

## Global circumstance on Geopark

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The concept of Geopark is getting to be known to wide range of people in many countries including Japan, such as researchers, citizens and officials in both municipal and central governments. Every people has every point of view on Geoparks. This situation will contribute to improve the concept of Geopark through the discussion of wide range of people.

Global Geoparks Network (GGN) and UNESCO are discussing about the formal link between them in the working group composed of member country and GGN hosted by Ecology and Earth Science division of UNESCO. When the formalization of Geopark in UNESCO is achieved the present style of evaluating Geopark by GGN may change. As a UNESCO program, support to the least developing countries that try to establish Geopark is important and necessary. The discussion between member countries and GGN is good opportunity to review the activity of Geopark until present with the point of view from outside.

In Japan, on-site evaluation by scientists and manager within Geoparks as well as members of Japan Geopark Committee (JGC) has started in 2012. It was a start of the peer review process between geoparks. Discussion on the policy to evaluate geoparks and candidate areas is getting more active since last May when first meeting on the evaluation policy between evaluators from JGC and geoparks. In those discussion they actively discuss on where Japanese geoparks go and how to promote geopark activity.

The author will present the situation around Geopark as mentioned above and propose issues that should be discussed in the Japanese geopark community.

Keywords: Geopark, UNESCO, Global Geoparks Network, Japanese Geoparks Network, Japan Geopark Committee

## Geoscience in Japanese Geoparks: Significance of Multidisciplinary and Interdisciplinary Geostories

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Geoparks target all geoscientific disciplines consisting of space and planetary sciences, atmospheric and hydrospheric sciences, human geosciences, solid earth sciences, and biogeosciences, presented as the science sections in Japan Geoscience Union (JpGU). In JpGU, academic meetings of geoparks have been held in the public session since 2010 and the multidisciplinary and interdisciplinary session since 2012. However, geostories of Japanese Geoparks Network (JGN) are likely to incline toward specific themes based on URL information uploaded on the JGN official website. Especially, physical geography, such as climatology, hydrology and geomorphology, seems to be slighted in many Japanese geoparks. Physical geography, studying interaction among atmosphere, hydrosphere and geosphere in multidisciplinary and interdisciplinary scopes, should be given more consideration in all Japanese geoparks.

Keywords: geoparks, geostory, geoscience, physical geography, Japanese Geoparks Network, Japan Geoscience Union

## Provision of the Risk Information for Geopark guests in Japan

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The exact provision of risk information are important to geopark guests. The possible of the risk on the guests are consulted with the statistical police white paper of the mountain accident in Japan. The consideration shows that the major risk factors on geoparks are fall and slip drop, encounters with dangerous animal and rock fall. However, it is impossible to find an alert, description and discussion regarding their risks in published articles and books which specialized in the geopark activity. Furthermore, more than two thirds of the official geopark websites are devoid of the provision of the risk information. Even the remaining one-third place some simple or little paragraph of hazardous issue. For the safety administration with the advertising of attractiveness of geopark, effective provision through the official websites and printed materials are required in the future.

Keywords: geo-site, geo-tour, alpine accident, alert, accountability, official website

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MIS35-04

Room:211

Time:May 2 11:45-12:00

## Democratic governance of the Japanese geopark movement

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Japanese geopark movements needs separation of powers. I would like to propose a model for the governance of a Japanese geopark movement.

Keywords: Japanese Geoparks Network, Japan Geopark Committee, academic society, science communication, bottom-up

## Program of Treasure Stones : Making an original rock specimen using a virtual geotour -

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We developed a making a rock specimen combined technique of a virtual geotour. To practice this program, a presentation file explaining highlights of geosites, rock samples and an original sheet which put on rock samples. To finish the program within 30 minutes, we limited 5 geosites in explanation and number of rock samples was 10. We carried out this program at Science Agora, which is a big scientific festival holding at Nihon Kagaku Mirai Hall in recent 2 years.

Participants of the program was mainly school students. They selected their favorite stone samples put them on the original sheet with a bond. In the virtual geotour, we explain not only rocks and landscapes but also relationship rock and people, histories of geosites and local foods using local special products. In 2012, we carried the program out with Shimonita Geopark and 151 participated (Sekiya, 2013). In 2013, 129 persons participated the program nevertheless a number of participates was limited. This program was almost popular with participants and received the Science Agora Award in 2012. Furthermore, this program became the fifth place in all programs by a guest popularity vote in 2013.

This program can be carried out regardless of a place, if machine parts and a place are set. And because people participating in this program have many families, various age groups can publicize the highlight of the Geopark. If participates get interests for the geopark, it is expected the increase of tourists of geopark area. In 2014, we hope some of geoparks join the program in Science Agora.

Keywords: Unzen Volcanic Area Global Geopark, virtual geotour, rock specimen, Science Agora

## Development of the textile with a geological map motif-To carry back geo-stories from geopark or natural history museum

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The textiles with the Seamless Digital Geological Map of Japan (1:200,000) motif were launched September in 2013. These textiles were developed under the two basic concepts such as making a superior textile by using the geological map as a design of the earth, and the other is making the product which the visitors can carry back a geological story home from natural history museum or geopark. To achieve these concepts, it was important that a designer cooperated with a geologist.

The textiles were developed with Nikko area of the Seamless Digital Geological Map of Japan (1:200,000) motif. The designer changed the color of each legend of the geological map on Geographic Information System (GIS) software and printed it on cloth. The products contained a handkerchief, a porch, and a mini-tote bag with purplish, greenish and pinkish colors each. Because the cloth for product is clipped out from the large cloth which a geological map was printed on, there are 10 areas of porch or 3 areas of mini-tote bag from one printed cloth. As a result, we made the many kinds of textiles such as 3 kinds of handkerchiefs, 30 kinds of porches and 9 kinds of mini-tote bags.

