World Data System
Asia-Oceania Conference 2017

Programme and Abstracts

27 - 29 September 2017
Kyoto University, Kyoto, Japan

Information and contributions of the Cooperative Event “Data-Analysis Workshop on Solar-terrestrial Environment”, held on 26 September 2017 at Kyoto University, are also included.
Organizers and Sponsors

Principal Organizers
ICSU World Data System
Data Analysis Center for Geomagnetism and Space Magnetism, Graduate School of Science, Kyoto University

Co-Organizers
National Institute of Information and Communications Technology
Institute for Space-Earth Environmental Research, Nagoya University
Society of Geomagnetism and Earth, Planetary and Space Sciences (SGEPSS)
Institute of Remote Sensing and Digital Earth, Chinese Academy of Science

Sponsors
Kyodai-zaidan
Science Council of Japan
Future Earth
Kyoto MICE

Scientific Organizing Committee (SOC):
T. Iyemori (Co-Chair), WDC for Geomagnetism, Kyoto, Kyoto University
G. Li, (Co-Chair), Institute of Remote Sensing and Digital Earth, CAS
T. Watanabe (Secretary), ICSU WDS International Programme Office
S. Harrison, WDS-Chair, Centre for Past Climate Change, University of Reading
S. Iwata, The Graduate School of Project Design
J. Li, Computer Network Information Center, CAS
M. Mokrane, ICSU WDS International Programme Office
Y. Murayama, National Institute of Information and Communications Technology
R. Shaw, IRDR International Programme Office
L. Shi, National Science and Technology Infrastructure Center, MOST, China
M. Taniguchi, Research Institute for Humanity and Nature
K. Takara, Disaster Prevention Research Institute of Kyoto University
J. Wang, Institute of Geographic Sciences and Natural Resources Research, CAS
S.-Y. Noh, Korea Institute of Science and Technology
J. Hunter, University of Queensland, Australia
B. Veenadhari, Indian Institute of Geomagnetism
L. J. Cruz, Marine Science Institute, University of the Philippines Diliman
W. Chu, GEO Secretariat

Local Organizing Committee (LOC):
T. Iyemori (Chair), WDC for Geomagnetism, Kyoto, Kyoto University
T. Watanabe (Secretary), ICSU WDS International Programme Office
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Y. Murayama, National Institute of Information and Communications Technology
H. Hashiguchi, RISH, Kyoto University
A. Kadokura, National Institute of Polar Research
Hanaoka, Yoichiro, National Astronomical Observatory Japan
T. Ashino, Center for Computational Mechanics Research, Toyo University
S. Haruyama, Graduate School and Faculty of Bioresources, Mie University
A. Kitamoto, National Institute of Informatics
Y. Kondo, Research Institute for Humanity and Nature
A. Yoshikawa, International Center for Space Weather Science and Education, Kyushu University
N. Nishitani, Institute for Space-Earth Environmental Research, Nagoya University
S. Abe, Institute for Space-Earth Environmental Research, Nagoya University
Y. Kubo, National Institute of Information and Communications Technology
H. Toh, Graduate School of Science, Kyoto University
M. Takeda, Graduate School of Science, Kyoto University
M. Nose, Graduate School of Science, Kyoto University
N. Takeuchi, Graduate School of Science, Kyoto University
Y. Odagi, Graduate School of Science, Kyoto University
World Data System Asia-Oceania Conference

2017

Programme and Abstracts

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http://wdc2.kugi.kyoto-u.ac.jp/wds2017/index.html
Preface

As Chair of the International Council for Science (ICSU) World Data System (ICSU-WDS), I am delighted to welcome you all to the WDS Asia Oceania Conference 2017. This is the first such ICSU-WDS regional conference in Asia and it is very exciting to see participation from so many scientists from so many different countries in this conference. This surely is evidence that the issues associated with data stewardship are recognized as important by scientists, managers and policy-makers in Asia.

Some of you are already familiar with the work of ICSU-WDS, and indeed active participants in that work. However, I am sure that some of you are less familiar with what ICSU-WDS is trying to do and would like to take this opportunity to highlight some key issues.

In the rapidly evolving landscape of data sharing and stewardship, one of the major challenges is the building of trust both within and between diverse communities. A cornerstone of trust is the process of certification of repositories and services. Certification is a demonstration that repositories and services reach acceptable practical, managerial and ethical international standards of data stewardship – and that they therefore can provide an excellent service to the community at large. ICSU-WDS have worked with the Data Seal of Approval (DSA) Board to create a unified set of Requirements for Core Trustworthy Data Repository certification and this WDS-DSA partnership now offers the opportunity for all data repositories to undergo certification.

