

U01-01

会場:419

時間:5月1日 09:00-09:15

日本学術会議と国際活動（仮）  
International Activities of Science Council of Japan (TBD)

春日 文子<sup>1\*</sup>  
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<sup>1</sup> 日本学術会議  
<sup>1</sup> Science Council of Japan

International activities of Science Council of Japan will be reviewed and discussed, including Future Earth, ICSU-WDS, and CODATA etc. (TBD)

Keywords: Future Earth, ICSU-WDS, GEOSS

## Global Data Framework and Japanese Contribution Global Data Framework and Japanese Contribution

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Open data is not only the subject discussed in the last G8 meeting 2013, but also can be a wide-spread argument and can become substantially important factor in conducting science. Of course we cannot make all the research data publicly open immediately after its creation. But also data and paper are important in the modern science scheme, for validating results of a scientific research, e.g., its reproduction or statistical significance particularly in fields such as physics, earth science, or so. Recently there are found scientific results in certain percentage of original papers which are not necessarily reproducible in life science fields. Today's society has increasingly big concern with climate change and huge earthquake etc., where scientific research may directly affect real worlds like political and people's decision making. Validation of scientific papers is important since it may affect mutual trust between science and society. Here electronic data which can be linked to scientific papers in data citation scheme, are part of evidence of our scientific truth. In comparison to the history for a couple of hundred year of the printing culture in scholarly communications, the modern technology like Internet, hard disk drives, etc., have only the tens-of-years history. Human beings are now challenging this new system of electronic way to conduct science with society, seeking the right strategy for management of scholarly information. International data management activity like ICSU-WDS from the academic side, and RDA related to governmental arrangement are part of such big challenges of the international community. Furthermore Future Earth, the international 10-year transdisciplinary research programme are promoted by ICSU, UN bodies, Belmont Forum, etc. for future of the planetary earth and human beings, where ICSU-WDS and CODATA are required to support Future Earth's international scientific data management. We need careful discussions to promote those activities, but with a bright hope for the human society who has the indispensable intellectual infrastructure called "science".

Keywords: Scientific data, World Data System, open data, data management, data science, geophysics

U01-03

会場:419

時間:5月1日 09:30-09:45

## The ICSU World Data System: Trusted Data Services for Global Science The ICSU World Data System: Trusted Data Services for Global Science

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This presentation will give a brief overview of the current activities of the International Council for Science – World Data System (ICSU-WDS). In particular, it will focus on ICSU-WDS' close involvement in the new Future Earth initiative and the Belmont Forum e-Infrastructure Steering Committee. It will also highlight joint projects between ICSU-WDS and the Research Data Alliance.

Keywords: ICSU-WDS, trusted data, long-term preservation, interoperability

U01-04

会場:419

時間:5月1日 09:45-10:05

## データの時代への課題と行動計画 Issues and Agenda toward Data Era

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Issues and agenda toward "Data Era" will be discussed.

キーワード: 日本学術会議, データ, CODATA  
Keywords: Science Council of Japan, data, CODATA

## アジアにおける Future Earth の重要性 Importance of Future Earth in Asia

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世界の自然科学者の集まりである International Council for Scientific (ICSU:国際科学会議) と人文社会科学者の集まりである International Social Science Council (ISSC: 国際社会科学協議会) が中心となって、地球環境変化研究と持続可能な地球社会の構築をめざした Future Earth という新しい国際的な枠組みが動きつつある。1970年代から地球環境の危機がさまざまなかたちで指摘されてきたが、21世紀に入っても地球環境は決して良くなっているとはいえない。温室効果ガス増加の抑制に向けた国際的な取り組みを含む「地球温暖化」への対策など、進められている面もあるが、水資源、大気や水汚染問題、生態系の破壊など、地球環境全体としてはより深刻化しているといっても過言ではない。Future Earth は、地球環境変化を包括的に理解しつつ、持続可能な人類社会の構築に向けて、研究者だけでなく、社会全体として行動を提起していこうという枠組みである。本発表では、まだ端緒についたばかりの Future Earth の設立経緯と現在の動向を説明し、今後、日本として、どう Future Earth に対応していくべきか、とくに自然科学分野だけでなく、人文社会科学関連のデータ・情報の包括的なアーカイブも含めて、Future Earth のアジアにおける重要性を含め、私なりの提案も含めて紹介したい。

キーワード: 地球環境変化, アジア, フューチャー・アース

Keywords: Global Environmental Change, Asia, Future Earth

## 気候－水循環－災害リスク軽減データ統合システムの開発 Integrated Data System on Climate, Water and Disaster Risk Reduction

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水循環は気候システムにとって、また人間が社会的生活を営むための管理システムにとって重要な要素である。気候システムにおいて、水循環の極端事象が生じると洪水や渇水が生じ、社会は人的・経済的に大きなダメージを受ける。同時に、水循環は生物多様性・生態系、農業・食料、健康、エネルギーにおいても、自然システムとしての気候と管理システムとしての水資源管理と密接に関連している。さらには土地利用や森林破壊との関連において、炭素循環とも不可分である。地球観測、予測、データ統合・解析、管理システム、教育システムを連携させ、分野を超えて情報・知の統合化を進めることによって、災害リスクを軽減し、レジリエントな統合的な流域管理のプロトタイプを開発することが肝要である。

