Sun. Jul 12, 2020

[J] Oral | O (Public)：Public

9:00 AM - 10:30 AM JST | 12:00 AM - 1:30 AM UTC | Ch.2

[O-01] Educational Materials of Geoscience in Japan

convener:Takayuki Ogata(Disaster Prevention Research Center for Island Regions, University of the Ryukyus), Shinichi Kawate(Musashi High School), Seiichiro Yamamoto(Okuetsu special education school), Hiroo Nemoto(Ritsumeikan University), Chairperson:Takayuki Ogata(Disaster Prevention Research Center for Island Regions, University of the Ryukyus)

9:00 AM - 9:15 AM JST | 12:00 AM - 12:15 AM UTC

[O01-01] Treatment of ocean in upper secondary school education

★Invited Papers

*Toru Miyama[1] (1.Japan Agency for Marine-Earth Science and Technology, Application Laboratory)

9:15 AM - 9:30 AM JST | 12:15 AM - 12:30 AM UTC

[O01-02] How Earthquakes Appear in Educational Materials of Geoscience in Japan

★Invited Papers

*Yasuyuki Kano[1] (1.Earthquake Research Institute, The University of Tokyo)

9:30 AM - 9:45 AM JST | 12:30 AM - 12:45 AM UTC

[O01-03] How are crustal movements handled in geoscience education of upper secondary school in Japan?

★Invited Papers

*Makoto Otsubo[1] (1.Geological Survey of Japan, Research Institute of Earthquake and Volcano Geology)

9:45 AM - 10:00 AM JST | 12:45 AM - 1:00 AM UTC

[O01-04] Paleontology in Earth and Planetary Science Teaching Materials, and Proposals for Next-Generation Teaching Materials.

★Invited Papers

*Akihiko Shibahara[1] (1.Research Institute for Earth Science Visualization Technology Co.,Ltd. (AIST Start-ups), Fukui Prefectural University Institute of Dinosaur Research)

10:00 AM - 10:15 AM JST | 1:00 AM - 1:15 AM UTC

[O01-05] The reviews of description of upper secondary school textbooks

★Invited Papers

*Seiichiro Yamamoto[1] (1.Okuetsu special education school)

10:15 AM - 10:30 AM JST | 1:15 AM - 1:30 AM UTC

[O01-06] Aiming to promote cooperation between school education and academic research in the fields of Earth Science and Geography

★Invited Papers

*Hiroo Nemoto[1] (1.College of Science and Engineering, Ritsumeikan University)

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10:45 AM - 11:00 AM JST | 1:45 AM - 2:00 AM UTC

[O01-07] The introduction of viewpoint of geoscience in “Integrated Geography

★Invited Papers

*Yasutaka Kogawa[1] (1.Okayama Prefectural Tsunami High School)

11:00 AM - 11:15 AM JST | 2:00 AM - 2:15 AM UTC

[O01-08] Teaching risks of global warming in a continually changing global climate

★Invited Papers

*Hasegawa Kouiti[1,2] (1.Komazawa University Senior High Shool, 2.Komazawa University, Institute for Applied Geography)

11:15 AM - 11:30 AM JST | 2:15 AM - 2:30 AM UTC

[O01-09] Earth science and geography teaching materials that can foster perspectives and ideas

★Invited Papers

*Ieyasu TAKIMOTO[1] (1.Utsunomiya University)

11:30 AM - 11:45 AM JST | 2:30 AM - 2:45 AM UTC

[O01-10] Issues for Alignment between Geography Education and Earth Science Education: Geographical Viewpoints and Ideas of "Academic / Education" and "Unification / Non-Unification"

★Invited Papers

*YOSHIDA TSUYOSHI[1] (1.Miyagi University of Education)

11:45 AM - 12:00 PM JST | 2:45 AM - 3:00 AM UTC

[O01-11] Handling of educational materials on geoscience in senior high school

★Invited Papers

*Shinichi Kawate[1] (1.Musashi High School)

12:00 PM - 12:15 PM JST | 3:00 AM - 3:15 AM UTC

[O01-12] Future perspectives of educational materials on geoscience

★Invited Papers

*Takayuki Ogata[1] (1.Disaster Prevention Research Center for Island Regions, University of the Ryukyus)

[J] Oral | O (Public)：Public

4:00 PM - 5:30 PM JST | 7:00 AM - 8:30 AM UTC | Ch.1

[O-03] Recent Advances in Earth and Planetary Science

convener:Tatsuhiko Hara(International Institute of Seismology and Earthquake Engineering, Building Research Institute), Katsuyoshi Michibayashi(Department of Earth and Planetary Sciences, Nagoya University), Hajime Naruse(Department of Geology and Mineralogy, Graduate School of Science, Kyoto University), Yasuhito Sekine(Earth-Life Science Insitute, Tokyo Institute of Technology), Chairperson:Tatsuhiko Hara(International Institute of Seismology and Earthquake Engineering, Building Research Institute)

4:00 PM - 4:35 PM JST | 7:00 AM - 7:35 AM UTC

[O03-01] Chibanian, the first Japanese GSSP associated with the last geomagnetic reversal

★Invited Papers

*Makoto Okada[1] (1.Department of Earth Sciences, College of Science, Ibaraki University)

4:35 PM - 5:10 PM JST | 7:35 AM - 8:10 AM UTC

[O03-02] Recent occurrence of extreme weather events under the accelerating global warming

★Invited Papers

*Hisashi Nakamura[1] (1.Research Center for Advanced Science and Technology, University of Tokyo)

[J] Oral | O (Public)：Public

2:15 PM - 3:45 PM JST | 5:15 AM - 6:45 AM UTC | Ch.2

[O-05] Understanding of formation process of Japanese archipelago from Japanese Geoparks

convener:Noritaka Matsubara(Graduate School of Regional Resource Management, University of Hyogo), Yayoi ICHIHASHI(Sado Island Geopark Promotion Office), HIROKO IMAI(Com Support Office /Wakayama University Center for Tourism Research), Hokuto Obara(Mine-Akiyoshidai Karst Plateau Geopark Promotion Council), Chairperson:Suzuka Koriyama(Sanin Kaigan Geopark Promotion Council)