Certified repositories and services also have the opportunity of becoming members of ICSU-WDS. Membership conveys multiple benefits – providing a direct source of information about international opportunities and developments, opportunities to share experience with other data stewards, and opportunities to ensure continued growth in expertise through training and participation in events such as the WDS Members Forum collocated with the biennial SciDataCon research conference and organized as part of International Data Week. WDS membership is also a concrete demonstration of a commitment to Open Data Sharing Principles and the best in data stewardship.

Finally, I would like to highlight that WDS is at the forefront of exploring emerging issues and approaches to data stewardship through its active collaboration with other data organisations (e.g. ICSU-CODATA, Research Data Alliance, Group on Earth Observations) and with the high-level research programmes of ICSU. Many of these issues will be highlighted in talks during this conference.

I hope that you find this conference a useful opportunity to share your experiences with others working in data science. I also hope that those of you who are involved in national or regional data repositories and services will see the benefits of active involvement in WDS. Please contact us about the certification procedure, WDS membership, or how you can contribute more actively to WDS goals.

Sandy P. Harrison

Chair of ICSU WDS Scientific Committee
Centre for Past Climate Change at the University of Reading, United Kingdom and Macquarie University, Australia
**World Data System Asia-Oceania Conference 2017**

**Dates:** 27 (WED) - 29 (FRI) September 2017  
**Place:** Kyoto University, Kyoto, Japan

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**Scope:**

The World Data System (WDS) is an interdisciplinary body of the International Council of Science (ICSU) with a mission to promote international collaborations on data stewardship, long-term preservation and provision of quality-assessed research data and data services. WDS is a membership organization federating scientific data centres, data services and networks thereof across a range of disciplines in the natural and social sciences as well as humanities. WDS has 108 members (70 Regular, 11 Network, 27 Partners and Associate Members) as of 1 September 2017, but the Asia-Oceania region comprises only 17 members. The WDS Asia-Oceania Conference will bring together data practitioners, data repositories managers and researchers to reinforce the data stewardship community in the region and help establish a collaborative system for access to and dissemination of research data. In addition, the establishment of such a regional network will support existing international research priorities such those set by the International Council for Science (ICSU) through its programmes: Future Earth, the Integrated Research on Disaster Risk, and the Urban Health and Wellbeing. The main objectives of the first conference, to be held in 2017 (Kyoto, Japan), are:

1. Strengthen collaboration in the Asia-Oceania region to reinforce WDS-oriented activities  
2. Build and expand WDS community in the Asia-Oceania region  
3. Exchange experience on successful WDS trustworthy data-repositories certification and membership application  
4. Encourage former ICSU World Data Centres to join WDS  
5. Introduce advanced technologies to data management  
6. Promote WDS-oriented activities in support of ICSU-led projects in the Asia-Oceania region.

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**Venue:**

The WDS Asia-Oceania Conference will be held at the Maskawa Building for Education Research in the North Campus of Kyoto University (map). The Cooperative-Event (Data-Analysis Workshop on Solar-terrestrial Environment) will be held at Science Seminar House, in the same campus.
Schedule of the Conference:

<table>
<thead>
<tr>
<th>Date</th>
<th>AM</th>
<th>PM</th>
<th>Evening</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 Sep.</td>
<td>Cooperative -Event (Data-Analysis Workshop on Solar-terrestrial Environment)</td>
<td>Cooperative -Event (Data-Analysis Workshop on Solar-terrestrial Environment)</td>
<td></td>
</tr>
<tr>
<td>(TUE)</td>
<td>Venue #1</td>
<td>Venue #1</td>
<td></td>
</tr>
<tr>
<td>27 Sep.</td>
<td>Registration</td>
<td>Opening Talks</td>
<td>Welcome Reception</td>
</tr>
<tr>
<td>(WED)</td>
<td>Venue #2</td>
<td>Keynote Talks</td>
<td>Venue #1</td>
</tr>
<tr>
<td>(TUE)</td>
<td>Venue #2</td>
<td>Cultural attraction</td>
<td></td>
</tr>
<tr>
<td>(FRI)</td>
<td>Venue #2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Date AM PM Evening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 Sep.</td>
<td>Venue #1 Cooperative -Event (Data-Analysis Workshop on Solar-terrestrial Environment)</td>
<td>Venue #1 Cooperative -Event (Data-Analysis Workshop on Solar-terrestrial Environment)</td>
<td></td>
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<tr>
<td>(TUE)</td>
<td>AM PM Evening</td>
<td>AM PM Evening</td>
<td></td>
</tr>
<tr>
<td>27 Sep.</td>
<td>Venue #2 Registration</td>
<td>Venue #2 Session 2. Data Activities related to Future Earth</td>
<td></td>
</tr>
<tr>
<td>(WED)</td>
<td>AM PM Evening</td>
<td>Venue #2 Session 3. Capacity Building Thematic Group Discussions</td>
<td></td>
</tr>
<tr>
<td>28 Sep.</td>
<td>Venue #2 Session 2. Data Activities related to Future Earth</td>
<td>Venue #2 Session 3. Capacity Building Thematic Group Discussions</td>
<td></td>
</tr>
<tr>
<td>(TUE)</td>
<td>AM PM Evening</td>
<td>Venue #2 Cultural attraction</td>
<td></td>
</tr>
<tr>
<td>29 Sep.</td>
<td>Venue #2 Session 4. Open Data and Open Science</td>
<td>Venue #2 Session 4. Open Data and Open Science, Session 5. Accreditation and Certification of Data Repositories</td>
<td></td>
</tr>
<tr>
<td>(FRI)</td>
<td>AM PM Evening</td>
<td>AM PM Evening</td>
<td></td>
</tr>
</tbody>
</table>