キーワード: 地球観測, 水循環, 気候変動, 減災, データ統合

Keywords: Earth Observation, Water Cycle, Climate Change, Disaster Risk Reduction, Data Integration

ボトムアップとトップダウンアプローチを併用した東アジアにおける森林火災からのCO<sub>2</sub>と水田からのCH<sub>4</sub>発生量の解析  
Synergetic approach of bottom-up/top-down studies on CO<sub>2</sub> and CH<sub>4</sub> emissions from biomass burning and rice paddy in East A

今須 良一<sup>1</sup>; 竹内 渉<sup>2</sup>; 関山 絢子<sup>2</sup>; 齋藤 尚子<sup>3</sup>; 松見 豊<sup>4\*</sup>; 川崎 昌博<sup>4</sup>; 林田 佐智子<sup>5</sup>; 小野 朗子<sup>5</sup>  
IMASU, Ryoichi<sup>1</sup>; TAKEUCHI, Wataru<sup>2</sup>; SEKIYAMA, Ayako<sup>2</sup>; SAITOH, Naoko<sup>3</sup>; MATSUMI, Yutaka<sup>4\*</sup>; KAWASAKI, Masahiro<sup>4</sup>; HAYASHIDA, Sachiko<sup>5</sup>; ONO, Akiko<sup>5</sup>

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There has been still a large discrepancy in estimations between bottom-up and top-down approaches for both CO<sub>2</sub> emissions from biomass burning and CH<sub>4</sub> from rice paddy in East Asia. The purpose of this study is to update the emission inventory databases as to be more consistent between these two approaches through a synergetic usage of satellite data, ground-based remote sensing measurements, and in situ data. The most important parameter to estimate total CO<sub>2</sub> emissions from biomass burning is the biomass amount of the forests. In this study the amount is estimated based on the normalized vegetation index (NDVI) observed by satellites and, CO<sub>2</sub> emissions from burning area are estimated by multiplying the fire strength evaluated from hot spot data with some auxiliary data such as soil moisture and groundwater level. As for the top-down approach, CO<sub>2</sub> concentration data observed from space are useful for constraining the inverse analysis of CO<sub>2</sub> emission strength. The greenhouse gas observing satellite (GOSAT) dedicated to observe atmospheric CO<sub>2</sub> and CH<sub>4</sub> concentrations was launched in 2009 and has been operated for more than five years. The main band of its sensor can measure the columnar CO<sub>2</sub> concentration, however, it cannot be directly converted into the concentration near the surface. One of our attempts is to develop a retrieval method to estimate CO<sub>2</sub> concentration in the lower troposphere, particularly in the boundary layer, from a synergy of spectrum data in a wide spectral range covering from short wavelength infrared to the thermal infrared. In order to validate this method we have carried out CO<sub>2</sub> sonde observations around Tokyo city where GOSAT has been operated in a specific observation mode (targeting mode) to obtain sufficient number of data over this area. Based on the validated results, this method will be applied to analyze the data observed in biomass burning areas. One of our important targets is Kalimantan (Indonesia) where peat fire is the main CO<sub>2</sub> emission source. We started the ground-based measurement of columnar CO<sub>2</sub> concentration using an optical spectrum analyzer (OSA), and expect that these temporally continuous data would be effective for achieving the consistency between bottom-up and top-down approaches. Also started are observations of columnar CH<sub>4</sub> concentration using the same type of spectrometer in Sichuan basin (China) and Karnal (India) where are identified as the extremely high CH<sub>4</sub> concentration area based on the almost decadal record of observations by SCIAMACHY and GOSAT. It is expected that the synergetic analysis of data from satellite and ground-based measurements could contribute to make clear the cause of high concentration of CH<sub>4</sub> in these areas.

キーワード: 二酸化炭素, メタン, GOSAT, トップダウンアプローチ, ボトムアップアプローチ, 地上リモートセンシング  
Keywords: carbon dioxide, methane, GOSAT, top down approach, bottom up approach, ground-based remote sensing

## 生物多様性・生態系情報に基づく生態系機能の推定 Estimation of Ecological Function based on Biodiversity and Ecosystem Information

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グリーン・ネットワーク・オブ・エクセレンス (GRENE) プロジェクトの環境情報分野の1つとして、我々は生物多様性情報と生態系情報の収集と利用を進めている。これまでの3年間で50万件以上の植物分布情報、1万件以上の植生情報をデータベース化し、利用可能になっている。これらの情報を基に、さまざまな環境情報や土地利用情報を加えて、植物各種の分布確率推定や、樹種を考慮したより確度の高い森林の生態系機能分布推定が可能となってきた。本講演では、これらの適用例である森林現存量の推定、二酸化炭素収支、昆虫による作物の受粉サービス量などの推定例を示し、我々人類が生物多様性や生態系から受ける恩恵である「生態系サービス」の推定に向けた取り組みを紹介する。

キーワード: 生物多様性情報学, 生態情報学, 生態系機能, 生態系サービス, IPBES  
Keywords: Biodiversity Informatics, Eco Informatics, Ecosystem Function, Ecosystem Services, IPBES

**GRENEプロジェクトで開発されたFMSによる飯舘村での放射性セシウム汚染土壌  
の環境モニタリング**  
**Environmental Monitoring of Soil contaminated by Radiocaesium in Iitate Village using  
FMS developed in GRENE project**

