Propose on a new style in geology guide books -an accessory-like cute mini book

*Mebae Kuranaga[2], Kiichiro Kawamura[1], Motoyo Matsuda[3], Miyuki Morikoshi[3]

1.Yamaguchi University/JAMSTEC, 2.Yamaguchi University, 3.Suken Shuppan

Geology is an important part in natural sciences in order to understand various common natural phenomena, particularly geohazards. However we has less opportunities to learn it during high school period. On contrary, the high school students are sometimes learning about geology when they visit shortly in universities. The short visits are doing sometimes under a (governmental) program of a linkage between universities and (junior) high schools. During the opportunities, the students study about geology through various outdoor works and indoor experiments, and also they receive several original texts. They of course understand the lectures at the time using the texts, but they may apt to forget partly (or completely) the contents after several (or one) day(s). It is because of less geology lectures in the high school. We consider that it is necessary an idea to keep the geological minds and thoughts for long time after the short visits.
In this paper, we propose a new style on guide books which students want to carry always attaching on a school bag or so. It is an accessory-like mini geology book. If the mini book is a souvenir in the short visit, the students would attach it on their bags, and they may keep the geological minds and thoughts. The students can make it by themselves, so that the host person would not need any time for the preparations.

Keywords: Mini book, Guidebook, Accessary

The new web service of Geosicence - Cross Cutting Comparisons (C3) -

*Koji Imai[1], Koichiro Matsushita[2], Ken Ebisawa[1], Daisuke Ikeda[3]

1.Japan Aerospace Exploration Agency Institute of Space and Astronautical Science, 2.Kyoto University of Art and Design, 3.Graduate School of Information Science and Electrical Engineering, Kyushu University

It is important to use many kinds of data in geoscience to understand the various geophysical phenomena. However, it is not easy to check the scientific data because each field in geoscience has been developing independently. Therefore, we had built a new web service, C3 (Cross-Cutting Comparisons; https://darts.isas.jaxa.jp/C3/) for promotion of the data utilization. By the interactive interface, C3 reduces distances between the fields and provides a quick look viewer. This poster describes the system summary and features of the service.

Keywords: Geoscience, Web service, Education, Cross-Cutting Comparisons

Development of the mobile 3D seismicity viewer

*Kentaro Emoto[1], Tatsuhiko Saito[2], Katsuhiko Shiomi[2]

1.Graduate School of Science, Tohokuk University, 2. National Research Institute for Earth Science and Disaster Prevention

It is widely known that Japanese Islands are located at the subduction zone of the Pacific and Philippine Sea plates and a number of earthquakes occur due to the subduction. Seismicity distribution is neither simple nor uniform; however, earthquakes intricately occur around Japan. Also, the shape of the subducting plate is complex. We usually plot the 2D map and vertical cross-sections to investigate the seismicity at a certain region. It is not easy to understand the 3D distribution from 2D images. Therefore, we develop the mobile application to show the 3D seismicity distribution with the subducting plates and topography in order to help non-professional understand where earthquakes occur around Japan.

We target the iPhone and iPad for the readily and intuitive user interfaces rather than that of the PC. By using the graphics API distributed in 2014, we can expect the high GPU performance of the 3D graphics on iOS. We use the Swift programing language and SceneKit framework used for 3D game applications. We use the Hi-net hypocenter catalogue on September 2015 as a sample data.

First, the hypocenter catalogues saved in the device is loaded. We can specify the ranges of the magnitude and depth. Spherical objects whose size and color corresponds to the magnitude and the depth are created and located at the position calculated by the latitude, longitude and depth information of the earthquake. The shapes of the subducting plates are described by triangular net which calculated by using the “triangular” command of the GMT and saved on the device as the COLLADA format. The shape of the topography based on the ETOPO1 is also saved on the device. The user can choose the color image corresponds to the height of the topography or coastline image as the texture image of the topography object. The displayed 3D seismicity distribution can be rotated, scaled and moved by swipe actions. Each spherical object has the information of the hypocenter such as the occurrence time, depth and magnitude. That information can be displayed by tapping the object.

