

Wind tunnel experiments on mega-ripple formation processes regarding to spray volume of coarse particles

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Mega ripples have been observed at one site in the Tottori Sand Dunes since 2013. At exposure area of ash and pumice layers in Tottori Sand Dunes, rill erosion occurs and aggregated coarse ash particles are supplied to sand surface. According to expanding of the exposed area of ash and pumice layers, supply rate of coarse particles increased. Mega-ripples could appear as a result of increase in supply of coarser particle to sand surface beyond a threshold value.

We made 9 cm wide, 60 cm deep and 7.28 m long wind tunnel for studying formation processes of mega ripples. Maximum wind speed attains 17.3 m/s. As for coarse particles, we selected polypropylene rounded particles (4 mm in diameter, 0.9 in specific weight). Fine sand particles were laid at 16 to 19 cm thickness and then polypropylene particles sparged over the sand surface. Considering results of preliminary experiments on bed-forms according to the volume of polypropylene particles scattered, we selected 45 g/m sparged rate of polypropylene particles for an initial experimental condition. 5 digital cameras were installed parallel to the wind tunnel to get longitudinal shape changes of bed-forms every 1 minute. Another camera recorded plane view of bed-forms particularly distribution pattern of coarse particles every 1 minute. We analyzed bed-form shape changes using these records.

Two types of transverse bed-forms were observed: one has short wavelength of 10 cm to 20 cm with steep erosional slope at stoss side and gentle slope at lee side (A-type), just opposite shape of normal wind ripples. The other has relatively long wavelength of 25 cm to more than 100 cm with a concave upward longitudinal shape (B-type). Coarse particles formed congested zones and smooth zones in successive way. In congested zones, fine sand particles were covered by coarse ones so that it was difficult to erode fine sand in these zones. On the other hand in smooth zones, fine sand particles were easily eroded. These processes form concave upward shapes: ridges and adjacent downward slopes were covered by coarse particles in both bed forms.

After 1 minute of the experiment, many A type bed-forms were formed, which coalesced each other into longer wavelength bed-forms. Within 20 minutes, A-types were decreased in number, instead B-type increased. Both bed-forms moved downwards, the maximum migrating speed of A-type attained 9 cm /min and an average migrating rate of B type was ca.4 cm/min. After 40 minutes, 5 or 6 mega-ripples were formed in the wind tunnel. Maximum wavelength was 115 cm and its height was 7.4 cm. Mega-ripples were formed in degrading stage of sand surface.

Keywords: mega-ripples, wind tunnel experiment, polypropylene particles, degrading stage of sand surface, Tottori Sand Dunes, exposure of ash and pumice layer

Geocological study of the coastal area in the San-in Kaigan Geopark. (Part1 Topography geological feature)

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I investigate it what kind of habitation space a creature of the shore area uses, and this study is intended that I clarify that the variety of the topography geological feature is related to the variety of the creature.

I considered the association with the creature which used it as habitation space. A variety of hollows are formed of tuff breccia and the granite, and much adherence creatures, necton use the space. On the other hand, it is thought that the conglomerate is not suitable for a convex surface form as creature habitation space. I showed a superficial surface form in sandstone, mudstone and andesite and knew that it became the use space only for limited creatures.

Keywords: Geocology, Beach, Coastal landform

Geocological study of the coastal area in the San-in Kaigan Geopark (Part 2 Biological diversity)

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About the creature distribution situation according to the geological feature, tuff breccia is the highest in biological diversity, and the granite is relatively high. A sedimentary rock and the volcano rock (andesite, rhyolite) indicating a superficial shape understand that biodiversity is low. In addition, as for the igneous rock that the joint developed, it is with the habitation space that is important for the sessile creature (a japanese goose barnacle or hard-shelled mussel) using the small space of the crack.

Keywords: Geocology, Beach, Coastal landform, Biodiversity

Role of museums and education centers in geoparks.

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Geoparks are expected as a place of the earth science education. They are propelled as lifelong educational programs by the museums. I arrange the role of museums in Japanese geoparks and some Europe geoparks and examine the role of museums in the future.

Ito (1991) reviewed the change of museums and divided the museums of Japan to following three generations.

