

Spread topography in Japan

NAGATA, Hidehisa^{1*}

¹Fu Sui Do co. Ltd.

Spread which is defined that subsidence, rotation and disintegration of overlying hard strata due to flow of underlying soft ones, is a one of types of landslides. In Japan, a few cases including ones induced by earthquake were reported. Possible topography due to the spread in Japan is introduced preliminarily. The followings may be the cases: a) southern part of Okinawa Island, and eastern islands of the Katsuren Peninsula, b) Kuwana city, Mie Prefecture, c) Mino highland, Gifu Prefecture, d) Ichihasama River basin, southern foot of Kurikomayama mountain, Miyagi Prefecture, e) northern foot of Karibayama mountain, Hokkaido. These cases have the common geological structure that hard rocks like welded tuff (c, d), lava (e) and limestone (a) lie extensively and most flatly on the soft rocks such as mudstone and tuff, other than (b) that is perhaps triggered by earthquake. The spread topography as shown here is probably distributed everywhere in Japan. Although some cases are recognized as active faults topography, the recognition should be done carefully.

Keywords: spread, landslides, active faults

Dissection process of hill around Mobara in Chiba pref.

MOKUDAI, Kuniyasu^{1*}

¹Pro Natura Foundation Japan

The dissected hills and valley is distributed around Mobara city in the southeastern part of Chiba Prefecture. The landform are affected the stratum and sea level change.

Keywords: Kazusa hill region, Kazusa Groups, valley

A study on the effectiveness of flood prevention projects in the Nakagawa basin, central Japan

MATSUZAWA, Takahiro^{1*}

¹Dep.Civil and Env. Eng.

The purpose of the present study is to verify the effectiveness of flood prevention projects for a certain river and to convey the information to citizens. To fulfill the objective, the past and current recorded data relating to the Nakagawa River were compared. Three past observation points of pre-projects and two current observation points after the projects were selected. Firstly, the latitude and longitude of these points were investigated by Google Earth. The location of the five points was then placed on the map by using GIS software. Secondly, change in the water level of every 12-h interval after a rainfall of the present river and the past river was examined and the rate of the change in water levels during and after rainfalls were also compared. These investigations revealed increasing of water levels of the past river during the rainfall and decreasing gradually after the rainfall, whereas decreasing of water levels of the present river even during the rainfall and also decreasing the level with noticeable fluctuation after the rainfall. It is considered that the flow discharges and water levels of the present river can be effectively controlled not only by natural way but also by flood prevention projects such as retarding reservoirs and drainage canals.

Keywords: Nakagawa river, GIS, flood prevention projects

Fluctuations of water level in the riverbed in 2011 in the upper reaches of the River Azusa, Central Japan

SHIMAZU, Hiroshi^{1*}

¹Rissho University

The upper reaches of the River Azusa, central Japan, is a braided river with gravel bed. Yearly mapping of the riverbed micro-landforms revealed that channel migrations and landform changes in the active riverbed occurs once every one or several years. To discuss the landform changes of the riverbed in the upper reaches of the River Azusa, photographs were taken at 10-minute or 30-minute intervals in the daylight between 3 July and 4 October using the GardenWatchCam made by Brinno Inc. The camera was set on the slope which can overlook the riverbed. Channel migration occurred before camera setting. It was probably caused by the 10 May and/or 22 June floods. After camera setting three flood events were observed on 4 July, 23 August and 20 September. On 4 July in the Baiu rainy season and on 20 September by a typhoon, water level of the main channel rose 0.5meters and 0.7 meters, respectively. During these events no landform change but slight lateral erosion occurred. Although the daily rainfall on 20 September was much larger than that on 4 July, the maximum depths of the main channel of the two flood events were the same. This shows that heavy rain event after the Baiu rainy season does not cause the extreme rise of the water level and that major landform change occurs only in the Baiu rainy season.

Keywords: riverbed, landform change, water level, River Azusa, Kamikochi

Upper limits of tsunami going upstream along the rivers in southern Miyagi and northern Fukushima Prefectures.