We investigate the frame rate as the performance of the application. The frame rate indicates the smoothness of the motion of the application and is the number of the drawing per second (fps). This time we check the fps on the iPhone 6 and the iPad Air. When we plot 1-day seismicity (450 earthquakes), the frame rates are (iPhone, iPad) = (60, 45) fps. With these high frame rates, we can smoothly move the 3D objects without any stress. For 1-week (3200 earthquakes) and 1-month (12800 earthquakes) seismicity distributions, the frame rates are (30, 18) fps and (11, 5) fps, respectively. All of the functions work without error for the 5fps, but the motion becomes jumpy.

In this presentation, we use the sample hypocenter catalogue. In the future we imprement the download system of the JMA unified earthquake catalogue through the Hi-net website.

Acknowledgement: We use the numerical data of the shape of the subducting plates distributed on the website of Dr. F. Hirose (Meteorological Research Institute)

Keywords: Hypocenter Distribution, 3D, iOS

Preliminary report on magnesium phosphate minerals found from a medico-historical sample

*Ritsuko Sugita[1], Masaaki Kasamatsu[1], Osamu Ohtsuru[1], Takeshi Ohmori[1], Hiroaki Nakanishi[2], Kazuyuki Saito[2], Isao Nagaoka[2], Noriko Ochiai[3], Shidu Sakai[2]

1.National Research Institute of Police Science, 2.Juntendo University School of Medicine, 3.Tokyo Metropolitan Edo-Tokyo Museum

Introduction

There are two pebble-like materials found in vomited matter of a patient in a medico-historical collection of Inoue Kanryu (1740-1812), who was a town doctor and a strategist, at the Tokyo Metropolitan Edo-Tokyo Museum, Japan. According to the note of Inoue, one of them was found from a wife of a townsman lived in Edo around 1776, and another was from a wife of a carpenter lived in a village near Edo in 1783. NRIPS and Juntendo Univ. School of Medicine started research on the material, because the collection of Inoue, predominantly documents, is expected to provide information on medical context of town doctors of the time. The result of preliminary examinations on the substance that it is estimated as a mixture of phosphate minerals will be reported in the presentation.

Material and analyses

The substance is an oval spherical, grayish pale brown color with luster, porous and layered. Qualitative elemental analyses were performed by micro X-ray fluorescence analysis (XRF; ORBIS, AMETEK) under the atmospheric condition, and energy dispersive X-ray analyzer attached to a scanning electron microscope (SEM/EDX; JSM-6600LV, JEOL and INCA Energy, Oxford Instruments) using high vacuum mode and the sample was coated by carbon. Identification of the material was examined by X-ray diffraction (XRD; SmartLab, Rigaku), and Fourier transformed infrared spectroscopy (FT-IR; JASCO FT/IR6100). XRF and XRD were performed without any pretreatment or collection of subsample from the material. A very small portion of the surface was collected for SEM/EDX and FT-IR analyses. As the results, phosphor, sulphur, and calcium were detected by XRF, and phosphor and magnesium were detected by SEM/EDX. Peaks of elements are very sharp with low background that indicates the sample is an inorganic substance. It is estimated as a phosphate mineral. The result of XRD indicates existence of newberyite and struvite, which are magnesium phosphate minerals. A spectrum of magnesium phosphate trihydrate was obtained by FT-IR, which supports the existence of newberyite. It is considered that primary component is newberyite with minor amount of struvite.

Discussion

Newberyite is a rare mineral found in cave guano (e.g. Karkanas et al. 2002), and in urolith of mammals including human (e.g. Gibson 1974, Ohmura et al. 1959) associating with struvite, apatite and other minerals. The sample is hardly considered as a urolith of the patient because it was included in her vomited matter. However, sediments containing large amount of newberyite is not known in Japan, and its occurrence according to the studies of foreign countries is fine crystals in most cases.

Analytical results in this report were obtained from the surface of the material and the origin of calcium detected by XRF is unknown yet. It is expected the origin of calcium will suggest what the material is derived from.

