method of slope failures by using satellite data of two periods before and after the earthquake. We prepared two ASTER data composed of band 1, 2, 3 and 4 acquired in 3 June 2004 and 10 November 2004, and polygon or polyline data indicating the slope failures such as scarps, landslide masses and the small scale slope failures triggered by the earthquake in the disaster condition maps. We prepared three 5-band data composed of the ASTER data after the earthquake and one data of band 2 to 4 before it, three 6-band data composed of ASTER data after the earthquake and two data of band 2 to 4 before it, and one 7-band data composed of ASTER data after the earthquake and all data of band 2 to 4 before it. Study area was classified into 8 items such as scarp, landslide dam, river, grass land, urban area, bare land, broad leaf, needle leaf by the supervised maximum likelihood classification based on these composed satellite data.

The averages of classification accuracy that is percentage of correct answers in the training area were 93.2% in the ASTER data after the earthquake, 95.9% in the 5-band data, 96.6% in the 6-band data and 97.2% in the 7-band data. The accuracies on scarp and landslide dam relating slope failures were better in the 5-band data composed of band 4, the 6-band data composed of band 2 and 4 and the 7-band data. Then the distribution of slope failures triggered by the earthquake was overlaid on the classified images by GIS. As a result of the overlays, it was found that the areas of classified scarp coincide well with the distribution of slope failures and the scarp is rarely misclassified at the valley floor in the images by the 5-band data composed of band 4 and the 6-band data composed of band 2 and 4. Consequently, we clarified in this study that the classification accuracy is higher using composed satellite data of two periods than using single satellite data, and increases the larger the number of composed bands in the maximum likelihood classification. In addition, if the target of the classification is slope failure, the accuracy might increase by composing band 4 data before the earthquake in preference to the satellite data after it.

Keywords: composed satellite data, maximum likelihood classification, slope failure, The Mid Niigata Prefecture Earthquake in 2004

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HSC25-07 Room:301A Time:May 20 16:30-16:45

# Distribution properties of foundation disaster caused by the Nagano-Niigata border earthquake in 2011

Takayuki Nakano[1*], Mamoru Koarai[1], OTOI, Kosei[1], Tomokazu Kobayashi[1]

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Nakano et al. (2012) reported preliminary about the relationship among follows: slope collapse, ground deformation, landform, geology, estimated location of earthquake source fault and region of interference fringes detected by InSAR on the inland earthquake with M=6.7 occurred on 12 March 2011, around Nagano-Niigata prefecture border (hereafter called "Nagano-Niigata prefecture border Earthquake"). In this presentation, we report about the distribution properties of foundation disaster caused by this earthquake after studying of interpretation of satellite imagery and thoroughly investigate in field.

Fig.1 shows overlaying foundation disaster points on geology and geological structure map or InSAR imagery. We identified the properties in addition to the characters reported by Nakano et al. (2012) as follows: 1) A large number of slope collapse occurred in steep slope area consisting of sedimentary rock in Neogene system except landslide area such as Matsunoyama region, 2) A large number of slope collapse and landslide occurred in limb of fold, even if it apart from epicenter (example for the eastside in Mt. Shomenkurayama) in dip slope area, i.e., the occurrence of slope collapse and landslide are tightly related to the geological structure. 3) A lot of ground deformations and cracks, which are almost gravity sliding of road fill, occurred near fold axis and fault line, even if it apart from epicenter.

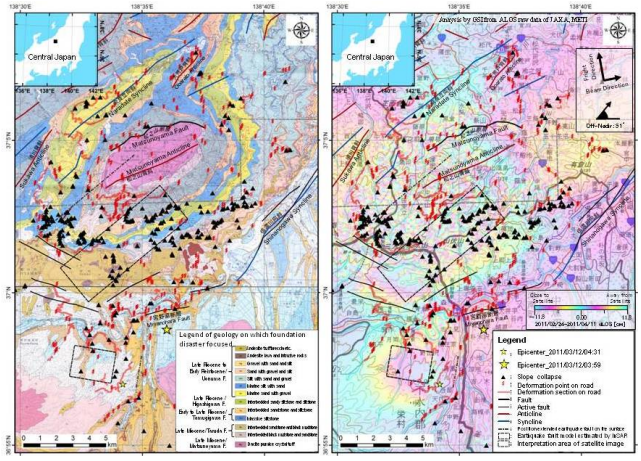
From the above, we conclude that a foundation disaster caused by a strong inland earthquake in fold zone will occur intensively in the area of hanging wall of the reverse fault with a large amount of crustal deformation, dominated by geology, geological structure such as fold and location of earthquake source fault. This tendency is reported by Koarai et al. (2012) as the example of the Mid Niigata Prefecture Earthquake in 2004, and a fold in this area might develop with the earthquake. (This works was supported by MEXT KAKENHI (22500994))

Reference

Koarai et al (2012): Relationship between slope collapse and growth of active fold. Proceedings of the 22ne Symposium on Geo- Encironments and Geo-Technics, 91-96.

Nakano et al (2012): Characteristic of foundation disaster on the Nagano-Niigata border earthquake. JpGU2012, HDS25-P14.