Since the Seamless Digital Geological Map of Japan (1:200,000) is a digital geological map made with a uniform legend throughout Japan, anyone can cut out any local geological map from it. Therefore, it is possible to make the product of the different design every area. If these textiles are made in each geopark, the visitors can carry back the textile with special stories of the geopark.

It is easy to make the T-shirts which a geological map was printed on now. However, it is difficult to make an attractive commercial product, and only an attractive product in cooperation with a designer increases the number of customers. As a result, the product with the geologic map increases the number of people who are interested in geology.

As we push forward a plan to make a product with the geological map of another area motif now, the new products are released soon.

Keywords: textile, geological map, geopark, natural history museum, GIS, geographical Information system

## The accretionary prism experiment for geoparks using powdered sugar, cocoa, and a cooking paper

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The analog experiment for understanding an accretionary prism was developed. The experiment is developed for children, students, and the tourists of geoparks. The experiment is simple and is using only familiar materials, such as powdered sugar, cocoa, and a kitchen paper.

Accretionary prism is usual in the Japanese geoparks. But, it is difficult to explain the mechanism of accretion to a child and a student, and the tourist of a geopark.

The accretionary prism experiment proposed until now had a thing adapting a sand box experiment (2004 besides Yamada, 2006, and Kaneda), and flour fault experiment (Okamoto, 1999, 2000).

<The method of an experiment>

Ingredients: powdered sugar, raw cocoa, creep, a cooking paper, a tea strainer, a spoon, a paper cup, the lap for kitchens, papier-mache.

Directions:

1. Papier-mache is wrapped in a lap to make continents.
2. Cut cooking paper into about 40 cm.
3. Build the layer of cocoa (the thickness is around 2mm) on an cooking paper using a tea strainer.
4. Sprinkle powdered sugar with a tea strainer on the layer of cocoa. The thickness is around 2 mm.
5. Wrapped papier-mache "continent" is set at the end of a cooking paper.
6. Sprinkle milk over the continent and continent side of the layer of cocoa and powdered sugar.
7. A cooking paper is pulled.
8. Cocoa and powdered sugar are added to a continent and duplex structure is formed.
9. Put cocoa, powdered sugar, and milk into a paper cup collectively, and pour out and process hot water to make cocoa drink.

Keywords: geopark, accretionary prism, analog experiment, kitchen experiment

## Approach of Educational Activities in Hakusan Tedorigawa Geopark

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The Hakusan Tedorigawa Geopark which was certified as a Japanese geopark in 2011 sets the theme "the journey of water" (water circulation seeing the Tedorigawa River) which is generally easy to understand. The geopark highlights the sites related to earth sciences, nature, people's lives and culture such as fossils, debris flow, an alluvial fan, brewing industry and "haiku" (Japanese poetry).

We have been utilizing these sites for children's education since the beginning, and promoting the activities in school education to popularize the geopark to children. Our aim is also on sustainable local activities.

Although it is said that teachers which don't have the know-how to teach children in the fields have been increasing, the new educational government guidelines given notice in March 2008, show that teachers need to teach children in the nature and daily lives. The activities of the geopark correspond with the guidelines, and it seems that we need to assist the teachers who have less time to study the new course. Study Supporters, who are retired science teachers, have been supporting teachers in the geopark. We aim to teach children in the fields only by in-service teachers.

Keywords: Hakusan Tedorigawa Geopark, educational activity, school education



## Introduction of teaching and materials the theme of Geo, and Disaster awareness of high school students in Shizuoka

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### [Introduction]

Science and Environmental Education Project (SEEP) , such as researchers, nature guide school teachers work together , we have developed educational content on the theme of natural science (Tsuda, et al. , 2013 ) . Developing Model class and geoscience materials 12 types aim it at the Izu Peninsula Geopark human resources development projects , and performed on the geo- guide with more than 150 people and described in three years , that capture the characteristics of the earth in Shizuoka Prefecture getting high marks from geo- guides of almost all .

We researched as " Fuji Disaster prevention Fellow training course " , a statistical study of disaster prevention survey of model class.

### [Method]

The subjects were about 320 students in high schools in Shizuoka Prefecture.

As a method we used, hands-on educational materials, interpreter, communication, sub- materials, learning worksheet.

Specifically, you have used the materials of three main lessons. Experimental observation and for each group a stone of four areas of Shizuoka Prefecture, select the age quiz that is specified in the introduction. It captures the age order in the puzzle by geologic province of Shizuoka Prefecture, including the area of each rock is in the deployment. Conclusion, I confirmed the origin of the earth in Shizuoka picture-story show the history of the land in Shizuoka (wood panel) or not there was any such events to the geological era.

### [Results]

In order to know the understanding of the individual, the question, "earthquake", "plate", "Nankai Trough earthquake in the past", "Mount Fuji eruption", "active volcano in the prefecture", "rock in the prefecture", "Geopark". We found that that is not known for most of the Geopark in high school outside of Geopark area.

It resulted in materials (60%) interest in the interpreter (22%) accounted for many, teaching increases the interest geology, geo-on (earth) as the reason

It is expected that by the SPSS statistical analysis, to present a detailed analysis of the data in the announcement.

