VESPA: developing the planetary science Virtual Observatory in H2020

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The Europlanet H2020 programme will develop a research infrastructure in Horizon 2020. The programme in- cludes a follow-on to the FP7 activity aimed at developing the Planetary Science Virtual Observatory (VO). This activity is called VESPA, which stands for Virtual European Solar and Planetary Access. Building on the IDIS ac- tivity of Europlanet FP7, VESPA will distribute more data, will improve the connected tools and infrastructure, and will help developing a community of both users and data providers. One goal of the Europlanet FP7 programme was to set the basis for a European Virtual Observatory in Planetary Science. A prototype has been set up during FP7, most of the activity being dedicated to the definition of standards to handle data in this field. The aim was to facilitate searches in big archives as well as sparse databases, to make on-line data access and visualization possi- ble, and to allow small data providers to make their data available in an interoperable environment with minimum effort. This system makes intensive use of studies and developments led in Astronomy (IVOA), Solar Science (HELIO), plasma physics (SPASE), and space archive services (IPDA). It remains consistent with extensions of IVOA standards.
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Keywords: Virtual Observatory, Open Data, Planetary Sciences

IUGONET activities for data sharing and interdisciplinary study

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We present our activities for sharing upper atmosphere data and promoting interdisciplinary studies in the solar-terrestrial physics community. The upper atmosphere is characterized by the following properties: (1) Both vertical coupling between the multiple spheres and global horizontal circulation are essential. (2) There are a variety of data sets. (3) The long-term variation is important. Thus, collaboration and data sharing are necessary to understand the mechanism of various phenomena in the upper atmosphere. On the other hand, there have been some issues in the research of the upper atmosphere. Database has been built and maintained individually by each university or institute, mainly by domain researchers, so it is often difficult to search and access data and the researchers are responsible for data sharing. In addition, since there are a variety of data sets, resulting in many types of file format, collection and analysis of data are time consuming.
The IUGONET (Inter-university Upper atmosphere Global Observation NETwork) project started in FY2009 to share the upper atmosphere data and promote interdisciplinary studies. We opened many kinds of ground-based observational data to the public via internet. We have developed metadata database for cross-searching various kinds of the upper atmosphere data obtained by the IUGONET members and analysis software for visualizing and analyzing these data. SPASE (Space Physics Archive Search and Extract) metadata model was adopted as a basis of the IUGONET metadata format. The IUGONET provided a plug-in software for SPEDAS (Space Physics Environment Data Analysis Software), which is a grass-roots data analysis software based on IDL (Interactive Data Language) for space physics community and supports multiple missions. We hold meetings for users of these IUGONET data and tools about twice a year. In the presentation, we will introduce these IUGONET activities and new plan to improve the metadata database system.

Keywords: IUGONET, upper atmosphere, data sharing, interdisciplinary study, metadata database, analysis software

