Special classes related to volcanic disaster prevention of Mt. Hakusan ~ Work at Shiramine primary school

*Tsuyoshi Hibino[1], Yoshihiro Hiramatsu[2], Atsushi Sakayori[2], Tatsuto Aoki[2]

1. Hakusan Tedorigawa Geopark Promotion Council, 2. Kanazawa University

After the eruption of Mt. Ontake in 2014, the interest to the volcanic disaster prevention has been increasing. In order to promote the volcanic disaster prevention from a long-term perspective, it is insufficient to stress only the dangers of volcanic eruption and its countermeasures. At the same time, it is necessary to foster human resources who have scientific understanding and interest in volcanoes.
In the Hakusan Tetorigawa Geopark, we carried out four lessons on the volcanic science and the disaster prevention and one field learning with the cooperation of Shiramine elementary school (33 children in all schools) from May to August 2016. In the classes, through lectures and experiments, they learned the composition of Mt. Hakusan, the characteristics of volcanic activity, the system of the eruption, the reaching range of cinder, pyroclastic flow, volcanic mud flow of the snow melting type at the Hakusan volcano disaster prevention plan and the disaster prevention behavior. On the field learning, they observed the rocks of river beach and the traces of lava flow along the ridge, and we looked back at the structure of Mt. Hakusan and the past volcanic activity that they learned in the classes. In addition, by observing the site of sabo construction and meteorological observation facilities through cooperation of the Ministry of Land, Infrastructure, Transport and Tourism and the Japan Meteorological Agency, we deepened the understanding of the local response to volcanic disasters and the mechanism by which disaster prevention information is issued.
In learning natural disasters, not only emphasizing disaster but also understanding the scientific process of phenomenon and learning about that blessing together are helpful to promote correct understanding and it is also a feature of geopark.
In addition, as a result of questionnaire on the volcano learning to parents at elementary school presentation, it turned out that about 60% of families were talking about learning contents. It was also confirmed that classes at elementary school lead to spreading effects not only for children but also for parents.
In this presentation we report the above efforts.

Keywords: Volcanic disaster prevention, Volcano experiment, Education, Field work, Geopark

River investigation system operated by citizens in Muroto Geopark

*Yugo Nakamura[1]

1. Muroto Geopark Promotion Committee

Local people in Muroto UNESCO Global Geopark, southwestern Japan, are worried about environmental changes of the forest in the drainage areas as this may cause changes in the quality of the water, increase the risk of overbank flooding, erosion of river channel, and landform change of beach areas. Our project has established an investigation system for the river and forest environment operated by local people with geopark staffs. This investigation system includes a method of estimating the volume of suspended sediment in river water by simple and easy techniques, such as differentiation of river water colour or transparency. 80% of Muroto Geopark area is covered by forest which is characterized by evergreen broad−leaved trees (mainly Castanopsis and Quercus). Agricultural lands on riverside plain had been urbanized after 1970s, but the condition of the forest has been kept favorable in Muroto Geopark area. Forest industries including charcoal makers in Muroto efficiently manage forest environment. The forest environment keeps moderate sediment amount and gentle river behaviors in Muroto in comparison with drainage basins in the adjacent regions. On the other hand, decrease of river sediment caused reduction of beach deposits and regression of the coast line. Our research project on river and forest environment will be continued next years.

Keywords: River water quality, River sediment, Forest environment, Simple technique

Itoigawa Geopark survey and disaster readiness education in response to the 2016 Niigata Yakeyama Eruption undertaken through strengthened cooperation with the Niigata Yakeyama Volcanic Disaster Council

*Ko Takenouchi[1], Takahiko Ogawara[1], Yousuke Ibaraki[1], Hiroshi Miyajima[1]