2:15 PM - 2:45 PM JST | 5:15 AM - 5:45 AM UTC

[O05-01] A possible JGN tour to experience 500 million years history of the Japanese Island

★Invited Papers

*Hideo Takagi[1] (1.Department of Earth Science, Faculty of Education and Integrated Arts and Sciences, Waseda University)

2:45 PM - 3:15 PM JST | 5:45 AM - 6:15 AM UTC

[O05-02] Fossils in the Japanese archipelago and Japanese Geoparks

★Invited Papers

*Daisuke Aiba[1,2] (1.Mikasa City Museum, 2.Mikasa Geopark)

3:15 PM - 3:45 PM JST | 6:15 AM - 6:45 AM UTC

[O05-03] A way of life on the accretionary prism at Geoparks and Geoparks project areas in Shikoku island.

★Invited Papers

*Azusa Tonotani[1], Satoru Imai[2], Takumi Sakakiyama[3], Tsubasa Ogasawara[4] (1.Tourism strategy division in Miyoshi city offce, 2.Tosashimizu Geopark Plan Promotion Committee, 3.Seiyo city Geopark Promotion Office, 4.Muroto Geopark Promotion Committee)

[J] Oral | O (Public)：Public

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[O-05] Understanding of formation process of Japanese archipelago from Japanese Geoparks

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4:00 PM - 4:30 PM JST | 7:00 AM - 7:30 AM UTC

[O05-04] Formation history of the Japanese Islands illustrated by Itoigawa UNESCO Global Geopark

★Invited Papers

*Ko Takenouchi[1], Yousuke Ibaraki[1], Takahiko Ogawara[1] (1.Itoigawa Fossa Magna Museum)

4:30 PM - 5:00 PM JST | 7:30 AM - 8:00 AM UTC

[O05-05] Geopark and volcanic activity in Japan
-based on Toya-Usu UNESCO global Geopark-

★Invited Papers

*Yuki Nishi[1] (1.Toya-Usu UNESCO Global Geopark Council)

5:00 PM - 5:30 PM JST | 8:00 AM - 8:30 AM UTC

[O05-06] Earthquakes, Landforms and Japanese Geoparks

★Invited Papers

*Yoshihiro Hiramatsu[1] (1.School of Geosciences and Civil Engineering, College of Science and Engineering, Kanazawa University)

[J] Oral | O (Public) : Public

Sun. Jul 12, 2020 9:00 AM - 10:30 AM JST | Sun. Jul 12, 2020 12:00 AM - 1:30 AM UTC | Ch.2

[O-01] Educational Materials of Geoscience in Japan

convener:Takayuki Ogata(Disaster Prevention Research Center for Island Regions, University of the Ryukyus), Shinichi Kawate(Musashi High School), Seiichiro Yamamoto(Okuetsu special education school), Hiroo Nemoto(Ritsumeikan University), Chairperson:Takayuki Ogata(Disaster Prevention Research Center for Island Regions, University of the Ryukyus)

This public session targets materials of geoscientific education in Japan, focusing especially on the government-approved textbooks by the Ministry of Education, Culture, Sports, Science and Technology. Specialists on science review the secondary school textbooks in terms of recently academic understanding on the all fields of geoscience. Educational specialists report practices and theories based on the secondary school textbooks of the subjects of Advanced Earth Science, Basic Earth Science, Geography A and Geography B. Such topics should be discussed in public because all Japanese use the government-approved textbooks for enhancing sustainability.

9:00 AM - 9:15 AM JST | 12:00 AM - 12:15 AM UTC

[O01-01] Treatment of ocean in upper secondary school education

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*Toru Miyama[1] (1.Japan Agency for Marine-Earth Science and Technology, Application Laboratory)

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*Makoto Otsubo[1] (1.Geological Survey of Japan, Research Institute of Earthquake and Volcano Geology)

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[O01-04] Paleontology in Earth and Planetary Science Teaching Materials, and Proposals for Next-Generation Teaching Materials.

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*Akihiko Shibahara[1] (1.Research Institute for Earth Science Visualization Technology Co.,Ltd. (AIST Start-ups), Fukui Prefectural University Institute of Dinosaur Research)

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[O01-06] Aiming to promote cooperation between school education and academic research in the fields of Earth Science and Geography

★Invited Papers

*Hiroo Nemoto[1] (1.College of Science and Engineering, Ritsumeikan University)

Treatment of ocean in upper secondary school education

*Toru Miyama[1]

1. Japan Agency for Marine-Earth Science and Technology, Application Laboratory

I reviewed text books for upper secondary school students to see how ocean is treated in the eduaction.

Keywords: Ocean Current, highschool education, wind-driven circulation, El Nino, global warming

How Earthquakes Appear in Educational Materials of Geoscience in Japan

*Yasuyuki Kano[1]

1. Earthquake Research Institute, The University of Tokyo

This talk will discuss on educational materials of geoscience in Japan considering three subjects related to seismology. Terminology in the materials are examined. The term “Tokai earthquake” is one of the good examples to check modern understanding and history of the description in educational materials. Appearance of description of small or medium earthquakes, and seismicity is examined to show the contrast to large and destructive earthquakes. Examples connecting natural disasters with research classes can be found in educational materials. For the explanation of natural disaster distinction of hazard and vulnerability or resilience should be introduced.

Keywords: earthquake, seismicity, destructive earthquake, historical earthquake, disaster mitigation

How are crustal movements handled in geoscience education of upper secondary school in Japan?

*Makoto Otsubo[1]

1. Geological Survey of Japan, Research Institute of Earthquake and Volcano Geology

In this presentation, I review the educational contents and materials of upper secondary school from the viewpoint of structural geology and tectonics, based on the curriculum for geology and geography education. I analyze the accuracy including the terminology, and show the topics to discuss on “how the results of scientific researches are is organized as a textbook of upper secondary school in Japan?”.