Reference

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Keywords: medico-historical sample, magnesium phosphate minerals , newberyite

International collaboration of public outreach activities of the earth and planetary scinece using digital globe

*Akinori Saito[1], Takuya Tsugawa[2], Chia-Hung Chen[3]

1.Department of Geophysics, Graduate School of Science, Kyoto University, 2.National Institute of Information and Communications Technology, 3.Department of Earth Sciences, National Cheng Kung University

Dagik Earth is an education and public outreach project using a 3-dimensional digital globe system [http://earth.dagik.org/english/]. The system is portable and easy to use in classrooms and local science museum. The cost of the system is much lower than the other 3-dimensional digital globe systems, such as Science On a Sphere of NOAA, USA, and Geo-Cosmos of Miraikan, Japan. The usage of Dagik Earth has been expanded in Japan in these years. Dagik Earth also aims to be used out of Japan, and international collaboration has been established for the outreach activities in several countries. The software of Dagik Earth is multi-lingual, in Japansese, English and Chinese. The Chinese version is developed by collaborators in Taiwan. The public outreach activities using Dagik Earth has been held in science museums in Taiwan. Training cource for school teachers were also held in Taiwan. In the presentation, the status of the international collaboration with Dagik Earth will be introduced, and the method to enhance the collaboration will be discussed.

Keywords: Digital globe, Education/Public Outreach, Internationalization

Introduction of stone painting as an outreach tool of geology for children

*Takeyuki Ueki[1]

1.Faculty of Risk and Crisis Management, Chiba Institute of Science

Stone painting is an action of painting picture on natural stone. In 2015, I lectured stone painting for parents and children in the summer vacation event of local organization, and children in the science festival of elementary school. Both children and parents could enjoy stone painting and only 30 minutes or more was necessary. Everything needed for stone painting, for example, acrylic paint are sold in one coin (100 JPN) shops. Questionnaire survey indicated that almost all of participants were satisfied with stone painting. Stone painting is convenient outreach tool of geology for children.

Keywords: Geology, Outreach, Children

Contents improvement and circulation of geographical field excursion using storytelling maps

*Yuichi S. Hayakawa[1], Naoko HASEGAWA[2], Rina Sato[3]

1.Center for Spatial Information Science, The University of Tokyo, 2.Ochanomizu University, 3.Graduate School of Frontier Sciences, The University of Tokyo

Geographical field trips (excursions) are frequently carried out in various places with guidance by geographical or local experts, but such opportunities are not always open to a vast amount of people because of the limitations in timing and number of participants in an event. Whereas, aggregation and diffusion of various information through Internet services including online maps and SNS (social network service) seem to have a potential to contribute to the widespread adoption of the content (knowledge) of geographical field trips, although such “virtual” showcase may not often remain in the mind of viewers. In this study, we test the validity and efficiency of online-based story maps that integrate geographical field trip contents as a “story” to enable its virtual experience for general people. In such story maps, discrete geographical knowledge strongly related to place can be effectively connected in a timeline or "spaceline", in which a viewer can follow the story as a virtual experience to enhance its impression. This system also has a potential of offering the opportunity for such people to follow and experience the “real” field trip by following location- and timeline-based stories shown on the online maps.
The workflow of the present study consists of 1) implementation of a field excursion, and 2) the development and online publication of the excursion content. First, in the excursion carried out in the field, diverse types of information provided by expert guides are collected using digital cameras, voice recorders and a GNSS receiver. Next, with support of Kiki-kaki Map software, the GNSS logs are temporally and spatially associated with audio and image data, and text information is manually added to the image data. These organized image, voice and text data are put into online maps (ArcGIS Online and PhotoField) and the characteristics of each system are compared to optimize the workflow. Text and image data are also collected in the field using an SNS (Twitter), some which are also compiled into the online story map. Established online story maps are also assumed to be used by other users, who will be able to follow the story that is shown in the online map with an ability to access to the excursion content in the field, enabling individual field excursion. In addition, the impressions of the users at this time are also collected using the SNS to be utilized to enhance the excursion content.
We show a case study of geographical field excursion held in June 2015 at Narimasu (Tokyo) and Wako (Saitama). From the comparison of story map services, their advantages and disadvantages are summarized, and the enhancement of the above workflow is provided. As a result, the guide contents of the excursion (expert knowledge) are arranged into a time series on the map, showing the usefulness of a story map with a high accessibility by a large number of people. It is also suggested that the information aggregation through SNS can additionally contribute to enrich the excursion contents by the participants (a variety of opinions and impressions) as a collective intelligence. This system is expected to be in possible use by more general tourist information and school education. This study is supported by JSPS KAKENHI 26560154.