1. Fossa Magna Museum, Itoigawa City

Mt. Yakeyama (2400 m), located on the border of the cities of Myoko and Itoigawa in Niigata Prefecture, is the Fossa Magna's northernmost active volcano and is a subject of regular monitoring by the Japan Meteorological Agency. Disaster readiness with regard to Mt. Yakeyama is a major issue for the City of Itoigawa. Since becoming a Global Geopark in 2009, natural disaster-related disaster readiness and disaster education activities have been given great importance. The city government, fire department and Fossa Magna Museum (Part of the Itoigawa City Board of Education, hereafter 'the Museum') aim to act as an agency for disaster readiness, providing scientific information and disaster drills through cooperation with volunteer disaster organizations. The eruption in spring 2016 became an opportunity to test the Itoigawa Geopark's volcanic disaster readiness. In addition to lectures, exhibitions, interpretations, field excursions, river cloudiness inspections and eruption record preservation, efforts were made to support the activities with the Friends of the Museum Society through cooperation with the local Kamihayakawa and Shimohayakawa Regional Community Centers. Also, support was received from the Niigata Yakeyama Volcano Disaster Readiness Council (Hereafter 'the Council') organizational members (Since 2016 curators of the Museum have also served as Council members).
Lectures (2 performed): (1) Current State of Niigata Yakeyama & Examples of Responses to Other Eruptions, Jun Funazazki (Niigata Regional Meteorological Observatory Director), Niigata Yakeyama Disaster Readiness Response, Itoigawa City Fire Department Disaster Readiness Division Chief. Held at the Shimohayakawa Regional Community Center (October 8th) with 140 in attendance. (2) Prediction of Eruptions and Their Mechanisms -Considering Niigata Yakeyama's Future- Kazuhiro Ishikawa (Chairman, Volcano Disaster Readiness Promotion Organization & Kyoto University Professor Emeritus) Understanding Eruption Damage by Reading Volcano Disaster Readiness Maps, Hideyuki Ito (Iwate University Professor), Held at the Museum, October 23 with 83 in attendance.
Field Study of Volcanic Ejecta: This tour was held on November 20 for people living in the Kamihayakawa Region beneath Mt. Yakeyama so they could better understand the scale of eruptions, the size and length of lava and pyroclastic flows, and how the valleys had been filled with volcanic ash, along with a tour of the erosion control dams. The tour was supported by the Friends of the Museum Society and led by museum curators with 34 in attendance.
Special Exhibit 'Preparing for Niigata Yakeyama's Eruptions - Study Volcanos to Save Your Life': Held Oct 23 to Dec 4 at the Museum, this exhibit featured photographs of Mt. Yakeyama, locally sourced materials about volcanic disasters, map data of Yakeyama's caldera provided by the Geospatial Information Authority of Japan, as well as panels on loan from the the Science Museum of Map and Survey and the National Volcanic Museum Federation Council.
Gallery Talk (Exhibition Interpretation): 8 interactive discussions led by museum curators were held on Sundays and holidays featuring demonstrations of pyroclastic and lava flow and inspection of volcanic ash and lava. 70 were in attendance.
River Cloudiness Inspection: Niigata Prefecture and Itoigawa City (Including the Fire Department and the Museum) conducted two analyses of the water quality and source of cloudiness which determined that

the source was from a hot water spring located at an elevation of 1050 m. These findings were reported to local people at a special lecture.
Eruption record preservation: A physical record of the debris, debris flow and mudslide damage caused by the 1974 phreatic eruption handwritten by local resident Hirokichi Hara was discovered and digitized to ensure its preservation.
Through partnership between the Council and the Itoigawa Geopark, the following positive outcomes have been achieved: (1) Support has been received from various experts and research organizations for the disaster readiness activities of Mt. Yakeyama (2) We have not only received volcanic observation data, but also been able to share our own surveys performed by the Itoigawa Geopark (3) We have been able to request a strengthening of the scientifically based observation system as the Itoigawa Geopark.

Keywords: Niigata Yakeyama Volcano, Steam eruption, Itoigawa UNESCO Global Geopark, Museum

Seismological application in activity at Geopark

*Makoto MATSUBARA[1], Kazuyuki Nakagawa[2], Yoshihiro Hiramatsu[3]

1. National Research Institute for Earth Science and Disaster Resilience, 2. Jiji Press, 3. Faculty of Natural System, Institute of Science and Engineering, Kanazawa University

1. Introduction
Geoparks are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. There are also many both natural and cultural heritages of earthquakes. The Seismological Society of Japan (SSJ) should supply appropriate contents for Geoparks as well as wait for the Geoparks to ask us to assist as the support for Geoparks. The SSJ established the working group of the preparation for Geopark support committee.