The first generation: The classic museum which preserve treasures with the scarcity value including a national treasure and the natural monument

The second generation: The museums which collect various materials and carry out the exhibition and education

The third generation: The museums which found a necessary document based on a social request and assume the civic participation and experience the axis of the administration.

Recently, activities of the museums are diversified. Museums do not only provide the exhibition and learning programs one-sidedly, but are used by a citizen spontaneously as place for scientific exchange. In addition, museum goes to each place and develops their educational programs with local people. Furthermore, they take a role as the think tank about protection, conservation and utilization of natural environments. The eco-museum is developed in each place, too.

A museum and learning facilities participate in the activity of the geopark more or less. It is written in guideline on Global Geopark Network that 'A Geopark must provide and organize support, tools, and activities to communicate geoscientific knowledge and environmental and cultural concepts to the public (e.g. through museums, interpretive and educational centres, trails, guided tours, popular literature and maps, and modern communication media)' This sentence shows that they expect mainly an offer of the exhibition and learning program. In addition, on the homepage of the UNESCO, it is stated that 'A Global Geopark is not a museum, it is an active laboratory where people can become engaged in

science from the highest academic research level to the level of the curious visitor'. (<http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/global-geoparks/some-questions-about-geoparks/geopark-and/science/>). This context shows an impression that the museum is a place to appreciate the display calmly.

Their museum image is similar to the museum of the first or second generation by Ito(1991).

Most of the museum and learning facilities have geopark corner in an exhibition room but there are few examples that a museum is active positively in Japanese geoparks. Some museums are in the members of the promotion council of the geopark and support it from a scientific aspect and an aspect of the education. However, there are few museum developing outreach programs in many place in the geopark.

Museum and organization of Lesbos Geopark and Psiloritis Geoparks in Greece are investigated. The museum and the university conclude an agreement with administration and local groups in each geopark and play a central part in management organization of geopark. It is different from position of the museums in most of Japanese geoparks, that the museums lead the geopark centrally.

Some European Geoparks have educational program called "RACCE (Raising earthquake Awareness and Coping Children's Emotions)" which is consist of common teaching materials and display in the museum on the earthquake. Existence of museum may have made RACCE easy to establish. There will be many points that Japanese geoparks should refer to them.

It is difficult to establish the large-scale museum with curators in all Japanese geoparks in actually. Cooperation between small educational facilities and concept of eco-museum worth considering as an alternative, but it is important to play a central role in the management organization.

Keywords: geopark, museum, lifelong education, earth science educaion, management

Tateyama Kurobe Geopark for active fault disaster prevention/mitigation

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There are not a lot of residents and visitors who can be conscious of the systematic work of the Earth in the shadow of the natural benefit clearly. The eastern part of Toyama Prefecture caught in Tateyama mountain range of alpine height 3000m and Toyama Bay, Japan Sea, of water depth 1000m consists of a coherent geomorphology of seas and mountains, forming a certain cultural region where people live in the peculiar topography composed of the seaside alluvial fans. Favors and seafoods of the natural environment characterize the region, land nature rich in diversity increase, and by the nature of this locality named as mecca of sabo and environmental researches. The coherent topography accomplished by the 3000m high, steep cordillera and the 1000m deep bay and their geology composed of Hida Belt as a major tectonic province in Japan can demonstrate a global dynamism which showed by the trace of continental collisions, the intermittent igneous activity after the Mesozoic era, the crustal movements and the climate changes in the Paleozoic era in the whole region (called the Tateyama Kurobe region, hereafter).

The naturalist guide systems in Toyama Prefecture have been maintained for 30 years and continuously performed their activities on spread enlightenment and protection/preservation of the natural property and wealth. High activity by a lot of guide organizations, resident volunteer groups and individuals cover the whole region from the coastal plains along and Toyama Bay to the main ridge of Hida mountain range. The field museum about water circulation is a typical example of geo-tourism in the waterfront fan complex in this region.

