

## Analog model of basement structure below the Kanto Plain

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It is commonly discussed the difficulties on promoting the geologic results for the students as well as citizens. To solve this problem, I made three-dimensional analog model of basement structure below the Kanto Plain. The horizontal scale of model is 1/200,000 but vertical scale is emphasized as 400%. Because the model was painted by gradations in color from yellow (Shallow) to dark blue (deep), it can be easily recognized the contrast between subsurface steep precipice and gentle slope of basement structure. Among them, the Tachikawa Active Fault is characterized by sharp drop of basement depth below the Kanto Plain. Thus the analog model of basement structure below sedimentary basin would be helpful to understand why long-period ground motion is amplified in the sedimentary plain.

Keywords: outreach, earth science, geology, educational promotion

## How does the understanding of volcano advance? ; An example from the experiment on forming stratovolcano

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Experiment on Polygenetic stratovolcano using waste food oils and colored sands (Kasama et al. , 2010) was demonstrated at grade schools to high schools in Kanagawa prefecture and Shizuoka prefecture. Two cross section pictures of stratovolcano were drawn by many students. One is a imagination sections before experiment and another is a sketches after experiment. These pictures were divided into several types by inner stratigraphy (Kasama, 2012a) and had a tendency corresponding to age (Kasama, 2012b). Furthermore, many educational practices have done from 2012 to 2014. Many data from 1409 people have obtained. According to the result, it becomes clear that the tendency corresponding to age, residential area and scientific interest of volcano, especially Mt. Fuji. The experiment type (ET) was drawn by lines changed from lower horizontal lines to upper tilted lines. ET was found in the experimental stratovolcanoes and was considered to be exact depiction. Textbook type (TT) was drawn by piling similar triangles. Horizontal type (HT) was drawn by horizontal lines like stratum (Kasama, 2012a).

Fig.1 shows a relation between horizontal type drawn before experiment (HTB) and experimental type drawn after experiment (ETA). They had negative correlation. ETA indicates observation capability. ETA increases with age. HTB indicates misunderstood prior knowledge. Misunderstanding was thought to be caused by the education of the stratum of the 6th grader. Because HTB was not so high at the 3th to 4th grader, but the 6th grader was highest of all. There was found no HTB in a science club which consisted high school and junior high school students, Kanagawa. But, teachers of elementary school of Kanagawa drew same HTB, and ETA did not beyond the high school students. It is an important problem that we must think about.

TTB and ETA had correlation. TTB indicate right back ground but it is not so exact. ETB and ETA also had correlation. ETB is thought to be the best expectation, but its proportion was low.

How to write outside slope lines of stratovolcano is divided into three types. Simple straight lines (SL) which like the side slopes of a scoria cone, convex curves (CV) which like the side slopes of a lava dome and concave curves (CC) which are suitable for the slopes of a stratovolcano. Ratios of three types were not so much depended on age, but heavily depended on arias in which students live. Many students living in Shizuoka prefecture wrote concave curves before experiment (CCB). A high school at Shimizu, Shizuoka indicated the highest CCB ratio. It was thought that students can see Mt. Fuji and its frank easily.

### References

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Tomohiro KASAMA (2012a) Cross sections of stratovolcanoes drawn by sixth grader. Japan Geoscience Union Meeting 2012, G02-P-9, Chiba.

Tomohiro KASAMA (2012b) Cross sections of experimental stratovolcanoes drawn by students of various age. The Geological Society of Japan Meeting 2012 Osaka, R19-O-8.

Keywords: experiment, stratovolcano, cross section, Mt. Fuji, children and students, teachers

G02-P02

Room:Poster

Time:April 29 18:15-19:30

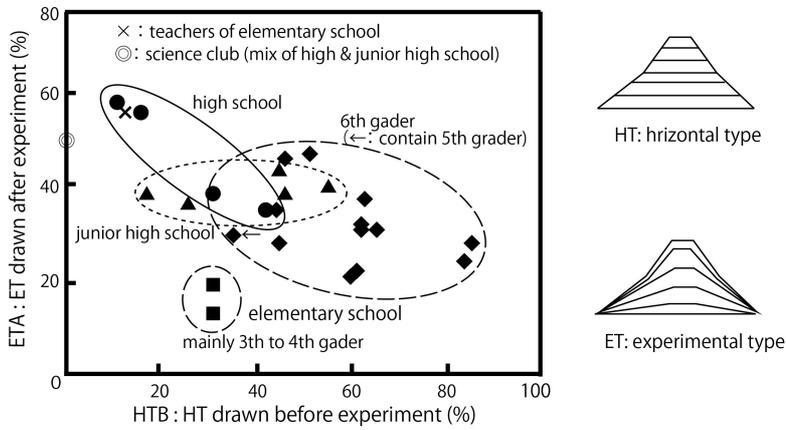


Fig.1 An analysis of pictures, showing a correlation between HTB and ETA.

