

Wed. Jul 15, 2020

[J] Oral | U (Union) : Union

2:15 PM - 3:45 PM JST | 5:15 AM - 6:45 AM UTC | Ch.1

[U-12] Future of Earth and Planetary Science (10): Big Data and Open Science

convener:Ryoichi Fujii(Research Organization of Information and Systems), Hodaka Kawahata(Atmosphere Ocean Research Institute, the University of Tokyo), Eiichi Tajika(Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo), Gaku Kimura(Tokyo University of Marine Science and Technology),
Chairperson:Gaku Kimura(Tokyo University of Marine Science and Technology), Eiichi Tajika(Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo)

2:20 PM - 2:45 PM JST | 5:20 AM - 5:45 AM UTC

[U12-01] Recommendation "To deepen and to promote Open Science in Japan"

★Invited Papers

*Masaru Kitsuregawa¹ (1.National Institute of Informatics / The University of Tokyo)

2:45 PM - 3:00 PM JST | 5:45 AM - 6:00 AM UTC

[U12-02] Current Status of Open Science and Research Data Sharing in AGU and JpGU

★Invited Papers

*Yasuhiro Murayama¹, Shelley Stall² (1.Strategic Program Produce Office, National Institute of Information and Communications Technology, 2.American Geophysical Union)

3:00 PM - 3:15 PM JST | 6:00 AM - 6:15 AM UTC

[U12-03] Open Science and Data/Sample Management in the Fields of Space Science

★Invited Papers

*Ebisawa Ken¹ (1.Institute of Space and Astronautical Science/Japan Aerospace Exploration Agency)

3:15 PM - 3:30 PM JST | 6:15 AM - 6:30 AM UTC

[U12-04] The open data in atmospheric science focusing upon the data related with meteorological service

★Invited Papers

*Kenichi Kuma¹ (1.Research Center for Advanced Science and Technology, The University of Tokyo)

3:30 PM - 3:45 PM JST | 6:30 AM - 6:45 AM UTC

[U12-05] Big data management in ocean science

★Invited Papers

*Jota Kanda¹ (1.Department of Ocean Sciences, Tokyo University of Marine Science and Technology)

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4:00 PM - 4:15 PM JST | 7:00 AM - 7:15 AM UTC

[U12-06] Open data management in Seismology and Solid Earth Science

★Invited Papers

*Naoshi Hirata^{1,2}, Katsuhiko Shiomi², Yasuyuki Kano¹ (1.Earthquake Research Institute, the University of Tokyo, 2.National Research Institute for Earth Science and Disaster Resilience)

4:15 PM - 4:30 PM JST | 7:15 AM - 7:30 AM UTC

[U12-07] Development of geospatial data and trends of open access

★Invited Papers

*Takashi Oguchi¹ (1.Center for Spatial Information Science, The University of Tokyo)

4:30 PM - 4:45 PM JST | 7:30 AM - 7:45 AM UTC

[U12-08] Sample archive and data management in International Ocean Discovery Program (IODP)

★Invited Papers

*Saneatsu Saito¹ (1.Japan Agency for Marine-Earth Science and Technology)

4:45 PM - 5:00 PM JST | 7:45 AM - 8:00 AM UTC

[U12-09] Archive and curating system for astrogeoscience material

★Invited Papers

*Tsuyoshi Komiya¹ (1.Department of Earth Science & Astronomy Graduate School of Arts and Sciences The University of Tokyo)

5:00 PM - 5:15 PM JST | 8:00 AM - 8:15 AM UTC

[U12-10] Comments on Open Access for Science Journals and Open data

★Invited Papers

*Eiji Ohtani¹ (1.Department of Earth and Planetary Materials Science, Graduate School of Science, Tohoku University)

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Rapid growth of Science produces big data sets. A broad discussion is to a consensus that scientific outcomes should be recorded with primary data set and accessible samples. Such strict but reasonable criteria affect repository system of research institution and science society. In this union session, we examine the present status of the openness of Earth & Planetary Science and discuss its future development.

