

HSC024-01

Room:201A

Time:May 24 08:45-09:00

Geomorphological land classification map and seasonal flood of the Stung Sen River floodplain

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The Stung Sen River forms a 7-km-wide floodplain in its lower reach flows down central Cambodia. Lower reach of the river has one of the large populations in Cambodia, because provincial capital of Kampong Thom city and many villages are located. At Kampong Thom city, water level of the river changes 7 m annually because monsoon and dry seasons. This study tries to make land classification map by aerial photograph interpretation and geomorphological field survey, and characterize the floodplain in monsoon season and location of settlements.

Lower reach of the river is mainly composed of uplands and floodplain which includes back marsh, natural levee, meander scroll and abandoned channel. Back marsh is subdivided into the highest back marsh I, back marsh II and the lowest back marsh III. Back marsh III is widely distributed as it goes to downstream. In monsoon season, back marsh I is hardly inundated though back marsh II is partly inundated and back marsh III is submerged at the maximum. The channel of lower reach has rectangular cross section of about 6-7 m depth and meander scrolls and abandoned channels are well developed along the channel, on the other hand natural levees are poorly formed. That means floodplain especially along the channel becomes remarkably wet. Although the channel shifts frequently occur, meander belt which is composed of the channel, meander scrolls and abandoned channels rarely shifts. In floodplain, back marsh deposits of silt to clay accumulate with channel deposits of gravel to medium sand in the rate of 0.1-0.6 mm/yr. The channel deposits become thicker as it approaches to the channel, and also the particle size becomes larger. Therefore, inundation and lateral erosion risks in monsoon season are higher as it approaches to the channel, and also inundation risk becomes higher toward the lower end of the river. Although present settlements in the lower reach are continuously located along roads regardless of flooding risk such as inundation and lateral erosion risks, the most villages in 1950s were located on uplands or back marsh I which have lower flooding risk. In the region like lower reach of the Stung Sen River which has annual water level change, we probably need the vision that is to adopt the flooding situation rather than control.

Keywords: aerial photograph interpretation, land classification map, the Stung Sen River, monsoon, Cambodia

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HSC024-02

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Impact of rainfall and flood on rice cultivation in Bangladesh

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The long-term variation in rice production in Bangladesh was examined for the period from 1947 to 2008, and the impact of rainfall and recent severe floods was discussed. Although rice production is highly dependent on summer monsoon rainfall in India and other Asian monsoon countries, the relationship is poorly identified in Bangladesh. On the other hand, a clear relationship has been observed between severe floods and rice production. In general, there are three varieties of rice crop in Bangladesh, namely Aus in the early rainy season, Aman in the late rainy season, and Boro in the dry season. The cultivated area of Aman was almost constant throughout the study period, with some sharp drops in severe flood years. That of Aus slightly increased before the mid-1970s, and then began to decrease subsequently, decreasing more rapidly after the late 1980s until 2006. The yield of Aus tended to rise sharply in years following severe floods. The cultivation area of Boro gradually increased after the mid-1960s, in particular after years of severe flooding. The yields of all varieties, especially Boro, consistently increased starting in the mid-1960s, due to the introduction of high-yielding varieties. Because yields also tended to increase after severe flooding, the total rice production rose sharply after years of severe floods. After the severe flood of 1998, the production of Boro exceeded that of Aman for the first time, and the difference in production between these two varieties has since increased. As such, rice production in Bangladesh has almost consistently increased in time, even with severe flood damage during rainy season.

Keywords: rice cultivation, flood, rainfall, irrigation

HSC024-03

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Practical use of DEM model by the comparison between figure of inundation disaster

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A tsunami or the storm surge are models of the inundation disaster with the rises of the surface of the sea. In the degree of the damage with this, the meters above the sea level from the surface of the sea makes a decisive factor. Therefore, I can make use for the prediction of the future damage by analyzing detailed meters above the sea level data. On the other hand, as for the flooding and the inland waters disaster of the river by the concentrated downpour, only a pitch difference does not necessarily control the degree of the damage. Some area encounter the disaster is various factors are connected with each other complicatedly, for example, the scale of the old back swamp, total precipitation from the beginning, direction of tilt and an angle of the ground, having soil and vegetation or not, an artificial structure or so. This report, the typhoon disaster that hit in succession to win on a large scale of 2004 to an example. An study area is the various places in Kagawa facing Setonaikai inland Sea. There is partly the area that underwent high tide and both river floods. The hazard map is made every management area by the kind of the disaster. Therefore I am totally worthless when plural disasters occur frequently at the same time. I put a map and the real one which I generated from a DEM model on top of one another on a GIS. DEM can survey a wide area quickly, and the remarkable local update of the artificial change is comparatively easy again. And I want to make use of a DEM model by a future disaster prediction. Furthermore, higher precision is practical and wants to make plain hazard map.

