

An analysis of radiocesium distribution map due to accident of the Fukushima Dai-ichi nuclear power plant by using stere

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The Great East Japan Earthquake on March 11, 2011 generated a series of large tsunami waves that resulted serious damage to the Fukushima Daiichi nuclear power plant (NPP) and radioactive materials were discharged to the environment. After this accident, various types of measurements were performed to obtain the affected range and concentration of radioactive material depositions. In particular, the aerial radiation monitoring (here after ARM) has measured the ambient dose-rate and radiocesium deposition in large areas including those above the forest and the high mountain which people couldn't enter easily on foot or by vehicles, it is useful for grasping the distribution of contamination. It is thought that understanding the feature of the place where the radiocesium has deposited leads to solving the behavior in the atmosphere of the radiocesium discharged by the accident. In recent years, a stereoscopic slope mapping method has developed by the progress in analysis using digital elevation model (DEM) and being used widely. Since the geographical feature can be visualized to 3D-images by this technology, it is used for understanding the geographical features in various fields. In this research, we tried to analyze in visible clearly about the distribution of the radiocesium deposition by lapping the ARM results over the stereoscopic slope map.

The distribution map of the radiocesium deposition which was obtained by the ARM was lapped over the stereoscopic slope map of the whole of Japan by using 10m-mesh DEM data. The DEM data we used for analyzing the ARM data were employed 1.8-km, 3-km, and 5-km mesh data for the areas around the NPP, East Japan, and West Japan, respectively. The ARM data between each point of measurement were interpolated by using a GIS software. The interpolated data were outputted as a 25-m mesh data of the dose-rate map. Here we have lapped the data over the stereoscopic slope map

As a result, the high dose-rate areas more than 1.0 micro Sv/h spread from the NPP to 80 km northwestward, and it turned out southwest from there that the place more than 0.1 micro Sv/h. As for this distribution, radiocesium seems to pass along the low elevation areas between high mountains. On the other hand, the southern part of Iwate Prefecture and the southern part in Ibaraki Prefecture showed that the place more than 0.1 micro Sv/h is flat places comparatively.

It can become the assistance which solves the radiocesium diffusion and its migration by applying this technology to the detailed measurement result used the other monitoring, such as the radiation surveys by using unmanned helicopters.

Keywords: Stereoscopic slope map, Aerial monitoring, Accident of Fukushima Daiichi nuclear power plant, Radiocesium

Geomorphological influences of the tsunami and river floods on the lower Natori River unprotected floodplain

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The lower reaches of the River Natori were attacked by the tsunami disaster of the 2011 Tohoku Earthquake. The unprotected floodplain along the river is traditionally used for farmlands. This study aims to discuss the geomorphological influences in the unprotected floodplain on the degree and types of damage to the farmlands caused by the tsunami flood and river floods after the tsunami disaster. The tsunami ascended more than 8 kilometers from the river mouth in the present channel. It ascended about 6 kilometers on the unprotected floodplain whose surface is 1 to 4 meters higher elevation than the present river channel. On the floodplain micro-landforms such as shallow ditches of former channels and relatively higher parts of islands are well preserved without artificial change. The tsunami flood ascended selectively through the shallow ditches in the upper part of the tsunami affected reaches. On some islands farmlands survived from the tsunami flood. After the tsunami disaster three times of river floods attacked the floodplain in September 2011 and May and July 2012. The fresh water of the river flood washed away the salinity of the tsunami sediments in the surface soil. It is good for growing vegetables in the floodplain. However, flood water ponded in the shallow ditches every flood event and it continued for a longtime. This severely damaged farmlands.

Keywords: tsunami flood, river flood, 2011 Tohoku Earthquake, unprotected floodplain, micro-landform, River Natori

Investigation of possible collapse of the wall of the underground munitions factory in Yoshimi Hyakuana historical site

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Deterioration due to salt weathering is a small scale phenomenon in general. However, the weathering might cause a serious failure after rock strength reduction as a result of the weathering for a long time. This study attempted to rock stability analyses on both ceiling and side wall rocks of underground munitions factory in the historical site Yoshimi Hyakuana. In order to evaluate the rock strength, Equotip hardness test and point load test, because it could not make core specimens for uniaxial strength test using collected rock samples from the site. Stability of ceiling wall rocks was analyzed using converted values obtained from these field data and it resulted in fairly stable at present. With considering the recession of the wall due to salt weathering, the calculated stability is somehow reduced. During the salt weathering, the strength of outermost surface of the rock wall decreases significantly. Stability of the outermost rock-wall was examined and resulted in adequate threshold strength of pre- and post-exfoliation.

Keywords: salt weathering, tuff, stability analysis, rock strength, Equotip hardness test, Yoshimi Hyaku-Ana

Laboratory experiment of scale effect for frost shattering

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This study investigated the size effects for frost shattering on A) welded tuff B) limestone C) tuff D) tuffaceous sandstone and E) sandstone. These samples are made into 1cm, 2cm, 3cm, 4cm and 5cm cubes. Freeze-thaw experiment were performed under the repeated temperate condition between repeated +15°C and to -15°C. This individual cycle continues 6 hours and up to 400 cycles. Exfoliation patterns are summarized that 1) small samples divided into two pieces with nearly equal sizes, 2) the amount of debris increases with decreasing the specimen sizes, and 3) small samples were rocks having bulk density and high porosity tend to be more damaged by frost shattering.

Keywords: frost weathering, frost shattering, size effect, laboratory experiment