Keywords: Nagano-Niigata prefecture border Earthquake, slope collapse, landslide, geological structure, fold



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HSC25-08 Room:301A Time:May 20 16:45-17:00

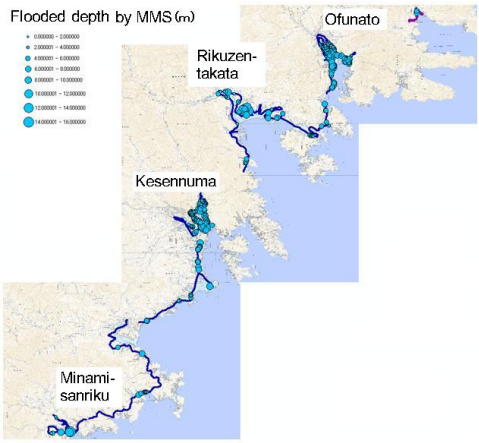
# Survey of Tsunami flooded depth by the 2011 off the Pacific coast of Tohoku Earthquake with Mobile Mapping System

Takaki Okatani[1*], Mamoru Koarai[1], Takayuki Nakano[1]

[1]GSI of Japan

Enormous amount of in-situ survey is essential for grasping tsunami flooded depth at damaged area if we don’t have effective survey tools. From this point of view, GSI collected image data with Mobile Mapping System in Sendai and Ishinomaki plains in April, 2011 and Sanriku region in May, 2011. Authors will report overall aspects of tsunami flooded depth brought by tsunami attack by the 2011 Off the Pacific Coast of Tohoku Earthquake.

Keywords: Mobile Mapping System, Tsunami Flooded Depth, The 2011 Off the Pacific Coast of Tohoku Earthquake



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HSC25-09 Room:301A Time:May 20 17:00-17:15

# Seismic Intensity prediction on Low Seismisity area

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Tono research institute of earthquake science (TRIES) operating the high density seismograms network (HDSN) at Tono area, Gifu prefecture, Japan (ex. Aoki *et al.* 1999, Okubo 2011a). Aoki and Okubo (2009) researched site amplification of seismic motions (peak-to-peak acceleration) using with approximately 50 seismic stations on E-W 30 km and N-S 20 km area. However, their amplification distribution does not indicate clear correlation with the seismic shake maps, which had estimated by the cabinet office of Japan or the NIED.

We recalculated seismic intensity of each stations by micro earthquakes, and estimated very localized amplification of seismic intensity in surface structures by using HSDN's surface seismometers and the reference borehole seismometer. Because we used statistics approach with reference borehole seismogram, our procedures can also apply to the other region whose inter-plate and/or crustal seismicity is not so high.

Thus, estimating the localized seismic intensity amplification variation will be helpful to construct urban or disaster mitigation plan on semi-mountain and/or low seismicity area. Additionally, our seismic intensity amplification variation map has correlation with gravity anomaly map and geological map. Therefore, we are considering that seismic hazard map can be refined by combining with the other geoscientific data.

Keywords: micro seismic event, borehole seismometer, Seismic Intensity distribution anormaly, community protection

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HSC25-10 Room:301A Time:May 20 17:15-17:30

# Estimation of liquefaction uisng landform classification

Mamoru Koarai[1*], Takayuki Nakano[1], Izumi Kamiya[1], Masashi Matsuoka[2]

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Koarai (2009) suggested the relationship between landform classification and earthquake damage. The suggested classification is detailed classification in lowland compared with classification of land condition map, because of the difference of composited grain size and ground water level in same landform classification. For example, we show the difference of sand dune or edge of sand dune, opened delta or closed delta, and natural levee with root or natural levee without root. In this study, we show the relationship table between landform classification and seismic intensity for liquefaction damage by earthquake (Table.1). This table consists of Wakamatsu et al. (2009)'s landform classification with DEM's analysis. In this table, valid plain is divided into gentle slope (under 1/100) or not, natural levee is divided into high (over 5m) or not, sand dune is divided into edge or not. In this presentation, we will show the results of estimation of liquefaction of past large earthquake using this table.

Table 1 Relationship table between landform classification and seismic intensity for liquefaction damage

Keywords: liguefaction, landform classification, natural levee with root, naturale levee without root

| Seismic intensity \ Landform classification | Mountain<br>Hill<br>Volcano<br>Volcanic hill<br>Reef<br>Water | Mountain foot<br>Volcanic foot<br>Rocky upland<br>Loamy upland | Fan<br>Sandy upland | Fan*1<br>Sand dune | Natural levee*2<br>Sand bar<br>Back march<br>Valley plain | Delta<br>Natural levee<br>Valley plain*1 | Sand dune*3<br>Lowlands between sand hills<br>Reclaimed land<br>Former river channel<br>River bed |
|---|---|---|---|---|---|---|---|
| 7 | 0 | 1 | 2 | 3 | 4 | 4 | 4 |
| 6strong | 0 | 0 | 1 | 2 | 3 | 4 | 4 |
| 6weak | 0 | 0 | 0 | 1 | 2 | 3 | 4 |
| 5strong | 0 | 0 | 0 | 0 | 1 | 2 | 3 |
| 5weak | 0 | 0 | 0 | 0 | 0 | 1 | 2 |

0:None dangerous
1:dangerous small
2: dangerous middle
3: dangerous large
4: dangerous maximum

*1 gentle slope (under 1/100)
*2 difference in elevation is high (over 5m)
*3 edge of the sand hill adjacent to lowlands

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# Distribution of active faults crossing Chuou-Shinkansen and consideration on the root

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Distribution of active faults crossing Chuou-Shinkansen and consideration on the root

Keywords: active fault, Chuuou Shinkansen, activity