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

HSC05-01 Room:101A Time:May 26 15:15-15:30

Japanese Tsunami Early Warning System and the Information Delivery

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Japan Meteorological Agency (JMA) has conducted computer simulation of tsunamis with around 100,000 earthquake scenarios involving various locations, magnitudes and fault mechanisms, and the results related to tsunami arrival times and heights are stored in a database. When a large earthquake hits, the operation system searches the tsunami database with reference to the source parameters of the earthquake and selects the most closely matching results. JMA then issues Tsunami Warnings/Advisories using the estimated tsunami heights in around 3 minutes.

The information is transmitted to disaster management section of each municipality through the jurisdictional prefecture as well as fire and police department, then delivered to local residents via Municipal Disaster Management Radio Communication Network with household-equipped receivers, speakers and municipal information cars. People can also get the information via the recent ”Area-Mail” services of cellphone companies as well as via mass media with TV and radio. The transmission to prefectures has been double-tracked and thus is secured by J-Alert system operated by the Fire and Disaster Management Agency (FDMA) of the Ministry of Internal Affairs and Communications.

JMA also operates the Northwest Pacific Tsunami Advisory Center (NWPTAC), which covers the northwestern Pacific and some of its southwestern part, and on an interim basis, the South China Sea region. NWPTAC monitors earthquakes in the region, and when a large tsunamigenic earthquake occurs, NWPTAC promptly issues tsunami advisories to countries in the region via the Global Telecommunication System (GTS)∗, facsimile and email. NWPTAC has been in operation under the framework of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS) and contributes to tsunami disaster mitigation in the region in cooperation with the USA’s Pacific Tsunami Warning Center (PTWC) which is responsible for monitoring earthquakes and tsunamis and providing information for the whole Pacific area.

∗Global Telecommunication System (GTS) is the communications and data management component implemented and operated by National Meteorological Services of WMO Members and International Organizations.

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HSC05-02 Room:101A Time:May 26 15:30-15:45

Application of the real time data and simulation data base for tsunami disaster mitigation and education

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Based on the lesson learnt from East Japan Earthquake 2011, we are developing early tsunami detection system using the real time data and advanced simulations. DONET systems deploying around the Nankai trough, will be applied to Tsunami early detection for the Nankai trough large earthquakes and tsunamis. And S-Net system is under construction around off Tohoku seismogenic zone for early detection of earthquakes and tsunamis. Especially, real time data from ocean floor networks are very important and indispensable for early tsunami detection. However, not only real time data system, but also advanced simulation researches are important too. For instance, the integration of real time data of tsunamis and advanced tsunami propagation and inundation simulation will be more powerful and practical information for evacuations and rescues. If we can detect tsunamis using ocean floor networks, we can estimate tsunami propagation and inundation based on the advanced tsunami data base. Furthermore, education and outreach using advanced and visualized tsunami simulation including propagations, inundations and evacuations are more important for saving lives from tsunamis. For the recovery and revival of damaged areas, evacuated people are the most important, indispensable and irreplaceable. In our presentation, we will introduce the early tsunami detection system and advanced simulation for evacuations from tsunamis and disaster mitigation.

Keywords: real-time, early detection of earthquake and tsunami, simulation, disaster mitigation, ocean floor network

Japan Geoscience Union Meeting 2015
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HSC05-03 Room:101A Time:May 26 15:45-16:00

How can we evaluate recovery from disaster?

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It takes four year from the 2011 Great East Japan Earthquake (GEJE). Construction of huge sea walls and resettlement in higher ground continues, though many people still lives in the temporary settlements such as manufacture housings or rental housings. It is important to monitor and evaluate the status of recovery for recovery management. However it is very difficult to define the status of completion of recovery. In the impacted area, it is expected that the population will not recover as it was even after all the recovery projects has been completed. And there is no consensus about the definition about the status about completion of recovery even among disaster researchers.This paper discuss about the proper way of recovery monitoring from the analysis of challenges about recovery monitoring for the GEJE.