2. Questionnaire survey for Geoparks
In September, 2016, the working group conducted the questionnaire survey for 57 regions composing the Japan Geopark Network, which are the UNESCO Geoparks, the Japan Geoparks, and associate members for proceeding to be Japan Geoparks. We supplied the information on seismic stations operated by National Research Institute for Earth Science and Disaster Resilience (NIED) within the Geoparks with the questionnaire. The reply came back from 47 regions.

3. Result
The earth formed by earthquakes and crustal deformations is applied to guide in the over 80 % of the Geoparks. About 65 % of the Geoparks have seismic geocites, however, the others do not have. There is no seismic geocites in about a quarter of the about 35 % of Geoparks, however, the others do not know whether they have the seismic geocites or not. Historical earthquake and tsunami marks, surface ruptures of the active faults are used as the geocites. Active faults as the geocites are not limited in the 102 active faults evaluated by the Headquarters for Earthquake Research Promotion of the Ministry of Education, Culture, Sports, Science, and Technology in Japan, however, many Geoparks do not use the them in the guide despite those within the Geoparks.
There are over 3000 seismic stations in Japanese Islands operated by NIED, the Japan Meteorological Agency, national universities, and so on. About 60 % of Geoparks recognize the existence of the seismic stations within the Geopark, however, only 20 % of them use the seismic stations as geocites.
A half of the Geoparks hold seminars about the earthquakes. These seismologically educational activities are usually held regardless of a large earthquake since many of them are held before the 2016 Kumamoto earthquake.

4. Discussion
Geoparks with seismic geocites hope the SSJ to hold seminars about attractive geostories connecting seismic stations and the Geoparks, however, they hope us to do gratis or with low rates because of the tight budget. The SSJ needs to supply a tool to get easily the seismic information within the Geopark and construct the organization to respond to the request from the Geoparks.
Geopark with no seismic geocite hesitate to get support from SSJ since they cannot image the relationship with the SSJ. They hope to have relationship with us after the recognition of the obvious seismic geocites or active faults. However, the inland earthquakes also occur at the blind faults in any time anywhere in Japan. We need to hold seminars or give lectures at the Geoparks with no geocite nor earthquake record

just after the disastrous earthquakes.

Keywords: geopark, seusmoligy, seismic station

Revision of the stratigraphic division of the Neogene in the Sado Island, Niigata Prefecture, Central Japan -Contribution of stratigraphic research to geopark activity-

Yukio Yanagisawa[1], *Mahito Watanabe[1]

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

Latest Paleogene to Neogene volcanic, volcanoclastic and sedimentary rocks are widely distributed in the Sado Island, central Japan. These rocks are important geoheritages which represent geological history of the Japan Sea. The Sado Geopark utilizes those rocks along with the geohistory recorded in them as major attraction for visitors.
We propose a revised lithostratigraphy for the Neogene sediments in the Sado Island in order to make it more concordant to the geohistory in the area, since our detailed lithostaratigraphic and diatom biostratigraphic studies have revealed some problems about stratigraphy in this area as follows;
1. One of the present stratigraphic boundaries is largely diachronous.
2. Some of the boundaries do not coincide to the timing of the important geological events which was made clear after the establishment of present stratigraphic framework.
Our proposal is;
The Orito Formation is devided into two formations. The boundary between two formations is ravinement surface indicating a rapid transgression, which corresponds to the transgression event widely found in latest Early Miocene along the eastern margin of the Japan Sea.
The Tsurushi Formation is disestablished and included in the redefined Nakayama Formation. The boundary between the two formations is revealed significantly diachronous by our diatom biostratigraphic study. The lithological difference between the two formations was formed by the diagenetic process and is not primary lithological difference. Thus we judged the present boundary is not adequate and the two formations must be combined.
The Nakayama Formation should be divided into two formations at a glauconite sandstone layer in upper part of the formation. The boundary between the two formations corresponds to a widespread hiatus which has been recognized in eastern margin of the Niigata sedimentary Basin.
By this revision, geological events widely found in the eastern margin of the Japan Sea are reasonably recognized in the Neogene stratigraphy of the Sado Island. We believe that this revised stratigraphy helps visitors of the Sado Geopark understand geological history of the island more easily.
In other geopark areas, there are also descrepancies between up-to-date geological history and lithostratigraphy. In general, researchers are not interested in local stratigraphy of geopark areas, and therefore such discrepancies are left unresolved. Cooperation between geologists in such geoparks and researchers in universities or institutes will resolve these problems by establishing a reasonable new stratigraphic framework.