Keywords: Fault, Active fault, Plate, Crustal movements, Stress, Tectonics

Paleontology in Earth and Planetary Science Teaching Materials, and Proposals for Next-Generation Teaching Materials.

*Akihiko Shibahara[1]

1. Research Institute for Earth Science Visualization Technology Co.,Ltd. (AIST Start-ups), Fukui Prefectural University Institute of Dinosaur Research

In recent years, groundbreaking research results on paleontology have occurred. Archeopteryx, for example, has been analyzed by scanning electron microscopy, suggesting that at least some feathers may have been black, as traces of organelles called melanosomes have been found in fossils. Similarly, the feather color of some feathered dinosaurs has been estimated, and the color of archeology, which had to be drawn by estimation in previous reconstructions, can be unified. It is beginning to affect science education and outreach.

Also, research on fossils in Japan is continuing vigorously. For example, the Geological Society of Japan created the “Prefectural Stones” list in 2016, with items for fossils. Thus, educational content reflecting the diversity of paleontological species in Japan.

In addition, photographs of specimens of minerals, rocks, and fossils held by the Geological Museum are published as a “Geological specimen database” by the Government of Japan Standard Terms of Use ver. 2.0. I would like to introduce such high-quality open data and how actually to use them with actual examples and discuss the possibilities of new teaching materials for Earth and planetary science.

Keywords: Paleontology, Fossil, Open Data

The reviews of description of upper secondary school textbooks

*Seiichiro Yamamoto[1]

1. Okuetsu special education school

In order to improve the quality of education, the academic knowledge of geoscience should be appropriately reflected. Therefore, the differences between the academic knowledge of geoscience and the descriptions of textbooks of geography and geosciences used in the textbooks of upper secondary school. We discuss what should be descripted in the textbooks.

Keywords: authorized textbooks, science communication

Aiming to promote cooperation between school education and academic research in the fields of Earth Science and Geography

*Hiroo Nemoto[1]

1. College of Science and Engineering, Ritsumeikan University

There are cases in which they are not correctly reflect for the results of academic research in descriptions on textbooks in the fields of Earth Science and Geography approved by the Ministry of Education, Culture, Sports, Science and Technology. One of the reasons may be due to lack of communications between researchers and school educators until now. We need to accelerate communication with each other in order to solve this problem as soon as possible. Moreover, we should discuss to make strategy how to solve the problem in cooperation between them in order to break through nowadays this condition.

Keywords: Earth Science, Geography, School Education, Academic Research, Curriculumme Management

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[O01-07] The introduction of viewpoint of geoscience in “Integrated Geography

★Invited Papers

*Yasutaka Kogawa[1] (1.Okayama Prefectural Tsunami High School)

11:00 AM - 11:15 AM JST | 2:00 AM - 2:15 AM UTC

[O01-08] Teaching risks of global warming in a continually changing global climate

★Invited Papers

*Hasegawa Kouiti[1,2] (1.Komazawa University Senior High Shool, 2.Komazawa University, Institute for Applied Geography)

11:15 AM - 11:30 AM JST | 2:15 AM - 2:30 AM UTC

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[O01-10] Issues for Alignment between Geography Education and Earth Science Education: Geographical Viewpoints and Ideas of "Academic / Education" and "Unification / Non-Unification"

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*YOSHIDA TSUYOSHI[1] (1.Miyagi University of Education)

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[O01-11] Handling of educational materials on geoscience in senior high school

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*Shinichi Kawate[1] (1.Musashi High School)

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[O01-12] Future perspectives of educational materials on geoscience

★Invited Papers

*Takayuki Ogata[1] (1.Disaster Prevention Research Center for Island Regions, University of the Ryukyus)

The introduction of viewpoint of geoscience in “Integrated Geography

*Yasutaka Kogawa[1]

1. Okayama Prefectural Tsunami High School

The next curriculum guidelines were announced in March 2018, and “Integrated Geography” of required subject is provided as the new subject of geography for “sustainable society”, and through International Geography Olympiad, International standard such as thought and skill which is cultivated in geographical education is indicated to high school teachers in all over the world. On the other hand, questions that are rarely dealt with in geography education in Japan may appear in the questions. For example, at the Olympiad in Belgrade held in 2017, questions about the "tides" were given to the students. Questions about the factors causing the tide and the mechanism of its occurrence are difficult to students who is not taking a course in geoscience

The author thinks that teaching contents of geoscience develop student’s knowledge and thinking skills in geography class. This presentation report what we are going to consider when we plan the class in “Integrated Geography”.

Keywords: integrated geography, International Geography Olympiad, geoscience

Teaching risks of global warming in a continually changing global climate

*Hasegawa Kouiti[1,2]

1. Komazawa University Senior High Shool, 2. Komazawa University, Institute for Applied Geography

1. Introduction

In the commentary of the new course study for senior high schools (2018, Ministry of Education, Culture, Sports, Science, and Technology - Japan), it is stated in “Basic Earth Science” that “based on the hypothesis that global warming is actually progressing, presentation of the data that confirms it is necessary. Students are encouraged to forecast global warming influences”. Nevertheless, as many people are aware, skepticism regarding global warming persists today. Politicians particularly point this out aggressively.
From a neutral standpoint, Masuda (2006) (Scientists in Japan (41(9)) summarized skepticism related to global warming while also giving some regard to the scientific consensus by IPCC. It is pointed out in his paper that some skepticism lacks scientific evidence. However, as long as the research about the global climate system is progressing, it is natural that this issue involves uncertainty. Of course, other phenomena researched in geosciences certainly involve such uncertainty. “Global warming” is specific in that the degree of public attention is high and its authenticity is discussed frequently. However, this presentation is not intended to argue the truth or falsity of global warming. Given those circumstances, the author intends to report what is important at the senior high school educational level.