New web service for open research data

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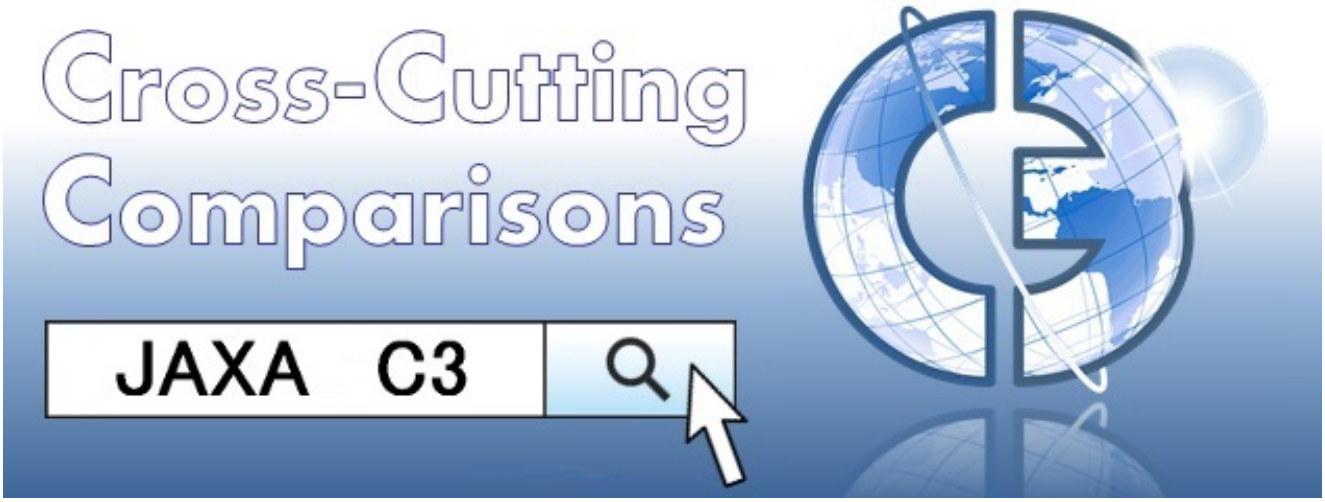
It is important to progress cross-cutting researches in geoscience to understand how the various geophysical phenomena have influence on each other. However, it is not easy to check scientific data for geoscientist in other fields because each area has been developing independently. Therefore, we had built a new web service, C3 (Cross-Cutting Comparisons) for promotion of the data utilization. By the interactive interface, C3 reduces distances between the fields in geoscience and provides a quick look viewer. In this presentation, we will talk about the system summary and features of the service.

Keywords: open data, web service, quick look viewer, active learning, cross-cutting comparisons, dagik earth



Sharing Low Frequency Radio Emissions in the Virtual Observatory: Application for JUNO-Ground-Radio Observations Support.

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In the frame of the preparation of the NASA/JUNO and ESA/JUICE (Jupiter Icy Moon Explorer) missions, and the development of a planetary sciences virtual observatory (VO), we are proposing a new set of tools directed to data providers as well as users, in order to ease data sharing and discovery. We will focus on ground based planetary radio observations (thus mainly Jupiter radio emissions), trying for instance to enhance the temporal coverage of jovian decametric emission. The data service we will be using is EPN-TAP, a planetary science data access protocol developed by Europlanet-VESPA (Virtual European Solar and Planetary Access). This protocol is derived from IVOA (International Virtual Observatory Alliance) standards. Data from all major decametric radio instruments will contribute: Nançay Decameter Array (France), LOFAR (France, Sweden, Poland), NenuFAR (France), URAN (Ukraine), LWA (USA), Iitate Radio Observatory (Japan), etc. Amateur radio data from the RadioJOVE project is also available. The attached figure shows data from those three providers. We will first introduce the VO tools and concepts of interest for the planetary radioastronomy community. We will then present the various data formats now used for such data services, as well as their associated metadata. We will finally show various prototypical tools that make use of this shared datasets.

Keywords: Jupiter, Radio Astronomy, Virtual Observatory

Development status of Iitate Jovian radio wave data archive as a unit of integrated archives of data from multiple ground stations for collaboration with Juno