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福島第一原子力発電所から放出された放射性セシウムの多くは5cm以内の表土に蓄積されている。そのため、日本政府（農林水産省）は農地除染のための3つの工法（表土剥ぎ取り、代かき、反転耕）を推奨している。現場ではこの3つの工法のうち主に表土剥ぎ取りによる除染が行われ、汚染土を含むフレコンバッグが水田に山積になっている。しかし、まだ汚染土の最終処分場は決まっていない。早期帰村と農業再生のためには、農家自身ができる除染方法を見つけることが緊急かつ重要な課題である。そこで、私たちは福島県飯舘村の水田で表土剥ぎ取り法と反転耕を組み合わせ、汚染表土を埋設する現場実験に挑戦している。私たちは“丁寧に”汚染土を処理するこの工法を「まてい工法」と命名した。現在、私たちはGRENEプロジェクトにおける農業研究用に開発した現地モニタリングシステム（FMS）に土壤放射線センサを取り付け、埋設した汚染土からの放射線量を監視している。降雨や灌漑による地下水の急速な変化にもかかわらず、現時点で埋設汚染土からの放射性セシウムの漏洩は確認されていない。この発表では、GRENEプロジェクトで開発したFMSの概要を説明すると共に、重要なグローバルデータの一つとして、福島における土壤放射線データベースの構築を提案したい。

キーワード: 除染, 放射線, 土壌, モニタリング, データベース, GRENE プロジェクト  
Keywords: decontamination, radiation, soil, monitoring, database, GRENE project

## レジリエントでサステイナブルな国土デザインのための環境情報活用フレームワーク

### Framework of Applications of Environmental Information for Realizing Resilient and Sustainable National Land Design

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#### 1. Introduction

This research project, GRENE-City, aims to construct a methodology to design and realize "resilient and sustainable national land" with mitigation and adaptation measures against vulnerabilities of national land and society. This "resilient" concept is derived from an understanding of "natural providence". The proposed system takes advantage of a broad range of information includes disaster risk caused by meteorological phenomena and others from DIAS (Data Integration and Analysis System) by the Earth Observation Data Integration and Fusion Research Initiative (EDITORIA), the University of Tokyo. As such the system will be developed as a "Progressive Integrated Database" based on various environmental information infrastructures provided by DIAS. In addition, this project aims to cultivate experts who can construct and utilize this database in actual policy making fields.

To achieve this goal, a re-design of national land and society for a reduplicative system in both normal and emergency situations is necessary. Both a "safety and security" concept, which takes account of damage reduction, and a "sustainability" concept which tackles low carbon, energy saving, and prevention of climate change, are needed in order to keep pace with the threats of predicted huge earthquakes and climate change.

#### 2. Contents

Natural hazards caused by climate change, earthquakes and other disasters may be increasing, and could strike in the near future our vulnerable society which is characterized by with declining birth rate and a growing proportion of elderly people, population decline, urban sprawl and etc. Based on the common recognition on these problems, this research project sets out to construct a methodology to lead to safer peaceful mind and sustainable national land and society by using DIAS.

The system needs to use data on natural and social situations. The data on natural situations includes earthquakes, climate change and disasters. The data on social situations include population structure, economic conditions, infrastructure, and land use. Additionally, not only the present data, but also historical data, such as land use and infrastructure change, record of disasters, population structures, and other information, are collected. Therefore "four-dimensional GIS" will be constructed to allow quantitative prediction and to evaluate policies considering historical faces, past place names, and other qualitative information.

In consequence, the system will analyze the vulnerability of national land and society caused by social, geographical, and other conditions, and natural variations and disaster risks. This system supports the examination of various policies, especially, the effectiveness of "Smart shrink" which could stop urban sprawl.

#### 3. Results and future works

##### 1) Information archives

This project collected historical data on earthquakes, tsunamis, and other natural disasters from old documents and other resources. In particular, records of tsunami damages of the Great East Japan Earthquake are stored. A prototype Web-GIS is developed to show these photos and tsunami height with map information.

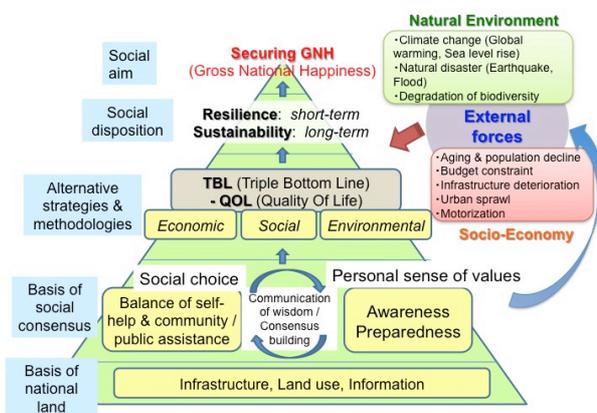
##### 2) Analysis and design

This project offers the evaluation of national land and cities with a view to safety, security, and sustainability. The system introduces QOL (Quality of Life) indicators. Data about accessibility, amenity, and disaster vulnerability to calculate QOL indicators are collected and added to the system. This will be utilized to illustrate conditions of residential amenity and disaster vulnerability in each area of the national land.

3) Utilization and deployment

This evaluation system will be applied to case study cities and regions. The problems and demands of the system will also be clarified. As a result, the system and database will be developed to accommodate requests from policy planning of city and national land.