Venue #1: Science Seminar House, Kyoto Univ. (In the North Campus)
Venue #2: Maskawa Building, Kyoto Univ. (In the North Campus)
Venue #3: Restaurant “Camphora”, Kyoto Univ. (Near the Main Gate)

Event Schedule:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Venue:</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Sep.</td>
<td>Welcome reception (Kagami-biraki)</td>
<td>Science Seminar House</td>
</tr>
<tr>
<td>(WED)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Sep.</td>
<td>Cultural attraction (traditional Kyoto dance, photo)</td>
<td>Maskawa Hall</td>
</tr>
<tr>
<td>(THU)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Sep.</td>
<td>Conference Party</td>
<td>Café-Restaurant “Camphora”</td>
</tr>
<tr>
<td>(THU)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*No registration fee required. Participants who attend the conference dinner (28 SEP) need to pay 5,000JPY on the registration desk.

Contact Point (LOC):

E-mail: wdskyoto2017@kugi.kyoto-u.ac.jp
mobile phone: 090-8984-3743
Floor Map of the Maskawa Hall

Important Remarks:

Drinking and eating in the Maskawa Hall (the main room of the conference) and exhibition hall are strictly forbidden.
General

North Campus

Venues

Welcome reception
Science Seminar House

North Campus

Welcome Reception

Hotel Venues

Shiran-kaikan
17 min. (to Maskawa Hall)

the Palace Side Hotel
10 min. "Karasuma-Imadegawa" No. 203 "Kyodai-Nogakubu mae" 9 min.

Kyoto Royal Hotel
1 min. "Kawaramachi-Sanjo" No. 17 "Kyodai-Nogakubu mae" 14 min.

Hotel → Kyoto sta.

Shiran-kaikan
2 min. "Kyodai-Seimon mae" No. 206 "Kyoto-eki mae" 35 min.

the Palace Side Hotel
5 min. "Marutamachi" "Kyoto" 8 min.

Kyoto Royal Hotel
1 min. "Kawaramachi-Sanjo" No. 17 "Kyoto-eki mae" 20 min.

Kyoto Heian Hotel
6 min. "Imadegawa" "Kyoto" 10 min.