Keywords: Geoscience materials, Geopark guides training programs, Visiting lectures in high schools, Disaster awareness

## Progress of school education through Geopark Studies in the Itoigawa Global Geopark

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Geoparks are parks where visitors can learn about the relationship between mankind and the earth, but they are also part of a movement to develop sustainable regional societies. Education is regarded as one of the most important elements of the Geopark Movement which includes a system to foster the human resources that will manage our sustainable society in future. Itoigawa has begun to construct a sustainable regional society since Global Geopark certification in 2009. The Itoigawa City Board of Education recognized the important role of the Geopark in school education and has included a Geopark Studies program within the compulsory education (elementary and junior high school) curriculum. The first action was to establish a new education plan called the Unified Education Policy for Children Aged 0 through 18 in 2009 in which Geopark Studies was first introduced. Since then, the City Board of Education's continuing support of Geopark Studies has provided the following results: (1) Number of staff member of the Science Education Center has been increased and a Geopark Department has been established in the Itoigawa Teachers Organization's Society of Education Research. (2) Training programs (outdoor and indoor) have been held by these organizations and the Itoigawa Geopark Council, showing educators how geoparks can be used for classroom education. (3) City-wide Geopark Studies Conferences have been held to give students a chance to share what they have learned. (4) Supplementary textbooks for grades 3 through 9 have been published and distributed by various editorial boards, providing invaluable resources for the study of earth science and history as well as regional culture. (5) Geosites have been equipped with information panels and leaflets which cater to school education. (6) The Geopark has become a valuable tool in the teaching of disaster prevention, with a local elementary school receiving national and prefectural awards for its efforts. (7) Every first Wednesday of each month has been set as the geo school lunch date which features regional cuisine made with local ingredients to allow students to learn the relation of Itoigawa's land, cuisine and local produce. (8) And finally, an exchange program has begun for elementary and junior high school students with Itoigawa's Sister Geopark in Hong Kong.

Keywords: geopark, school education, Itoigawa

## CPD program for improvement of guide skill in the San-in Kaigan Geopark

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San-in Kaigan Geopark is the largest global geopark in Japan and there are thirty guide groups in the geopark. Some group members which receive following training programs are registered as official guides of the geopark. (1) Principles of geopark and outline of the San-in Kaigan Geopark, (2) Geology, geography, biology, history and others in the individual area, (3) Manner and technique of guide, (4) Conservation and related ordinances, and (5) Emergency resuscitation methods and system of insurances. License of the official guide is renewed every three years. They must participate at least fifteen seminars and events and improve the skill to guide the geopark during valid period of the license.

It is not easy to prepare enough programs for all official guides because of the wide area of the geopark. On the other hand, there are many educational facilities represented in the San-in Kaigan Geopark. They have many lifelong educational programs independent to the guide training of geopark. But some of them are available to upgrade the guide skill. Accordingly, CPD (continuous professional development) system has been adopted as the improvement program of the official guides in the San-in Kaigan Geopark. Official guides of geopark take the programs provided as CPD program by the educational facilities and they get a CPD-point. Not only such seminars but promotion to out-reach events (symposium, caravan, festival and others) and participation to national and international geopark conferences (GGN, APGN, EGN, JPN and others) is available to CPD-point. In order to renew the license of official guide, they must have fifteen CPD-points in three years.

CPD-program have following effects: (1) Securing of improvement programs for guide, (2) Exchange between people and geopark guides, (3) Deepening of interesting to guide activities, and (4) Development of lifelong education in the geopark.

Keywords: geopark, San'in Kaigan, continuous professional development, lifelong education

## Restoration of the coastal geo-environment along Tottori Sand Dunes

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Along the coast of Tottori Sand Dunes, south-west Japan, dimensions of offshore bars were illustrated from air photos taken in 1968-2008 at 5 year intervals and grain size distributions at berm crests on the beach have been investigated over a half century since 1955. The results show that beach environments have been restoring naturally after damages induced by human activities, such as sand and gravel harvesting in the Sendai River during 1960-1975, which had caused diminishing of offshore bars, coastal erosions and beach sediment coarsening ( $>1.0$  mm) at 1980's and finally vegetation covering of the Tottori Sand Dunes. After stopping sand and gravel harvesting, large floods occurred in 1998 and 2004. These floods transported lots of sediment from upper parts of the drainage area to the main Sendai River. Around 2000, offshore bars along the coast became larger and grain sizes on the beach changes finer ( $<0.4$ mm) after 2011. These grain size values are similar to those in 1955. We are expecting that weeds on the Tottori Sand Dunes will relief naturally by activating blown sand. These phenomena are a good story to get visitors notice well-coordinated natural systems as a geo-park site in the San'in-kaigan Global Geo Park.

Keywords: Tottori sand Dunes, weeding of sand dunes, offshore bar, grain size distribution of beach deposit, sand and gravel harvesting, changes over a last half century

## Various effects that the shape of volcano has brought to the local area: an example of the Takachihonimine volcano

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When it comes to a volcanic blessing, it will be reminded of hot springs, spring water, and geothermal energy in many cases. However, these are only partial views of the blessing of a volcano directly useful to a life of people. In order to know deeply what kind of benefit the volcano itself has brought human society, it is necessary to see a volcanic blessing from many sides. As the beginning, this study focuses the shape of volcano.

The Takachihonimine volcano located at the eastern part of the Kirishima Volcano Group, SW Japan is the stratovolcano formed about 7,000 years ago, and has an acute summit and twin volcanoes on its both sides. Such a magnificent shape of the volcano is often dealt with as an icon of Kirishima, and is expected to have brought great influence to people's culture, a sense of values, and a religion view. In this research, I investigate where and how the influence of the topographical features of the Takachihonimine volcano has worked.

Keywords: Kirishima Volcano Group, Takachihonimine, Volcanic blessing

## The Activities of MLIT on the Hakusan Tedorigawa Geopark

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The national flood control project in the Tedorigawa River by MLIT (Ministry of Land, Infrastructure, Transport & Tourism) is deeply related to the Hakusan Tedorigawa Geopark themes 'the journey of water and rocks'.