Keywords: Neogene, Stratigraphic division, Diatom biostratigraphy, Geopark, Sado Island

Damage investigation activities utilizing Geopark organization for the 2016 Itoigawa Station North Great Fire in Itoigawa City, Niigata Prefecture

*Takahiko Ogawara[1], Ko Takenouchi[1], Hiroshi Miyajima[1], Yousuke Ibaraki[1], Toshihiro Uchiyama[2], Goichi Yamamoto[3], Takeshi Kubo[4]

1. Fossa Magna Museum, 2. Itoigawa Geopark Promotion Office, 3. Itoigawa Geopark Tourism Guide association, 4. Friends of Fossa Magna Museum

On December 22, 2016 at about 10:20 a.m., a fire broke out in a ramen restaurant near the north entrance to Itoigawa Station. Southerly winds caused the fire to quickly spread, becoming the largest fire in Itoigawa City since 1954. It has been given the name “2016 Itoigawa Station North Great Fire” (provisional). Over 43 teams of firefighters were dispatched to the fire from Itoigawa and neighboring towns, but the gale force winds allowed the flames to leap from building to building, complicating the containment efforts.

The fire was safely contained at 8:50 p.m. and after continued firefighting efforts it was finally extinguished the following day at 4:30 p.m. 17 people suffered minor to moderate injuries, but in part due to police and the residents’ efforts, there were no casualties. 147 buildings were damaged in the fire (120 completely destroyed, 5 half destroyed and 22 partially damaged), including Kaga-no-I, Niigata Prefecture’s oldest sake brewery established in 1650; 200 year old restaurant Tsurukiya; and the similarly old inn Heiando Ryokan. Roughly 40,000 square meters were consumed in the fire, making it the worst fire in Japan in the past 20 years (Fig. 1).

In 2009, Itoigawa City became one of Japan’s first three Global Geoparks. Even before that time, the city worked to promote the “geostories” which connect the regions’ unique climate, topography and geology. For this reason, the city was able to quickly explain that this fire’s devastating spread was a result of this *Renge-oroshi* wind phenomenon, a product of regional geological features such as the Umidani Mountains, Northern Alps and valleys created by the Itoigawa-Shizuoka Tectonic Line. This fire is the first in Japan to be classified as a natural disaster as defined by the Act on Support for Reconstructing Livelihoods of Disaster Victims due to the effect of strong wind. The government’s decision to classify this fire as a natural disaster is in no small part due to the efforts of the Geopark in making a clear case to the administration that this fire spread as a result of this *Renge-oroshi* phenomenon and how this phenomenon is related to Itoigawa unique topography, geology and climate.

The investigation of the fire damage was undertaken by the existing Geopark Organization. The defining feature of this fire is how it spread through leaping flames carried by gale force winds recorded at speeds up 27.2 m/s. As the flames leapt from building to building, the sources of the fire increased and by noon over 3 distinct fires were confirmed. Because of this, it is important that the damage investigation includes a detailed investigation of when and where the fire spread, especially with regard to leaping flames. In interviews with responders from the Itoigawa City Fire Department, most of the fires caused by leaping flames broke out far from the original fire where no firefighters were responding so the details are unclear. For this reason, it is important to collect information through interviews with the residents, business owners and banks in and around the affected area.

This damage investigation will be conducted with the help of volunteers from the Itoigawa Geopark Tourist Guide Association and the Friends of the Fossa Magna Museum Society, both member organizations in the Itoigawa Geopark Council. The reason for choosing these volunteers was the need for people who could interview the many people affected in and around the disaster site from a scientific perspective. The investigation was conducted from the beginning of February 2017 with volunteers conducting face-to-face interviews with those affected by the fire and collecting anonymous surveys regarding the spread of the fire and the conditions at the disaster site. This data was then compiled and analyzed at the Fossa Magna Museum (Fig. 2).

Through this data, a clear image emerged of how the fire spread through leaping flames on the day of the fire. Hours after the fire broke out, the flames leapt to a building a few hundred meters from the original fire and the strong winds made extinguishing the flames difficult. We also learned that windows broken by the fire causing the fire to leap into the buildings where the flammable interiors quickly burst into flame. Also, burning wood falling in between cracks in roof tiles caused the roofs to catch fire.