2. Descriptions of “global warming” in current Basic Earth Science textbooks

The author compared textbooks from five publishers. Figures displaying rising temperature data over the past century and increases in CO_2 concentrations during the past decades are shown in every textbook. On the other hand, regarding factors of global warming and future forecasts, every textbook uses careful expressions such as “it is considered that …, it is common to consider that …”. Some textbooks describe past climate and urge careful consideration, whereas other textbooks present the uncertainty while pointing out other phenomena such as the heat island effects. Two textbooks present future forecasts of IPCC, whereas one of them presents more details related to measures against global warming. Although each publisher devotes some consideration to the uncertainty related to global warming, their nuances differ.

3. Considerations for education

Through instruction about global warming, the author is aware of the cultivation of an “attitude of recognizing the uncertainty of science and not being confused by the reports”. At Komazawa University Senior High school, Basic Earth Science is taught two hours per week as a necessary course for first-year students. In this course, “Global warming” is taught during the third term related to “earth history”. In this connection, importance is attached to the understanding of climate feedback. During the history of the earth, sudden climate changes occurred several times, followed by the total extinction of many species and the eventual evolution of life as we know it. This indicates positive feedback on the global climate system triggered by some contributory factors such as volcanic eruption or collision with a meteorite. In the class, the possibility of a drastic change to the global climate by several factors is

emphasized. Furthermore, the fact that research of this system is still developing is also taught.
In the study of geoscience, new observation data such as remote sensing data from satellites and earth excavation data are obtained through daily technological innovations. This data might in some cases cast doubt on the present dominant theory. It is natural that the meaning of the data is investigated carefully every time it emerges and that discussions are made to narrow and resolve the uncertainty. Regarding climate feedback, positive feedback system (changes are accelerated) and negative feedback system (changes are suppressed) are still on the research stage. It is a good topic for teaching that science involves uncertainty.

Keywords: global warming, Uncertainty, Climate feedback

Earth science and geography teaching materials that can foster perspectives and ideas

*Ieyasu TAKIMOTO[1]

1. Utsunomiya University

What is required for earth science and geography education in secondary education is not to educate experts, but to foster the necessary earth science and geography perspectives and ideas as members of society.Students have misconceptions of the earth and geography based on their own experiences. The purpose of education is to change the misconception into more scientifically appropriate concepts through classes.From these points, the most important elements of the teaching materials of the earth science and geography required are the contents and materials that can properly feed the viewpoints and ideas unique to the subjects.At present, there is a problem in the figures showing the phenomena published in textbooks. For example, it is necessary to understand that the meteorological front is drawn with emphasis on height. However, if teachers do not understand that, they will foster students with wrong viewpoints and ways of thinking.From the above, from the standpoint of having experience as a teacher in school and teaching in the School of Education, it is important that textbooks used in schools accurately describe phenomena.

Keywords: perspectives and ideas , misconception, figure

Issues for Alignment between Geography Education and Earth Science Education: Geographical Viewpoints and Ideas of "Academic / Education" and "Unification / Non-Unification"

*YOSHIDA TSUYOSHI[1]

1. Miyagi University of Education

Yamamoto and Ogata (2018) compared and examined natural descriptions common to high school Geography and Earth Science education in all textbooks on subjects related to both educations and found that many terms differed in both educations. I found that there is a discrepancy between academic terms and educational terms. The academic accuracy, which is a common factor in teaching materials, was questioned again. In response to this point, in order to seek the qualities and abilities of modern education, it is meaningful to discuss the direction of unification and non-unification of terms that are common to various specialized fields. Therefore, this paper first considers the principle of “Academic / Education” and “Unified / Non-unified”.
The “Academic / Education” axis is inevitably the expressions and explanations necessary to adapt to children when students look down on academic terms and explanations according to the place of education and the stage of learning. The "Unification / Non-unification" axis has advantages in both "Unification" and "Non-unification". The advantage of "Non-unification" is that there is room to give a sense to deepen and the idea by various ways of expressing and explaining with various words and phrases. if you adhere to "Unification", it may be difficult to set the criteria for what you want to "unify" with, and it may be difficult to achieve common understanding by "unification". On the other hand, even if there are terms and educational contents that are common terms of “unification”, in order to deepen the field-specific learning, each academic viewpoints and ideas. Furthermore, it is important to effectively nurture the viewpoints and ideas of various specialized fields, including both specialized fields, in order to form a comprehensive human being. Therefore, depending on the conditions and circumstances at that time, the direction of using “unified” or “non-unified” can be recognized. Judging from Fig. 1, (①) domain is valued in compulsory education. (③) domain will be seen in the latter stage of secondary education, so it will be the main subject of this discussion. Under this fundamental arrangement, discussions are deepened from the points of "type Ⅰ, Ⅱ, Ⅲ". In addition, discussions on regional, national and international perspectives ("internationality") and historical (futuristic) changes ("transformation") will need to be considered.
With this sort of arrangement, this paper focuses on Geographical viewpoints and ideas to deepen the discussion. From the point of "Type Ⅰ", it has been described by educationally abstract words and concepts based on academic concepts. And, in the transition of the curriculum guidelines, they have been treated, but in lesson practice, they have been treated as non-unified, in other words, somewhat vague. From the point of "Type Ⅱ", there has not been considered a point of contact with Earth Science, so in order to achieve meaningful cooperation, it is necessary to understand Earth Science viewpoints and ideas and adjust for cooperation. From the point of "Type Ⅲ", Geographical viewpoints and ideas of the new curriculum are related to "internationality" from an academic perspective but are in line with the geographical concepts of the International Charter for Geographical Education. Be unified. However, it is educational in that it is shown from Geographical viewpoints and ideas of social phenomena and the relationship between "viewpoints" and "questions" under the new curriculum guidelines. In lesson practice, the degree of abstraction is high, so it must be non-uniform. In other words, in terms of “internationality”, as described above, they are unified, but they tend to be vague from a regional and

individual teacher perspective. In terms of "transformation", there are both sides of "transformation / non-transformation". The former has a strong educational aspect in response to the needs of the times, and the latter has an academic aspect such as geographic philosophy and geography. Will be strong. Based on the above, this paper focuses on Geographical viewpoints and ideas and suggests from textbook descriptions of other countries while focusing on the direction of modern education. In addition, we will discuss.