Active faults such as Atotsugawa faults, Kurehayama faults, and Uozu-off Itoigawa fault zone are distributed in the region. The Atotsugawa fault is a famous strike-slip fault in Japan and was the target for the research program "active fault frontier". The Kurehayama fault is a reverse fault, which represents a typical example of inversion tectonics in the coastal plains and the strain concentration zone along the eastern margin of Japan Sea. This fault lies beneath the central urban area of Toyama City, and the construction department of the City conducted reflection surveys from 2010 years for 2 years, offering a good example of risk management by the local government. The Uozu-off Itoigawa faults are a typical example of active reverse fault, which would generate large tsunamis in the Toyama Bay. Since major types of active faults can be observed only in the geopark, this region can be utilized as a field museum for active faults and related disaster prevention. Cooperation reinforcement with the Itoigawa Geopark it neighbors inevitably is asked from existence of the Itoigawa offing fault which is submarine active fault.

A damaging earthquake occurred in the source area of Kurobe River on October 30th, 2011, after the off-Tohoku-district Pacific earthquake which occurred on March 11, 2011, and fumarole activity in the Jigokudani craters is also getting active in Tateyama Volcano, and the explosion crater Shinyu of Tateyama Caldera had also changed suddenly in a geyser from 2013. Moreover, the trench type great earthquake occurring in the Nankai-trough subduction zone is assumed at present. The central urban area of Toyama City in the Toyama plain should be utilized as 'field museum for disaster prevention and risk reduction' in this situation. This is because the Toyama plain was the severe disaster area by the 1858 Hietsu earthquake which was an induced earthquake of the Ansei Nankai-Tokai earthquakes and the urban area became as the case which has succeeded in rehabilitation by the feudal clan and unity of people.

Keywords: active fault, natural disaster, disaster prevention, disaster mitigation, field museum, SABO

The resources and their significance on tsunami disaster prevention of Nobiru-geosite in Higashimatsushima City

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About 4 years have passed from the Great East Japan Earthquake. But even now the victims are in a difficult situation in many aspects. They suffer from, in particular, not being able to foresee the future including economy. We, including disaster heritage by Earthquake, trying to create a Geopark utilizing geo-resources in the region. We carry out a geo-tour for the purpose of science education, disaster prevention education and the sightseeing in this Geopark and are going to plan the activation of the disaster area.

In the presentation, I will focus on the geo-resources of Nobiru district in Higashimatsushima City, Miyagi Prefecture. A tsunami attacked repeatedly from the Jomon period approximately 8,000 years ago, and the city suffered a big disaster as well as the Great East Japan Earthquake. Especially Nobiru district has issued a number of victims in the Great East Japan Earthquake.

Therefore, there remains many disaster heritage associated with the 3.11 tsunami here. Having investigated the geo-resources associated with the tsunami in this region, we will introduce them and also introduce geo-story they tell.

Keywords: Higashimatsushima City, Nobiru district, Great East Japan Earthquake, Tsunami, Disaster prevention education, Geopark

Image of geopark for university students: a case report of Nagasaki Prefecture

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The Unzen Volcanic Area Global Geopark is the pioneer of Japanese geoparks, located in central Kyushu Island, southwest Japan. However, a large proportion of local university students do not recognize it. I have lectured physical geography in the University of Nagasaki for three years, including a topic of geopark and field works around the geopark. Also I assigned a report on finding and explaining a local geo-site for students. Image of geopark for university students will be outlined and categorized by subjects, base on totally more than 250 reports.

Keywords: geopark, geo-site, physical geography, university student, Nagasaki Prefecture