Walk
Bus
Railway
Taxi
# Programme

**26 SEP (TUE)  Cooperative -Event (Data-Analysis Workshop on Solar-terrestrial Environment)**


<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00-10:30</td>
<td>Registration of Cooperative Event</td>
<td>T. Watanabe (WDS International Programme Office)</td>
</tr>
<tr>
<td>10:30-10:40</td>
<td>Scope of the Data-Analysis Workshop on Solar-terrestrial Environment</td>
<td>T. Watanabe (WDS International Programme Office)</td>
</tr>
<tr>
<td>10:40-11:00</td>
<td>Summary report of the space weather environment in recent half year</td>
<td>S. Abe (International Center for Space Weather Science and Education, Kyushu University)</td>
</tr>
<tr>
<td>11:00-11:15</td>
<td>Sumary report of solar radio observations during recent half year</td>
<td>Y. Kubo (Space Environment Laboratory, National Institute of Information and Communications Technology)</td>
</tr>
<tr>
<td>11:15-11:30</td>
<td>Report of cosmic-ray neutron monitor observations since March 2017</td>
<td>T. Watanabe (WDC for Cosmic Rays, ISEE, Nagoya University)</td>
</tr>
<tr>
<td>11:30-11:45</td>
<td>Review of Geomagnetic Events at KAKIOKA from February to August, 2017</td>
<td>T. Shimamura, and T. Ohkawa (Kakioka Magnetic Observatory, Japan Meteorological Agency)</td>
</tr>
<tr>
<td>11:45-12:00</td>
<td>Report on Equatorial magnetic field variations based on EE-index from March to August 2017</td>
<td>A. Fujimoto, S. Abe, T. Uozumi, H. Matsushita, A. Yoshikawa (International Center for Space Weather Science and Education, Kyushu University)</td>
</tr>
<tr>
<td>12:00-12:15</td>
<td>Ionospheric observations in April - September 2017</td>
<td>T. Tsugawa*, M. Nishioka, H. Kato, M. Ishii (Space Environment Laboratory, National Institute of Information and Communications Technology)</td>
</tr>
<tr>
<td>12:15-12:30</td>
<td>SuperDARN radar observations in March – September 2017</td>
<td>N. Nishitani (Institute of Space-Earth Environmental Research, Nagoya Univ.)</td>
</tr>
<tr>
<td>12:30-13:30</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>13:30-14:00</td>
<td>Discussions</td>
<td></td>
</tr>
<tr>
<td>14:00-14:20</td>
<td>S-1 (memorial) Utilization of a Suite of Ground-based and space based data with the aid of magnetohydrodynamic simulation to understand solar eruptive events and initiation of coronal mass ejections (CME)</td>
<td>S. T. Wu* (Center For Space Plasma and Aeronomic Research and Department of Mechanical and Aerospace Engineering, The University of Alabama in Huntsville), Presented by C.-C. Wu (Naval Research Laboratory) *1931-2017</td>
</tr>
<tr>
<td>14:20-14:40</td>
<td>S-4: Real time GPS data in Indonesia for space weather monitoring</td>
<td>Buldan Muslim¹⁸ and Joni Efendi²¹⁷ (’Space Science Center, National Institute of Aeronautics and Space, LAPAN, ’Geospatial Information Agency, Indonesia)</td>
</tr>
<tr>
<td>14:40-15:00</td>
<td>S-5: Importance of geomagnetic data and the role of WDC-Mumbai in solar terrestrial research (invited)</td>
<td>B. Veenadhari (Indian Institute of Geomagnetism)</td>
</tr>
<tr>
<td>15:00-15:20</td>
<td>S-6: The data and metadata management in Australian Bureau of Meteorology, Space Weather Services (invited)</td>
<td>K. Wang (Space Weather Services, Bureau of Meteorology, Australia)</td>
</tr>
<tr>
<td>15:20-15:50</td>
<td>Break, Poster Viewing</td>
<td></td>
</tr>
</tbody>
</table>
### Programme

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:50-16:10</td>
<td><strong>S-7</strong>: A comparison between the geoeffectiveness of north-south and south-north magnetic clouds, and an associated prediction</td>
<td>C.-C. Wu(^1)*, R. P. Lepping(^2), D. B. Berdichevsky(^3), and K. Liou(^4) ((^1)Naval Research Laboratory, (^2)Goddard Space Flight Center, NASA, (^3)College Park, Maryland, (^4)Applied Physics Laboratory, Johns Hopkins University)</td>
</tr>
<tr>
<td>16:10-16:30</td>
<td><strong>S-8</strong>: Time varying heliospheric size due to variations in solar activity</td>
<td>H. Washimi(^1)<em>(^2), T. Tanaka(^1) and G. P. Zank(^2)</em>(^3) ((^1)International Center for Space Weather Science and Education, Kyushu University, (^2)Center for Space Plasma and Aeronomic Research, and (^3)Department of Space Science, University of Alabama in Huntsville)</td>
</tr>
<tr>
<td>16:30-16:50</td>
<td><strong>S-9</strong>: The days when aurorae were seen in Japan: Tracing back Japanese historical documents beyond the Carrington event</td>
<td>H. Hayakawa (Osaka University)</td>
</tr>
</tbody>
</table>

### 27 SEP (WED) WDS Asia-Oceania Conference 2017 #1

Venue: Maskawa Building for Education Research, Kyoto University (http://www.sci.kyoto-u.ac.jp/en/map.html)

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00-10:30</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>10:30-10:50</td>
<td>Opening Address</td>
<td>SOC</td>
</tr>
<tr>
<td>10:50-11:00</td>
<td><strong>W-1</strong>: Welcome address from National Institute of Information and Communications Technology (NICT)</td>
<td>F. Tomita (Vice President, National Institute of Information and Communications Technology)</td>
</tr>
<tr>
<td>11:00-11:10</td>
<td><strong>W-2</strong>: Welcome and note on ICSU ROAP Activities</td>
<td>L. J. Cruz (Chair, ICSU Regional Committee for Asia and the Pacific)</td>
</tr>
</tbody>
</table>