Keywords: Commonality, Internationality, Transfiguration, Human formation , Geographical concepts, Lesson

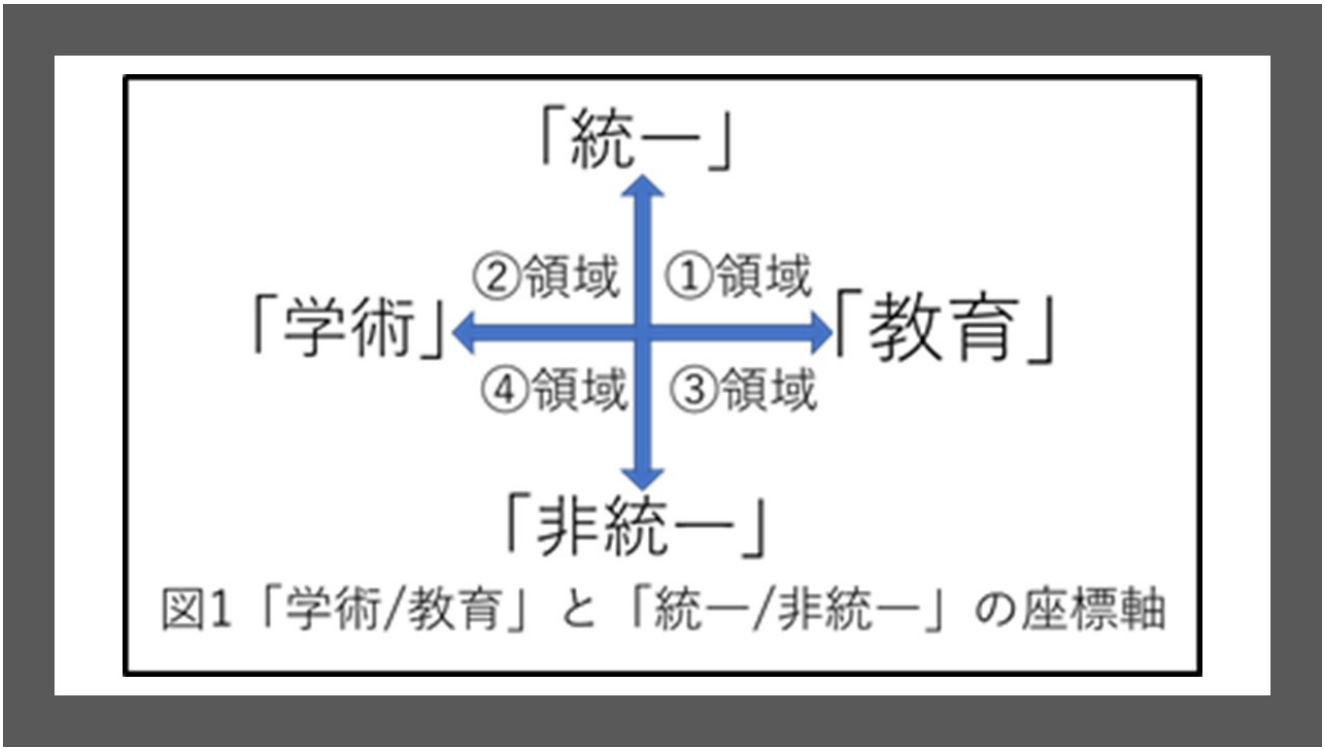

図1「学術/教育」と「統一/非統一」の座標軸

Handling of educational materials on geoscience in senior high school

*Shinichi Kawate[1]

1. Musashi High School

The educational materials used in senior high school for geoscience will be discussed based on the report of educational specialists. Considering how the contents of the educational materials are related to academic and educational aspects, we will examine how they can be handled and devised in senior high schools.

Keywords: Geoscience, School education, Educational materials

Future perspectives of educational materials on geoscience

*Takayuki Ogata[1]

1. Disaster Prevention Research Center for Island Regions, University of the Ryukyus

Geoscientific education is programmed in many educational institutes, such as primary schools, secondary schools, museums and geoparks. Many materials of geoscientific education are based on the government-approved textbooks, whereas the textbooks are partly unsuitable for academic knowledge of recent geoscience. Future geoscientific education requires educational materials and school curriculums which involve multi-disciplinary and inter-disciplinary geoscience.

Keywords: geoscience, school education, lifelong education, educational materials

[J] Oral | O (Public)：Public

Sun. Jul 12, 2020 4:00 PM - 5:30 PM JST | Sun. Jul 12, 2020 7:00 AM - 8:30 AM UTC | Ch.1

[O-03] Recent Advances in Earth and Planetary Science

convener:Tatsuhiko Hara(International Institute of Seismology and Earthquake Engineering, Building Research Institute), Katsuyoshi Michibayashi(Department of Earth and Planetary Sciences, Nagoya University), Hajime Naruse(Department of Geology and Mineralogy, Graduate School of Science, Kyoto University), Yasuhito Sekine(Earth-Life Science Insitute, Tokyo Institute of Technology), Chairperson:Tatsuhiko Hara(International Institute of Seismology and Earthquake Engineering, Building Research Institute)

This is an outreach session, in which invited speakers present their recent findings and developments in fields of earth and planetary sciences. This session has been presented as a public session since 2005. The JpGU Publicity and Outreach Committee members are conveners of this session.

4:00 PM - 4:35 PM JST | 7:00 AM - 7:35 AM UTC

[O03-01] Chibanian, the first Japanese GSSP associated with the last geomagnetic reversal

★Invited Papers

*Makoto Okada[1] (1.Department of Earth Sciences, College of Science, Ibaraki University)

4:35 PM - 5:10 PM JST | 7:35 AM - 8:10 AM UTC

[O03-02] Recent occurrence of extreme weather events under the accelerating global warming

★Invited Papers

*Hisashi Nakamura[1] (1.Research Center for Advanced Science and Technology, University of Tokyo)

Chibanian, the first Japanese GSSP associated with the last geomagnetic reversal

*Makoto Okada[1]

1. Department of Earth Sciences, College of Science, Ibaraki University

On January 17, 2020, a GSSP proposal for "Chiba Section", which was a candidate for Japan's first Global Boundary Stratotype Section and Point (GSSP), and had been under review for a long time, was ratified by the International Union of Geological Sciences (IUGS). As a result, the Middle Pleistocene, which is between 774,000-129,000 years ago, was named as the Chibanian period.