SAIJO, KIYOSHI^{1*}

¹Miyagi University of Education

Upper limits of tsunami going upstream along the river channels in coastal areas of southern Miyagi and northern Fukushima Prefectures, at the time of the 2011 off the Pacific coast of Tohoku Earthquake, were determined on the basis of the field observation. The results suggest that some factors such as river channel inclination, geomorphic settings, and landuse control the distances of tsunami going upstream.

Keywords: The 2011 off the Pacific coast of Tohoku Earthquake, Tsunami, River, Miyagi Prefecture, Fukushima Prefecture

Detection of linearments in the southern part of Iwaki City using a LiDAR data

IWAHASHI, Junko^{1*}, SEKIGUCHI Tatsuo¹, ONO Yasushi¹, TAKAHASHI Noriyo¹

¹GSI of Japan

We detected the linearments in the 826 km² area of the southern part of Iwaki City, in the region where Yunodake Fault and Idosawa Fault are located, using digital images created from a 2-m LiDAR DEM. The linearments were traced on a computer screen by fully-zoomable images, which are frequently 1:10,000 scaled images. We digitized all linearments except for artificial features, and saved the data as a shape file. The linearments are arranged in four groups: 1) earthquake surface faults caused by the earthquake in April 11th 2011 (M 7.2) and traces which is assumed to be the extension of the fault 2) other fault traces 3) linearments caused by landslides 4) structural geomorphology. We also created a summit level contour map from the LiDAR DEM, and compared with the known faults which include the earthquake surface faults.

Keywords: Iwaki, Yunodake Fault, Idosawa Fault, LiDAR, linearment, summit level map

The difference land process of the radioactive material by the soil erosion from various land use divisions

YODA, Hiroki^{1*}, ONDA, Yuichi¹

¹Graduate School of Life and Environmental Sciences

The Fukushima Daiichi power plant accident has released large amount of radioactive materials to the atmosphere. Since then we are being monitoring the radioactive material distribution by soil erosion in different land use types (moderate slope tabako field, steep hill slope, grass land, grazing land and young cedar forest stand) in Yamakiya-Kawamata town, Fukushima prefecture., Stainless plat was used to construct runoff plot per land use type. At each erosion event, eroded materials were collected in the outlets of each plot and the radioactive materials contents were determined using gamma-ray spectrometer. Within the observation period (July 17 to September 4, 2011), results indicates that large volume of outflow ($717 \text{ m}^3 \text{ ha}^{-1}$) was recorded from grass land use type. Moderate slope of tabako field had shown the highest values in sediment load (920 kg ha^{-1}) and inventories of both ^{137}Cs (1.0 kBq m^{-2}) and ^{134}Cs (1.2 kBq m^{-2}). The differences of sediment load and radioactive materials among the land-use types might be partly because of the difference in slope and land cover types. For example, the smallest amount of outflows in both sediment and radioactivity were obtained from young cedar forest stand where the canopy, undergrowth and tick litter layer on the forest floor prevent the mobilization of radionuclide coded soil materials which ends lowest outflow amount.

Keywords: Cesium-137, Cesium-134, Radionuclides, Soil Erosion, Gamma-ray Spectrometer, Canopy

Development of a Grid-based Landscape Evolution Models and Application to Actual Topography

INOUE, Shin^{1*}, TANAKA, Yasushi²

¹Dia Consultants Co.,Ltd, ²Department of Geography, Komazawa University

We developed a simple and widely useable Landscape Evolution Models (LEMs) to investigate Japanese actual topography and we examined influence of differences of coefficients of a river and sea erosion. As a result, this LEMs suggests that channels are meandered when the drainage index is large and it is consistent with previous research. However, this model implies that the formation age and elevation of paleo-shoreline shift by the area and it is not consistent with previous insights. In order to consider whether it actually occurs or not, we must investigate actual topography and geology. The LEMs is a tool to visualize the idea about landscape evolution based on many topographical researches. Application of LEMs to actual topography means verifying the idea. Therefore, developing LEMs and applying it to actual topography and examining these results is very important for us to understand "landscape evolution process" more deeply.