Some sabo structures in the geopark, constructed in the early Showa era, are designated as a Civil Engineering Heritage and as Registered Tangible Cultural Properties. MLIT, as a member of the Hakusan Tedorigawa Geopark Promotion Council, offers learning opportunities that allow people to look closely at these structures.

A massive flood, the most disastrous in history to that point, occurred in the Tedorigawa River in 1934. A huge rock known as the Shiramine Hyakumangan-no-iwa Rock (literally 4,800 ton rock) that cascaded along with it now sits neatly in the middle of the river. It is a reminder of the sheer scale of the event and is visited on elementary school field trips or on the geo-tours.

Opened in 2001, the Hakusan Sabo Science Museum introduces scientific information on landslide control measures based on the nature, geology, history, and lifestyle of Mt. Hakusan through video and exhibits in cooperation with the Hakusan Tedorigawa Geopark Promotion Council and is visited annually by more than 10,000 people.

The Ishikawa Coast Field Museum, managed in collaboration with the geopark, is an outdoor museum located on a coastal area that offers information on local history and the formation of the coast.

Keywords: Hakusan Tedorigawa Geopark, "Journey of Water", "Journey of Rocks", Sabo at Mt.Hakusan, Ministry of Land, Infrastructure, Transport & Tourism

## The link among Geopark, Biosphere Reserve, and National Park in Hakusan, Japan

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Mt. Hakusan (2,702m) is an independent mountain on the Japan Sea side of Central Japan. An area extending over 4 prefectures (Toyama, Ishikawa, Fukui, Gifu) was designated as a national park in 1962, and as a biosphere reserve in 1980 by UNESCO. In 2011, the whole area of Hakusan City (in Ishikawa Prefecture) including the peak of Mt. Hakusan was designated as a Japanese geopark. Therefore, 3 systems on conserving and utilizing nature became to coexist in Mt. Hakusan, and since then, the link among these three is not only a complicated issue but a big chance.

National Parks are locations where human activities are restricted to protect the superb natural landscapes that are representative of Japan and where facilities have been installed to provide essential information and other functions to help visitors come in closer contact with nature (31 national parks in Japan). Biosphere reserves are sites seeking to reconcile conservation of biological and cultural diversity and economic and social development, recognized under UNESCO's Man and the Biosphere (MAB) Programme. To make the 3 functions (conservation, development and logistic support) effective, they have 3 zonations; core area(s), buffer zone(s), and transition area (5 biosphere reserves in Japan). Geoparks are sites enjoying earth and geotourism, supported by UNESCO (6 global geoparks and 27 Japanese geoparks in Japan).

Biosphere reserves and geoparks are both aiming at sustainable development. They attach importance to not only conservation but also utilization of nature, in contrast with the World Heritages. In addition, both form global networks each, which support each site together and diffuse their ideas. However, you can find some differences between these two. For instance, biosphere reserve is an official program of UNESCO, while geopark is a program supported by UNESCO. And the largest difference is that biosphere reserves pay most attention on ecosystems when geoparks pay most attention on earth.

However, they are not only focusing on ecosystems or earth, but they are also focusing on their connections formed with culture or lives. For example, there is a settlement called Shiramine around Mt. Hakusan, located on the river terrace which is a limited flatland in this mountainous area. In Shiramine, fire burned fields were established and forestry was conducted, which could say as a utilization of both topography and biological resources. In the summit of Mt. Hakusan, we could see various alpine vegetations affected by some topographical factors such as the quantity of snow or the formation of the earth. The earth, ecosystems and culture are connected tightly, which connection will be more clarified by both biosphere reserves and geoparks. From this context, you can say that geotours and ecotours might be held as same tours such called geo-ecotours, as it were which Koizumi (2011) said.

National parks are underlying biosphere reserves and geoparks. Both remain under national sovereign jurisdiction, but on the other hand are requested to take effective measures of nature conservation by each state's laws. National parks are representative institution of conservation in Japan, which have some zonations to restrict human activities in phases. Besides, national parks carry out some activities that could be more attractive by cooperating with biosphere reserves and geoparks which have more precise themes.

However, this cooperation depends on the link among the 3 organizations. So in Mt. Hakusan, the secretariats of Hakusan Tedorigawa Geopark Promotion Council and Mt. Hakusan Biosphere Reserve Council are both carried out by Hakusan City, assigning the same staffs, to strengthen the link between these two. Moreover, Ministry of the Environment which manages national parks, takes part in both councils.

The link among the three has just started. We are aiming to create new values and attractions transmitting from Mt. Hakusan, using this beneficial opportunity.

Keywords: Geoparks, Biosphere Reserves, National Parks, Mt. Hakusan, Geodiversity, Biodiversity

## What we learned from the verification of the Dinosaur Valley Katsuyama Geopark reexamination results

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<sup>1</sup>Hirosuke Yoshikawa

We truly feel that reviewing the reexamination results of our geopark verification with local residents and geopark staff members provide us with the opportunity to fundamentally improve its construction. Furthermore, we can use these results to plan future initiatives and development strategies.

We will explain how we can fully utilize these results, such as raising the standards of the overall community and policies and efforts that Katsuyama should undertake as a whole.

Keywords: the reexamination results, our geopark's verification, development strategies, plan future initiatives



## Present state and Future outlook of Mishimamura Geopark Project

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<sup>1</sup>Mishimamura Village

Mishimamura Village intends to become a member of Japanese Geopark Network desterilizing its natural, historical, and cultural background. The village consists of three islands. The central island, Satsuma Iwo-Jima is located at the edge of Kikai Caldera, which erupted about 7300 years ago. Its volcanic, fumarolic, and hydrothermal activities are very good resources of tourism. In relation with these activities, historical sulfur mining, sulfur trading, and appearance on palaeographies are also good resources of tourism. In addition, a famous Kabuki actor comes to play because of historical background of the island, and famous djembe player comes to play djembe with children in the island. In spite of these interesting resources, the village has not constructed sightseeing tours that organize these resources. Here, the village started to desterilize these resources in order to vitalize the village. In this presentation, I will present our original approach and future plan to be a member of Japanese Geopark Network.