In this talk, I will explain what a geologic age and a GSSP, which are generally difficult to be understood is.

Geologic ages are mainly divided by changes in fossil flora and climatic cycles. A geologic age used to be defined by a type section of a sedimentary formation which represents the most typical fossil flora indicating the geologic age. However, this scheme was not able to determine when the geologic age started. To solve this problem, a scheme to have a type section for the boundary of two geologic ages was proposed in 1976 to define an initiation of geologic age. A type section in this scheme is called as "GSSP: Global boundary Stratotype Section and Point". For the whole Earth's history, 116 boundaries of geologic ages have been defined. However, GSSPs have been able to be set up only for the last ca. 635 Ma, after the Ediacaran period, whose geologic formations yield fossils of organisms. Currently, 74 GSSPs have been ratified by IUGS.

Because a GSSP is the best section representing the initiation boundary of geologic age, a GSSP has a role to be a reference section to define the boundary horizon in some other section elsewhere in the world. Even if a geologic section in somewhere only contains a limited kind of fossils, the GSSP needs to provide data for the same type of fossils with that section to facilitate for stratigraphic correlations. Consequently, a GSSP has to be a marine formation yielding many kinds of fossils and providing various methods for stratigraphy as much as possible. Moreover, a site for the GSSP has to be guaranteed feasibility for future studies and sampling.

The initiation of Pleistocene, ca. 2.6 Ma, is defined as the period for the start of the Northern Hemisphere Glaciation (NHG). During that period, the Earth's climate cycle has changed from 20 kyr to 41 kyr, and the amplitude has gradually become larger. After that period, between 1.2 and 0.5 Ma, the climate cycle has changed again from 41 kyr to 100 kyr, and the amplitude became much more significant. This second change, called sometimes as EMPT (Early-Mid Pleistocene Transition), has been utilized as the basis to divide Early and Middle Pleistocene. However, the difference is so gradual, which is not suitable to define an exact boundary.

For this reason, the Matuyama-Brunhes boundary (MBB), which is the last geomagnetic reversal in the Earth's history, has been used as "a marker horizon" to define the Early-Middle Pleistocene boundary. Consequently, a GSSP for the Early-Middle Pleistocene boundary has to provide a high-quality geomagnetic record to be able to indicate the MBB horizon in the geologic section where the GSSP is set up. Since the actual point for the GSSP, represented as a "Golden Spike", should be on a distinctive layer in the section, the Byk-E tephra bed laying just below the MBB was proposed as the GSSP horizon in the

Chiba section.

Keywords: Global Boundary Stratotype Section and Point, Matuyama-Brunhes geomagnetic reversal boundary, Chiba Composite Section

Recent occurrence of extreme weather events under the accelerating global warming

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Natural climate variability has been causing extreme weather events in a number of regions around the world even before the emergence of global warming. In recent years, however, record-setting events of extreme warmness, torrential rainfall and drought have become more frequent under the accelerating global warming. It is discussed in this talk how the superposition of natural climate variability and the global warming can cause such record-setting extreme events.

Keywords: extreme weather events, global warming, natural variability

[J] Oral | O (Public)：Public

Sun. Jul 12, 2020 2:15 PM - 3:45 PM JST | Sun. Jul 12, 2020 5:15 AM - 6:45 AM UTC | Ch.2

[O-05] Understanding of formation process of Japanese archipelago from Japanese Geoparks

convener:Noritaka Matsubara(Graduate School of Regional Resource Management, University of Hyogo), Yayoi ICHIHASHI(Sado Island Geopark Promotion Office), HIROKO IMAI(Com Support Office /Wakayama University Center for Tourism Research), Hokuto Obara(Mine-Akiyoshidai Karst Plateau Geopark Promotion Council), Chairperson:Suzuka Koriyama(Sanin Kaigan Geopark Promotion Council)

As of October 2019, there are 9 UNESCO Global Geoparks and 35 Japanese National Geoparks in Japan. Each geopark records the formation process of the Japanese archipelago, and we can know the formation of the Japanese archipelago by connecting all the geoparks. In this session, we discuss about formation process of Japanese archipelago and relationship between Geology and people's lives through the Japanese Geoparks.

2:15 PM - 2:45 PM JST | 5:15 AM - 5:45 AM UTC

[O05-01] A possible JGN tour to experience 500 million years history of the Japanese Island

★Invited Papers

*Hideo Takagi[1] (1.Department of Earth Science, Faculty of Education and Integrated Arts and Sciences, Waseda University)

2:45 PM - 3:15 PM JST | 5:45 AM - 6:15 AM UTC

[O05-02] Fossils in the Japanese archipelago and Japanese Geoparks

★Invited Papers

*Daisuke Aiba[1,2] (1.Mikasa City Museum, 2.Mikasa Geopark)

3:15 PM - 3:45 PM JST | 6:15 AM - 6:45 AM UTC

[O05-03] A way of life on the accretionary prism at Geoparks and Geoparks project areas in Shikoku island.