Through further consideration of the results of this investigation, we hope to better understand the conditions surrounding the spread of this fire. The information gathered from the investigation will be shared throughout the Geopark Network in the hope that it will be useful for disaster prevention.

Keywords: Itoigawa city, Massive fire, Foehn phenomena, Damage investigation, Natural disaster, Itoigawa UNESCO Global Geopark

Fig.1

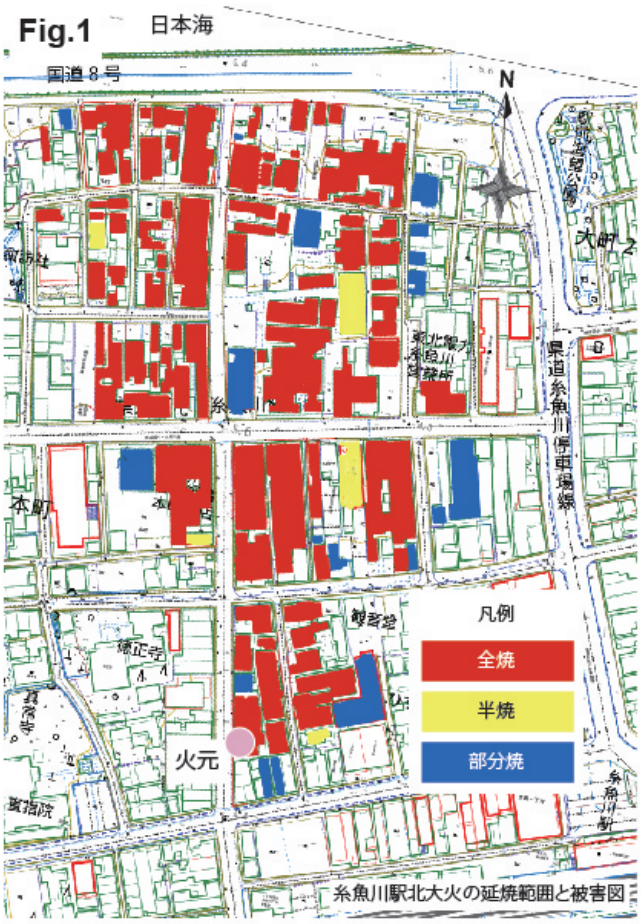


Fig.2

Seamless geostory including atmospheric and hydrologic sciences: A case of Daito Islands, Japan

*Shunsuke Tsushima[1], Takayuki Ogata[2]

1. Mito Local Meteorological Office, 2. Disaster Prevention Research Center for Island Regions, University of the Ryukyus

Seamless geostory and a geoscientific guidebook is developed in Daito Islands (located in Okinawa prefecture), focusing especially on contents of atmospheric and hydrologic sciences. Climate in Daito Islands is strongly controlled by Pacific anticyclone and uplifted atoll forms on Philippine Sea Plate. Landform of Daito Islands shows shallow depression covered by Quaternary coral limestone, which produces specific meteorological and climatological phenomena such as inactive ascending current and cold air pool by strong surface inversion. These atmospheric and hydrologic topics are linked with historical geology in a seamless geostory and a guidebook for geoscientific outreach. In addition, our guidebook includes JMA Minamidaitojima Meteorological Office for interpretation of upper air analysis as an advanced scientific research.

