

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

MIS23-11

Room:101B

Time:May 25 17:00-17:15

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 Happa-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