★Invited Papers

*Azusa Tonotani[1], Satoru Imai[2], Takumi Sakakiyama[3], Tsubasa Ogasawara[4] (1.Tourism strategy division in Miyoshi city offce, 2.Tosashimizu Geopark Plan Promotion Committee, 3.Seiyo city Geopark Promotion Office, 4.Muroto Geopark Promotion Committee)

A possible JGN tour to experience 500 million years history of the Japanese Island

*Hideo Takagi[1]

1. Department of Earth Science, Faculty of Education and Integrated Arts and Sciences, Waseda University

"Geology and Topography of Japan in Chronological Order" published in January 2017 (Seibundo Shinkosha) shows the 500 million-year history of the Japanese Island using a lot of photographs. The basic policy was to cover all (44) domestic geoparks. In accordance with the purpose of this session, I propose a virtual JGN tour where you can experience the history of the Japanese Island in each geological period. When the formation ages of the highlight geosites that can be the highlight of each geopark are arranged, the characteristic of Japanese geoparks is that more than half of the geoparks in Japan are related to Quaternary volcanoes. In addition, there are about half of the geoparks where the Cambrian to Neogene strata and rocks are the highlights. The geological formations and topography formed in the Quaternary are the highlights of all geoparks. Even in geoparks that span multiple eras, only one era for one geopark can be selected. When the Paleozoic and Mesozoic periods are put together, we can organize geotours across geological era (or period-by-period), and geotours covering geological events that form the Japanese Island (eg, accretionary complex formation, opening of the Sea of Japan, Quaternary volcanism, etc.).

Keywords: geopark, geotour, geological era

Fossils in the Japanese archipelago and Japanese Geoparks

*Daisuke Aiba[1,2]

1. Mikasa City Museum, 2. Mikasa Geopark

The "fossil" is any preserved remains, impression, or trace of the prehistoric creatures in the strata. The Japanese archipelago consists of the Cambrian–Quaternary, which yields the various kinds of fossils such as vertebrate, invertebrate, plant, and microfossils abundantly. Paleontological researches of these fossils can reveal the paleoecology, ecological system, evolutionary history, mass extinction and so on. The fossils are indispensable for discussing of the Japanese archipelago and its fauna and flora developments. In some Japanese Geoparks, the fossils are important to explain the local geology, history, and industry. For example, ammonoid fossils are discovered under the exploitation of a first coal mine in the Mikasa City in late 18th century. The discovery of ammonoid fossils near the coal measures is inevitable, because the tectonics of Hokkaido Island and the geological structure seen in this area cause the discovery. On the other hand, the fossils are also not irrelevant to agriculture. A firm stratum including the microfossil "diatom" shapes a sunny slope, and various strata including shell fossils distributed under a grape field bring the delicate taste of wine.
In this talk, the fossils in the Japanese archipelago and paleontological researches are reviewed, and the relationships between the fossils and Japanese Geoparks are introduced with exemplary cases.

Keywords: Fossil, Paleontology, Japanese archipelago, Geopark

A way of life on the accretionary prism at Geoparks and Geoparks project areas in Shikoku island.

*Azusa Tonotani[1], Satoru Imai[2], Takumi Sakakiyama[3], Tsubasa Ogasawara[4]

1. Tourism strategy division in Miyoshi city offce, 2. Tosashimizu Geopark Plan Promotion Committee, 3. Seiyo city Geopark Promotion Office, 4. Muroto Geopark Promotion Committee

An accretionary prism is that sedimentary rocks and volcanically products on the ocean plate added under the continental plate. Land of Shikoku island consists of accretionary prisms 60% or more.

The north boundary of the accretionary prism in Shikoku island is Japanese median tectonic line (MTL), which mostly runs to an east-west direction in Shikoku island. The greater part of south area of MTL consists of accretionary prism, which were formed during a variety of age. Geological regions in this accretionary prism are divided into Sambagawa belt, MIkabu belt, Chichibu belt, Kurosegawa belt and Shimanto belt, respectively. Those geological regions distribute east-west direction, and formation ages show the more young towards to south region with the exception of a few regions.

Geoparks and Geopark project areas in Shikoku island almost are located on accretionary prism. On those Geoparks and Geopark project areas, we can feel unique ecosystems, historical and cultural life, which closely connects geology and landscape.

In this presentation, we introduce that the unique ecosystems, historical and cultural life were developed on the accretionary prism through Geoparks and Geopark project areas in Shikoku.

Keywords: Geopark, Accretionary prism in Shikoku

[J] Oral | O (Public)：Public

Sun. Jul 12, 2020 4:00 PM - 5:30 PM JST | Sun. Jul 12, 2020 7:00 AM - 8:30 AM UTC | Ch.2

[O-05] Understanding of formation process of Japanese archipelago from Japanese Geoparks

convener:Noritaka Matsubara(Graduate School of Regional Resource Management, University of Hyogo), Yayoi ICHIHASHI(Sado Island Geopark Promotion Office), HIROKO IMAI(Com Support Office /Wakayama University Center for Tourism Research), Hokuto Obara(Mine-Akiyoshidai Karst Plateau Geopark Promotion Council), Chairperson:Suzuka Koriyama(Sanin Kaigan Geopark Promotion Council)

As of October 2019, there are 9 UNESCO Global Geoparks and 35 Japanese National Geoparks in Japan. Each geopark records the formation process of the Japanese archipelago, and we can know the formation of the Japanese archipelago by connecting all the geoparks. In this session, we discuss about formation process of Japanese archipelago and relationship between Geology and people's lives through the Japanese Geoparks.

4:00 PM - 4:30 PM JST | 7:00 AM - 7:30 AM UTC

[O05-04] Formation history of the Japanese Islands illustrated by Itoigawa UNESCO Global Geopark

★Invited Papers

*Ko Takenouchi[1], Yousuke Ibaraki[1], Takahiko Ogawara[1] (1.Itoigawa Fossa Magna Museum)

4:30 PM - 5:00 PM JST | 7:30 AM - 8:00 AM UTC

[O05-05] Geopark and volcanic activity in Japan
-based on Toya-Usu UNESCO global Geopark-

★Invited Papers

*Yuki Nishi[1] (1.Toya-Usu UNESCO Global Geopark Council)

5:00 PM - 5:30 PM JST | 8:00 AM - 8:30 AM UTC

[O05-06] Earthquakes, Landforms and Japanese Geoparks

★Invited Papers

*Yoshihiro Hiramatsu[1] (1.School of Geosciences and Civil Engineering, College of Science and Engineering, Kanazawa University)

Formation history of the Japanese Islands illustrated by Itoigawa UNESCO Global Geopark