## 3D visualization and outreach of subsurface geological information using multi-layered miniature produced by 3D plotter

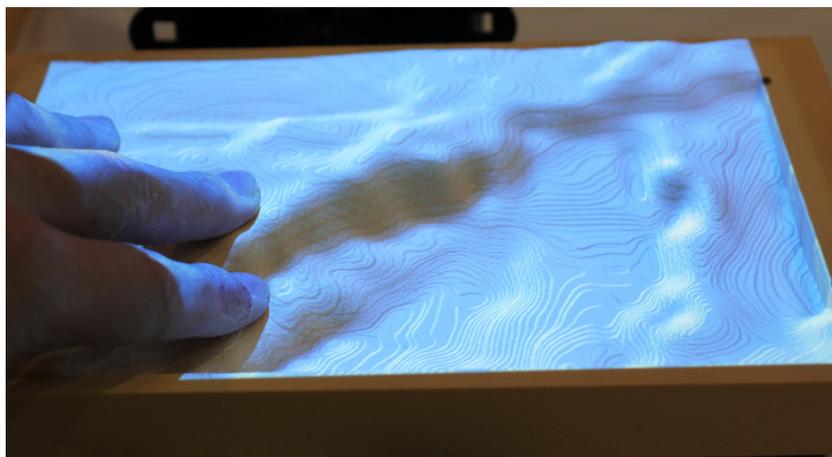
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In recent years, people can access to geological information quickly and easily with the help of information technologies. However, it is difficult to recognize three dimensional distribution of geological structure without professional training of map reading. To solve this problem, several techniques were established to build up finely-detailed miniature with rapid prototyping and projection mapping. There are extremely small contours on the surface of the miniature. These contours are used for marker to calibrate projection. This miniature, called Highly realistic Projection system (HiRP system) is used for outreach and research activities in museums, schools, geoparks etc.

I, the present writer, will report about 3D visualization about subsurface geological information using multi-layered miniature. A number of geological datasets, such as borehole datasets, 3D subsurface structure model published by Geological Survey of Japan (GSJ) are also used to modeling interior structure of the model. I will also report about interactive miniature coupled with GIS, and global trends in rapid prototyping.

Keywords: Geological information, 3D model, Rapid prototyping, Projection mapping, 3D plotter, Geopark



## Benefit of intergenerational course training as a "Science Seminar" in earth science

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A science outreach program "Science Seminar" has been given to junior and senior high school students by graduate students in Niigata University since 2009. We will present an effective age to educate earth science exhibited by statistics of questionnaire and how the intergenerational course training is arranged in the science seminar.

Keywords: Delivery lesson, Graduate student, Earth science for junior high school students, Career education for young scientist

## How should the outreach activity for the earth and planetary sciences be promoted?

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The earth and planetary sciences cover various scientific and technological fields so that it is clear that the earth and planetary sciences are one of the most important fields of academic study for the society, and meanwhile the public is responsible for them. Many outreach activities have been held, and interactive ways have been especially remarkable in this decade. The communication which is mediated with scientific knowledge and perspectives is called as "Science Communication". Science Communication is not only the enlightenment of science by academic groups for the public but also the role for picking up the voice of the public. The context for Science Communication has been changed over time, therefore, it is more important how the Science Communication should be promoted as needed than why it should be. However, the schematic concepts for Science Communication less have been established.

We "Universal Earth" have hypothetically proposed the concept of Science Communication and verified it through the science events. Science Cafe is one of useful ways to promote Science Communication with the available facilities and also it is one of the largest number of events are held in Japan. However, Science Cafe is just one way of Science Communication so that we had another symposium to discuss how Science Communication should be promoted and what we can do with other Science Communication tools.

In this presentation, we report the conclusions of the Science Cafe and the symposium about Science Communication held in 2013. We hope our presentation generate the discussions.