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Introduction

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[U12-03] Open Science and Data/Sample Management in the Fields of Space Science

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[U12-05] Big data management in ocean science

★Invited Papers

*Jota Kanda¹ (1.Department of Ocean Sciences, Tokyo University of Marine Science and Technology)

Recommendation “To deepen and to promote Open Science in Japan”

*Masaru Kitsuregawa¹

1. National Institute of Informatics / The University of Tokyo

“The Fourth Paradigm” published 2009 which proposed Data-Intensive Scientific Discovery, or data-driven science, is followed by the US White House’ s bigdata initiative statement, and Japan’ s proposal of Society 5.0. The indispensable importance of Data’ s role in those pictures also coincides with data as fuel of Artificial Intelligence software system. This Committee to Deepen and Promote Open Science of Science Council of Japan has an objective to give comprehensive multi-viewpoints on data, so as to promote research data sharing (RDS) as well as to clarify the importance of a platform for the envisioned data sharing practices.

- (1) Rule making in the data-centric era
- (2) Construction of the Data Platform
- (3) Archive repository on various data and research material

Current Status of Open Science and Research Data Sharing in AGU and JpGU

*Yasuhiro Murayama¹, Shelley Stall²

1. Strategic Program Produce Office, National Institute of Information and Communications Technology, 2. American Geophysical Union

"Open Science" and especially its research data sharing have been increasingly argued in the international academic community and its concept and attempts to implement it have been influential in national academies, learned societies, research institutions, libraries, academic journal publishers and individual researchers and experts. Especially, AGU (American Geophysical Union) has been one of very active institutions to promote Open Science, by approaching to and advocating AGU's member researchers and experts, making nice showcases in forming an earth & space data community, consensus making with journal publishers, reaching out to AGU members and external communities with frequently updated messages such as data policy/position statement and so forth. This talk will be a very brief introduction of such Open Science activities by AGU, and also attempt to show a few examples from JpGU of catching up the international transformation of science.

Keywords: Open Science, research data sharing, open access journal

Open Science and Data/Sample Management in the Fields of Space Science

*Ebisawa Ken¹

1. Institute of Space and Astronautical Science/Japan Aerospace Exploration Agency

ISAS/JAXA is carrying out space science research in cooperation with other universities and institutions. In 2016, the Advisory Committee on Space Science and Engineering submitted "A proposal for the handling of data held by ISAS." The proposal consists of seven main statements: 1. Useful data should be made public and stored for a long time. 2. Those data that will be evidence of published results should be made public. 3. Status of the non-public data should be reviewed after the proprietary period. 4. Establish a storage system for important non-public data. 5. Actively make necessary decisions and negotiations regarding data. 6. Establish a committee by experts to discuss various issues related to data. 7. Support research communities and universities to restore/process ISAS data. With these proposals put into action, ISAS is constructing open space science archives.

Based on the above proposals, the "Science Data Committee" was established in ISAS and released the "ISAS Data Policy". From the viewpoint of "open science" in space science, the critical points of the data policy are explained below.

This policy applies to data acquired by ISAS, but it is expected to be respected by other parties related to ISAS data. The "data" covered by this policy is "information that has scientific value in a broad sense and can be used for a long period without depending on a specific physical medium." Therefore, the so-called "sample" is not included in the data, but the digitized analysis result is treated as data. The evidence data of the published results should be made public. The reasons for making data "undisclosed" are limited as follows: When there is an issue of protection of personal information or public safety; when the processing is not incomplete; and when the research team is granted a certain proprietary period.

The policy of the public (open) data is as follows: Appropriate data processing and explanation should be provided so that people can use the data with only general knowledge. Public data should be kept available for an extended period (30 years or more). Use identifiers such as DOIs to make data citation easy. The rule for using public data complies with CC-BY 4.0 and the Government Standard Terms and Conditions (version 2.0). Consequently, the public data can be used for free of charge, and the purpose of the data usage is not questioned (commercial use is allowed), as long as the origin of the data is indicated as ISAS/JAXA.

With the establishment of the data policy, proper data management is being in place at ISAS. First, it became clear what is data and what is not. For what classified as data, it was decided to be public or proprietary. For the proprietary data, as long as the proprietary period and the person in charge were determined, the data are securely stored (e.g., SMILES and Kaguya LO / 1 data). For those data which also belong to other organization, the negotiation was made to make it public inventing specific rules (e.g., "KAGUYA" HDTV data). If unprocessed raw data had accumulated at the end of the satellite operation, higher-order processing was made with additional budget (e.g., "Akari"). For some data, DOIs are being assigned (e.g., SMILES, Akatsuki). In some cases, universities are taking initiative in processing and publishing ISAS satellite data (e.g., "Arase").