Many local governments do output evaluation, which is the evaluation about completion or status of projects such as levee construction or public facilities reconstruction, though the outcome evaluation is necessary. The number of outcome evaluation is very limited, which is the evaluation about how the set goal of recovery is accomplished such as recovery of livelihood, or business resumption. Iwate prefecture does outcome evaluation based on questionnaire survey on business resumption and objectives on recovery plan, but the other local governments do only output evaluation. In addition to those policy based monitoring by local governments, researchers propose new scheme of recovery monitoring and evaluation, such new technique to monitor or evaluate recovery using CCD camera. Based on analysis on present activities of local government, and proposed new techniques from researchers about recovery monitoring and evaluation, this paper propose possible scheme for the long term recovery monitoring and evaluation.

Keywords: Great East Japan Earthquake, Recovery

Japan Geoscience Union Meeting 2015
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HSC05-04 Room:101A Time:May 26 16:15-16:30

The Study on Risk Awareness and Tsunami Evacuation Behavior: The Case of the Great East Japan Earthquake

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Evacuation behavior depends on risk awareness, but what affects awareness? The study focuses on the evacuation behavior of people living in the Hirota-town, Rikuzentakata City, Iwate Prefecture, Japan, which affected by the 2011.3.11 Great East Japan Earthquake. Hirota-town is a small town which repeatedly affected by tsunamis: 1896 Meiji Sanriku Tsunami, 1933 Showa Sanriku Tsunami and 1960 Chile Earthquake Tsunami. People living in the Hirota-town had knowledge on tsunamis, knew well about historical tsunamis which attacked their town, had hazard maps, heard tsunami evacuation alerts, but those were not sufficient to raise their awareness to let them to evacuate. Then, what should we do to raise their risk awareness? The study clarifies elements affected risk awareness based on questionnaires and intervews, and discusses the effecitve approaches for tsunami evaucation.

Keywords: tsunami, The Great East Japan Earthquake, risk awareness, evacuation

Japan Geoscience Union Meeting 2015
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HSC05-05 Room:101A Time:May 26 16:30-16:45

Seasonal Flood in wetland with socioeconomic view in Phu My, Kien Giang, Vietnam ? a case study

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Phu My is locate in the Ha Tien Plain, a shallow basin, in the southwest corner of the Mekong Delta. Floodwaters create a large area of grasslands where the Phu My Lepironia Project has been implemented. The project started in 2004 in response to several failed attempts to change the plain for rice paddy fields and shrimp aquaculture; and a partnership between researchers, experts, and local village community has established so that the wetland resources can be used and managed for the purposes of environment conservation and income generation for local people. The project covers the area size 2,890 hectare of wetland with Lepironia grasses (*Lepironia articulata*). Local community people participate to this project to collect and dry the grass stems to produce high-quality handicrafts for sale. It is reported that their average income has increased as much as 500%. Yet, their main income source is still rice cultivation, which is affected by acidic water and seasonal floods. Although flooding prevention system and three dykes to prevent saline water intrusion have been built, it is not certain how much local people understand and respond to such information as they are Khmer and not full-literate in Vietnamese language. This study discusses a balance and relation between wetland conservation, extreme climatic conditions such as floods, and the local traditional cultural values for future sustainability and resilience.