Keywords: resilient national land, sustainability, natural disaster, triple bottom line



## Greene Ecohealth プロジェクトにおける地域健康と地球規模データ科学 Population health and global data sciences in Greene Ecohealth project

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Age of global and big data has come. The amount of data explosively increase and the expectations of exploring such data and effective utilization of data analysis results go wide of the mark. We enjoyed somehow the benefits from the big data analysis in daily life and some of the field in sciences; however, how can it be delivered to the health field, especially in areas or regions where the data collection is difficult due to the lack of data collection system? In developed countries, we can have data related to health and it has been already used for improvement public health service system. Furthermore, it has been linked to environmental data to know the results from climate and environmental changes. But this is only limited to developing countries and data or information from developing countries or regions, where the most vulnerable people from climate changes live and no information exists even on population, is still lack in identifying and monitoring the real situation. To sort out such information lack situation, the GRENEcoH project, a GRENE-Ecohealth project that is running under the GRENE-environmental information program, has started data collection of population health in areas in the Lao People's Democratic Republic using up-to-date technology to collect and link individual data. The system called in general as Health and Demographic Surveillance System (HDSS), which collect information about residents in the certain given areas for research. The HDSS programs are run in different areas and by different organization in African and Asian countries, however, in Japan; the HDSS is not paid enough attention. In this presentation, the introduction and the scientific and social values of HDSS and our technology will be presented.

キーワード: 開発途上国, 辺縁地域, 地域健康, 感染症

Keywords: developing countries, marginal areas, population health, infectious disease

## DIAS メタデータシステムの開発 Development of DIAS Metadata System

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We are developing a metadata system in the Data Integration and Analysis System (DIAS) project sponsored by Japan Ministry of Education, Culture, Sports, Science and Technology. A major goal of the DIAS metadata system is to collect all metadata of earth observation data produced under the projects sponsored by Japanese government. The DIAS metadata system is comprised of metadata registration system, metadata retrieval system, and download system.

Cooperation with other data centers is also an important goal of the DIAS metadata system. We have imported metadata from JAMSTEC (Japan Agency for Marine-Earth Science and Technology) data catalog and JaLTER (Japan Long Term Ecological Research Network) database, and supported integrated metadata search through the DIAS retrieval system. On the other hand, by exporting DIAS metadata, DIAS is now listed in the Earth Observation Catalogs of GEOSS Portal. We are developing a metadata coordination system to make it possible more comprehensive exchange of metadata among data centers.

キーワード: 地球観測データ, メタデータ  
Keywords: earth observation data, metadata

## DIASの運用体制の設計・提案 Design and proposal of operational DIAS

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DIAS (データ統合・解析システム、Data Integration and Analysis) は、様々な分野の利用者 (ステークホルダー) が協働して地球観測データ、気候変動予測データ、社会・経済データ等、超大容量で多様なデータ・情報を利活用し、資源管理、生物多様性、自然災害など、地球環境に関わる社会的課題に対し、適応策やレジリエントな社会形成に向けた情報を提供し、新たな科学知や公共的利益を創出する。それによって新たなイノベーションや社会の成長を牽引する社会インフラとなることを目指している。

2011年度よりDIAS第Ⅱ期計画として「地球環境情報統融合プログラム」(DIAS-P)が開始されており、その課題の一つとして、上記目的の実現に必要な科学的先端性を持続的に発揮し、実利用によって公共的利益を実現できる運用体制 (実運用DIAS) について、海洋研究開発機構が中心となって、東京大学 EDITORIA、宇宙航空研究開発機構および国立環境研究所との協力の下で設計し、文部科学省に提案することとしている。その設計作業のベースとして、実運用DIASが果たすべき役割を示す暫定的なレファレンスモデルを設定した。この概要は以下の通りである。このレファレンスモデルに示されたようなインフラや体制は実現すれば世界初のものとなる。このレファレンスモデルは、関係者のニーズを反映しつつ、設計作業の進捗に伴って毎年度見直される。

DIASは、さまざまな地球観測データのほか、実利用化ワークベンチ (各分野のステークホルダーの協働のもと、多様なデータ・情報を統融合し、公共的利益を創出するための情報基盤) および機能向上パートナーシップ (DIASの機能を持続的に向上するとともに新たな科学知を創出するための協働組織) を通じて得られるデータ (分野特有の観測データ、社会・経済データ、農・水産業活動に係るデータ、土地利用・土地被覆データ、道路・港湾などの交通ネットワークデータ、地形データ、災害発生データ、その他) を提供し流通させる統合ポータルとして、これらのメタデータを統合的に管理・公開する。アーカイブ自体が研究成果として認知されるような状況をいかにして創り出すかも今後の検討課題となる。

DIASのコアインフラは、データをアーカイブするための大容量ストレージおよびデータを解析・統融合するための解析空間や解析ツールからなる。いずれも大規模データを取り扱えるものとする。

DIASは、防災、資源管理などの政策決定者 (国内および途上国) を主たるユーザーとして想定するが、DIASの統融合データや解析機能を実際に主として使用するの、施策担当者 (decision maker) に判断材料を提供する研究者 (科学コミュニティ) や、実利用化ワークベンチにおいて協働する関係者とする。また、DIASデータポータルへのアクセスを通じて、エンドユーザー、市民活動グループ、民間サービスその他もユーザーとして想定する。