Since the FY2016, past ISAS mission data kept at universities have been collected, processed, and released. An open call was made, and ISAS supports budgets for accepted proposals. Approximately 20 data types have been prepared and published in this manner.

Today, ISAS commonly highly processes the data obtained by ISAS satellites, so that anyone can use them only with general knowledge ("open data archive"). On the other hand, ISAS cannot take responsibility for the integrity of the "personal" data processed by researchers based on their intentions. We expect that research will progress if these personal data are also made open. However, we have not established a framework for archiving those personal research data. That is an issue not only for ISAS but also for national and global open science.

Keywords: Space Science, Open Science, Data Archive, Data Policy

The open data in atmospheric science focusing upon the data related with meteorological service

*Kenichi Kuma¹

1. Research Center for Advanced Science and Technology, The University of Tokyo

When we discuss the open data related with the atmospheric science, we need to consider the history and the role of the operational meteorological services. In this paper, starting with the history of meteorological services, exchanging the observation data and various information internationally, we will discuss how the international body and the national meteorological services have been working on the data policy considering the mutual prosperity with the commercial services.

In Japan, the Japan Meteorological Agency (JMA) has been working on this issue to sustainably supply the huge data to the society through various bodies including commercial services. For the society of atmospheric sciences, there is an agreement between JMA and the Meteorological Society of Japan (MSJ) on the use of the JMA data for the scientists of MSJ.

To further utilize the data or models for the society, there are several issues to be discussed in the session.

Keywords: Weather service, open data

Big data management in ocean science

*Jota Kanda¹

1. Department of Ocean Sciences, Tokyo University of Marine Science and Technology

In the field of ocean science, an international framework for sharing observation data has been established from an early stage. The Intergovernmental Oceanographic Commission (IOC) was established in 1960 at UNESCO primarily for international cooperation in the field of ocean science. A mechanism for exchanging observation data has been established immediately after its foundation. Specifically, each member country has a national data center, a system for collecting, managing and providing ocean data in each country. International data exchange is conducted between these national centers. In Japan, the Hydrographic and Oceanographic Department of the Japan Coast Guard operates the Japan Oceanographic Data Center (JODC). The IOC also has the International Oceanographic Data and Information Exchange (IODE) program, which works on technical considerations and future directions for data exchange and disclosure. In this way, the open oceanographic data has a relatively long history, and a system has been built up with accumulating experience. Meanwhile, ocean science and observation technology have advanced remarkably, and the scope of activities such as the IOC has diversified. New aspects have also become prominent in the exchange of oceanographic data. Wide-area and continuous observation data from satellites and floats have become available in addition to the observations made by traditional vessels. While the amount of data becomes enormous, observing data in real time with improved data processing capabilities has enabled data assimilation into model calculations and eventually accurate predictions of ocean status. One of the major directions is to deal with the huge size data in real-time. The Argo Project, as an example, is a global scientific program where international organizations such as the World Meteorological Organization (WMO) and the IOC and research and administrative organizations in various countries cooperate to deploy the Argo floats that automatically ascend and descend to observe. The vast amount of data obtained from many floats of various countries is released free of charge, released in real time and archived through quality checks in parallel. Observation data used to be passively collected from individual researchers/research-groups and government agencies with their own purposes. In contrast, large-scale international collaborative projects with a focus on the relationship between climate change and the ocean have been in progress and produce enormous data sets. In consideration of the needs for various oceanographic data, frameworks such as the Global Oceanographic Observation System (GOOS) are established in order to coordinate the overall oceanographic observations by rational input of observational resources and by examination of observational designs. With the cooperation of several members of the Oceanographic Society of Japan, I will discuss the current status, issues, and future direction of data management in ocean science.