Trend of IUGS on GeoParks, GeoVandalism and GeoEthics

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The Executive Committee of IUGS (International Union of Geological Sciences) decided to continue supporting IGGP (International Geoscience and GeoParks Programme) after successful development of IGCP for 45 years. It is stressed that we invite much more researchers from developing countries. The GeoParks movement is also very fruitful in these years (particularly in China). On the other hand, there is not much difference for ordinary citizen between GeoParks, World Heritage (there are a few geological world heritages), National Parks, and Natural Preserves, although there must be distinct differences in between these programmes. They work under each popular logs. Natural Trust Movement in Britain also works by spontaneous motion for natural preserve of citizen. These seem no different with GeoParks in appearance to utilize the world-famous geological outcrops and areas for education and heritage to the citizen and world. In particular, the USA has many national parks and monuments that are used for education on nature and morals of young people by family outside. These are quite different from Japanese national parks in which many regulations and controls are involved. The universities have effective curriculums of summer camp (USA) and mapping project (UK), similar to the previous promotion thesis (Shinron) of Japan, and are well supported by professors, students and society. In these years, natural preserves (including environments and resources) have been popular but the geological leaders may trend different ways to economic development of the world and their own country. IUGS have done four IGCs (International Geological Congresses) in these more than 12 years, suggesting to utilize geology for the economic development. These are of a different trend as UNESCO and other nature conservation associations which seek basic education for natural environments. GeoParks and other similar movements must be on such nature conservation trends. On the other hand, GeoVandalism includes outcrop destruction by geologists and civil engineering projects in s.s., and environmental destruction in s.l. for opposing such un-ethical deeds, as such geo-ethical points of view must be claimed much more for nature conservation, natural preserve, natural heritage etc. Two geo-ethical programmes are going on (www.iapg.geoethics.org/, www.icog.es/iageth), and special issue of Episodes, 2014 Vol. 37 No. 4 (www.episodes.co.in) is published for claiming geohazards in subduction zones. Our geologists must work for education of the world and citizen by our professionalism (<http://tg-ggp.org/>). The movements of so-called geo-something must be discussed in the term of geo-ethics.

Keywords: IUGS, GeoParks, GeoVandalism, GeoEthics, National Park Movement

Why was Mt. Fuji not nominated for the UNESCO Natural World Heritages?

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The Mount Fuji area, which consists of 25 sites reflecting the essence of the sacred and artistic landscape, was inscribed on the Cultural World Heritage list of UNESCO in 2013. However, Mount Fuji has outstanding beauty of a solitary stratovolcano, which is well known around the world, and still has many important geomorphological, geological, and biological features in spite of the urbanization of surrounding areas and the existence of many alpinists and hikers. Why was Mt. Fuji not nominated for Natural or Mixed World Heritages, but for Cultural World Heritages? This study critically reexamined the records of the working group, which was established by the Ministry of the Environment of Japan and the Forestry Agency of Japan in 2003 for selecting Natural World Heritage candidates, and reevaluate the value of the Mount Fuji area as a candidate for Natural or Mixed World Heritage and also for global geopark.

Keywords: Mt. Fuji, World Heritage, natural heritage, UNESCO, geopark, candidate

Proposing to geopark area setting and the satellite geosite, based on the earth scientific view.

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The area setting of geopark in present Japan is often done by the administrative unit excluding the one that the remote island etc. can be divided clearly and geographically. Therefore, judging from the aspect of the earth science, an extremely unnatural area setting is often done. It is a big problem that should be solved to spread the earth science to a general person.

On the other hand, even if the area is set from an earth science aspect, it besides the area might have to be requested for more detailed understanding. We want to propose to set the satellite geosite outside a main area in geopark for that.

Keywords: geopark, satellite geosite, earth science

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The importance of the seamless geostory

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Geopark is often mistaken for a park of the geological and geomorphological feature. But geopark is a park of Earth. Geopark has to be the park where the earth can be understood overall. I will present some geostory on Chokai-Tobishima Geopark plan, Motobu Hanto Geopark plan and Happo-Shirakami Geopark.

Keywords: geopark, geostory, earth science

Geopark Studies as a New Applied Geoscientific Discipline

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Geopark requires scientific supports by academic associations and geoscientists. Geoparks in Japan tend to concern only parts of geological and geographical topics, and rarely understand multidisciplinary and interdisciplinary geoscientific scopes. Geoscience also requires a method of effective outreach covering multidisciplinary and interdisciplinary topics since geoscientific problems are characterized as seamless phenomena. Geopark is an effective tool involving multidisciplinary and interdisciplinary outreach, if scientific and attractive geostories are produced by seamless geoscience. Although many staffs work in geoparks, they are difficult to understand a seamless geostory because almost all Japanese geoparks are controlled under a local government system. Academic staffs are also employed in Japanese geoparks, whereas young researchers and communicators seem to lack multidisciplinary and interdisciplinary scopes because of specialized and independent academic communities. The JpGU geopark session allows science communication among all geoscientific disciplines (space and planetary sciences, atmospheric and hydrospheric sciences, human geosciences, solid earth sciences and biogeosciences) and geoparks. Discussion in this session leads to geopark studies with academic status, which contributes to both geoparks and geoscience in terms of intersectional researches, geoscientific education and science communication supported by academic foundations. This session should produce a framework for geopark studies, linked with sustainability sciences, as a new applied geoscientific discipline.