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

1. Itoigawa Fossa Magna Museum

Itoigawa UNESCO Global Geopark has metamorphic, igneous and sedimentary rocks formed from Paleozoic to Cenozoic, which illustrate the formation environment and process of the lands of Itoigawa. Also, the rocks form characteristic geologic structures such as the Fossa Magna whose western edge is defined as the Itoigawa-Shizuoka Tectonic Line. We can understand an overview of the geologic history of the Japanese Islands from rocks and geologic structures observed in the Itoigawa Geopark. Plenty of rock pebbles which are polished and palm-sized have been carried by debris flows from mountainous areas to the sea. The coast of Itoigawa is like a ‘museum of stones’. Thus, Itoigawa Geopark can illustrate the formation processes of the Japanese Islands including its continental era over 500 million years, which are representative of island arcs situated on the western margin of the Pacific Ocean. The formation history of the Japanese Islands is exhibited in the Fossa Magna Museum as the information base of the Itoigawa Geopark and the exhibition helps visitors to understand the relationship between geosites observed in the field and the history of the Japanese Islands.

The history of the Japanese Islands illustrated by geology of the Itoigawa Geopark is as follows:
Jade rock (Paleozoic era): Jade rocks including gem quality jade had formed in the deep part of the continental margin where the oceanic plate was subducting. After that, jade had been uplifted by tectonic serpentinite diapir with other metamorphic rocks including new minerals or rare minerals from the deep part to the shallow part of the crust. Jade rocks and metamorphic rocks exposed in the mountainous area were carried as rock pebbles to the sea by debris flow generated in the uplifting mountainous area in the Quaternary. People in the Jomon era, (Neolithic age, 6000 years ago) collected jade pebbles from the beach and made jade beads which shows the world’s oldest jade culture. Jade was the first stone that spread over the Japanese Islands as a stone showing the spiritual nature of the Jomon people.

Limestone (Paleozoic era): Coral reefs which formed on top of or around a volcanic island in the Paleo-Pacific Ocean had changed to thick limestones during movement processes of the oceanic plate. In the Quaternary period, uplifting of the land made characteristic karst landforms such as many dolines with deep caves in the limestone. Inside of the dolines thick snow even in the summer has kept the environment of the Ice age.

Kuruma Group (Mesozoic era): Jurassic Kuruma Group consisting mainly of sandstone and mudstone includes plenty of fossils of fauna and flora. Especially fossil of flora changed to coal beds which were mined intermittently in the Meiji to Showa periods.

Fossa Magna and Itoigawa-Shizioka Tectonic Line (Cenozoic): The Fossa Magna which shows a North-directed geological depression in central Japan was a great fissure formed during the opening process of the Sea of Japan. The Fossa Magna is filled with sandstone, mudstone and volcanic rocks which were deposited on the sea floor. These strata including marine mammal fossils exposed in the mountainous area shows evidence that mountains of the Fossa Magna region originated from the old sea floor. Shear zone of the Itoigawa-Shizuoka Tectonic line forms a large valley between the Kubiki Mountains (Fossa Magna) and the Hida Mountains (rocks of Mesozoic to Paleozoic). The Salt Road which

was made along the tectonic line was a trail for trade between Itoigawa and mountainous provinces. Salt and marine products were carried to mountainous areas from Itoigawa, while tobacco and cereals were carried to Itoigawa from mountainous areas.

Keywords: Fossa Magna, Itoigawa-Shizuoka Tectonic Line, Japanese Islands, Itoigawa Geopark

Geopark and volcanic activity in Japan -based on Toya-Usu UNESCO global Geopark-

*Yuki Nishi[1]

1. Toya-Usu UNESCO Global Geopark Council

Geoparks in Japan relate closely to volcanoes, because subduction zones locate around our country. The Geoparks have used volcanic products and blessing formed by eruption for education and tourism.
For example, Toya-Usu UNESCO global Geopark utilize Toya-caldera, debris avalanche deposits, lava dome, buildings destroyed by eruption for excursion. Also, they are performing project to understand foods grown by volcanic activity.
In this presentation, I would like to describe geological history and volcanic activity in Janan, diversity of volcanic products (lava, pumice and pyroclastic flow deposits), utilization of Geosites which relate to volcanoes, also discuss about essential action to live in volcanic island.

Keywords: Geopark, Toya-Usu UNESCO Global Geopark, volcanic activity in Japan, Education for disaster reduction , Geopark tourism

Earthquakes, Landforms and Japanese Geoparks

*Yoshihiro Hiramatsu[1]

1. School of Geosciences and Civil Engineering, College of Science and Engineering, Kanazawa University

The horizontal force on the Japanese archipelago has changed from extension to compression about 3Ma. This compressive force is one of the major factors that give each geopark the valuable landforms currently in front of us. This compressive force is also a factor in causing large earthquakes with terrible disasters to human society.

Earthquakes are caused by subsurface faulting. A fault movement causes uplift and subsidence of the ground. Repeating fault movements forms various landforms, that is, mountains, plains, basins, terraces, and fans, which are scenic spots. Thus, we can say that the diversity of geoparks in Japan is brought not only by the geological diversity but also by the geographical diversity created by seismic activity on various time scales.

One of the characteristics of Japanese geoparks is the transmission of natural disasters and efforts for disaster prevention. Surface ruptures and fault scalps on the surface accompanied with a large earthquake, and collapsed areas due to severe ground motion are maintained as geosites. Monuments of past earthquakes and tsunamis, together with their transmission, are used for geopark activities. These are used for education of possible future earthquake disasters.

Faults not only cause earthquakes, but also moisturize people's lives. Since a fault is a water path, there are famous waters and hot springs along the fault. Valleys formed by faults have been used as a highway that carries people and goods. Diverse landforms created by the faulting, combined with climatic features, have also provided a place for local specialties or outdoor activities.

The history of Japan is the history of symbiosis with natural disasters. Earthquakes occur under the earth where we live. The wisdom of living with earthquakes will disappear without efforts to convey it. To know the origin of the earth through geoparks is to look to the past, understand the present, and think about the future.

Keywords: Fault, Scenic spots, Earthquake disaster