Keywords: Ocean, Open data, Big data

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Discussion

Open data management in Seismology and Solid Earth Science

*Naoshi Hirata^{1,2}, Katsuhiko Shiomi², Yasuyuki Kano¹

1. Earthquake Research Institute, the University of Tokyo, 2. National Research Institute for Earth Science and Disaster Resilience

This talk will present on open data for Seismology

Keywords: MOWLAS, data doi, observation infrastructure

Development of geospatial data and trends of open access

*Takashi Oguchi¹

1. Center for Spatial Information Science, The University of Tokyo

Geospatial data are fundamental for various social activities and academic research. The acquisition and utilization of geospatial data have been supported by rapidly developing technologies such as remote sensing, GIS, the Internet, and artificial intelligence. Some geospatial data are commercial products, and some are freely accessible public domains. In the 1990s, the US Government promoted the acquisition of national geospatial data and open-access distribution. Other developed countries including Japan also adopted similar systems in the 21st Century. Even private companies such as Google distribute free geospatial information. Furthermore, numerous volunteers over the world also contribute to the production and distribution of free geospatial data such as OpenStreetMap.

There are also abundant commercial geospatial data provided by private companies and cooperation bodies, and some of them are useful for scientific research. CSIS (Center for Spatial Information Science) at the University of Tokyo has been operating a data sharing system of such commercial data for academic researchers. CSIS buys a set of data with a special contract with the data distributor, so that researchers whose research proposals are approved by CSIS can freely access the data. Because of this system, various researchers in Japan and other countries have been using some commercial data without buying them individually. CSIS also collects and distributes data produced by individual researchers; for example, a data set constructed by a young researcher for his PhD thesis is currently managed by the data sharing system of CSIS.

In Japan, production and utilization of geospatial data have been developing in relation to natural disasters. Soon after the 1995 Great Hanshin earthquake, people recognized the importance of geospatial data and GIS for rescuing and supporting affected people as well as regional reconstruction, and the Japanese Government initiated related national projects. After the 2011 Great East Japan Earthquake and Tsunami, activities using geospatial data and GIS such as the preparation of hazard maps were also enhanced. Open access to geospatial data is required for effective hazard mitigation, because it enables efficient rescue activities and various assessments. Open access to educational materials to learn how to utilize geospatial data and GIS is also important for human resource development, and relevant projects are ongoing.

Keywords: Geospatial data, Open access, Natural disasters

Sample archive and data management in International Ocean Discovery Program (IODP)

*Saneatsu Saito¹

1. Japan Agency for Marine-Earth Science and Technology

The International Ocean Discovery Program (IODP, 2013-2023) is an international marine research collaboration that explores Earth's history and dynamics using ocean-going research platforms to recover data recorded in seafloor sediments and rocks and to monitor subseafloor environments. IODP depends on facilities funded by three platform providers (Japan, US, and European Consortium for Ocean Research Drilling) with financial contributions from additional partner agencies. Together, these entities represent 23 nations whose scientists are selected to staff IODP research expeditions conducted throughout the world's oceans. This program was evolved from the early phases of scientific ocean drilling, Deep Sea Drilling Project (DSDP, 1966-1983), Ocean Drilling Program (ODP, 1983-2003), and Integrated Ocean Drilling Program (IODP, 2003-2013).

A total of ~430 km of IODP, ODP and DSDP cores (physical samples drilled from the seafloor) are archived and curated at core repositories funded by the platform providers. Cores are geographically assigned to specific repositories based on their ocean of origin. After the expedition moratorium period (12 months post-expedition), core samples may be requested for scientific research. Sample requests for all DSDP, ODP, and IODP cores are submitted using the Sample and Data Requests Database. By receiving samples, researchers implicitly agree to comply with the IODP Sample, Data, and Obligation Policy.

Data from IODP expeditions can be accessed via databases managed by the expedition's Science Operators. After the expedition moratorium period all shipboard data are open to the public. The Site Survey Data Bank (SSDB) is a repository for digital site survey data submitted in support of IODP proposals, expeditions and related activities. Many files are freely available, but proprietary holds requested by proponents are strictly maintained. The SSDB also contains older site survey data for some ODP proposals and legs. Analog site survey data (e.g., paper plots) submitted in support of IODP, ODP and DSDP proposals and expeditions/legs are stored on site at the SSDB.