**Keynote Talks**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:10-11:30</td>
<td><strong>K-1</strong>: ICSU-WDS, trustworthy data services for science</td>
<td>M. Mokrane (Executive Director, ICSU WDS International Programme Office)</td>
</tr>
<tr>
<td>11:30-11:50</td>
<td><strong>K-2</strong>: Future Earth and WDS - collaboration at international and national levels</td>
<td>F. Kasuga (Director, Future Earth Global Hub in Tokyo)</td>
</tr>
<tr>
<td>11:50-12:10</td>
<td><strong>K-3</strong>: The role of Regional Centre for Future Earth in Asia</td>
<td>H. Mallee (Director, Regional Centre for Future Earth in Asia, Research Institute for Humanity and Nature)</td>
</tr>
<tr>
<td>12:10-12:30</td>
<td><strong>K-4</strong>: Scope and goal of the WDS Asia-Oceania Conference, 2017</td>
<td>T. Watanabe(^<em>)</em>, T. Iyemori(^2) and G. Li(^2) ((^*)WDS International Programme Office, (^2)WDC for Geomagnetism, Kyoto, Graduate School of Science, Kyoto University, (^3)Institute of Remote Sensing and Digital Earth, CAS)</td>
</tr>
</tbody>
</table>

12:30-13:40 Lunch (1st Group Photo), Poster posting

### Session 1. International Collaborations on Data

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:40-14:00</td>
<td><strong>1-1</strong>: GEO implementation of data sharing and data management Principles</td>
<td>Wenbo Chu (GEO Secretariat)</td>
</tr>
<tr>
<td>14:00-14:20</td>
<td><strong>1-2</strong>: Introduction to China GEOSS data sharing platform</td>
<td>Jian Wang (Institute of Remote Sensing and Digital Earth, CAS)</td>
</tr>
<tr>
<td>14:20-14:40</td>
<td><strong>1-3</strong>: Data Integration and Analysis System (DIAS): recent activities toward Open Science</td>
<td>A. Kitamoto (National Institute of Informatics)</td>
</tr>
<tr>
<td>Time</td>
<td>Session/Activity</td>
<td>Speaker/Institution</td>
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</tr>
<tr>
<td>14:40-15:00</td>
<td>1-4: World Data Center for Microorganisms: The global cooperation on microbial big data</td>
<td>Juncai Ma (World Data Center for Microorganisms, CAS)</td>
</tr>
<tr>
<td>15:00-15:20</td>
<td>1-5: AOSWA, Asia-Oceania Space Weather Alliance</td>
<td>M. Ishii (National Institute of Information and Communications Technology)</td>
</tr>
<tr>
<td>15:20-15:40</td>
<td>1-6: Construction of Chinese Space Science Data Center (CSSDC) and international cooperation in recent years</td>
<td>Yuan,Yaqin* and Zou,Ziming (National Space Science Center, CAS)</td>
</tr>
<tr>
<td>15:40-16:00</td>
<td>2-7: WDS China Common Clearing House Prototype and its application in Renewable Resource and Environment Data Center</td>
<td>Juanle Wang (Institute of Geographic Sciences and Natural Resources Research, CAS)</td>
</tr>
<tr>
<td>16:00-18:00</td>
<td>Poster Session</td>
<td></td>
</tr>
<tr>
<td>18:30-20:00</td>
<td>Welcome reception (Opening address: Prof. M. Kitano, Vice President of Kyoto University)</td>
<td>Venue: Science Seminar House, Kyoto University <a href="http://www.sci.kyoto-u.ac.jp/en/map.html">http://www.sci.kyoto-u.ac.jp/en/map.html</a></td>
</tr>
</tbody>
</table>

**28 SEP (THU) WDS Asia-Oceania Conference 2017 #2**
Venue: Maskawa Building for Education Research, Kyoto University  (http://www.sci.kyoto-u.ac.jp/en/map.html)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session/Activity</th>
<th>Speaker/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00-09:30</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>09:30-09:50</td>
<td>2-1: Development plan of the Future Earth data services/system</td>
<td>K. Yamada-Kawai*, H. Mohri¹, C. Downy¹, K. Fukushi¹, E. Brondizo¹, and M. Hernandez¹ (Future Earth Global Hub in Tokyo)</td>
</tr>
<tr>
<td>09:50-10:10</td>
<td>2-2: Frameworks, standards, and trust: Supporting disaster risk - DBAR Working Group approach</td>
<td>Wim Hugo (South African Environmental Observation Network)</td>
</tr>
<tr>
<td>10:10-10:30</td>
<td>2-3: Technological contributions to “last mile” Disaster Reduction and Risk Management (DRRM) efforts of the Philippines</td>
<td>J. S. Marciano¹ and A. M. F. Lagmay²* ¹'Advanced Science and Technology Institute, ²University of the Philippines</td>
</tr>
<tr>
<td>10:30-10:50</td>
<td>2-4: Ecological topics of the SIMSEA’s activities in Future Earth</td>
<td>N. Miyazaki (University of Tokyo &amp; Marine Science Foundation)</td>
</tr>
<tr>
<td>10:50-11:10</td>
<td>Break, Poster viewing</td>
<td></td>
</tr>
<tr>
<td>11:00-11:30</td>
<td>2-5: Data for Monitoring Carbon Cycle Change in the Asia-Pacific using an integrated observation, Modelling and Analysis System</td>
<td>N. Saigusa (National Institute for Environmental Studies)</td>
</tr>
<tr>
<td>11:30-11:50</td>
<td>2-6: Using health information system to assess public health impacts of disasters: a retrospective study of Pakistan earthquake 2015</td>
<td>Junaid Ahmad* and Mokbul Morshed Ahmad² ¹'Disaster Preparedness Mitigation &amp; Management, Asian Institute of Technology, Thailand, ²Regional and Rural Development Planning; School of Environment, Resources and Development</td>
</tr>
<tr>
<td>11:50-12:10</td>
<td>2-8: Importance of high-quality data for developing tsunami risk assessment tools: A comparison of data from Japan and ASEAN countries</td>
<td>A. Suppasri*, T. Ornthammaramrath² and F. Imamural ¹*International Research Institute of Disaster Science, Tohoku University, ²Faculty of Engineering, Mahidol University</td>
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**29 SEP (FRI) WDS Asia-Oceania Conference 2017 #3**
Venue: Maskawa Building for Education Research, Kyoto University (http://www.sci.kyoto-u.ac.jp/en/map.html)