Keywords: Outreach, Science Communication, Science Cafe

## Delivery lecture for elementary school students with hand auger boring

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In order to awareness building of earth and environment science for elementary school students, we conducted outdoor practices as a delivery lecture at a Buddhist temple on the Toshima upland (the Musashino I surface), Tokyo. The first lecture in the summer of 2012 was unsuccessful due to miss allocation of time and excessive schedule of study topic with indoor lecture. Even an auger boring using handy soil corer(hand auger LS-3 series, Sanyo testing machines Co. ltd.) took 3 hours, despite that the work was carried out by four adults. In the aftermath, the students could not advance sample treatment and description works, and finding ground water.

In the summer of 2013, the schedule focused on the boring, sample treatment and measurement. As a result, students experienced the following subject; boring work in 4 meters in depth, sample description, measurement of soil color and temperature, verification of ground water. The answers of the questionnaire after the lecture shows the students amazed a variety of characteristics of geology and environmental study and long history of the earth which were recorded at under their foot. We are planning further lecture and boring at the temple in next year.

Keywords: earth science education, summer homework, core description, the Kanto loam, soil temperature, ground water

## Approach to the improvement of the field work

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We started up a new project “ Geo Education ” in 2012. This project purpose is increase awareness for geo-scientific education in elementary and secondary level through field excursions. In other words, it is the knowing the earth by touching and seeing the real. The members consist of scientist, engineer, teacher and university students specialize in earth science. It is probably new activity which prepares the operation methods and the instructor cooperation with the school.

In 2012, we held the field excursions with two junior high schools in Tokyo. Through the two field excursion, we will clarify figuring out of field materials and future problems involved. In 2013, we did activities about the development of field materials to the improvement of the field excursions.

In this presentation, we will introduce our project “ Geo Education ” and report the results and problems on this year’s activities.

Keywords: Geoscience education, field materials, field excursion, awareness activity, elementary and secondary level

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## Outreach activities of AIST for geothermal energy, 2013: simple paper materials

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<sup>1</sup>AIST

We developed a pen-and-paper game to study various uses of geothermal energy in 2012, and reported it in last JpGU meeting (Mizugaki et al., 2013). In 2013, we developed an additional material, a simple paper model illustrating cascade use of geothermal energy.

These materials are used in following outreach events:

AIST Tsukuba open house 2013

Geoscience Exhibition in Miyagi 2013

Keywords: outreach, geothermal energy, paper model, pen-and-paper game

## An Evaluation of Sieving Effect of Volcanic Ash Fine Particles by A Statistical Particles Image Analysis

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<sup>1</sup>Malvern instruments A division of Spectris Co., Ltd.

### 1. Introduction

The analysis of particle size and shape characterization is an important evaluation of volcanic ash. It is well known that particles size and shape is one of dominant parameter of volcanic ash for flowability, flying property and abrasively. A sieving is used for particle size analysis of volcanic ash as common method. However, particle has possibility to have shape effect when it goes on through mesh of a sieve. In conventionally, a manual microscope approach has been used for few number of particles shape observation. It is not able to described particle shape as significant number. On the other hand, a fine particle characterization of volcanic ash (less than 50 $\mu$ m) has also importance to hazard protection issue which is a fine particle has possibility to long duration time in air. Our group has reported particle characterization and classification of a volcanic ash fine particle using by images for the purpose of determining particle size distribution which is based on described in ISO13322. The particles are appropriately dispersed and fixed on an optical microscope implemented a fully automated sample stage and an automated real time particle image analysis function on software. This report will be discussed for effect of sieving and precise classification against volcanic ash fine particle by a statistical particle image analysis.

### 2. Material and method

In this study, the volcanic ash was sampling from Ito flow in Kagoshima. This sample was already filtered coarse particles before, and sieved by a analytical sieve (TOKYO SCREEN CO.,LTD), these mesh size were 75 $\mu$ m, 50 $\mu$ m, 32 $\mu$ m. It was passed to 75 $\mu$ m, 50 $\mu$ m and only trapped on 32 $\mu$ m. As a statistical particle image analysis, Morphologi G3-SE (Malvern Instruments) was used for evaluation of particle size and shape. The observation mode was diascopic mode (Transmittance mode) and magnification was 100x in total magnification. The sample was dispersed with SDU (Sample Dispersion Unit) which attached Morphologi G3-SE. Number of measured particles was 120,000 and a parameter filter function on software was used based on shape and pixel number of particle image.