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Jovian radio emissions in decametric wavelength range (DAM, 20-40MHz) observed by ground stations and spacecraft have brought us various information on Jovian magnetospheric activity: The source field line of Io-related DAM is connected to Io in the inner magnetosphere. The energy of Io-related DAM is supplied by Io-Jupiter current system. The source field line of Non-Io-related DAM is connected to the outer magnetosphere. The intensity of non-Io-related DAM seems to be affected by the interaction between the outer magnetosphere and solar wind.
The merit of the ground-based observations is that high sensitivity antenna and high time resolution receiver can be employed without limitations of the equipment mass and downlink data rate, which often becomes issues in spacecraft observations. On the other hand, the demerit of the ground-based observation with single station is coverage: The ground station cannot observe Jovian radio emission while the Jupiter is below the horizon. However, this demerit can be solved by combining datasets from multiple stations in different longitude range. Virtual Observatory (VO) could be a promising solution for such combined data analyses. In preparation of the collaborative ground-based radio wave observation with Juno, which will start the in-situ observations of the Jovian polar magnetosphere in this summer, the researchers working on ground-based observations of Jovian radio wave in Europe, US, and Japan started collaborations such as having a new support portal for collaborative planning of ground-based observations.
Wideband radio spectrogram data obtained at Iitate observatory since 2004 in CDF format have been provided via Iitate HF radio wave data archive. In addition, we finished setup of a new repository server for VO interface at Tohoku University in 2015 with supports of Paris Observatory team. This server will be the first step for integrated browsing of the Jovian radio wave data from multiple ground stations via VO interface, which will be useful also for collaborative studies of Jovian polar magnetosphere with supports of JSPS Bilateral Program "Coordinated observational and theoretical researches for Jovian and Kronian auroral radio emissions" between France and Japan. We also plan to add information on Jupiter's synchrotron radio observation made at the Iitate observatory into the VO repository server in near future.

Keywords: Jovian decametric radio wave, Virtual Observatory (VO), Juno

How to make the data sets in “dark long tail” open and preserve?

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In data analysis, we often encounter the difficulty by lack of data and try to find additional data sets by asking researchers in the same research community. Sometimes, we can reach the data set suitable to fill the gap of data or we find unexpected data set which is very useful. However, in most cases, we cannot find the data. We know that there are a huge number of datasets—mainly obtained on a research project basis—that are not registered to active data centres, and hence are 'dark' to many of us. These datasets are typically built by small research groups for a limited period, and data are not open for public. Although they exist only for a limited period, such data are very important and useful if the location of observation site is highly unique, or if other observations are not available.
One way to make such data sets open from the 'dark long tail' is to register metadata that describe the observations in as much detail as possible. An example of this in practice is IUGONET (Interuniversity Upper atmosphere Global Observation NETwork), which has a common database of metadata and forms a virtual data centre of distributed databases at several institutions. This data system includes databases from the 'dark long tail', as well as large well-known databases. Another way is to use university repositories. However, in this case, we need a common method to find and retrieve the data set.

Keywords: open data, data preservation, small data set

Current status and challenges of open data in biodiveristy field

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Biodiversity informatics is a research field aiming to share species-level biodiversity data, including taxon names and occurrence records based on specimens or observations. Such data is indispensable for many kind of activities relevant to biodiversity, researches, plannings for biodiversity conservations, and cultural activities. Until now, global projects, such as the Global Biodiversity Information Facility (GBIF), provide frameworks to accumulate and share biodiversity data. Recently, people realized that biodiversity data should be open to facilitate and promote the data reuse. GBIF decided to change dataset licenses to the Creative Commons License, and many project have been launched to publish biodiversity data openly available (e.g. iDigBio, pro-iBiosphere, and Atlas of Living Australia). Open-access journals directly linked to biodiversity databases are also good solutions to make the data open.
In Japan, only small amounts of resources on biodiversity have been hitherto openly published. Most of them depend on individual efforts. The author has been published taxon name databases as open data by the assistance of GBIF Japan Node. In addition, some projects are also currently in progress. Linked Open Data for ACademia (LODAC) is a project to publish academic data in Linked Open Data (LOD) format. Both of taxon and occurrence data are converted and stored in LOD format, and linked to other LOD data such as DBPedia. The openly published records are used as a core component of the biodiversity LOD.
Many people still have difficulty to openly publish their data. One issue is there are no cultures and incentives to encourage open data publications. A data citation system like that for scientific papers using Digital Object Identifier (DOI), and a data paper publication framework could be solutions for this issue, though there have not been any evaluation systems in research communities. Another issue is a risk of the publication of sensitive data, that is, distribution records of endangered or commercially valuable species. The improvement of data interoperability between biodiversity and other fields is also a challenge for the future.
In this presentation, the author will show the current progress of open data activities on biodiversity information in Japan, and discuss on future challenges and collaborations.