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<td>Eunjung Shin (Science and Technology Policy Institute)</td>
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<td>4-3</td>
<td>Research data infrastructure in Chinese Academy of Science</td>
<td>Lianglin Hu*, Jianhui Li† (Department of Big Data Technology and Application Development, Computer Network Information Center, CAS)</td>
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<td>T. Shirai*, M. Owashi†, Y. Fukuda†, J. Zeng†, and N. Saigusa† (Center for Global Environmental Research, National Institute for Environmental Studies, ¹Environmental Information Department, National Institute for Environmental Studies)</td>
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<td>B. Ritschel</td>
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<td>Heidi J. Imker (University Library, University of Illinois at Urbana-Champaign)</td>
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<td>13:40-14:00</td>
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<td>K. B. Agadi (School of Library and Information Sciences, Central University of Gujarat, India)</td>
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<td>I. G. Dillo (DANS: Data Archiving and Networked Services)</td>
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<td><strong>P-1</strong> WDS National Committee of Japan</td>
<td>T. Watanabe1* T. Iyemori 2 I. Kojima3 and Y. Murayama4 (1ICSU WDS International Programme Office, 2WDC for Geomagnetism, Kyoto, Kyoto University, 3National Institute of Advanced Industrial Science and Technology, 4National Institute of Information and Communications Technology)</td>
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<td>Juanle Wang1* and Guoqing Li2 (1State Key Laboratory of Resources and Environment Information System, Institute of Geographic Sciences and Natural Resources Research, CAS, 2Institute of Remote Sensing and Digital Earth, CAS)</td>
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<td>Anai Wang1* and Juanle Wang2 (1National Institute of Polar Research, 2National Institute of Information and Communications Technology)</td>
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<td><strong>P-4</strong> Data citation for Antarctic sciences in Japan</td>
<td>M. Kanao1* and A. Kadokura1 (1Polar Environment Data Science Center, Joint Support-Center for Data Science Research, Research Organization of Information and Systems)</td>
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<tr>
<td><strong>P-5</strong> Polar Data Journal by National Institute of Polar Research</td>
<td>A. Kadokura1*, Y. Minamiyama1, M. Kanao1, T. Terui2, H. Yabuki1,2 and K. Yamaji1,2 (1Polar Environment Data Science Center, Joint Support-Center for Data Science Research, Research Organization of Information and Systems, 2National Institute of Polar Research, 3National Institute of Informatics)</td>
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<td>Anai Wang1* and Juanle Wang2 (1National Institute of Polar Research, 2National Institute of Information and Communications Technology)</td>
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<td><strong>P-7</strong> Data citation for Antarctic sciences in Japan</td>
<td>M. Kanao1* and A. Kadokura1 (1Polar Environment Data Science Center, Joint Support-Center for Data Science Research, Research Organization of Information and Systems)</td>
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<td><strong>P-8</strong> Polar Data Journal by National Institute of Polar Research</td>
<td>A. Kadokura1*, Y. Minamiyama1, M. Kanao1, T. Terui2, H. Yabuki1,2 and K. Yamaji1,2 (1Polar Environment Data Science Center, Joint Support-Center for Data Science Research, Research Organization of Information and Systems, 2National Institute of Polar Research, 3National Institute of Informatics)</td>
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<td><strong>P-9</strong> The Framework of OAIS and its application assumption in World Data Center for Renewable Resources and Environment (WDS-RRE)</td>
<td>Anai Wang1* and Juanle Wang2 (1National Institute of Polar Research, 2National Institute of Information and Communications Technology)</td>
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<td><strong>P-10</strong> Data citation for Antarctic sciences in Japan</td>
<td>M. Kanao1* and A. Kadokura1 (1Polar Environment Data Science Center, Joint Support-Center for Data Science Research, Research Organization of Information and Systems)</td>
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<td><strong>P-11</strong> Polar Data Journal by National Institute of Polar Research</td>
<td>A. Kadokura1*, Y. Minamiyama1, M. Kanao1, T. Terui2, H. Yabuki1,2 and K. Yamaji1,2 (1Polar Environment Data Science Center, Joint Support-Center for Data Science Research, Research Organization of Information and Systems, 2National Institute of Polar Research, 3National Institute of Informatics)</td>
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<td>Thirteen years daily and annual mean land surface temperature and frost number index dataset over third pole based on MODIS instantaneous LST products</td>
<td>Youhua Ran1* and Xin Li2 (Cold and Arid Regions Environmental and Engineering Research Institute, CAS, 2CAS Center for Excellence in Tibetan Plateau Earth Sciences)</td>
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<td>Atmospheric Radar Observation Database at Research Institute of RISH, Kyoto University</td>
<td>H. Hashiguchi3*, M. Shiotani1, M. Yamamoto1, A. Shinbori2 and T. Tsuchida1 (Research Institute for Sustainable Humanosphere, Kyoto Univ., 2Institute for Space–Earth Environmental Research, Nagoya Univ.)</td>
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<td>P. K. Purohit1* and Roshni Atulkar1 (National Institute of Technical Teachers’ Training and Research)</td>
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<td>Seema C. S.J. and Prince. P. R1, (Dept of Physics, University College, India)</td>
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<td>The global characteristic of a magnetic crochet and some statistic results</td>
<td>Xing Zan-Yang1, Ley Zhu1, Zhang Qing-He1, Han De-Sheng2, Chen Yao1 (School of Space Science and Physics, Shandong University, 2SOA Key Laboratory for Polar Science, Polar Research Institute of China)</td>
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<td>Li Ge1-2*, and Wang Juanle1-3 (Institute of Geographic Sciences and Natural Resources Research, CAS, 2Shandong University of Technology, 3Jiangsu Center for Collaborative Innovation in Geographical Information Resource Development and Application)</td>
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<td>Xiukuan Zhao1*, Baqi Ning1-2, Lianhua Hu1-2 and Haiyong Xie1-2 (Key Laboratory of Earth and Planetary Physics, Institute of Geology and Geophysics, CAS, 2Beijing National Observatory of Space Environment, Institute of Geology and Geophysics, CAS)</td>
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<td>Activity of the World Data Center for Geomagnetism, Kyoto</td>
<td>T. Iyemori1*, H. Toh1, M. Takeda1, M. Nose1, Y. Odagi1 and N. Takeuchi1 (World Data Center for Geomagnetism, Kyoto, Graduate School of Science, Kyoto University)</td>
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<td>C. Zapart1*, Y. Shirasaki1, M. Ohishi1, Y. Mizumoto2, W. Kawasaki2, G. Kosugi1 and S. Eguchi1 (1Astronomy Data Center, National Astronomical Observatory of Japan, 2National Astronomical Observatory of Japan, 3Fukuoka University)</td>
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<td>A. Saito1*, J. Okada1, and T. Tsugawa2 (1Department of Geophysics, Kyoto University, 2National Institute of Information and Communications Technology)</td>
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<td>N Baba1*, Y Michida2 and P Pissierssens3 (1Japan Oceanographic Data Center, 2Atmosphere and Ocean Research Institute, the University of Tokyo, 3UNESCO/IOC Project Office for IODE)</td>
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UTILIZATION OF A SUITE OF GROUND-BASED AND SPACE BASED DATA WITH THE AID OF MAGNETOHYDRODYNAMIC SIMULATION TO UNDERSTAND SOLAR ERUPTIVE EVENTS AND INITIATION OF CORONAL MASS EJECTIONS (CME)