Keywords: DEM, flood, storm surge, GIS, micro-topography

HSC024-04

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Estimation of slope failures area induced by the Mid Niigata Prefecture Earthquake by analysis on geomorphic quantities

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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 investigate the common geomorphic quantity on the landslides induced by the earthquake at the study area, and discuss the mean of it.

For analysis on geomorphic quantity, polygon data of existing landslides before the earthquake in the disaster condition maps and elevation data of 10m-mesh digital elevation model in the fundamental geospatial data were used. The large scale slope failures indexed by polygon data in the disaster condition maps are considered landslides caused by the earthquake. We analyzed the coordinates of the centroid, maximum elevation, average elevation and minimum elevation on scarps and landslide masses of the existing landslides before the earthquake by GIS. From the each elevation data associated with the centroid, we calculated the surface models based on the scarps and the landslide masses by using the kriging method, and made elevation difference maps between the two surface models. In addition, we made an elevation map, a slope gradient map, a relief map based on the elevation difference between summit level and streamline surface at the study area. We discussed the characteristics of geomorphic quantity of the area induced landslides by the earthquake considering their maps overlaid the large scale slope failures and the mean of the GIS analysis based on the landform units of the landslides.

The large scale slope failures are located at the various elevations. It is difficult for us to clarify the relationships between the slope failures and slope gradient, and the former and the relief because of the area scales for analysis. It is clarified that the distribution of the large scale slope failures overlaps well with the area indexed the large difference value between the two elevation differences, the first is the elevation difference between the two surfaces based on the maximum elevation of the scarp and minimum elevation of the landslide mass, and the second is the elevation difference between the two surfaces based on the average elevation of the scarp and average elevation of the landslide mass. In this study, following seven interpretations are applied to the GIS analysis based on the landform units of the landslides. 1) The average elevation of the scarp is correlative with the elevation of the landform unit uplifted by crustal movement. 2) The average elevation of the landslide mass is correlative with the elevation of the present landform unit. 3) The difference elevation between 1) the scarp and 2) the land slide mass is correlative with the amount of loss on landslide vulnerability to return to the surface before the crustal movement. 4) The maximum elevation of the scarp is correlative with the elevation of initial form. 5) The minimum elevation of the landslide mass is correlative with the elevation of the base level of erosion. 6) The difference elevation between 4) the scarp and 5) the land slide mass is correlative with the amount of stock on erosion probability to deepen to the base level of erosion. 7) The difference value between 3) the amount of loss on landslide vulnerability and 6) the amount of stock on erosion probability is correlative with the instability of present landform for earthquake motion.

Consequently, we think that the landform analysis from the view point of geography can estimate the landslide area caused by the earthquake more accurately than it from the view point of topography.

Keywords: Landslide, Slope failure, DEM, The Mid Niigata Prefecture Earthquake in 2004

HSC024-05

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Formation of the debris-flow fan along the foot of the Yoro fault scarp - toward the prevention of debris flow disasters

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Slope failures and debris flow events are triggered by meteorological forces such as heavy rains, or earthquake shaking. Recent earthquakes of 2004 Mid Niigata Prefecture Eq., 2007 Noto Hanto Eq., and 2008 Iwate-Miyagi Midland Eq. produced numerous landslides and debris flows to damage the adjacent areas. Geomorphic conditions such as slope angle and remained landslide masses have an important rule to control the occurrence along with seismic intensity (Moriya and Sugai, 2010 JpGU Meeting). In this paper, we demonstrate the evolutionary processes of the debris flow fans developed along the foot of the Yoro fault scarp and discuss the potential of debris flow disaster triggered by the faulting activity.

Yoro fault, one of the most active reverse faults in Japan, is considered to produce two large historical earthquakes of 745 Tenpyo Eq. and 1586 Tensho Eq. along with the antepenultimate Eq. of about 2 ka. The Yoro fault has a potential to produce a huge earthquake of up to Mw 8 with the estimated recurrence interval of around a thousand years. The fault has made large relief between the Yoro mountain and Nobi plain with a constant vertical slip rate of over 1mm/y during the last 1 Ma (Sugai and Sugaiyama, 1999). The Yoro fault scarp has been dissected by 31 tributaries with an area of over 0.2 km² and the tributaries have made debris-flow fans at their mouths. Relation between fan area (A_f) and drainage-basin area (A_d) can be expressed as a power function: $A_f = 0.43 A_d \exp 0.85$ ($r=0.81$). Relatively high exponent value indicates that the denudation rate is independent of the drainage size, resulting parallel retreat of the fault scarp.