Keywords: Scientific ocean drilling, IODP, Sample archive, Open data access

Archive and curating system for astrogeoscience material

*Tsuyoshi Komiya¹

1. Department of Earth Science & Astronomy Graduate School of Arts and Sciences The University of Tokyo

This presentation will introduce the current status and problems of the storage and distribution of geological samples, and of open access to journals and data. Since the dawn of modern science in the Meiji era, many valuable scientific resources of geology, rocks, meteorites, fossils and drilling samples, as well as paleo-topographic and geological photographs, geological maps, and basement data, were collected by Japanese researchers from Japan and foreign countries. And, they are stored at universities, institutions and museums in Japan. In addition, a large amount of rock samples were collected through a number of large-scale research projects since the 1990s, which were used to provide important data to drive the projects. However, such research materials would not become waste even after the initial purposes were achieved, but will be the initial investment for new research frontiers. And, scientific history such as the Apollo samples and Burgess' s fossils also has proven that the systematic archiving of research materials by governments can create significant breakthroughs. Once samples were lost, it would be very difficult to obtain the samples again. Therefore, storage of samples with high academic values is very advantageous and important in creating a frontier of research. Actually, the storage can reduce the time and cost involved in reappraisal because these samples are already well-described.

However, the current situation of the archive and curation system of geological samples in Japan is in a very serious situation. At present, only the National Museum of Nature and Science in Japan receives samples stored by researchers belonging to other research institutions, and encourages curators to receive a number of samples. This effort is now the most effective way to save samples belonging to retired researchers. However, even the effort has its limit. On the other hand, meteorite samples in the National Institute of Polar Research (NIPR) and dredge and piston core samples in the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) are managed by the institutions, respectively. And, curation systems of the institutions have been already established. However, it is quite difficult for even the institutions to permanently keep the storage systems because the storages will be filled up soon. Except for these institutions, most geological samples in Japan are basically managed by the individuals who collect them. Even non-meteorite samples including Antarctic samples in the NIPR and non-marine operation samples in the JAMSTEC are managed by the individuals. Therefore, there are several problems with continuous and permanent storage and management of samples. The most serious problem is space. In many universities and institutes, researchers have only small spaces so that only small amounts of samples can be stored there. The second concerns samples of retired researchers. Due to space and management issues, such samples are often abandoned. Third, there is no systematic archiving and curation system so that the samples are managed by owner' s own systems. The fourth is employment of curators.

Recently, there have been moves to improve these situations. First, symposiums on archiving and curation of samples have been held at GSJ and so on. Second, the AIST Geological Survey Research Center and other related organizations have become active after our program was selected for Large Research Projects 2020.

In recent years, the need for open access to digital data and the storage of data sources has been strongly urged by European countries. In Japan, open access to journals is recommended, but it is actually far

behind. Many Japanese magazines, written in English and Japanese, are registered in the J-stage, so everybody can access to them. However, open access to papers published in foreign journals is left to each author, and it costs a lot of money. As a result, only few papers are open to the public. If the domestic journals were widely accepted by overseas researchers and all Japanese researchers submitted to the domestic journals, the problem of open access would be automatically solved. But, it is quite difficult because there is no substitute for Nature or Science, and even ordinary scientific journals in Japan.

It is necessary and important that both research samples and digital data are archived and stored on a common platform in order to investigate the samples in the future, to prove and reproduce research results, to preserve scientific heritages, and to give back to society. Establishment of archive and curating systems for astrogeoscience material is very important and should be addressed urgently.

Keywords: Building of an archive system of samples

Comments on Open Access for Science Journals and Open data

*Eiji Ohtani¹

1. Department of Earth and Planetary Materials Science, Graduate School of Science, Tohoku University

The trend of open data, which makes scientific information available to the public, is rapidly spreading to the free world, especially in Europe, while colliding with the trend of information protection and information state management. Here, I will discuss the issue of science journals as one of the issues of open science in Japan from the standpoint that open science policy is basically correct and indispensable. Journals have the ability for scientists to post and publish them, and the ability for scientists and the public to get information from the journal. There are three main problems here in Japan.

1. Progress in open access to journals

2. Necessity of data repository and current situation in Japan

3. Journal Issue: Package Price Rising

Here, I would like to comment on the above three points. Both are urgent issues. All of these require strong JPGU leadership and are one of the most important tasks of the next executive committee of JPGU.

Keywords: Science journal, Open access, Open data, Data repository