Keywords: field excursion, social network system, story map, location information, expertise knowledge, collective knowledge

Analog model of the Alluvium incised-valley topography under the Nakagawa Lowland, central Japan

*Masaki Takahashi[1], Susumu Tanabe[1]

1.Institute of Geology and Geoinformation, Advanced Industrial Science and Technology

It is commonly discussed the difficulties on promoting the geologic results for the students as well as citizens. To solve this problem, we made three-dimensional analog model of basement structure below the Nakagawa Lowland. The horizontal scale of model is 1/50,000 and vertical scale is emphasized as 1/1,000. The model was painted by gradations in color from yellow (Shallow) to dark blue (deep), so that it can be easily recognized the contrast between subsurface steep precipice and gentle slope of basement structure. Among them, the Ayasegawa Active Fault is characterized by sharp drop of basement depth below the Kanto Plain. Thus the analog model of basement structure below the Nakagawa Lowland would be helpful to understand why short-period ground motion is amplified in such incised-valley.

Keywords: outreach, geology, educational promotion

Environmental analysis with micro shells and environmental education by using shells thrown up to the seashore - Osaka Nature Conservation Association "Micro Shell Project"

*Miyoko Shibazaki[1]

1.Graduate School of Science,Osaka City University

"Micro shell" is a kind of shell with only a few millimeters even if it has grown up. There are quite a few species in micro shells, but it is not well-known to general people. As a part of activity of "Micro Shell Project" of Osaka Nature Conservation Association, we held nature observation meetings and leader skill up workshops, developed educational programs and web encyclopedia, and surveyed seashores in Japan. Moreover, we have been making effort to survey seashore in various place in Japan and to prevail environmental educational programs by using thrown up seashells.
The shells which live at the bottom of the sea have less motion ability than other organism such as fishes, so they get more influence from natural surroundings and are useful as good environmental barometer. Especially in micro shells, there are various life style, such as floating and adhesiveness, in micro shells. Their feeding habits are also various.Some eat by ripping off ell grasses and seaweeds, others do by filtering plankton, are carnivorous or are carrion feeder. And the population and the species composition are affected by the shape of the seashore, the material type (e.g. rock and sand) of the bottom and the flowing of ocean currents and tides.At the coastal region, ecosystems in various habitat such as shore reefs, sandy beach, seaweed beds and tidal flats intricately interact each other and inhabit together.
So it is necessary for our understanding various biocoenosis and seasonal variation to understand each micro habitat. Quite a few micro shells are often thrown up to the seashore. Wide range of people from children to old persons can observe them because gathering samples is easy and such activity doesn't require any special tools such as a snorkel. Moreover it is useful for understanding the difference of each seashore and the role of natural environment.
The composition of species may vary according to the geographical feature of the research point and the weather even if they are in the same seashore, because the thrown up condition varies by the shape of seashore, surrounding geological feature, the amount of soil from rivers and weather. Regardless of the variety, survey of thrown up shells can be used for the comprehensive environmental evaluation of coastal area. In this presentation, we report the outcome of Micro Shell Project, such as micro shell species list, the feature and the environmental evaluation for each seashore. The surveyed points are following: Suma-kaigan (Hyogo pref.), Ozaki-kaigan (Osaka pref.), Wakaura (Wakayama pref.), Masuhoura (Ishikawa pref.), Yuigahama (Kanagawa pref.), Kotohikihama (Kyoto pref.). And we also refer environmental education by using micro shells.

Keywords: Micro shell, environmental educational programs

Past, present, and future of aurora and human society

*Ryuho Kataoka[1]

1.National Institute of Polar Research

We introduce our outreaching activities of Aurora 4D project (https://aurora4d.jp). Aurora 4D project is a collaborative challenge among different fields of humanity, natural science, and citizen science. We are archiving the eye-sighting records of aurora phenomena in old writings, as well as mapping the digital images of aurora uploaded to internet by people in present society. The interesting records of worldwide expansion of special aurora activies are important to understand the physics and to mitigate the related space hazards, and it is interesting to discuss the history, and background of people at that time.