This study was carried out as commissioned research from the Nuclear Waste Management Organization of Japan (NUMO).

Keywords: LEMs, DEM, GTL, sea level change, landform development, marine terrace

Volume loss due to the catastrophic sector-collapse causing the Okinajima debris avalanche of Bandai volcano, Japan

YOSHIDA, Hidetsugu^{1*}

¹Kanto Gakuin Univ.

This research discusses the volumetric magnitude of the catastrophic sector-collapse of Bandai volcano occurred in the late Pleistocene. The collapse produced the huge-scale rockslide-debris avalanche deposits named as the Okinajima debris avalanche. The collapse had occurred at the southwestern part of the volcano, and the Okinajima debris avalanche went down into the Inawashiro and Aizu basins and deposited there. Along with the conspicuous hummocky landforms observed, we can recognize the horseshow caldera on the southwestern sector of volcanic edifice. Some previous researches indicate that the collapse volume (or depositional volume) reaches more than 4 cubic kilometer (km^3). In regard to the catastrophic collapse volume at the Bandai volcano, the author has once examined another event occurred in 1888 A.D., the smaller one. By focusing on the size-distance distribution pattern of debris avalanche hummocks, Yoshida (2012) evaluated the appropriateness for the volume estimation of the 1888 collapse (ca. 0.49 km^3) by Yonechi et al. (1988) and Yonechi and Chiba (1989). Based on this result, it is made a fresh review of the collapse volume of the Okinajima event. The investigation offers new insights as follows;

1) Collapse volume is not likely to exceed beyond ca. 3.2 km^3 , calculated from the dimensions of the volcanic body and the source area (scar).

2) Scar size is approximately five times larger than that of the 1888 collapse, which amounts to the collapse volume of the Okinajima event of ca. 2.5 km^3 at a maximum, referred to ca. 0.5 km^3 of the 1888 event. The Okinajima's value is comparable to that observed at Mt. St. Helens in 1980 A.D.

3) According to the empirical relationship shown by the author's previous results and the distribution pattern of the Okinajima's hummocks, the loss volume by collapse is expected as ca. $1.8\text{-}1.9 \text{ km}^3$. This is kept within the error (Yoshida et al., 2012) from the above mentioned observed value ($< 2.5 \text{ km}^3$).

Keywords: catastrophic sector-collapse, volume, hummocky landforms, Okinajima debris avalanche, Bandai volcano

Preparation of the digital stereoscopic topographic maps of Japan using 10m DEMs

SHIRASAWA, Michio^{1*}, YOKOYAMA, Ryuzo¹

¹Yokoyama Geo-Spatial Information Lab.

By using 10m mesh DEM of GSI, we have developed four kinds of digital stereoscopic topographic map (DSTM), i.e., slope map, positive openness map, negative openness map and shaded relief map of elevation, for the total land areas of Japanese territory, with the scales of 1/500,000 and 1/200,000. The application of those maps are under investigation by our colleagues, and some results will be introduces in the oral and poster sessions in this conference.

Keywords: Digital elevation model, Stereoscopic topographic map

Simultaneous reading of small-meso scale topography in NE Japan outer arc, using digital stereoscopic topographic map

MIYAUCHI, Takahiro^{1*}, IMAIZUMI, Toshifumi², SHIRASAWA, Michio³

¹Graduated School of Science, Chiba University, ²Graduated School of Science, Tohoku University, ³Yokoyama Geo-Spatial Information Laboratory

Geomorphological reading is the most important and fundamental working in topographic process study. Recently, many kinds of tools, demonstrated by highly precise topographic maps, relief maps and high resolution air-photos and satellite images, are developed for improvements in the readings. But in any case, it seems to be difficult to simultaneously read topography in several scales and describe the results as a map. Digital stereoscopic topographic maps (DSTM) by Yokoyama et al. (2012) makes it possible and is newest effective tool from professional and educational viewpoints .

We demonstrated the effect of using DSTM in small-meso scale terrestrial topography reading in the northern Northeast Japan arc. Obtained results are as follows.