Keywords: Geostory, Atmospheric Science, Hydrologic Science, Daito Islands

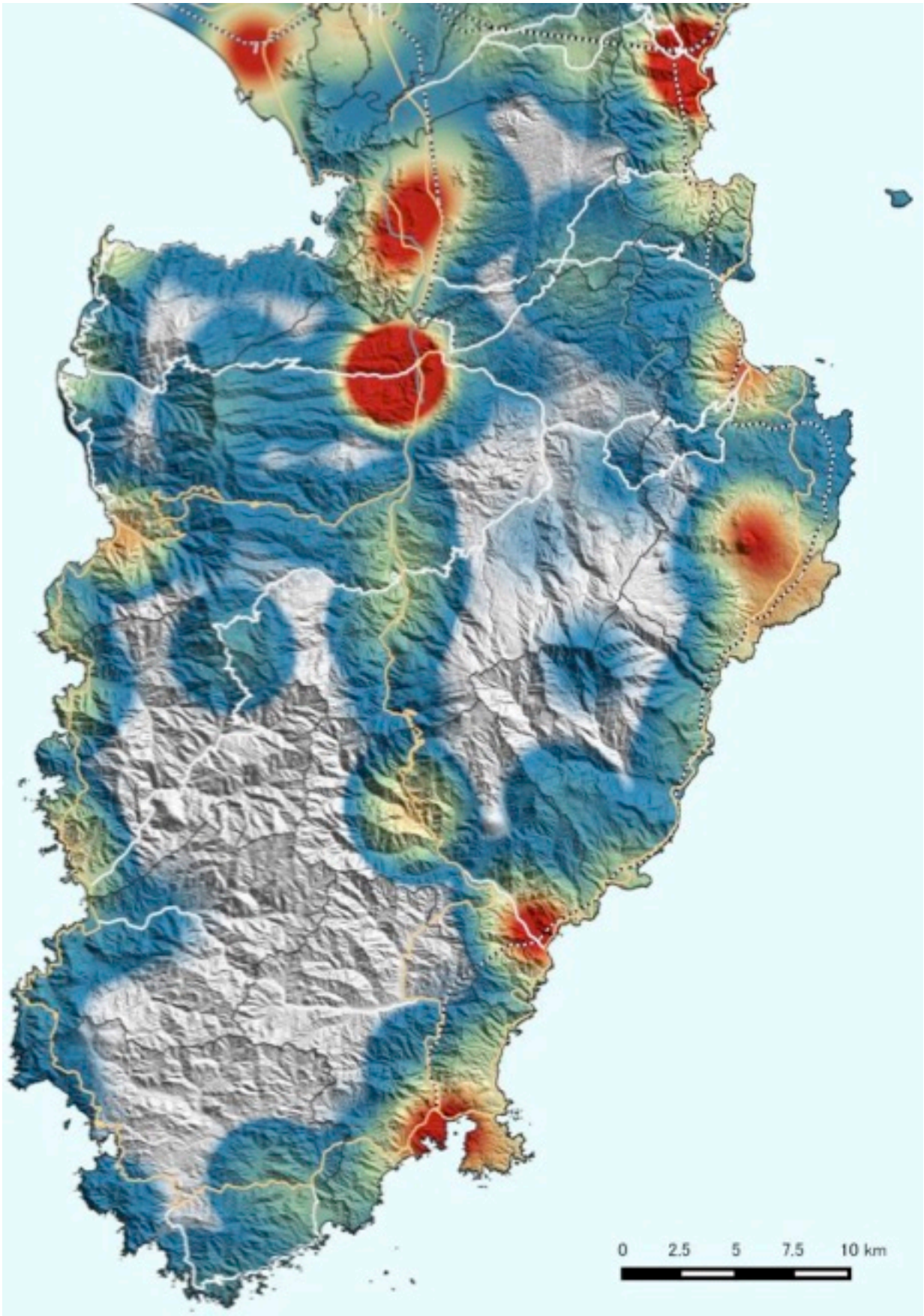
Geopark visitor's trend survey using distribution of location-added photograph posted on SNS

*Yusuke Suzuki[1]

1. Izu Peninsula Geopark Promotion Concil

In this research, we attempted to grasp the tendency of visitors from the distribution of photos with location posted on SNS within the Izu Peninsula Geopark area.Flickr with a high proportion of photographs taken with single lens reflex etc was used as the source of photographs.In 2015 there were 5000 photos taken in the Izu peninsula. Using the latitude and longitude information contained in the list of this photograph, the photographing spot was plotted on the GIS.In this presentation, we will report on the location of the visitor ascertained from the photo shoot location, and the relationship between the trend and geosite.

Keywords: Geopark, SNS



Present State of Geoparks on the Twitter. -Prospectuve study based on Social Network Analysis-

*Hideyuki Itoh[1], Hanako Onodera[1], makoto kumagai[1,2], Morio Tsuji[1], Masaki Suzuki[1]