Developments of teaching and outreach tools of world sand collection in Kochi Core Center. - Usefulness of sand sediments-

*Miho Sasaoka[1,2]

1.SASAMI-GEO-SCIENCE, Inc., 2.Kochi Univ.

Kochi Core Center (KCC : Kochi Univ. / JAMSTEC) is the organization to research and store drilling-core samples. KCC has hosted teachers and students of elementary, junior-high and high-schools as well as scientists. For outreach works, we are developing a tool, using sand sediment samples that were collected worldwide
"Sand" is very informative material about the Earth and familiar for us. Here I present our plan to develop the tool of the sand samples and to explore quality outreach and teaching works. I would like discussion to improve outreach and teaching works for Earth science.

Keywords: teaching materials for outreach, Kochi Core Centre, sand samples

Earth and planetary science education on the Internet: Tokyo Tech's first MOOC, "Introduction to Deep Earth Science"

*Shoh Tagawa[1,5], Koji Tazawa[2], Haruka Sakuraba[1], Yoshiyuki Okuda[1], Hideki Mori[3], Jeffrey Scott Cross[3,5], Kei Hirose[4]

1.Dept. of Earth and Planetary Sciences, Tokyo Institute of Technology, 2.Dept. of Industrial Engineering and Economics, Tokyo Institute of Technology, 3.Online Eucation Development Office, Center for Innovative Teaching and Learning, Tokyo Institute of Technology, 4.Earth-Life Science Institute, Tokyo Institute of Technology, 5.Academy for Co-creative Education of Environment and Energy Science, Tokyo Institute of Technology

Recently, massive open online courses (MOOC or MOOCs) have gained wide-spread attention as a new educational platform delivered via the internet. MOOC is defined as "an online course that is open to anyone with internet access" and many leading institutions all over the world have provided many fascinating courses in various fields. Students enrolled in MOOCs study their interested topic in a course not only by watching video lectures, reading texts, and answering questions, but also by utilizing interactive online tools such as discussion boards, Q&A sessions and peer assessments. MOOC is also gaining popularity as a way to do outreach activity and diffuse research results.
Tokyo Institute of Technology provided its 1st MOOC, "Introduction to Deep Earth Science Part1", on edX, which is one of the largest MOOC providers. This four-week-long course was designed for 1st year college students and with two learning goals in this course; 1) to introduce students to the fascinating knowledge of solid Earth, 2) to provide an opportunity to use scientific thinking as well as to show how interesting and exciting science can be. This course contained materials such as 1) structure of inside of the Earth 2) internal temperature of the earth and how it is estimated and 3) chemical compositions and dynamics inside the earth.
In this presentation, we will share details on the course and feedback received from some of the 5000 enrolled students from 150 countries and regions. Furthermore, we will explain our MOOC making model, which is a team based course creation effort between the course instructor, Tokyo Tech Online Education Development Office (OEDO) staff and student teaching assistants (TA).

Keywords: online education, MOOC (massive open online courses), outreach, solid earth, high-pressure geoscience , career education for young scientists

"Intermediate term forecast" based on seismic intensity data base for understanding the usual seismisity

*Tetsuro Imakiire[1], Naoji Koizumi[2]