### 3. Result

A classification based on sieving were under 32 $\mu$ m sample (sample 1), over 32 $\mu$ m sample (sample 2) and no pretreated sample (sample 3). Those samples were analyzed on over 60,000 particles by statistical particle image analysis. As a result, Number Based Circle Equivalent Mean (NCED Mean) was 8.7 $\mu$ m (sample1), 13.9 $\mu$ m (sample 2) and 9.6 $\mu$ m (sample 3) on each. However, 510 particles of over 32 $\mu$ m particles were detected in sample 1. It was assuming from this result that shape effect happened. Therefore the result of focus on over 32 $\mu$ m particle to consideration of more precise classifications was shown in Table 1. This result showed sample 1 was the most elongate in the same size particles. Intensity Mean (IM) is reflected to sample thickness and transparency. High IM particles are tin particles or glass like particles in normally. Therefore, it can possible to classification glass liked particle or non glass like particle in volcanic ash based on IM parameter. According to results, sample 1 was most of including a glass like particle in amount of particles (Table 2, Fig 1).

### 4. Conclusions

In summarize of this study, it was clarified particle shape effect against sieving. This report will be more discuss about application and capability of numerical definition of volcanic ash by the statistical particle image analysis as new approach for this research area.

Keywords: Volcanic ash, Particle size, Particle shape, Particle image analysis, Sievng

# Japan Geoscience Union Meeting 2014

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G02-P09

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Table 1: Each Class Data

| Class               | sample   | Number of particles | OE Diameter Mean (µm) | Aspect Ratio Mean |
|---------------------|----------|---------------------|-----------------------|-------------------|
| Class 1 (12-20µm)   | sample 1 | 83                  | 14.8                  | 0.65              |
|                     | sample 2 | 3,543               | 14.9                  | 0.65              |
|                     | sample 3 | 891                 | 16.4                  | 0.64              |
| Class 2 (12-42µm)   | sample 1 | 116                 | 29.5                  | 0.65              |
|                     | sample 2 | 4,044               | 39.5                  | 0.65              |
|                     | sample 3 | 453                 | 39.9                  | 0.64              |
| Class 3 (over 42µm) | sample 1 | 38                  | 45.2                  | 0.62              |
|                     | sample 2 | 4,918               | 47.8                  | 0.62              |
|                     | sample 3 | 378                 | 46.6                  | 0.64              |

Table 2: Intensity Means by Class

| class               | sample   | Mean Intensity | number | intensity mean > 80 % |
|---------------------|----------|----------------|--------|-----------------------|
| class 1 (12-20µm)   | sample 1 | 63             | 133    | 39%                   |
|                     | sample 2 | 61             | 102    | 26%                   |
|                     | sample 3 | 54             | 107    | 31%                   |
| class 2 (12-42µm)   | sample 1 | 63             | 84     | 43%                   |
|                     | sample 2 | 57             | 1,051  | 36%                   |
|                     | sample 3 | 58             | 102    | 37%                   |
| class 3 (over 42µm) | sample 1 | 79             | 24     | 62%                   |
|                     | sample 2 | 88             | 2,187  | 66%                   |
| sample 3            | 81       | 192            | 61%    |                       |



## Primary environmental radioactivity education

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The physics of radioactivity or the radiation has very close relation to developments of physics from the beginning of the 20th century. The human being does not have an organ taking in radioactivity directly, which is different from visible light, hearing, temperature, and the taste. The radioactivity is an extremely mysterious phenomenon historically in this way, and this is why the elucidation was pushed forward. In addition, the radiation is statistical phenomenon because radiation is a phenomenon caused by an atomic nucleus change and an electronic state change of the atom. However, this historically important and mysterious phenomenon is not almost taught in a beginning class or the secondary education. It is only handled for a last unit in physics II of the high school. A public, who did not learn physics about the radioactivity and who experienced the nuclear power plant accident that it follows East Japan great earthquake disaster of 2011, face the radioactivity. As a result, confusion occurred about intuitive and sensible understanding about the radioactivity. On the basis of the above-mentioned background, we make a teaching plan about the beginning class in the radioactivity education and report the result that we practiced in high school and university cooperation educations.

Keywords: Radioactivity education

## Investigation of disaster memorials of the 2005 Fukuoka Earthquake and the 1982 Nagasaki Flood

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After the huge tsunami disaster of 2011, the existence such as the monuments which ticked away the teaching of the ancestor who conveyed a disaster was performed a close-up of in each place. The history of the past valuable teaching and disasters such as monuments might be forgotten with time. Therefore, it is an opportunity to raise disaster prevention awareness to convey history of disaster and a disaster sign.