At two artificial outcrops cutting the fan surfaces, AMS-14C dates of series of buried soil layers sandwiched between debris-flow units indicate that the latest three debris flow units can be correlated with the latest three large earthquakes above. Each debris flow unit deposits laterally continuously and has a thickness of around several ten cm. These indicate that each alluvial fan has grown intermittently through overflow deposition of debris produced by slope failure triggered by Yoro fault activity. Large earthquakes trigger lots of slope failures on the fault scarp and produce debris abundant enough to overspill the incised tributary channel which has been formed in inter seismic periods and under the erosion control against meteorological events. The fan surfaces, thus, have great risks with debris flow attack triggered by earthquakes even if the ground shaking is not harder than the alluvial lowland.

Keywords: Yoro fault, earthquake shaking, debris flow, alluvial fan, natural disaster, Nobi plain

HSC024-06

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The subsequent development of 'Fill Vulnerability Scoring System'

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In the same session last year, the outline and effectiveness of "Fill Vulnerability Scoring System" were reported (Nakano and Koarai, 2010). Among them, it was left as a subject considering study of optimal parameter to rate non-deformation fills as the safety. In this presentation, we report on study result about the subject and the circumstances surrounding the system later.

In "Fill Vulnerability Scoring System", three methods, the scoring method written on the "A manual of guideline of investigation of movement calculation in large residential fill area" by MLIT published in 2008, statistical lateral resistance model and statistical three-dimensional stability analysis model were constructed in this study, can assess the vulnerability of fills. Among these, the optimum parameters used statistical lateral resistance model had been determined as the best examples can be explained statistically from fill form and earthquake damage data in Sendai, Hanshin, Nagaoka, Kashiwazaki region. But, these optimum parameters are different for the purpose and term of the user. Therefore, we prepared for the following three parameters; (1) The parameters can extract the most accurately the deformable fills by earthquake (percentage of correct answers about deformed fills in past cases is 100 %), (2) The parameters can tell deformable fills from non-deformable fills most efficiently, (3) The parameters can extract the deformable fills precisely (percentage of correct answers about deformed fills in past cases is more than 90 %) and can extract the non-deformable fills precisely as much as possible.

The manual of guideline is considered to be revised presently. It is expected that this scoring system appear as a simple fill vulnerability scoring method in the manual of guideline.

Keywords: fill vulnerability scoring system, large residential fill area, guideline scoring method, statistical lateral resistance model, statistical three-dimensional stability analysis model

HSC024-07

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Guidline of field investigation of large-scale fill-slope instability triggered by earthquake in the future.

Hidemasa Ohta^{1*}

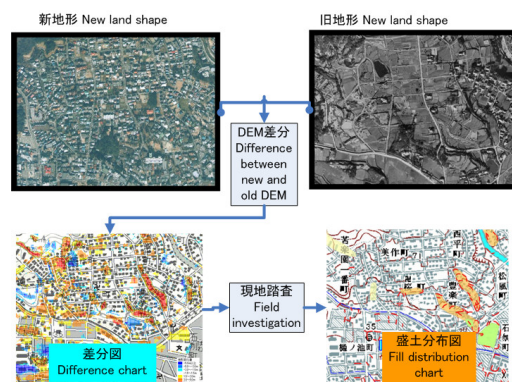
¹Ohta Geo-research Co.,Ltd

Recently,it is well known that the valley burial fill slides along a slope by earthquake.But no guideline of field investigation of large-scale fill-slope exists.I will show one idea of the field reconnaissance method of the fill-slope.

When earthquake occurs,the behavior is extremely different from the fill part and the cutting ground part (non-fill part).Therefore,it is a main purpose to confirm, to correct the fill distribution presumed by the difference of old and new DEM.

The items that should be confirmed by the site investigation are as follows.