Keywords: geopark, caldera

## Introduction of the Nankikumano Geopark activity research project

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Various business (spread activity, utilization as education, tourist attractions, the Geopark guide training) is developed mainly on "Nankikumano Geopark promotion meeting" from 2012. "Nankikumano Geopark activity research project" was carried out to plan accumulation and the regional activation of the academic document of the Nankikumano Geopark design in 2013. As for this project, an individual, a local group, a private enterprise work on an academic investigation and the spread together in a Geopark design area.

Keywords: Geo-resources, Local promotion, Geo-tourism

## Plan to aim at the revival and activation of disaster region by disaster heritage of the Great East Japan Earthquake

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The coastal area of Miyagi Prefecture was destroyed almost completely on 11 March 2011 by the Great East Japan Earthquake. Now, many people are working hard and trying to recover from the destruction. As a member of the victims and as a researcher living in the affected areas, we are planning to create a Minami Sanriku Coast Geopark to the affected coastal areas, and to contribute to the reconstruction also.

Simultaneously with general subject such as a stratum, fossil, geographical feature and a cultural heritage, we use the affected heritage which was born in the Great East Japan Earthquake.

At the same time as the scientific understanding of an earthquake or tsunami, the reason to focus on these because we want to help local disaster management in the future. To date, we have finished the investigation of tour point of about 50 places. In the present talk we will focus on an example of Yamamoto town geosite located on the border with Fukushima Prefecture and Miyagi Prefecture.

Keywords: geopark, Minami Sanriku Coast, disaster heritage, revival, Yamamoto Town

## ”100 Earth Heritages” and its Geographical Concept

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### 1. The Association of Japanese Geographers and ”100 Earth Heritages”

Geopark Committee in the AJG aims to choose ”100 Earth Heritages”. They organized three symposiums and four questionnaire surveys. Furthermore, Committee of 100 Earth Heritages Selection has launched in 2012 and started the selection. This committee has members of the AJG who are both researchers of physical and human geographies. This article introduces a manner of the selection work for understanding a priority of value in Japanese geography.

### 2. Manner of 100 Earth Heritages Selection

The committee proposed questionnaire survey to members of the AJG several times in order to reflect their opinions in the selection. As a result, 264 places of proposed sites were shown (including some overlap); 155 from speakers and 40 from the audiences in March of 2012, 7 from speakers and 38 from the audiences in March of 2013, 20 from questionnaire respondents and 4 from questionnaire on the web. Based on the list of a total 264 places of proposed sites, the vote by the member of the committee and an argument were performed in July, 2013, and an 65 Earth Heritages were picked up. Enumeration and the vote of the new proposed site by the committee have been held again, and 33 Heritages were added afterwards. It has remaining two places at January 31th, 2014.

### 3. Contents of 100 Earth Heritages

In January 2014, 98 places of Earth Heritages are chosen. As for the Earth Heritages, 47 prefectures have one heritage at least. It depends on consideration in that the heritages should be used for geographical education in schools in Japan. However, on the other hand, the difficulty of the evaluation of the geographical value hides in the back of this consideration. In other words, geographical valuableness can insist on in area wherever of Japan.

### 4. Geographical Values from the perspectives of 100 Earth Heritages

For each heritage, the commentary sentence for choice reason is written. This article clarifies geographical value by considering the contents of the commentary sentence. The contents of sentences mostly consist of the plural sites. This is because a certain reciprocal viewpoint (story) was made between the sites. A nature and human reciprocal relations are seen in the contents. For example, in one of Yoshino River District, this district has mountains of steady sedimentary rocks and rivers cutting sharply between the mountains, this becomes the precondition of the creations of small and unique bridges for movements between the villages for settlements. Such nature and human relations are frequent in the commentary sentences of other heritages. In other words, it is thought that the geographical value from ”100 Earth Heritages” is these reciprocal relationships.

On the other hand, the contents of the commentary sentence can point out the problem, too. This article points out two dimensions. First one is seen in the contents. A writer of the commentary sentence is only physical geographer or humanities geographer. Therefore the contents are slightly deflected to physical or human geographical contents so that they should start to learn about each other’s fields. The second problem can point out that there is a giving an environmental determinism like impression for a reader, because a natural condition is described as a precondition in the sentence. So, it may be said that it is necessary for geography to discuss the environmental determinism. If the general relationship of a natural phenomenon and the humanities phenomenon is proved scientifically, it is one of the geographical directionality for Geoparks.

Keywords: Earth heritages, Physical geography, Human geography, Regional geography, Environmental determinism

## Activity support for the educational continuity from primary through early secondary levels in the Mikasa Geopark

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In the Mikasa Geopark, the educational continuity from primary through early secondary levels has been carried out since 2005. In this educational project, there is a subject "Regional Studies", which learns about attributes of Mikasa (eg., history, nature, and industry).

On the other hand, the Mikasa City Museum was established in 1979 to preserve materials of human, natural, and industrial histories of Mikasa. The curators of the museum have supported the subject "Regional Studies" as a museum activity since the first year (2005) of the educational project. Recently, the cooperation program between the educational and geopark activities is exploring.

In the presentation, we introduce the cooperation among the educational, museum, and geopark activities, and discuss the results and subjects.