実利用化ワークベンチでは、ニーズによって、必要な気候・気象・海洋データの分解能が異なるので、ダウンスケールリングなどによって、求められるデータを作成する。公開が制限されているデータの利用を実利用化ワークベンチのドメイン研究者等が希望する場合は、そのための許認可手続きも実運用DIASが支援・代行し、さらには「こんなデータを探してもらいたい」という要望にも対応する。

実利用化ワークベンチは、エンドユーザーのニーズを把握した上で、継続的にプロトタイピングを行うとともに、成功事例の経験・ノウハウを積み重ねつつ段階的に対象範囲を拡大する。実利用化ワークベンチのプロトタイピング段階においては各利用分野の研究者、関係府省、自治体等と協働して有用な政策ツールを開発する。さらに、DIASは開発済みワークベンチの社会実装を支援し、他分野に展開するための普及・広報も行う。

以上の目的のため、オープンソースを用いて遠隔協働システム ubiDIASを開発し、各種ポリシー及び国連の持続可能な開発目標を調査・検討した。

キーワード: DIAS, 運用, 設計

Keywords: DIAS, operation, design

U01-14

会場:419

時間:5月1日 14:15-14:40

Activities of the Union Commission for Data and Information of the International Union of Geodesy and Geophysics  
Activities of the Union Commission for Data and Information of the International Union of Geodesy and Geophysics

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FOX, Peter<sup>1\*</sup> ; BARTON, Charles<sup>2</sup>

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The data and information activities of IUGG, International Union of Geodesy and Geophysics, will be introduced, from a viewpoint of IUGG's Union Commission for Data and Information.

Keywords: IUGG, Data and Information, eGY

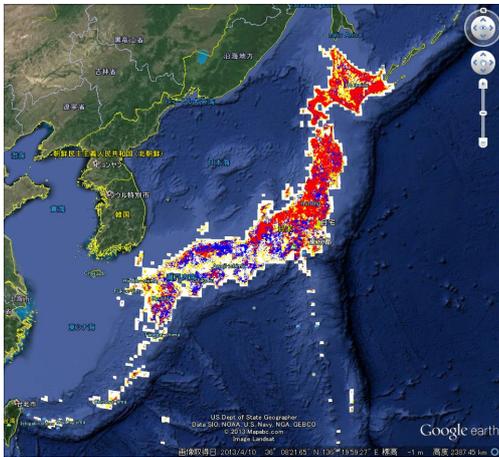
## GRENE-ei 生物多様性分野で整備している日本の土地利用データベース LUIS の概要 The Land Use Information System (LUIS) Database which has been developed under the GRENE-ei biodiversity area

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我々、国立環境研究所・地球環境研究センター・地球環境データベース推進室では、GRENE 環境情報分野 (GRENE-ei)・生物多様性分野において、かつて「GRID つくば」からデータ提供を行っていた、土地利用情報システム (Land-Use Information System: LUIS) のデータ提供システムの再構築を行っている。LUIS とは、3つの時代における国土地理院発行の地形図から、日本全国の土地利用の情報を、約 2 km メッシュ単位で数値データ化し、それぞれの時代の土地利用の様子やその変化を可視化するものである。3つの時代としては、「明治・大正期 (1900 年頃)」、「昭和中期 (1950 年頃)」、「昭和後期 (1985 年頃)」の 3つの時代がデータベース化されている。各々のメッシュ毎に、メッシュの左上隅の土地利用、メッシュ内で最大の面積を占める土地利用、その他メッシュ内に存在するすべての土地利用が、地形図の土地利用分類に従ってデータベース化してある。現在データを簡単な日本地図上にプロットする機能のほかに、Google Earth 上に表示させる機能についても開発を行っている。図は、Google Map 上にプロットした、1900 年と 1985 年の広葉樹の分布を示す。赤が両時代とも存在、青が消滅、黄が新たに出現を示している。将来は、国立環境研究所の地球環境データベースサーバーからデータを提供する予定である。今回は、このデータベースの概要について述べる。

キーワード: データベース, 土地利用, LUIS, 地形図, GRID つくば  
Keywords: database, land use, LUIS, topographical map, GRID-Tsukuba



## 北極域データアーカイブ (ADS) Arctic Data archive System(ADS)

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Of all the regions on the planet, the Arctic currently shows the biggest rise in average temperature due to global warming, and is one of the regions expected to become most affected by climate change on the Earth in the future. The change in the Arctic area brings a profound impact to the global climate system through changes in interactions between the atmosphere, ocean circulation, and the cryosphere. These climate changes not only impact upon human activities, but also the Arctic flora and fauna ecosystem.

Large parts of the observations and mechanisms of the environmental change, including the climate of the Arctic region, are still not well understood. In order to further our understanding of these complex systems, an integrated study carried out with continuous observations in the Arctic is proposed. In the Arctic Environmental Observation Center in the National Institute of Polar Research, operations began on the Arctic Data archive System (ADS) in March 2012, in order to promote the mutual use of scientific data.

The purpose of the Arctic Data archive System is to archive and distribute multiple observational (atmosphere, ocean, terrestrial, and ecology) and model simulation datasets, and promote utilization of these datasets. ADS is the central repository of archived data on Arctic research in Japan.