We investigated the disaster memorials of the 2005 Fukuoka Earthquake and the 1982 Nagasaki Flood. We surveyed in 24 sites around Fukuoka and 23 sites around Nagasaki, we was able to confirm some disaster memorials. And we made the map which could take a walk through these damage traces.

Keywords: 2005 Fukuoka Earthquake, 1982 Nagasaki Flood, Disaster memorials

## The Earthquake-making Event of Meteorological Research Institute

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The Otenki-Fair at Tsukuba has been conducted in every August by Meteorological Research Institute, Aerological Observatory, and Meteorological Instrument Center. The Earthquake-making Event is one of the exhibitions in the Otenki-Fair. Participants jump on the floor 1 m away from a seismometer, then calculated magnitude will be displayed on the screen of a PC. The magnitudes usually range from -4 to -6. This event is popular with children.

The software for the Earthquake-making Event worked on a PC9801 computer by a program written in N88BASIC. Because a long time has passed since the cessation of production of PC9801, this event faced possible discontinuance due to hardware trouble. Therefore we transplanted the program into VisualBasic to continue the event with current Windows machines. At the poster meeting place, we will demonstrate the event.

Keywords: event, earthquake, magnitude

## ”Listen to the sound of earthquake!” - Experiment of sonificated seismic wave in public relations events

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Meteorological Research Institute (MRI) located in Tsukuba city carries out an annual public relations event titled ”Otenki Fare Tsukuba” on a weekday during the summer school holiday. Every event has two to three thousands visitors mostly from Tsukuba city or neighbor cities. Typical visitors are a group of school child(ren) and their mother. This event is a good opportunity for MRI not only to appeal its research activities but also to diffuse basic knowledges widely on weather, earthquakes and so on.

Edutainment titled ”Listen to the sound of earthquake!” has developed (Hayashi and Takayama, 2009; *QJS*), by which we can hear a sound of any earthquake selected from a menu. The substance of the edutainment is just a presentation file created by Microsoft PowerPoint(R); and interactive operating environment with a menu is realized by using PowerPoint’s functions of slide-show and animation. Therefore, the file can easily be modified by other technicians than the author.

The contents, or various sounds of earthquakes, are WAVE-formatted sound data produced by 10 - 1000 times fast-forwarding using actually observed seismograms. The process, which assume that seismograms are time-series of compression wave transmitted in the air, sacrifices the physical accuracy, but the process without accompanying frequency modulation conserves the scaling law of the sound source; and then, we can feel a material of the source of ”sounds of earthquakes” by listening differences of pitches, intensities and tones. The edutainment intends to make listeners understood on the existence of the diversity of earthquake based on various type of earthquake. By the way, ”sounds of deep low frequency earthquake”, which were processed by the same method as above, were used in the TV program of NHK titled ”Megaquake III” in 2013 so that the difference of source mechanism between slow earthquakes and ordinary ones were explained.

”Listen to the sound of earthquake!” has been displayed for one of the attractions in ”Otenki Fare Tsukuba” every year since 2007. Its display and contents have been improved; the line out from each personal computer (PC) is now divided into three headphones, in order to match the requirements of number of visitors increasing year by year, and the typical guests consisting of a mother and two children; in addition, contents has replaced after the occurrence of major earthquakes.

However, there are still several problems remained. The first one is that 45-seconds experience is too short for most primary school children to feel the diversity of earthquake, which the edutainment want to teach them, from listening their sounds. They just simply enjoy and end. The second one is that the interface using mouse and selecting contents from the displayed menu is becoming user-unfriendly for children in the age of smart phones and tablet PC. The last one is essentialness of multi-language interface.

In the JpGU2014 meeting, PCs installed ”Listen to the sound of earthquake!” will be displayed, after experiment, discussions on possible improvements and application to other public relations event will be welcomed.

Keywords: diversity of earthquake, edutainment, elementary school children, PowerPoint, sonification of seismic wave

## Survey of educational study on disaster prevention

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The consciousness of importance and need of the disaster prevention education for the natural disaster is increasing more. In this study, we tried that we grasped the actual situation of the study on previous disaster prevention education through compiling of research paper title by the some keywords. We set that the keywords are the causing phenomenon of the disasters, e.g. earthquake, tsunami, volcano, typhoon, and directly expression word of disaster prevention education, safety education. Our result shows these selected words are not so many used in the title of previous research papers. Although this procedure has an inadequacy, we can understand a tendency and the actual situation about the methods and contents of the disaster mitigation education.

Keywords: Disaster mitigation education, Title of reserch paper