Keywords: educational continuity, regional study, museum activity, geopark activity, Mikasa Geopark

## The effects of experience-based science and environmental education on Byobugaura geosite in Choshi Geopark

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Choshi geopark is certified by Japan Geopark Committee (JGC) at September 24, 2012. In this study, we will introduce the contents and the effects of geoscience education program for junior high school students using Byobugaura geosite in Choshi Geopark.

Choshi, located at the east end of the Boso peninsula, 100km east of Tokyo, Chiba prefecture, Japan, has many geological heritages that should be preserved and passed on to future generations. Representative geological features in Choshi are as follows. First, the Biobugaura geosite, comprising Pliocene and Pleistocene sedimentary rocks, is approximately 9 km in length and 30~50 m in height and faces the Pacific Ocean. This topography, which is also called "Dover in the East", consists of sharp cliffs formed by land erosion resulting from sea waves. According to a previous report, the speed of erosion is 5~6 m per year. To prevent erosion, seawall was constructed in 1966. The seawall was a necessity for the residents' safety even though it negatively affected the geo-heritage. Second, Inubouzaki geosite, the Cretaceous shallow sea sediments, designated as a government national monument, are exposed in the Inubouzaki coastal area at the east end of the Choshi peninsula. Third, the "Inuiwa" geosite, carried on the tradition of the "Yoshitune legend" which is a legend concerning a samurai warrior in the medieval period of Japan, are composed of Jurassic greywacke, mud stones, and conglomerates that includes calcareous coarse fragments with fusulina fossils.

Our education program using Byobugaura geosite designed it to be usable by a curricular science class of the junior high school, and it conclude for one day. The contents of this program compose two parts, the morning part contain geotour and tephra sampling in the Byobugaura geosite, and the afternoon part consisted of geological lecture and stereomicroscope observation of tephra constituents, e.g. volcanic glass and minerals etc.

The results of questionnaire analysis for participants show (1) this program is understandable for major part of attended students, (2) this program have good effects for induction of affection for local environment, and (3) this program increase desiring to learn for earth science.

Keywords: Geopark, Choshi, Science education, tephra, Byobugaura, Life cycle thinking

## Analuzing the Efficcy of Natulal Disaster Awareness Programs based on the Understand- ing of Geophysical Mechanisms

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Izu Peninsula was once a submarine volcano situated in the south sea. This area collided with Honshu with the Northward movement of the Philippine sea plate and formed a peninsula from about 10 Million years back.

After this land volcanism took place that formed multiple large volcanoes. In this geopark we made attempts to popularize earth science and disaster management by conqutting questionnaires with local schools. As a result we understood the efficacy of natural hazards education by using familiar examples. From the participants there were even demands for more information and more comprehensive training programs.

Keywords: Geopark, Disaster Mitigation Education

## Detection, Observation, Preservation, and Utilization of Sand Boiling Traces along an Active Fault : Effort of Hakusan T

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The Morimoto-Togashi Fault Zone which goes through Kanazawa City to Tsurugi District, Hakusan City, is one of geosites where people can learn about the formation of earth in the Hakusan Tedorigawa Geopark. On the eastside of the fault mountains (elevation of 650 meters) were formed by the upheaval. On the other hand, on the westside of the fault the Tedorigawa River transported much sediment, and an alluvial fan was formed by them.

In recent years two excavation surveys of the buried cultural properties were carried out in the western margin of the active Togashi Fault. One at the Bunyudo ruins (Hiramatsu and Kozaka, 2013) and the other at the Netsuno ruin which was excavated in 2013. Sand boiling traces were found in the both ruins, which showed a huge earthquake occurred between the late Yayoi Era and the Heian Era. It is difficult to identify the active fault which the earthquake happened, causing the sand boiling traces. However, from a survey in Umeda District along the Morimoto Fault, it was reported that the latest activity occurred after approximately 2000 years ago, prior to the fourth century (Headquarters for Earthquake Research Promotion, 2013). Therefore, the sand boiling traces are likely to be caused by the activity of the Togashi Fault, considering that the sedimentary layer which the sand boiling traces were found is correlated to the era the fault movement occurred.

We report people's activities related to these ruins where they are located on slight elevations of the alluvial fan, together with an introduction of the sand boiling traces. Additionally, we report about a study tour held in 2013 for the citizens to walk around and observe the both ruins and the Togashi Fault.

The Hakusan Tedorigawa Promotion Council is planning to peel off the sand boiling traces, panel it, and then utilize it as learning materials of the geopark to learn about the formation of earth and disaster prevention.

Keywords: Hakusan Tedorigawa Geopark, Active Fault, Morimoto-Togashi Fault Zone, Sand boiling traces, ruins



## A practical use of geoparks as university educational materials

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The purpose of this presentation is to show the practical use of geoparks as university education and to discuss the relationship between local universities and local communities. Tottori University of Environmental Studies opens four classes of *Project Research* for freshmen and sophomore. The classes of Geoparks started in 2012. The aim of the geopark classes is to learn the method of a field survey. There were various topics on geoparks; for freshmen, the development of virtual geotour, the land use survey of Yoshioka hot springs town and the development of geo product, and for sophomore, the development of geo guided tour at Aoshima of Koyamaike Lake and the regional survey of Yoshioka. These output share with local communities and geoparks. It becomes clear that a geopark makes a good use of social learning.

Keywords: university education, regional survey, social learning, San'in Kaigan Geopark, Tottori University of Environmental Studies

## Geopark guide training program in Amakusa area

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<sup>1</sup>Amakusa Geopark planning promotion committee

Amakusa Geopark planning promotion committee trained 149 geopark guides in Amakusa area in 2013. We introduce a state of the Geopark guide training at the geosites.

"Amakusa Geopark plan" is an action for "Amakusa Geopark" aiming at authorization of the Japanese Geoparks Network. The five elements, geology, geography, viewing point, culture and industry, comprise the main core of the Amakusa area which is shown at the geosites throughout the islands.