Keywords: wetland, flood, Lepironia, sustainable rural development, Vietnam

Japan Geoscience Union Meeting 2015
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HSC05-06 Room:101A Time:May 26 16:45-17:00

Constraints on scenarios of great earthquakes along the Nankai trough based on historical records of tsunami heights

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For a verification of many possible scenarios of great earthquakes along the Nankai trough, we examine the effects of the expansions of source areas on resultant tsunami heights at the Pacific coasts and Seto Inland Sea (Hyodo et al., 2014). For a maximum class scenario (M ? 9), predicted tsunami heights exceed real damage records of 1707 Hoei tsunami at the Tosa bay and Pacific coastlines near the Kii channel owing to large slips on the up-dip extension of fault segments off Shikoku Island. Such discrepancy indicates that large slips nearby the trough axis was not remarkable even in the 1707 Hoei earthquake which is considered to be one of the largest historical Nankai Trough earthquakes. While, since the proposed M9-class scenario also includes large slips with several meters at the down-dip side up to about 35km depth, coseismic crustal subsidence reaches to the further landward than usual Nankai Trough earthquakes. Hence, the maximum subsidence at the Seto Inland Sea region becomes one or two meters. Such crustal subsidence makes Inland Sea tsunamis effectively higher, and then, simulated tsunami heights corrected by crustal subsidence is consistent well with some of real damage records in the Seto Inland Sea region. However, the tsunami height cannot be explained at some places where the tsunami height reaches to three meters. We consider such higher tsunami could be explained if we include dispersion effect in the tsunami simulation. The calculation of dispersive tsunami wave for longer time period of more than several hours is challenging. We are trying it and will discuss the results in the presentation.

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HSC05-07 Room:101A Time:May 26 17:00-17:15

Development of agent based evacuation simulators coupled with STOC-CADMAS

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In this paper, development of agent based evacuation simulators are described. The agent based model was coupled with STOC-CADMAS (Arikawa and Tomita, 2014), which connects tsunami propagation simulator and 3-D numerical simulator. The STOC-CADMAS system calculates detailed inundation processes occurring in a town from a tsunami source location.

By using this system, the effect of the vertical evacuation and seawall were verified. The three different parameters, which were the evacuation place, the existence of seawall and the beginning time to evacuate, were changed. The tsunami condition is given as the elevation velocity. In this paper, this velocity is assuming that 1.0m/min.

The results are the followings;

1) The result of comparison of existence of seawall indicated that the effect of the seawall depended on the beginning time to evacuate. If the people started to run away after tsunami overflow the seawall, then the mortality with seawall was larger than that without seawall.

2) The vertical evacuation is better than the horizontal evacuation in this paper. But this depends on the tsunami condition, of course. So, the numerical simulations with various conditions should be needed.

Keywords: Tsunami simulation, 3 dimentional, Multi Agent, Coupling simulation

Japan Geoscience Union Meeting 2015
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HSC05-08 Room:101A Time:May 26 17:15-17:30

Disaster Information and Awareness: A Study on Typhoon and Storm Surge in The Philippines

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Introduction

"Use knowledge, innovation and education to build a culture of safety and resilience at all levels" is one of the priority actions addressed by Hyogo Framework for action 2005-2015. In many developing countries, there are a large number of young age who have less experience in natural hazards. Philippines is located in the typhoon belt of the Pacific, which frequently encounters strong precipitation (Mateo & Oki, 2011). During Nov. 6-8, 2013, the central region (Visayas) was attacked by a heavy storm and storm surges caused by Super Typhoon Haiyan. The typhoon primarily impacted Leyte and Samar (Daniell et al., 2013).

Research Design

In Dec. 2013 (less than 2 months after the impact), we did surveys in some Barangays of Tacloban City in Leyte to observe the perspective of people in terms of disaster information and awareness (Leelawat et al., 2014). Also, in Aug. 2014, we conducted surveys via the IRIDeS disaster education program (similar to Yasuda et al., 2014) with 218 elementary school students (9-15 years old) at 4 schools located in Palo, Tacloban, and Tanauan. These schools were in Leyte, an island in the Visayas group. Leyte is more than 616 km far from Manila.