- (1)Whether the fill exists really or not?
- (2)Whether the cut and fill boundary and the range of the fill are appropriate or not?
- (3)Whether the direction of dip in the natural ground is correct or not?
- (4)Whether serious damages have been generated or not?
- (5)Whether information for the sliding at the earthquake of the fill can be confirmed or not?
- (6)Additionally, information such as maintenance objects and evacuation areas



Keywords: valley burial fill, earthquake, field investigation, DEM, fill-slope slide, Guideline

HSC024-08

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Sector-collapse volume of Bandai volcano in 1888, Japan, inferred from size-distance distribution pattern of hummocks

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This study aims to investigate the sector-collapse volume of Bandai volcano at the 1888 event, the best-known example in Japan. There are some conflicting views concerning the volumetric magnitude at the collapse. In this research, the author focuses on the size-distance distribution pattern of hummocks in order to definitize the collapse volume. The widespread preservation of hummocks along the course of rockslide-debris avalanches is useful for understanding the physical characteristics of landslide. Our recent researches (Yoshida, 2010; Yoshida et al., 2010) have shown the empirical relationships between size-distance distribution pattern of hummocks and the collapse volume of the source volcanoes. Hummock size generally decreases as an exponential function of distance for volcanic rockslide-debris avalanches. It has been found out that the intercept coefficient, which corresponds to the initial average size of hummocks (blocks) at the origin of the landslide, shows a strong correlation with the volume of the collapsed mass, indicating that the initial size of blocks at the source may be determined by the volume of the collapsed mass. For the 1888 debris avalanche hummock, too, hummock size decreases as an exponential function of distance. According to the empirical relationship shown by the previous results and the intercept coefficient value for the 1888 avalanche hummocks, the landslide volume should be expected as ca. 0.5 km³. Previously (or traditionally), the estimated value (ca. 1.2 km³) by Sekiya and Kikuchi (1889) has been most frequently referred to as the catastrophic collapse volume of Bandai volcano in 1888. However, the above result supports the estimation (ca. 0.49 km³) by Yonechi et al. (1988) and Yonechi and Chiba (1989), emphasizing the significance to consider that the volumetric magnitude of the sector collapse stays within the order of 0.1 km³.

Keywords: collapse volume, hummocks, size-distance relationship, 1888 debris avalanche, Bandai volcano, Japan

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HSC024-09

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Tephra GIS using Cyber Japan Web System

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The authors introduce the way to open the tephra GIS database using Web-GIS. Outcrop information and tephra distribution information on the 1/25,000 topographical maps are distributed by Cyber Japan Web System. The authors developed the trial Web GIS system about Bandai Volcano and Akita-Komagatake Volcano. At first, the location information of outcrops is described on topographical maps. When the users click the location of outcrops, various data about outcrops is described such as photo of outcrop, column section, sketch of the outcrop, mineral composition, petrologic characteristics, index of each minerals, chemical composition and so on.

Input information about Bandai volcano is based on Suzuki et al. (1995), Koarai et al. (1995), Koarai and Soda (1995) and so on such as the tephra originated Bandai Volcano (HP1 and HP2) and wide spread tephra (Nm-KN, Nm-SB, Aso4, On-NG and so on). Input information about Akita-Komagatake Volcano is the isopack maps of each tephra and outcrop information based on Wachi et al. (1977) and chemical composition of each tephra based on Fujinawa et al. (2004). In addition, the assumption of volcanic hazard areas on hazard map, polygon data of landform classification, the results of automated landform classification using 50m DEM and 10m DEM are input in this database. This research was supported by Grants in Aid for Scientific Research (19650259).

Keywords: Tephra GIS, Cyber Japan Web System, outcrop information, Bandai Volcano, Akita-Komagatake Volcano

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HSC024-10

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Effective Mitigation System by Local Government Using Event Trees and Risk Assessments

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Since the announcement of the Eruption Alert Level System by the Japan Meteorological Agency in 2007, local governments near active volcanoes are required to install Disaster Prevention Plans and hazard maps. Although earlier hazard maps published were mostly intended for specialists, recent maps have more resident-friendly (Nakamura et al., 2008). However these hazard maps and mitigation systems were basically designed by deterministic algorithms and intended to countermeasure specified volcanic activities in correspondence to the previous Volcanic Alert System, JMA.

By using the GIS database and probabilistic logic methods, effective mitigation systems and hazard maps capable of responding to Eruption Alert Levels changes are investigated by Disaster Mitigation Committees at Nasu volcanic area. (1) To build up the GIS database of social and natural environments and disaster prevention infrastructures. (2) To quantitatively assess factors of hazard, vulnerability and value of losses by using risk analyses. (3) To construct hazard event-trees and eruption scenarios by referring to disaster records and volcanic history. (4) To resolve appropriate disaster mitigation plans for the target volcanic area.

Disaster Mitigation Committees discuss and decide on the present Disaster Prevention Plans and hazard maps and local governments published them to residents.