The purpose of Geopark guide training program, through a lecture in room and the local training in field, is aimed for the interpreter of the local geology, creature, culture and industry. The committee confers the qualification of the guide to the person who passed an authorized examination. Geopark guides perform their activity after the enrollment to each local tourism guide association.

Through this program we expect an effect guide authorization, common knowledge of the activity for local inhabitants and the interpreter for geopark which can convey resources in this area to anyone clearly. Geopark guide is important as a diffuser explaining "What is geopark" precisely and is necessary for an action united with local inhabitants or the education spread.

Residents and officials alike collaborate to preserve the geologic inheritance of Amakusa with an educational perspective. Exposing the unique beauty of this inheritance as a tourist attraction in conjunction with the history and culture of the area, an attractive geo-tourism will be found aim at the promotion of the Amakusa area.

Point of the local promotion by the tourism is comment on an earth science-like element for constitution of the earth and a story about the local history and culture.

Keywords: geopark, guide, inhabitants

## Program for broadening the knowledge base and awareness of geopark guides -An example of Amakusa Goshoura Geopark-

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<sup>1</sup>Goshoura Cretaceous Museum, <sup>2</sup>Association of Goshoura Geo-Tourism Guide

It is very important for any geopark that its guides are actively involved in geo-tourism. Guides must strive to continually increase their awareness and broaden their knowledge base of not only their geopark, but also of neighboring areas. We will use the Amakusa Goshoura Geopark as an example to demonstrate a guide awareness-raising program in action with regard to the geology, geography, history and culture of its neighboring areas.

The Amakusa Goshoura Geopark contains strata and fossils in deposits spanning 100 million years. The strata were deposited in the Cretaceous and Paleogene periods of earth's history, and contain abundant fossils including dinosaurs from the Cretaceous period and large mammals common to the Paleogene.

From the peak of Karasu-toge, a geosite in the geopark, we can see a 360-degree panoramic view of the Yatsushiro Sea and landscape of Kyushu Island including Fugen-dake, Yatsushiro Plane, Aso Mountain, Hitoyoshi Basin, Mt. Shiraga, Ontake and Yahazudake on the Hisatsu Volcanic Plateau, Izumi Plane, Mt. Shibi, Nagashima, Shishijima and Koshikijima.

Members of the Association of Goshoura Tourism Guide group are trained to explain not only about the panorama from Karasu-toge including geologic composition and topographical features of Kyushu Island, but the wealth of information stored in its strata. As an example, the association had a tour to study the geology, geography, history and culture on the coastal area from Ashikita to Nagashima along the Yatsushiro Sea in 2014. Similarly, it will take part in the study of the Shimabara peninsula at the Shimabara Global Geopark in the near future. Training programs like these have been instituted as a means of support for the Amakusa Goshoura Geopark guide's continuing education.

Keywords: Geopark guide, neighboring areas, broadening knowledge

## Mt. Apoi Geopark telling a global dynamic movement of the earth

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<sup>1</sup>Hokkaido Univ. Museum, <sup>2</sup>Samani

Mt. Apoi geopark is located at the southwestern end of the Hidaka mountains, facing to the Pacific southward. Recently, a tectonic map showing a distribution of major plates in the northern hemisphere and suggesting a global sense of plate motion between the North American plate and the Eurasian plate was published. This map gives an easy understanding on a background of the Hidaka mountain building and a simultaneous interpretation on a global dynamic movement of the earth.

We have an excellent example of global mobile belt of the earth, which is the Tethys ophiolite belt from the European Alps ~Greek ~Turkey ~Iran ~Oman ~Pakistan ~Indus Suture ~Andaman ~Great Sunda toward the east, including the continent-continent collisions between Africa and Europe, and India and Asia. Also, we have an above example of active tectonic event such as the Hidaka mountain building, here in Mt. Apoi geopark, Hokkaido, Japan.

Keywords: Mt. Apoi geopark, peridotite, upper mantle, basaltic magma, plate boundary, global dynamic movement

## Communication of Information on the Internet By Geopark: Case Study of Sanriku Geopark

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<sup>1</sup>Chuo Kaihatsu Co., <sup>2</sup>Sanriku Geopark Promotion Conference

The Sanriku geopark certified the Japanese geopark in 2013. It is the largest geopark in Japan that consists of 16 cities in Aomori, Iwate, and Miyagi prefecture. The Sanriku geopark promotion conference is disseminating information at the Internet.

In February 2011, we created the general-oriented website which summarized geological history and the highlight of Sanriku regions. Then, in response to the Great East Japan Earthquake, we have created a new web site for education travel and academic investigation in September 2011, and then, the variety of information was added to the general-oriented website towards the authorization to a Japanese geopark.

Furthermore, through the information by SNS, such as a blog, Facebook and Twitter, we increase the update frequency of information, promotion meeting was to update the content and functionality depending on the purpose or object. We increased the updating frequency of informaton, and updated contents and function according to the purpose.

Now, the degree of name recognition or comprehension of the “ geopark ” are not increasing. However, exposure to mass media and concern of local and a surrounding area are increasing in response to Japanese geopark authorization of Sanriku regions. In order to correspond to this, we decided to newly renew a website in 2014.

In this presentation, we introduce our renewal case and information transmission method and the results of a survey of website on other geoparks.

Keywords: geopark, communication of information, internet, Sanriku

## Utilization of Earth sciences for regional development

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The information on earth sciences is useful for disaster prevention of a natural hazard like earthquake and volcanic eruption etc. The new trend utilizing the information of earth sciences to lifelong learning and tourism occurred in recent years. The geopark can be the best place providing this information.