Disaster Information & Warning

Based on Leelawat et al. (2014), we found that the most preferred method for officials to announce disaster warning was TV for any period of time (i.e., 1 week before, a few days before, and just before impact). Nevertheless, the score of TV decreased as the typhoon approached while the preference of radio increased as its impact approached. While most samples received warning message, 47% did not evacuate to shelters. The reasons for not evacuating were Safety of all family members must be ensured first, [Believing that it was] More dangerous to go outside, Uncertainty of expected typhoon level - might subside, etc., respectively.

Disaster Understanding & Awareness

First, we found that students in different locations have different level of awareness. The students in a school near the sea considered natural disasters are dreadful higher than the schools far from the sea, probably because their location is along the coastal area. Second, students whose school is on the mountain where the landslide occurred at that time have higher awareness of the immediate future disasters than students whose school is on the plain area. Third, students whose school is on the mountain considered the natural disasters are dreadful higher than students of plain-area school. Better understanding of disaster information and awareness would be helpful for supporting improvement of disaster management preparation.

Acknowledgements

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Keywords: awareness, education, information, storm surge, typhoon

Japan Geoscience Union Meeting 2015
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HSC05-09 Room:101A Time:May 26 17:30-17:45

Tsunami Early Warning-Mexico and Spain-

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The Caribbean as well as the Mediterranean region are earthquake and tsunami-prone areas therefore many coastal countries have developed Early Warning and Awareness Policies and Protocols to predict, protect and ameliorate the impacts from these naturals hazards.

Mexico, due to its geographical location and holding more than 9,000 kilometers of coastline it faces the Gulf of Mexico, the Caribbean and the Pacific Ocean. Spain, with almost 5000 kilometers of coastline, is a country located in Western Europe facing the Mediterranean Sea, the Atlantic Ocean and the Gulf of Vizcaya (Cantabrian Sea). The latter has a higher population density and coastal development than the former.

The Pacific Cocos-North American subducting plate in the south west of Mexico is active earthquakes prone zone hence a potential tsunami prone area, while the presence of the Caribbean Plate could also expose its Caribbean Coastline (2). In the case of Spain, although not common, tectonic faults in the Mediterranean Sea and Atlantic Ocean could also be the source of earthquakes and tsunamis like the one, which occurred in 1775.

Despite this situation both countries have just recently started to develop early warning and mitigating measures and policies, which may include remote and rural areas although the concept of remoteness may be different between both countries due to their coastline length and degree of development, hence the access to information and awareness programs as well as protection and disaster amelioration in these areas may largely differ. General differences and similarities are discussed.

Keywords: tsunami, Mexico, Spain, Early Warning, Protocol, Policy

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Sophistication of coastal tsunami height real-time prediction system by sparse modeling

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From the correlation of tsunami heights and DONET observation data in the Nankai Trough from coastal to offshore, relationship between the average waveform of tsunami height and DONET observation data of the coastal area is revealed (Baba et al. 2013). However, when compare calculated from the tomographic model and actual tsunami height, evaluation becomes excessive case exists.

Therefore, we propose a new way from the previous method to predict the tsunami heights of each point. The previous approach is to integrate data from multiple observation points in one by taking average of the absolute amplitude data, and to predict the tsunami heights of each point at coast line. The new method, in view of individual relationships between tsunami heights prediction point and the observation point. And weighted data of all stations are superimposed. Thereby, predict a tsunami height in accordance to the characteristics of each point.

To be specific, expressed by sparse modeling the relationship of the observed data and the coastal tsunami heights. Then, it is used to predict the tsunami heights as a weighting of the observation data at each heights tsunami prediction point. By performing individually optimization of the weight for each prediction point, the prediction accuracy can be ensured in tsunami scenarios that are used to validate the system. However, for tsunami outside the scenarios there is a possibility that the prediction accuracy is reduced. Therefore, so as not to excessively adapt to the scenarios that are used in the verification, not only the prediction point of interest, also to ensure a proper prediction accuracy in the neighborhood of the predicted point. As a result, it can be predicted in consideration of continuity of the location on the map.

Keywords: sparse modeling, real-time prediction, tsunami