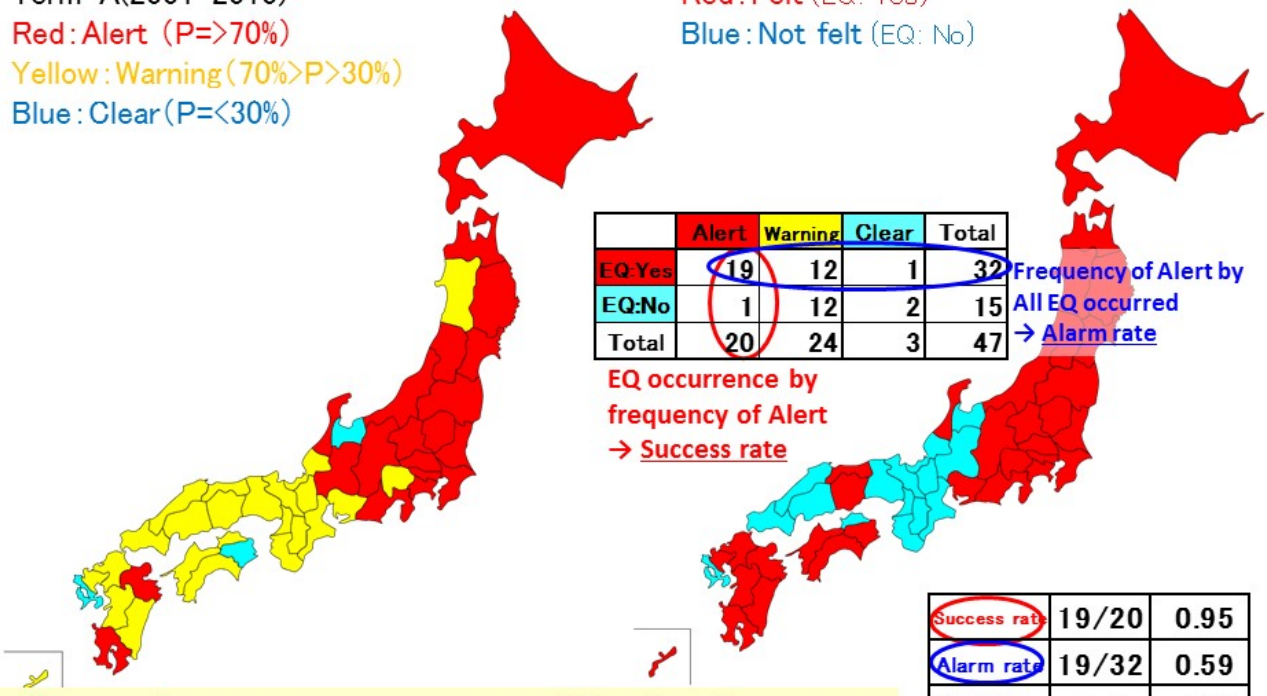
1.GSI of Japan, 2.School of Enviromental Scinece, The University of Shiga Prefecture

It is preferable to determine the individual action for seismic risk mitigation based on the correct knowledge of earthquakes. Although no reliable method to forecast the great earthquakes, which would cause serious damages, in short term, some seismic hazard information such as probabilistic hazard maps by the Headquarters for Earthquake Research Promotion based on long term evaluation of the seismic activity are released. However, these long term evaluations mainly show the probability for several decades or longer term. It would be difficult to imagine the risk for the citizens, when they see the caption which says "Probabilities of ground motions equal to or larger than seismic intensity 6 Lower, occurring within 30 years from the present", within the everyday life time. On the other hand, people may experience some earthquakes with intensity 4 or 5 lower, which would not cause any damages, within several years or months. The memories of these earthquakes would continue, as they feels such earthquakes rather frequently. Even if the intensity felt at their own residence would not be so strong, the news informing the strong intensity in the same prefecture should impress the people to trigger the consideration on risk management for the earthquake, personally.
The purpose of introducing the "Earthquake forecast" in our report is NOT to propose an original physical model nor statistical model developing the reliable method for earthquake forecast or prediction through the scientific discussion. The main purpose of this report is to introduce simple example to citizens to understand the common seismic activity based on the usual seismisity data. Therefore, we choose the seismic intensity database of JMA, not the earthquake catalog, to provide the parameters for our model, as intensity is easy to imagine the effect of earthquake, personally. The probability to feel fairly strong earthquake within several month to one year would be shown in a simple format understandable by anybody. Such kind of simple information would be helpful to realize the usual seismic activity, as well as to consider the individual risk mitigation action imaging the more destructive and less frequent earthquake occurrence.
The statistic model used for the "forecast" is Homogeneous Poisson Process, which presume minimum number of a priori parameter, the average recurrence term of the events based on the record of past events. We will show the example of "Intermediate term forecast" as the target term with three months and one year for 2015, and unit areas with each prefecture (Fig.1). As the evaluation of the "forecast" shows that the "Success rate" is around 70% to 90% and the "Alarm rate" is over 50%, it would be appropriate to understand usual seismic activity through this "forecast" like idea.