Keywords: geopark, geoscience, outreach, geoscientific education, science communication, sustainability sciences

Japanese continental drift theory mentioned over 1200 years ago, before the Wegener's theory

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Geology of the Shimane Peninsula has been known as having the most deformed strata among the Miocene series of the Japanese Islands. Otsuka (1939) named it as "Shinji folded zone." Tai (1952) mapped the northwestern part of Matsue City and first discussed the stratigraphy of the Miocene formations. Large-scaled investigations carried out by the governmental institution (1967-1971), and subsequently Yamauchi et al. (1980) and Nomura (1986), respectively, discussed the stratigraphy and biostratigraphy of the eastern and middle part of the peninsula. Kano et al. integrated the areal geology into 1/50,000 scaled map such as Taisha, Izumoimaichi, Etomo, Sakaiminato and Matsue.

Izumo-no-kuni-fudoki (The Izumo Province fudoki) was compiled in 733, which was 1282 years ago. A very stimulated story, the Shimane Peninsula was formed as added the land pulled part from the peninsula, somewhere of Shiragi, old name of Korean country (A.D. 6~10 century). This story is very popular in Japan, known as "the Kunibiki myths." The physicist and essayist, Torahiko Terada, took up this story just like the Wegener's "Continental Drift Theory" in his essay of "Geophysicist and mythology." Up to the present, no one discussed the place where is the peninsula of Shiragi. However, the place is clearly located in Korea.

One more stimulated concern on this story is the paleomagnetic reconstruction of early Miocene Honshu Island. Clock-wise rotation of southwest Honshu Island has been well studied, and the geographic location of southwest Honshu Island in the early Miocene is clarified as being very near Korea.

We investigated the geology of the Pohang basin and its neighboring area. The early Miocene series of the Guryompo Peninsula are mainly composed of the Beomgogni Group and Janggi Group, both of which are characterized by volcanoclastic rocks such as dacite and andesite. Lithology of shale in the Janggi Group is similar to that of the Koura Formation distributed in the Shimane Peninsula, which yields brackish fossil *Corbicula*. The geologic ages of the Beomgogni Group and Janggi Group are ranged in 22~17Ma, earlier ages of which are also similar to those of the Koura Formation.

Surprisingly enough, the story of the "Kunibiki myths" suggests the people 1300-years ago figured out geographic nature of the earth that is unchanged with the present view of the earth. The "Kunibiki myths" never mentioned the geological reason, why is the Guryompo peninsula similar to the Shimane peninsula. However, we suppose the myths have been born through the people interchanged between Shiragi and Izumo countries. We suggest thus high potential of people's observing ability to the geology and topography of the earth indicated in the "Izumo Province fudoki."

Keywords: Izumo Province fudoki, Kunibiki myths, Shimane peninsula, early Miocene, Continental drift theory

2014 Eruption of Nakadake Aso Volcano and countermeasure of Aso Global Geopark

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After 6 years of continuous efforts with our community, Aso becomes a member of the Global Geoparks Network. We have to carry on and illuminate our geo-activities further to contribute to the regional area. In this station, Nakadake Aso Volcano has erupted at November 25, 2014 until February 2015. We investigated about the activities of Nakadake Aso and provided information to tourists and local residents. In this report, we introduce the video observation and volcanic ash in 2014. And we compared with today's data and historical data.

Keywords: Geopark, Volcanic ash, Nakadake Aso Volcano, Ash eruption, Strombolian eruption, Disaster reduction

Ibaraki university students' academic support activities on North Ibaraki Geopark

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Ibaraki University Geological Information Utilization Project consists of Ibaraki University students who interested regional contribution by geology. Our project team mainly support North Ibaraki Geopark using geological information that was not well known generally.