1. Faculty of policy studies, Iwate prefectural University, 2. Sanriku Geopark commitie

As of January 2017, there were 43 geoparks in Japan, of which 8 are designated as UNESCO global geoparks. Various activities are conducted in these geoparks, such as those for ecotourism and product development. However, in many geoparks, these activities did not contribute to sustained regional development.
Itoh *et al.* (2015) used an Internet questionnaire to investigate the level of awareness of geoparks, finding that people’s awareness of geoparks is generally low and they also do net have a difinitive image of Geoparks.
Recently, an information marketing business that analyzes big data on social networking sites (SNS) such as Twitter and LINE was developed. It used in various fields to investigated such as corporate image and risk management of the corporate.
In this study, we investigated the word of “Geopark” is how tweeted and shared on SNS using the big data analysis provided by Valway121 net Ltd.
Over the three-week measurement period from December 7 to 21, 2016, 20,000 cases per day were analyzed. In addition to “GeoPark,” “ecopark” and “world heritage site” were included in the search conditions, and the results were compared.
During the measurement period, the number of hits for geopark was 1,049, while those for ecopark and world heritage site were 63 and 2,753 respectively, indicating a significantly higher number of hits for the latter. Furthermore, the number of hits for geopark rose to 172 on December 9, 2016, which was attributed to the announcement by the Japan Geopark Committee (JBC) of the recertification examination results on the same day.
Most geopark influencers are geopark stakeholders such as “izugeo.” In contrast, many individual world heritage enthusiasts, travel lovers, and bot systems rank highly for world heritage. Furthermore, the number of followers of these Twitter accounts is more than 10 times that of the geopark stakeholders, and a tendency to transmit the same information repeatedly was recognized.
On the other hand, in terms of the characteristics of comments on geoparks, geopark stakeholders mostly describe events and geosites, and the number of retweets was not that high. In addition, the number of comments by people other than the stakeholders was extremely small. In other words, on SNS, geoparks are considered to form a closed system comprising their stakeholders and a few geopark enthusiasts.

Keywords: Geopark, twitter, SNS analysis, ecopark, World Herritage

Characteristics of geopark evaluation system as seen from the field evaluation reports by the Japan Geopark Committee

*Masahito Yamada[1,2], Shinichi Sugimoto[3]

1. Board of Education, Choshi City Hall, 2. Choshi Geopark Promotion Council, 3. Sanriku Geopark Promotion Council

1. Introduction

The concept of Geopark arose in the mid-1990s as a response to conserve and enhance value of areas of geological significance in Earth history. Later in 2004, with the support of UNESCO, European Geoparks and China Geoparks came together to create the Global Geoparks Network (GGN). In Japan, the Japan Geopark Committee (JGC) was established as a domestic judging organization in 2008. The JGC conducts evaluation to join Japanese Geoparks Network (JGN), assessment of activities at geoparks belong to JGN, evaluation of candidates for new accession belong to the GGN. Domestically, seven regions were first certified as Japan Geopark in December 2008, and now there are 43 geoparks (of which eight regions are from UNESCO global geopark).

The JGC has undergone evaluation of domestic geoparks over nine years, and the results have been published on the web. In this research, we analyzed what are the features we can see in JGC evaluation reports.

2. Method

We conducted text mining using results from 2009 to 2016 at each geopark from the JGC's evaluation reports. We used KH Coder, a free software.

We arranged the evaluation reports as follows. First of all, as a first stage, it was divided into three categories: JGN new evaluation, JGN revalidation, and GGN candidate. As a second stage, we classified them among the categories according to the year in which the evaluation was conducted. As the third stage, we classified it by region for each year.

We examined whether there are distinctive words in each of the three categories of the first stage. Also, we examined whether there were characteristic words transition along the timeline. We also examined the co-occurrence relation of the characteristic words.

3. Result

JGN new evaluation, JGN revalidation, GGN candidate appears distinctive words, respectively. Also, characteristic words were found to have changed along the timeline.

Keywords: Japan Geopark Committee, field evaluation reports, text mining

Definition of geosite and operation in Japan

*Kuniyasu Mokudai[1]

1. Japan Geoservice Incorporated

Geopark consists of geosites. In geopark activities in Japan, geosites have been described as "natural and cultural attractions on earth science", and thus precise definitions have not been made. There is no mistake in the meaning of geotourism, but it is a place with scientific value, which is the original purpose, and it is missing the meaning that it is subject to conservation. Since 2015, the Global geopark has become an official UNESCO programme, and social recognition has also improved. Under such circumstances, the situation that individual Geoparks designate geosites based on their own recognition must be revised. I will organize geosites of each geopark in Japan from conservation geoscientific point of view. Then deepen the discussion on the definition of geosite.

Keywords: geosite, conservation earth science, definition of terms