Keywords: volcanic hazards, risk assessment, volcanic eruption

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HSC024-11

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Education for Disaster Prevention at Lower Secondary School : Report on a Practice in Home Economics

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This is a report on the practice of disaster prevention education in Home Economics at a lower secondary school in Yamagata City where severe natural disasters have not affected since 1967. According to the courses of study (national curriculum) for lower secondary schools in Japan, safe indoor conditions to the risks such as natural hazards should be taught in Home Economics. The classes of safe indoor conditions to natural hazards spent two school hours out of seven hours allowed on the education unit of housing at seventh-grade at Yamagata Forth Junior High school. In the first hour of the two, the author from Yamagata University taught the hazard of the earthquake that would occur on the active fault at the western edge of Yamagata Basin, and the seismic intensity in the school district and the damage due to the earthquake estimated by Yamagata Prefectural Government. The students were then instructed to consider the risk in the bedroom of their own in case of strong earthquake shaking. They acquired the risk prevention methods such as removal of the bed from the place of overturning furniture, fixing furniture to the wall, and so on. In the second hour, the last hour of the unit, the students discussed the indoor safety and risk about the model room described in the textbook. The second class was instructed by the regular teachers (Ms. Ito and Ms. Suzuki) at the high school.

Questionnaires to the students were implemented before and after the first class and on six month after the classes. The results of the surveys show the positive effects of the classes to the students and their home. The awareness of the students to earthquake disaster were raised and the preparation for mitigation of the disaster at home were enhanced.

Keywords: earthquake disaster, education for disaster prevention, home economics, education of housing

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HSC024-12

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Child disaster prevention education utilized risk communication methods-In case of Tsukuba City-

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¹National Research Institute for Earth Sc

We designed Making a Jigsaw Map and Making a Picture Diary utilized risk communication methods for Child disaster prevention education, and verified the effect for parent and child with the teacher of the elementary school. As a result, parent and child could study disaster prevention in a game form and were able to think about it being possible at the time of a disaster from the glance of the child.

Keywords: map, diary, child, disaster, education

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HSC024-13

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Risk communication for making disaster response training plan in mountainous area - in case of Mushikame, Iketani and Na

Yohei Sunaga^{1*}, Toshinari Nagasaka¹, Taiyoung Yi¹, Tsubokawa Hiroaki¹, Yuichiro Usuda¹, Hitoshi Taguchi¹, Okada Shinya¹

¹NIED

To mitigate the damage caused by natural disasters, risk governance should be improved. We propose risk communication method "making training plan and doing training" for improving governance. This method is arranging the problem that can happen at the time of a disaster, making countermeasure, making training plan, doing training, and countermeasure effectiveness. This paper introduces the demonstration experiments in Mushikame, Iketani and Naranoki settlement in Yamakoshi area of Nagaoka City and reports the effects of the risk governance transformations in the demonstration area.

Keywords: risk communication, risk governance, planning for disaster response training, Yamakoshi Area in Nagaoka City

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HSC024-14

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Awareness Raising in People for Potential Flood Risk - Zagreb, Croatia

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¹DPRI - Kyoto University, ²University of Zagreb

The City of Zagreb, the capital of Croatia facing to Adriatic Sea, has been grown as the centre of commerce, industry, and agriculture. The population of the city has increased as development of its economy, culture, and politics and the city still keeps expanding in size. Especially, the urban area has been developed in the plain along the Sava River since 1960s. However, there was a huge flood occurred in this area in 1964 due to the water level increase in the Sava River after heavy rain. This flood brought extensive damages in the city area and people living there. Having learned from this bitter experience, a drainage canal (Sava-Odra Canal) was constructed in the Sava River; and there has been no outstanding flood occurred in the city centre area afterwards. On the other hand, people living in the area where the water is discharged from the drainage canal have been suffering from floods due to the water coming from the canal. In fact, they experiences a severe flood in September 2010. With these background, it seems that the level of people's awareness and preparedness toward floods are differet in the city cerntre area and in the suburb area. This research will examine the extent to which IT tool such as 3D images can make a contribution in order to raise awareness, consciousness and preparedness in people towards unforeseen flood risk through social scientific approaches.

Keywords: flood, Croatia, awareness raising, IT tool

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HSC024-15

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Attitudes of Residents against Tunami Disaster - case of the Okitsu Region, Shimanto City, Kochi Prefectuer

Tatsuto Aoki^{1*}, Members of the Physical Environment Seminar¹

¹SRDS, Kanazawa Univ.

Keywords: disaster mitigation for Tsunami, attitudes of residents, cognition of disaster risk, actions for disaster mitigation