Until 2013, we published "geo tourism maps" of 14 sites of North Ibaraki Geopark and performed geo tours using these maps. Furthermore, we committed North Ibaraki Geopark Promotion Council and drew maps and signboards, and assisted geo tours. In 2014, we extended our regional contribution activity based on the industry-government-university-civil-bank collaboration. The performance is as follows.

1) Producing a North Ibaraki Geopark promotion video (PV)

We collaborated with a professional cameraman, Tsukuba Bank and local governments. The PV can introduce geological feature of North Ibaraki area by aerial video. The PV will be screened at branches of Tsukuba Bank, the North Ibaraki Geopark Satellites, and several events.

2) Producing a North Ibaraki Geopark official product "Geodora"

The North Ibaraki Geopark official product "Geodora" was produced in partnership with Kamejirushi Corp., Kasumi Corp., Seibu Corp., a designer, and North Ibaraki Geopark Working Group. The action was paid attention by mass medium, and raised Geopark awareness.

3) North Ibaraki Geopark Summit

We hold a North Ibaraki Geopark Summit. At the summit, 40 participants consisted of North Ibaraki Geopark guides (interpreter), local government officers, Tsukuba Bank officers and civils debated about "geo tour". By information sharing, the connection was stronger and contributed North Ibaraki Geopark revitalization.

4) Producing a new map

The new map in Hitachiota (Mt. Mayumi area) was produced. The information on animals, plants, historical and culture offered by interpreter was added to the geological information. Hitachiota local government will incur the printing costs of the map in the coming year.

We introduced Ibaraki University Geological Information Utilization Project and North Ibaraki Geopark in the annual meeting of the Geological Society of Japan and Science Agora.

Keywords: North Ibaraki Geopark, Regional Contribution

Effects and Issues of Resident Involvement in Geopark Model Route

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One of the important roles of geopark activities is resident understanding of the geopark concept, territory and its features. For this purpose, it is important that local residents participate in geopark activities positively. However, in Japan, where local development has been undertaken by governmental organizations, it is difficult for local residents to take part in geopark activities. This time, we planned "Geopark Model Route" across the San'in Kaigan Geopark in cooperation with local people, to promote better understanding and communication with local people, government and academia involved in geopark activities.

<San'in Kaigan "Geopark Model Route">

In a geopark, creating a tour route and map which allow visitors to explore the geosites easily is required. We have therefore prepared a "Geopark Model Route" for walking tours, sea kayaking, driving in half-day or one day, and for enjoying the feature of each area. Each map includes outlines of about twelve must-see geological spots, allowing visitors to enjoy sightseeing and learn about the San'in Kaigan Geopark.

<The process for planning a "Geopark Model Route">

1) San'in Kaigan Geopark Promotion Council Academic Group selects the candidate sites from the area where geopark activities are prosperous, and if requested to create a map by local residents. 2) Local guides, tourism facilities, local residents, geopark-related officials and academic members form a working group on creating a draft of map. 3) The working group surveys the field and checks the highlights, safety, estimated walking time, etc. 4) Academic Group creates a map. 5) The working group checks the content of the map.

Since Academic Group directly got involved in creating a map, the contents were thought to become difficult. To make it understandable to the general public, we posted images and descriptions on the map to Facebook and modified them to more simply by collecting public opinions through SNS during the process 5).

<Effects and issues of resident involvement in "Geopark Model Route">

We were able to make "Geopark Model Route" useful for local residents, by involving experienced local guides and people in the area. It is important that geopark guides take part in map creation especially in the process 2) & 3). Firstly, geopark guide's participation made the map more practical. Secondly, by working together by local residents and researchers, scientific information could be shared among local people. As mentioned above, we think that resident involvement in planning "Geopark Model Route" was effective, however, some problems were found in its operation. The map is not used effectively in the area which has fewer visitors and no local guides.

From now on, it is also necessary to accept visitor's opinions and correct continuously so that the map may come to be more effective and useful for both visitors and local residents.

Keywords: Geopark, Community Development

Present condition and challenge for the future in using information tools in San'in Kaigan Geopark

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Geopark has been actively performed geotourism for the purpose of the regional sustainable development. Geotourism uses a variety of information tools for PR. For example, a website, brochures, signboards, guide, app, SNS, etc.. We examined a website, signs, guide in San'in Kaigan Geopark.