キーワード: 北極域, 環境, 温暖化, ADS

Keywords: Arctic, Environment, Global Warming, ADS

## JAXAの地球観測データによる地球惑星科学研究への貢献 JAXA's contributions for Earth and Planetary research using earth observation data

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JAXA's earth observation satellites play an important role in providing essential information for Earth science and applications regarding global warming, climate change, water cycle change, agriculture, public health and disaster management.

JAXA have been operating Greenhouse gas Observing SATellite (GOSAT), and Global Change Observation Mission-Water 1 (GCOM-W1) successfully. These satellites are collecting geophysical data of the earth's surfaces and atmosphere those are important for the earth and planetary researches.

In addition to those ongoing earth observation satellite missions, new satellites will be added to the line.

One is GPM (Global Precipitation Measurement), the successor of TRMM focusing to measure precipitation. Another one is ALOS-2 (Advanced Land Observing Satellite) carrying an L-band synthetic aperture radar. Those new generation satellites will contribute to observe disaster, earth resources, climate change, water cycle, etc.

JAXA will make continuous efforts to create and provide satellite-based information for not only scientists but also decision makers and stakeholders in order to contribute to solving global and regional issues. In order to make such information useful, close collaboration with various players in various sectors is essential.

Keywords: GCOM, ALOS, GPM, TRMM, GOSAT

## IUGONET project and its products for multidisciplinary study on upper atmospheric physics

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ABE, Shuji<sup>1\*</sup>; YATAGAI, Akiyo<sup>2</sup>; KOYAMA, Yukinobu<sup>3</sup>; TANAKA, Yoshimasa<sup>4</sup>; SHINBORI, Atsuki<sup>5</sup>; UENO, Satoru<sup>6</sup>; UMEMURA, Norio<sup>2</sup>; SATO, Yuka<sup>4</sup>; YAGI, Manabu<sup>7</sup>; HORI, Tomoaki<sup>2</sup>

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In order to investigate the mechanism of long-term variations in the upper atmosphere, it is crucially important to make cross-cutting studies with various kinds of data observed between Sun and Earth region. Thus, it is needed to combine databases which maintained by each institute and to accelerate to make data-sharing network in the STP community. The IUGONET (Inter-university Upper atmosphere Global Observation NETwork) project was established in 2009 as a six-year research project supported from the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. It consists of the five Japanese universities and institutes (NIPR, Tohoku University, Nagoya University, Kyoto University, and Kyushu University, that have been leading ground-based observations of the upper atmosphere for decades), and collaborates with many domestic (for example, the National Institute of Information and Communications Technology (NICT), the National Astronomical Observatory of Japan (NAOJ), and the Kakioka magnetometer observatory, Japan Meteorological Agency) and overseas institutes/projects (for example, ESPAS in EU). One of our products in the IUGONET data management framework is developing systems for searching metadata of these observational data, and the metadata database (MDB). In the STP community, there are various kinds of archived data observed by many instruments, for example radars, magnetometers, photometers, radio telescopes, helioscopes, and so on. The IUGONET MDB is based on DSpace as a metadata registering system, which is mainly used in literature management. It also adopts an extension of the SPASE data model as a metadata format, which is widely used in the upper atmospheric community in USA. As a result, this system can deal with all kind of data belonging to IUGONET institutes, including cosmic ray, meteorological information observed by automatic weather station, etc. The system can also get flexibility to other type of data including the satellites and the numerical simulation which are used in the STP community. It is one of our challenges to apply the IUGONET system to many kinds of data in other communities. This MDB system is in operation since 2011 with over 10 million metadata. Other challenge of the IUGONET is developing software which can use for scientific research and publication. The iUgonet Data Analysis Software (UDAS) is a plug-in software of Themis Data Analysis Software (TDAS), which is upgraded to Space Physics Environment Data Analysis System (SPEDAS). The UDAS provides many routines for loading the ground-based observational data from various types of instruments, and performing scientific data analysis. This platform made it easier for STP community to analyze a various kind of data in a unified way. The IUGONET project will be closed at the end of fiscal year 2014. In this presentation, we will introduce the achievements and problems of our six-year project and discuss futures for global data sharing and research.

Keywords: Solar-Terrestrial Physics, metadata database, data analysis software, IUGONET

## Introduction of NICT ionospheric data archive system Introduction of NICT ionospheric data archive system

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NICT has a long history of operational ionospheric observation with ionosondes since IGY 1957. On the beginning, we had four domestic observatories, Wakkanai, Akita, Kokubunji and Yamagawa. After that Akita was closed and Okinawa joined and we operate these four observatories continuously. In addition, Syowa station in Antarctica has been observing ionosphere by NICT since IGY, too. In addition as the World Data Center for ionosphere, we have a lot of number of ionospheric data obtained by foreign institutes.

The present ionosonde system named 10C provides digital image of ionogram. However, all other previous systems provide analog image and recorded on films. Now it becomes a serious problem to lose data by corrupted of films. The only solution of this issue is to digitize the film image but usually the cost is very high. We search the way to keep low cost and comfortable quality for future analysis and find a method named ribbon scanning. In this method we keep whole of one film data in one file, which makes cost low and avoid losing data by frame skipping. We had trial of resolution of digital image and confirm the quality is same level of original image.

We already had some fruitful results using these data archive. Maruyama et al. [2012] shows the statistic results of ionospheric variation after large earthquakes. Other than these kinds of study we expect the archive is useful for discussion of long-term variation of ionosphere with climate change. For improving the use of these dataset we need to solve another issue. Film-digitized images are suitable to manual scaling with naked-eye but we cannot use these data automatically because the axes vary in each image. To solve the issue we need to try image analysis to detect the axes automatically.