Keywords: biodiversity informatics, open data, databases, taxonomy, linked data

International collaboration for a trustworthy research data infrastructure

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Today’s research is international, transdisciplinary, and data-enabled, which requires scrupulous data stewardship, full and open access to data, and efficient collaboration and coordination. New expectations on researchers based on policies from governments and funders to share data fully, openly, and in a timely manner present significant challenges but are also opportunities to improve the quality and efficiency of research and its accountability to society. Researchers should be able to archive and disseminate data as required by many institutions or funders, and civil society to scrutinize datasets underlying public policies. Thus, the trustworthiness of data services must be verifiable. In addition, the need to integrate large and complex datasets across disciplines and domains with variable levels of maturity calls for greater coordination to achieve sufficient interoperability and sustainability.
The World Data System (WDS) of the International Council for Science (ICSU) promotes long-term stewardship of, and universal and equitable access to, quality-assured scientific data and services across a range of disciplines in the natural and social sciences. WDS aims at coordinating and supporting trusted scientific data services for the provision, use, and preservation of relevant datasets to facilitate scientific research, in particular under the ICSU umbrella, while strengthening their links with the research community.
WDS certifies its Members, holders and providers of data or data products, using internationally recognized standards. Certification of scientific data services is essential to ensure trustworthiness of the global research data infrastructure. It contributes to building a searchable, distributed, interoperable and sustainable research data infrastructure. Several certification standards have been developed over the last decade (NESTORseal, DIN standard 31644, TRAC and ISO 16363.) In addition, the Data Seal of Approval (DSA) and WDS have set up core certification mechanisms for trusted digital repositories in 2009, which are increasingly recognized as de facto standards. While DSA emerged in Europe in the Humanities and Social Sciences, WDS started as an international initiative with historical roots in the Earth and Space Sciences. Their catalogues of requirements and review procedures are based on the same principles of openness and transparency. A unique feature of both DSA and WDS certifications is that it strikes a balance between simplicity, robustness and the effort required to complete.
A successful international cross-project collaboration was initiated between WDS and DSA under the umbrella of the Research Data Alliance (RDA), an international initiative started in 2013 to promote data interoperability which provided a useful and neutral forum. A joint working group was established in early 2014 to reconcile and simplify the array of certification options and improve and stimulate core certification for scientific data services. The outputs of this collaboration are a Catalogue of Common Requirements (https://goo.gl/LJZqDo) and a Catalogue of Common Procedures (https://goo.gl/vNR0q1) which will be implemented jointly by WDS and DSA.

Keywords: Open Science, Trusted Digital Repositories, International Coordination

Recent activity of DOI-minting to solar-terrestrial physics data in Japan

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The Japanese government has found an importance of "Open Science" and is now going to promote its associated activities in Japan. In the end of March 2015, a report entitled "Promoting Open Science in Japan" was published by the expert panel on Open Science, based on Global Perspectives, Cabinet Office. According to the report, research data should be made openly available, although they are subject to constraints that ensure ethical, legal, and commercial protections. To accelerate data availability, it is needed to prepare data identifiers, such as digital object identifiers (DOIs), and to foster a practice of citation for research data. This is because the citation for research data provides the following benefits: (1) Readers can more easily locate the data used in the paper, obtain necessary information of the data (i.e., metadata), and validate the findings of the paper; (2) readers can also easily discover datasets which are relevant to their interests but have not been noticed; and (3) data contributors/data centers can gain professional recognition and rewards for their labors to publish and manage data set in the same way as for traditional publications.
Recognizing the importance of data citation, World Data Centers (WDCs) in Japan including WDC for Geomagnetism (Kyoto University) and WDC for Ionosphere and Space Weather (National Institute of Information and Communications Technology) started discussion to mint DOI to their own database in August 2013. The discussion finds that Japan Link Center (JaLC) is a proper agency to register DOI-URL mapping, because JaLC aims at public information services to promote science and technology in Japan and it handles scientific and academic metadata and content from holders nationwide, including national institutes and universities. We develop a web-based system to register metadata with JaLC and to create landing pages of data, to which DOIs are mapped. The system can handle version of the landing pages when the data are updated. JaLC started a 1-year pilot program to mint DOI to the database from October 2014. We have been participating in the program, resulting in DOIs for the mesospheric wind velocity data observed with MF radar at Poker Flat, Alaska (doi:10.17591/55838dbd6c0ad) and the geomagnetic Dst index (doi:10.17593/14515-74000). These are the first practices of the DOI-minting to scientific data in Japan. One of these DOIs is even cited in a paper by Kinoshita et al. (2015), providing the first example of data citation in Japan.
We will present our activities of DOI-minting to solar-terrestrial physics data in Japan and discuss its future perspective.
Reference
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How open scientific research data transform transdisciplinary research: a theoretical debate