S T Wu (1933-2017)

Center For Space Plasma and Aeronomic Research and Department of Mechanical and Aerospace Engineering, The University of Alabama in Huntsville, Huntsville

It is well-known that solar eruptions are the major drivers of space weather. Physically, solar eruptions are explosive releases of excess magnetic energy of the Sun’s corona (coronal mass ejection). Here we will use a suite of observations together with magnetohydrodynamic simulation to initiate and verify a solar eruptive event that leads to a CME. The suite of observations includes the ground based as well as space based observations. The ground based observations from Stanford Synoptic map and SOLIS magnetic field measurements are used to construct the undisturbed solar wind. The active region magnetogram from SDO/HMI is used to construct the dynamical evolution of the coronal magnetic field using our very well tested 3D Magnetohydrodynamic Data-Driven Active Region Evolution (MHD-DARE) model (Jiang, et al. 2016; Wu et al. 2006) and these simulated magnetic field configurations will be verified by using SDO/AIA images. Then, these outputs will be introduced to the 3D MHD global corona-heliosphere evolution (3D MHD-GCHE) model (Feng, Zhou and Wu, 2007, Wu et al. 2016) to investigate the CME initiation and its outputs will be compared with STEREO/CORE-1 data to verify the CME initiation. We have selected Active Region 11283 to illustrate this formalism by using our 3D MHD-DARE model and 3D MHD-GCHE model for solar eruption and CME initiation verified by STEREO-COR-1.