Ibaraki University Geological Information Utilizing Project team is providing geological informations for the management of North Ibaraki Geopark. Main act is creation of 15 sightseeing guidance maps. Now, we are improving the contents of previous maps. Furthermore, we are having strong cooperation with local residents and companies for the regional development.

Keywords: Geopark, North Ibaraki Geopark, regional development

## Activity of Misato-Kai in Sado Island Geopark

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<sup>1</sup>Sado city board of education Geopark promotion office

We introduce the activity of Misato-Kai, which played an important role for Sado Island Geopark to be a member of Japanese Geoparks Network.

Misato-Kai is the association that was established in 2006 by hostesses of local Japanese inns and hotels to keep close relationship with each other and revitalize tourism in Sado Island. Until now, they've made eco-friendly chopsticks and OMOTENASHI pocket notebooks.

Also, they make place mats as their activities. These mats are made of paper and have some pictures and captions on them to introduce some tourist attractions and promotional programs to guests. This time, they made the place mat under the theme of Sado Island Geopark and many groups and associations such as, Misato-Kai, Sado City and welfare facilities give much support to make it. The cooperation is the significant feature for this activity.

Now, these place mats are attracting favorable comments from hotel guests. Some guests bring it home and others leave some messages on it for people of welfare facilities in Sado Island. It is a useful tool for communication between the hotel guests and the hostesses in local Japanese inns.

In Sado Island, many associations are extremely active. They are very important for Sado Island Geopark activities. We hope that we can work together for our geopark in the future.

Keywords: Sado Island Geopark, Misato-Kai, tourism

## Let us Enjoy Geo-Tetsu - the Sixth Geo-tour through Train Windows, Nakamura and Sukumo Line of the TOSA KUROSHIO RAILWAY

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<sup>1</sup>Geo-Tetsu Project Committee of the Fukada Geological Institute

### 1. Aims of Geo-Tetsu activities

Geo-Tetsu is the name of the activity that shows everyone ways to enjoy and learn about geology and related sciences, using railways (Kato et al., 2009). Following five year's Geo-Tetsu promote activities are continued by geological engineers who love railways, organized with the corporation of the Fukada geological institute since 2009 (Fujita et al., 2013) and established Geo-Tetsu Project Committee since 2013.

Geo-Tetsu offers the chance to get acquainted with geological features, not only through train windows but also along paths accessible from the stopovers alongside the railway routes. We selected enjoyable Geo-Tetsu courses and Geo-points. As much information is obtainable and can be gathered from various perspectives; the railway itself, geology, geography, cultural heritage and sight-seeing as well. We hope that the general public will enjoy a new style of railway traveling provided by the Geo-Tetsu. The Nakamura and Sukumo Line of TOSA KUROSHIO RAILWAY is presented in this as sixth route of Geo-tetsu.

### 2. The Nakamura and Sukumo Line, the sixth Geo-Tetsu project

#### (1) Abstract of the Nakamura and Sukumo Line

The Nakamura and Sukumo Line run from Kubokawa at Shimanto Town to Sukumo City in the western region of Kochi Prefecture. The railway connects from Kubokawa to Nakamura at 43.0km, and from Nakamura to Sukumo at 23.6km. Both are single track, and the route not electrified. In the line, there are characters designed by Takashi YANASE. Additionally, they have seven wrapped vehicles of municipalities. John Mung (Manjiro Nakahama), Whales, Whale Sharks, Kashiwa-jima Island, Kyoto cultures of the Shimanto City, and the event character of the Sukumo City etc. are painted there. The vehicles not only transport passengers but also inform the charms of the western region of Kochi Prefecture.

The Nakamura Line and the Sukumo Line have a different history of construction. At first, the construction of the Sukumo Line had been promised. However, the Nakamura Line was given to priority by the political motivation. The Nakamura Line was started constructing in 1956, and opened in 1970. On the other hand, the Sukumo Line was started constructing in 1974, but it was interrupted by the Japanese National Railways reconstructing promote measure law in 1981. Afterwards, both routes were succeeded by TOSA KUROSHIO RAILWAY Ltd. as the third sector railway. At last, when the Sukumo Station opened, it became a present route in October, 1997.

#### (2) The rich geological and sight-seeing resources of the Nakamura and Sukumo Line

The Nakamura and Sukumo Line runs on the Shimanto terrane that consists of sandstone and the mudstone from Cretaceous to Paleogene. The train leaves Kubokawa Station (asl 210m) and goes to Kaina Station (asl 47m), descending the inclination of 23 permil or less. Especially, "the First Kawaoku Tunnel (2031m)" is well worth as loop of 350m in radius, descending 20 permil, and the exit appears below by 40m. If you have the compass, you can confirm its needle will be made one rotation in the tunnel. When we goes out there, train runs along Iyoki River. Soon we arrive at the Tosa-Saga Station in famous of bonito's single-hook fishing. The train passes under a lot of short tunnels with the outcrops of turbidite of Shimanto terrane around Tosa-Shirahama. Between Ukibuchi and Tosa-Irino Station, you can visit the river-mouth deviation of the Fukiage River. There are almost stone monuments of the Nankai Earthquake at the Kamo shrine in woods of pine at Irino.

Through the Kotsuka Station, the train changes front to the west. It crosses the Shimanto River in parallel to a red bridge as old national road. In the downstream, there is a long dam for the flood disaster evasion. The train advances straight in the Nakasuji lowland (Kano et al., 2003), which understood the slope-basin deposit (Domeki Formation). Lastly, the train comes out of Hijirigaoka Tunnel (5084m), we arrive at the Sukumo Station.

Keywords: Geo-Tetsu, Geo Point, Nakamura and Sukumo Line of the TOSA KUROSHIO RAILWAY, loop tunnel, Shimanto terrane, Nakasuji lowland