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The mention of the open scientific research data (hereafter referred to as “OSRD”) in the 2013 G8 Science Ministers Statement promoted the acceptance of open science, that was defined as “efforts to make the output of publicly funded research more widely accessible in digital format to the scientific community, the business sector, or society more generally” in the OECD report issued in October 2015 [1]. This definition means that the concepts of OSRD is a keystone of open science and should be applied to all fields of sciences, including fieldwork-based sciences such as cultural anthropology and forest ecology, as well as laboratory- and observation-based “big data” sciences (e.g., genome science and astronomy). It is noteworthy that recent field science projects reflect the gradual transformation from individual discipline-oriented approaches to collaborative, integrative, multidisciplinary, and interdisciplinary ones. Moreover, “transdisciplinary” approaches, in which societal stakeholders such as governments, business industries, non-profit organizations, and local residents are involved in issue-driven research projects through a process of co-designing research agendas, co-producing knowledge, and co-disseminating perspectives, evidence, and knowledge [2], play an important role in implementing solutions to global-scale issues at a local community. It seems that the concepts of OSRD and transdisciplinary approaches are heading in the same direction toward sharing data sources and research outcomes with researchers and stakeholders for making better decisions to transform society. This paper discusses how OSRD will benefit transdisciplinary approaches through accelerating scientific and social innovations by involving non-conventional research agents such government staff, local residents, skilled volunteers (*pro bonos*), science communicators, and researchers based at different fields of research.

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Keywords: Open scientific research data, Transdisciplinarity, Pro bonos

International Trends on Open Science Policies and Research Infrastructures

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JpGU has been facilitating sessions related to data and information topics in past meetings, convened by groups/communities with interdisciplinary interests including scientific data centers, data systems, data sciences, and social network services. New dimensions and cross-disciplinary subjects are expected for further contribution to advancing the earth and planetary sciences. Open Research Data and Open Science are increasingly becoming hot topics, in parallel to establishment of ICSU-WDS (2008), G8 Open Data Charter (2013), deployment of RDA (2013), and so forth. RDA is especially concerned with common e-infrastructure. In this digital era, if Open Science practices become daily reality, e-infrastructure or common digital environment will be necessary platform for many research activities. E-infrastructure is becoming a hot topics in G8 GSO (Group of G8 Country Senior Officials) meeting, OECD Open Global Science Forum, Belmont Forum (an international group of funding agencies/funders for global environmental issues). Future Earth, an international new initiative for global environment and the planet earth led by International Council for Science, created a Data Task Force for discussing data sharing and open data/science issues. European Commission has set up High Level Expert Group of European Open Science Cloud (HLEG-EOSC). HLEG-EOSC give the advice to an EC Commissioner (ministerial person) for setting up the EOSC initiative and new call for proposal. EOSC is intended to the infrastructure of global open science, which will contribute to European data sharing and communications on digital infrastructure. Promotion and acceleration of European digital economy, under the EC's vision of Single Digital Market, will be supported by activities of Open Science and Open Innovation.

Keywords: open science, data sharing, data infrastructure