Through the examination , we could discover an aspect that website has not been used effectively. However, there are visitors from overseas and outside of Geopark area. Utilization of the signboards is about 26 percent in Genbudo Cave. And utilization of guide is about 10-30%. As a result, it becomes clear that information tools have not been effectively utilized. From now on, we have to consider how to use information tools, and how to convey to foreigners and so on.

Keywords: Geopark, Geotourism, Information tools, San'in Kaigan Geopark

The Geo-Tetsu World of Shikoku District from Keywords in the Newspaper Series

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1. What is the Geo-Tetsu ?

The Geo-Tetsu (Kato et al., 2009) is discover wonders of the earth by train trips, that enjoy and learn the nature along the railway. The Geo-Tetsu is supported by the members of Geo-Tetsu Project Committee of the Fukada Geological Institute (<http://fgi.or.jp/geo-tetsu/>). We select enjoyable Geo-Tetsu courses and Geo-points through which people can see geoscientific phenomena and railway facilities through train trips, and continue the proposal of geo-tours using a railway (Fujita et al.,2013).

2. The new approach of the Geo-Tetsu

We started writing the series of "The Geo-Tetsu Trip: Let us Enjoy Wonders of the Geological feature and the Topography of Shikoku District by Train" by a request from the Kochi Shimbun Company. It was published as the series in a "Saturday Nature" in 24 times of the Kochi Shimbun on every month third Saturday from April, 2013 to March, 2015. According to the marketing data which the Kochi Shimbun Company announced in January 2013, as for the morning edition circulation is 198,350, estimated total readership is 539,156, share in Kochi is 86.3%. It was a good opportunity in a meaning to have many people could know the Geo-Tetsu with or without interest to earth science and railways. It also became the new method of the Geo-Tetsu that the style of writing the familiar sceneries as Geo Points in around a station or along a short interval between the stations.

3. The style and layout of the series of "The Geo-Tetsu Trip"

The series was constructed as follows: the size about 1/2 (A3 size) of the newspaper space; the subject, subtitle, the text; a geological map and route map; one piece of big color photo and others 1-2 pieces; the surrounding map and the illustration of the geological structures as necessary. The series is complete in one issue. A member of the Geo-Tetsu Project Committee of the FGI wrote it by turns and tried improvement of the content with the committee.

4. The Geo-Tetsu world of Shikoku district from keyword of the series

We selected 9 routes of railway of Shikoku district in the series for two years. There are many keywords of disasters and railway facilities. The rugged topography and complicated geology of Shikoku district are reflected in them. You can know the railway technological invention to overcome the difficulties; fault motions of Median Tectonic Line, large-scale landslides, the re-routing and disused lines. It was also reported the flood of the Niyodo River and the Shimanto River.

Not only those keywords, we introduce the pleasure from the train window. We can enjoy various topography of the famous sightseeing at Oboke, the incised meander at Shimanto River, and the erosion topography of Sanuki plains. On the Geo-Tetsu trip, we can feel the benefit of geological feature and topography, too. It was focused on the people living along the railway that the springs called Uchinuki of the alluvial fan at Iyo-Saijo, the beach ridge at Akano and so on. In addition, there are episodes of the historical context until construction of the railway and the dawn of the geological history. There are also articles about the origin of the place name about the land. From various keywords only in Shikoku district, we can feel the original Geo-Tetsu story.

Keywords: Geo-Tetsu, Shikoku district, newspaper series, the Geo-Tetsu trip, keywords

The Akatsuki Tourism: Venus observation campaign as next-generation geopark contents

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This paper discusses the potential of planetary science as next-generation geopark contents, which has not been focused ever. It should be easy to divert existing geopark contents to planetary science outreach because the Earth is a planet.

In order for the geopark tourists to understand planetary science contents, the guides have to require considerable time and patience of the guests to tell the whole story beyond the story about the Earth. Clearly, we cannot challenge the patience of lay tourists. We should therefore target the geo-fan base, and make them to become a word-of-mouth hubs that popularize the geocontents.

In order for the geopark tourist not to understand planetary science but just to touch the topics, astronomical observation events may work. A good example is the Venus observation campaign in 2017, supporting and cheering the Japanese spacecraft Akatsuki in geoparks.