### Reference

Maruyama, T., T. Tsugawa, H. Kato, M. Ishii, and M. Nishioka, Rayleigh wave signature in ionograms induced by strong earthquakes, *J. Geophys. Res.*, DOI: 10.1029/2012JA017952.

Keywords: WDS, WDC, ionosphere, space weather

**The Current and the Future of AIST GEO Grid Technologies- A Case Study of Fukushima Radiation Monitoring Application**  
**The Current and the Future of AIST GEO Grid Technologies- A Case Study of Fukushima Radiation Monitoring Application**

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KOJIMA, Isao<sup>1\*</sup>; NAKAMURA, Ryosuke<sup>1</sup>; OGAWA, Hiroataka<sup>1</sup>; TANAKA, Yoshio<sup>1</sup>; MATONO, Akiyoshi<sup>1</sup>

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<sup>1</sup>National Institute of Advanced Industrial Science and Technology

The Current status and future perspective will be discussed of "GEO Grid" Technologies which have been studied and developed at AIST (National Institute of Advanced Industrial Science and Technology). Also a case study of Fukushima Radiation Monitoring Application will be reviewed.

Keywords: GRID computing, geoscience data, database technology, information technology, RDA, ICSU-WDS

**Making Dynamic Data Citable: Approaches to Data Citation within the Context of the RDA Working Group**  
**Making Dynamic Data Citable: Approaches to Data Citation within the Context of the RDA Working Group**

Rauber Andreas<sup>1\*</sup>  
RAUBER, Andreas<sup>1\*</sup>

<sup>1</sup>Vienna University of Technology

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Being able to reliably and efficiently identify entire or subsets of data in large and dynamically growing or changing datasets constitutes a significant challenge for a range of research domains. In order to repeat an earlier study, to apply data from an earlier study to a new model, we need to be able to precisely identify the very subset of data used. While verbal descriptions of how the subset was created (e.g. by providing selected attribute ranges and time intervals) are hardly precise enough and do not support automated handling, keeping redundant copies of the data in question does not scale up to the big data settings encountered in many disciplines today. Furthermore, we need to be able to handle situations where new data gets added or existing data gets corrected or otherwise modified over time. Conventional approaches, such as assigning persistent identifiers to entire data sets or individual subsets or data items, are thus not sufficient.

In this talk we will review the challenges identified above and discuss solutions that are currently elaborated within the context of the working group of the Research Data Alliance (RDA) on Data Citation: Making Dynamic Data Citable. These approaches are based on versioned and time-stamped data sources, with persistent identifiers being assigned to the time-stamped queries/expressions that are used for creating the subset of data. We will further review examples of how these can be implemented for different types of data and see how this fits into the larger context of activities on Data Citation.

Keywords: Research Data Alliance, data citation, dynamic data, information technology, interoperability

## データベースへのDOI付与に関する国内WDCの最近の活動 Recent activity of DOI-minting to database by WDCs in Japan

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NOSE, Masahito<sup>1\*</sup>; KOYAMA, Yukinobu<sup>1</sup>; IYEMORI, Toshihiko<sup>1</sup>; ISHII, Mamoru<sup>2</sup>; MURAYAMA, Yasuhiro<sup>3</sup>; KADOKURA, Akira<sup>4</sup>; SHINOHARA, Iku<sup>5</sup>

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Recent electronic journals are published with DOI (digital object identifier) such as doi:10.1029/2012SW000785. DOI is a persistent name that is resolved into URL, where readers can obtain digital objects of the journal articles; for example, abstract, figures, and pdf files. The DOI system was launched around 2000 and becomes popular these days so that DOI is ordinarily indicated in references and citations.

The next development of the DOI system is to extend it to database. It makes possible for researchers to cite the data used in a scientific publication, which is called "data citation". Data citation provides the following benefits:

- 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.
- Readers can also easily discover datasets which are relevant to their interests but has not been noticed.
- Data contributors can gain professional recognition and rewards for their published data in the same way as for traditional publications.
- Data centers can measure the impact of individual datasets and receive proper credit of their work.

Recognizing the importance of data citation, World Data Centers (WDCs) in Japan including WDC for Aurora (National Institute of Polar Research), WDC for Geomagnetism (Kyoto University), WDC for Ionosphere and Space Weather (National Institute of Information and Communications Technology), and WDC for Space Science Satellites (Japan Aerospace Exploration Agency) 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, universities. Two representatives of the above 4 WDCs are working closely with JaLC to define a registration scheme to implement the DOI-URL mapping. We are also developing a web-based system to register metadata with JaLC and create landing pages for database. We expect to start a pilot program to mint DOI to the database from the middle of 2014.