(1) Small scale topography of < 10 km in size and < 100 m in height: Early Pleistocene marine terrace sequences are seamlessly observed and their situation can be recognized. New active structures can be identified by unusual drainage patterns and incision degrees.

(2) Meso scale topography of 10-100 km in size and 100-1000 m in height: More than C-class active faults in activity are clearly identified by continuous shades representing fault scarps. Fault line valleys and scarps by differential erosion and low-relief erosion surface are clearly detected besides.

(3) Coastal, volcanic, tectonic and structural topography can be simultaneously read in regional scale of 1:200,000. Based on this excellent fruit, We presented the synthesized geomorphological map, considering internal and external process.

The above results indicate that DSTM is useful for analytic geomorphological study and the complication of regionally described topography. Further practical applications are desirable in interdisciplinary fields around geomorphological science.

Keywords: Geomorphological reading, small-meso scale geomorphology, digital stereoscopic topographic map, regionally described topography, northern Northeast Japan arc

Interpretation of geologic structures and structural landforms using a digital stereoscopic topographic map

KANISAWA, Satoshi^{1*}, IMAIZUMI, Toshifumi¹, SHIRASAWA, Michio²

¹Tohoku University, ²Yokoyama Geo-Spatial Information Lab.

Structural landforms depend on the differences of resistance of rock weathering and denudation. Especially, these reliefs are well preserved in the mountainous areas because of denudation processes to the areas reflected in the geologic structures such as fault and fold of the strata and zonal structure of plutons. As an example, we present the good correspondences between the results of geological observation and the reliefs of inner structure of zoned plutons, faulting, and folding in the Kitakami Mountains. In this study, the correspondences are demonstrated by 10m mesh DEM-derived digital stereoscopic topographic maps. These topographic maps can show the vertical information of the height of topography, therefore the differences of slope or relief are stereoscopically and clearly expressed as shaded information with the height of topography.

The 10m mesh DEM-derived digital stereoscopic topographic map is a good and effective tool to decipher the geologic structures from the structural landforms, and furthermore make possible to multiple and inter-disciplinary discussions. The new knowledge and interpretations can be expected and achieved from the use of this map.

Keywords: Digital stereoscopic topographic map, Kitakami Mountains, Geologic structures, Structural landforms

Identification of tectonic landform using digital stereoscopic topographic map and satellite image data

KOSAKA, Hideki^{1*}, KAGOHARA, Kyoko², MIWA, atsushi³, IMAIZUMI, Toshifumi⁴, SHIRASAWA, Michio⁵

¹Kankyo Chishitsu Co.,Ltd, ²AIST, ³Oyo Co., ⁴Tohoku Univ., ⁵Yokoyama Geo-Spatial Information Lab

In order to delineate the geomorphic features in and around the active fault zone, the Kitakami Lowland and Itoigawa-Shizuoka tectonic line, digital stereoscopic topographic map and satellite image data were combined. The main image involved in this study was (1) digital stereoscopic slope map (DSSM) and (2) ALOS image. The DSSM shows geomorphic line and surface of fluvial terraces, so it shows the distribution of the old terraces and the development of the erosional scarps around the fault zone. 3D display of the scarps and surfaces suggest that geomorphic features change in dip and strike direction of the active fault zone. The detailed image (1/50,000) shows fault scarp across erosional scarps.

Keywords: Kitakami Lowland, Itoigawa-Shizuoka tectonic line, digital stereoscopic slope map, scarp, active fault

Interpretation of large-scale landslide slopes in Tohoku District by stereoscopic topographic maps

HIGAKI, Daisuke^{1*}, Ryuzo Yokoyama², Michio Shirasawa²

¹Hirosaki University, ²Yokoyama Geo-Spatial Information Lab., ³Yokoyama Geo-Spatial Information Lab.