Keywords: Seismisity, Earthquake forecast, Seismic intensity data base, Homogeneous Poisson Process

One year "Forecast" for 2015
based on the seismisity of
Term-A(2001-2010)
Red : Alert (P=>70%)
Yellow : Warning (70%>P>30%)
Blue : Clear (P=<30%)

Result :EQ felt in the prefectures
over intensity level 4 during 2015
Red : Felt (EQ: Yes)
Blue : Not felt (EQ: No)



	Alert	Warning	Clear	Total
EQ:Yes	19	12	1	32
EQ:No	1	12	2	15
Total	20	24	3	47

Frequency of Alert by All EQ occurred → Alarm rate

EQ occurrence by frequency of Alert → Success rate

Success rate	19/20	0.95
Alarm rate	19/32	0.59
"Safe" rate	2/3	0.67

"EQ: Yes" means one or more earthquake(s) was(were) felt and "EQ: No" means no earthquake was felt during 2015 in that prefecture.

Fig.1 One year "Forecast" and "Result" for 2015

The practical effect of water environmental education using groundwater flow model

*Seongwon Lee[1], Yorinao Shitaoka[1], YOHEI SHIRAKI[1], Kitazawa Toshiyuki[1]

1.Department of Environmental Systems, Faculty of Geo-Environmental Science, RISSHO University

It is essential to understand groundwater flow and material cycle accompanying it to understand the hydrological cycle/material cycle on land. Unfortunately, directly confirming the flow of groundwater is impossible because groundwater flows under the ground where we cannot observe it. Therefore, there are several things that are difficult for people to understand regarding groundwater, which results in incorrect interpretations or the incorrect image of it in many cases. In particular, for students who have grown up in recently urbanized areas, tap water is recognized as domestic and commercial water, which means that they recognize that water comes out when the faucet is turned on. In fact, there are many students who have never seen a well as a domestic and commercial water.

Making these students understand groundwater flow and the material cycle accompanying it is extremely difficult. This is because making someone understand a phenomenon that they have never seen before is complicated.

Making students understand groundwater flow is a very important theme. If they do not understand groundwater flow, it is impossible for them to understand the material cycle accompanying it and the contamination process. Primarily, making the students understand the concept of water as a courier of various materials is considered to be a very important theme for future water environmental education and environmental conservation.

Accordingly, in this AP program, a Groundwater Flow Model (GFM) is used as an educational tool wherein the flow of groundwater is visualized and after conducting classes to make the students understand groundwater flow and the material cycle accompanying it, the results are reported here.

Keywords: groundwater flow model, material cycle, water environmental education, groundwater, hydrological cycle

Learning Skills expanded form Saturday Lecture “Earth and Planetary Sciences” at High school (the Evening Course)

*Keiji Hisayoshi[2,1], Maki Taniguchi[2], junichi Esuga[2]

1.Dept. of Earth and Space Science, School of Science, Osaka University , 2. Kasugaoka High School

Osaka prefectural evening course high school has started a lecture on Saturday targeted for all the grades and the another school's student. The Saturday lecture "Earth and Planetary Sciences" is established as an open class of a general target from 3 years before at Kasugaoka high school (the evening course). We're lecturing on 15 times a year and 2 hours for once (90 minutes) in "Earth and Planetary Sciences". The current research of the earth, a planet, the universe and the life are offered so that a student may show the interest.
Kasugaoka high school cooperates with Osaka University, Naruto University of Education, Tsuyama technical college and JAXA. Therefore, it's possible to lecture on the quality highly. Further, a lecture as" investigation" is established and experimental work is performed. We expect that students get a scientific approach and objective perspective by working on an unsolved problem. We plan to do such investigation activity with teachers of elementary and junior high schools.

Keywords: High School (the Evening Course), Saturday Lecture, Open Lecture, Earth and Planetary Sciences