Keywords: DOI, Database, Data Citation, Data Publication

U01-23

会場:419

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## Interlinking Articles And Data? The Past, Present, And Future Interlinking Articles And Data? The Past, Present, And Future

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Activities of linking scholarly articles and scientific data will be introduced.  
Keywords: data publication, scholarly article, data citation

## Open Science Data Discovery Platform Open Science Data Discovery Platform

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Technology and use case studies of "Open Science Data Discovery Platform" will be introduced. So far we have harvested approximately 0.6 million metadata of data citation (DOIs and related metadata given to datasets) from publicly open databases of ICSU-WDS, PANGEA, ICPSR, etc., and have been developing new technology to leverage those data-citation link information and scholarly article archives. This technology, including linguistic, time-space, and ontological analysis techniques, is expected to have potential to enable new knowledge finding from various relations between datasets and articles, as well as analysis of higher-class clustering and grouping structures of relationships and links between science-technology information sources and even various communities which are related to science and technology data and articles. Through this process, perhaps to be like easy user-interface in future (like Web of Science), even international perspectives will be easily captured of more general science and technology research information pieces, links, and inter-relations to each other. For example, regarding climate change prediction and related decision making we may be able to find easily by an online search system how different earth observation datasets are used in political papers and meteorological papers.

キーワード: 科学データ, ICSU-WDS, データベース技術, データ検索, データサイテーション  
Keywords: Scientific data, ICSU-WDS, database technology, data search, data citation

## Hadoop による時系列衛星画像のための時空間データマイニングシステムの構築 Construction of spatio-temporal data mining system for time-series satellite imagery using Hadoop

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A large number of spatio-temporal data have been stored in various fields of science, such as remote sensing, numerical simulation, and astronomical observation, in which data often appears as time-series images. To extract spatio-temporal knowledge from spatio-temporal data including time-series images, spatio-temporal cross section relevant to a target task has to be extracted from a mass of data. Since these data are stored as a large number of files, utilization of distributed processing framework such as Hadoop or Gfarm is promising.

We constructed distributed data mining system for time-series satellite images using 53 nodes (3 masters and 50 slaves at maximum) of iMac and Hadoop which enables distributed file system and distributed processing using MapReduce. We evaluated the scalability and performance of the system for the task extracting time-series data from a large number of images carefully and found that partitioning the images into optimum numbers and reducing the data between map phase and reduce phase is essential.

The system was then applied to two different tasks focusing on time-series data analysis extracted from satellite imagery: statistical modeling of seasonal changes in vegetation index and spatio-temporal correlation analysis of weather satellite images. The tasks were successfully implemented on the system and the computational time was decreased in inverse proportion to the number of slave nodes, thus usefulness of the distributed system to spatio-temporal data mining for time-series images.

キーワード: 分散処理, Hadoop, MapReduce, データマイニング, 時空間, 衛星画像  
Keywords: distributed processing, Hadoop, MapReduce, data mining, spatio-temporal, satellite imagery

## NICTサイエンスクラウドの基盤技術開発、システム構築、および科学データ処理への応用

### Basic Technologies, Integrated Systems and Applications of the NICT Science Cloud

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MURATA, Ken T.<sup>1\*</sup>; WATANABE, Hidenobu<sup>1</sup>; UKAWA, Kentaro<sup>2</sup>; MURANAGA, Kazuya<sup>2</sup>; YUTAKA, Suzuki<sup>2</sup>; KASAI, Yasuko<sup>1</sup>; SATOH, Shinsuke<sup>1</sup>; ISHII, Shoken<sup>1</sup>; YAMAMOTO, Kazunori<sup>1</sup>; NAGATSUMA, Tsutomu<sup>1</sup>; TSUGAWA, Takuya<sup>1</sup>; NISHIOKA, Michi<sup>1</sup>; GUO, Zhihong<sup>3</sup>; KUROSAWA, Takashi<sup>4</sup>; MIZUHARA, Takamichi<sup>5</sup>

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This paper is to propose a cloud system for science, which has been developed at NICT (National Institute of Information and Communications Technology), Japan. The NICT science cloud is an open cloud system for scientists who are going to carry out their informatics studies for their own science. The NICT science cloud is not for simple uses. Many functions are expected to the science cloud; such as data standardization, data collection and crawling, large and distributed data storage system, security and reliability, database and meta-database, data stewardship, long-term data preservation, data rescue and preservation, data mining, parallel processing, data publication and provision, semantic web, 3D and 4D visualization, out-reach and in-reach, and capacity buildings.



## Global spectral crustal model Global spectral crustal model

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We compile the harmonic coefficients, which describe the Earth crustal density structure with a spectral resolution complete to degree/order 180. These coefficients can be used in gravimetric studies of the Earth lithosphere structure, isostasy, crustal loading, sedimentary basins and related topics. The global spectral crustal model is separated into 9 specific layers of the topography, bathymetry, polar ice sheets, sediments (3-layers) and consolidated crust (3-layers). The harmonic coefficients describe uniformly the geometry and density (or density contrast) distribution within each crustal component. The topographic and bathymetric coefficients are generated from the topographic/bathymetric model ETOPO1 and the global geoid model GOCO03s. A uniform density model is adopted for the topography. The ocean density distribution is approximated by the depth-dependent seawater density model. The ETOPO1 topographic and the DTM2006.0 ice thickness data are used to generate the ice coefficients, while assuming a uniform density of the glacial ice. The geometry and density distribution within sediments is described by the 3 stratigraphic layers of a laterally varying density model, and the same structure is used to describe the density distribution within the consolidated crust down to the Moho interface. The sediment and consolidated crust coefficients are generated from the global crustal model CRUST1.0. The density contrasts of the ocean, ice, sediments and remaining crustal structures are taken relative to the reference crustal density.

キーワード: crust, density, gravimetric forward modeling, harmonic analysis

Keywords: crust, density, gravimetric forward modeling, harmonic analysis