Interpretation of large-scale landslide slopes in Tohoku District by stereoscopic topographic maps

Keywords: Landslide slopes, Disaster management, Stereoscopic topographic map

Comparison of tectonic geomorphology using digital stereoscopic topographic map

KAGOHARA, Kyoko^{1*}, IMAIZUMI, Toshifumi², MIYAUCHI, Takahiro³, SHIRASAWA, Michio⁴

¹AIST, ²Graduated School of Science, Tohoku University, ³Graduated School of Science, Chiba University, ⁴Yokoyama Geo-Spatial Information Laboratory

Accumulation of digital-elevation data and development of visualize technique for them has enabled to multi-scale geomorphic readings based on geomorphic feature which is different from aerial photograph and satellite images. We present examples on tectonic geomorphology readings of Median Tectonic Line, Adera Fault, Inazani Faults and Senya Fault, using four kind of digital stereoscopic topographic maps (DSTM) by Yokoyama et al. (2012). We focus on differences in distinguishability among their maps. Shaded-relief map shows topographic roughness as shade. Digital stereoscopic slope map (DSSM) shows finer variations in surface structure. Positive values of topographic openness are high for convex forms, whereas negative values are high for concave forms, so digital stereoscopic positive openness map (DSPOM) and digital stereoscopic negative openness map (DSNOM) emphasize ridges and valleys. Fault scarp and terrace scarp are identified clearly from DSSM. Stream-offset and col along strike-slip fault well represent in DSNOM. By using DSSM, DSPOM and DSNOM, we can identify more various topographic patterns clearly than that from shaded-relief map. We hope that the digital stereoscopic topographic maps can be not only researcher's tool but also useful materials for education and disaster prevention.

Keywords: tectonic geomorphology, strike-slip fault, dip-slip fault, digital stereoscopic topographic map

Digital stereoscopic slope map derived 5m and 2m mesh, in the Sendai plain and the Iwaki region

NAKAJIMA, Hidetoshi^{1*}, IMAIZUMI, Toshifumi², MIYAUCHI, Takahiro³, KAGOHARA, Kyoko⁴, MIWA, atsushi⁵, SHIRASAWA, Michio⁶

¹Geospatial Information Authority of Japan, ²Graduated School of Science, Tohoku University, ³Graduated School of Science, Chiba University, ⁴AIST, ⁵OYO Co., ⁶Yokoyama Geo-Spatial Information Lab

We interpreted fault topography by using detail digital stereoscopic slope map (Yokoyama et al., 2012) derived 5m mesh data and 2m mesh data in the Sendai plain and Iwaki region, respectively. Obtains results are as follows.

1) New tectonic slope continue northeast to southwest in direction, parallel to the Nagamachi-Rifu fault zone, in northwest part of downtown in Sendai.

2) Surface fault caused by the 2011 earthquake in Iwaki region, clearly interpreted by using digital stereoscopic slope map derived 2m mesh DEM data. The fault trace accompanied with scarp of maximum 2m in height, penetrate through the river bottom and slope of hillside.

Keywords: 5m & 2m mesh DEM, Digital stereoscopic slope map, Nagamachi-rifu active fault zone, 2011 earthquake fault in Iwaki

Software development of Viewer for Stereoscopic Topographic Map

SASAKI, Tatsuya^{1*}, YOSHIKANE, Masanori¹, SHIMOYAMA, Nao¹, SHIRASAWA, Michio², YOKOYAMA, Ryuzo², IMAIZUMI, Toshifumi³

¹OYO corporation, Database Business Department, ²Yokoyama Geo-Spatial Information Lab., ³Graduated School of Science, Tohoku University

This paper shows the new software development of stereoscopic topographic map browser. Anaglyphic raster data of stereoscopic topographic map of Japan's land area generated from 10m-mesh DEM by the Geospatial Information Authority of Japan were used in this development.

This viewer was developed based on GIS engine MAGIS (developed by OYO Corp.). MAGIS is a general-purpose GIS engine which has been widely used in Japanese local governments as a business support system in public domain management.

The new viewer provides seamless and fast mapping, as well as smooth zooming of stereoscopic topographic map data of Japan's whole land area. This usability can benefit a wide range of map users with its user-friendly interface.

The parallax of stereoscopic topographic map data has been pre-optimized for this viewer. The new browser will be released to all the map users.

Keywords: Digital stereoscopic topographic map, GIS, Software Developmnt