In summary, this investigation of solar eruption leading to CME initiation is quite different from current simulations. We have used an observed unstable flux-rope obtained from magnetograms of HMI/SDO with our MHD-DARE model and inserted this flux-rope into our 3D MHD-GCHE model to track the propagation for the initiation of the CME. The results revealed that the simulated CME images match the STEREO/COR-1 image well. Further, it also showed the possible location of a solar energetic particle event (SEP).

REFERENCES


REAL TIME GPS DATA IN INDONESIA FOR SPACE WEATHER MONITORING

Buldan Muslim1* and Joni Efendi2

*1Space Science Center, National Institute of Aeronautics and Space, LAPAN, Jl. Dr. Junjunan 133 Bandung, Indonesia
2Geospatial Information Agency, Jl. Jakarta-Bogor KM 46, Cibinong, Bogor, Indonesia

The use of GPS for positioning, surveying and mapping applications in Indonesia is systematically started at the end of 1980s. In this case, static surveying and real time (absolute and differential) positioning are the two most positioning modes being used. The GPS CORS in Indonesia were firstly established by the Indonesian National Coordinating Agency for Surveys and Mapping (Bakosurtanal) with three stations, i.e. in Cibinong (West Java), Medan (North Sumatra) and Parepare (South Sulawesi). In October 2009 the GPS CORS of Bakosurtanal consists of 51 continuously operating GPS reference stations. Several clusters of local GPS CORS have also been established by other governmental agencies and universities. GPS CORS prospect in Indonesia is very promising especially for maintaining the national spatial reference system to support various applications of positioning, surveying, and mapping, such as in land administration, mining and transportation sectors. Observing several natural hazard phenomena in Indonesia, e.g. earthquake, tsunami volcanic eruption, land subsidence, and landslide will also be greatly improved. GPS based mapping of tropospheric water vapor and ionospheric TEC over Indonesia region will also benefit from the enormous data provided by GPS CORS (Abidin et al., 2010). The current status of GPS CORS in Indonesia consists of 140 GPS stations operated by Geospatial Information Agency of Indonesia. By using RTCM format, the real time GNSS data can be accessed from every ware with available internet connection (Heo et. Al., 2009). The real time GNSS data can be used for differential GNSS positioning, real time ionospheric space weather monitoring as well as water vapor monitoring. By using goGPS Matlab toolbox (Herrera et. Al., 2016) we have developed the real time ionospheric estimation from GNSS carrier wave and pseudo range data which is streamed every second. The real time ionospheric data is very useful and have a potential for space weather activities caused by X ray solar flare and large tsunami waves.

ACKNOWLEDGEMENTS

The authors acknowledge Arif Aditya of Geospatial Information of Indonesia for discussion about RTCM data.

REFERENCES


The manifestation and development of magnetic storm is closely related to the interaction of solar wind and magnetosphere following the reconnection processes of interplanetary magnetic field with the earth’s magnetic field boundary. In the history of geomagnetism, geoelectricity, and space science, the use of ground magnetic records has demonstrated to be a powerful tool for monitoring the levels of overall geomagnetic activity. Different indices such as Dst, Kp, and Ap were proposed to express different aspects of geomagnetic field variations. The geomagnetic records from Colaba-Alibag observatories in India contain historically the longest and continuous observations recorded on photographic paper since 1872 to the present day digital data using modern magnetometers. Some of the super intense space weather events are investigated using old preserved historical records of Colaba, India. A historical reference is Carrington (1859), who witnessed the largest registered geomagnetic storm and related it to a white-light flare in the Sun from a very large active region, as seen in the photosphere, is observed in Colaba, India records and is well investigated (Tsurutani et al., 2003). The period of October and November 2003 witnessed major magnetic storm events in the present solar cycle. Solar region 486 produced one of the largest solar flares of this solar cycle, an X17/4B proton flare peaking and had intense radio bursts. A very fast earthward directed full halo Coronal Mass Ejection (CME) was observed. This powerful CME produced an intense magnetic storm on 29 October. Varied development pattern during the storm main phase for the events of 29 October, 30 October and 19 November of 2003, major events of solar cycle 23 and 24 are studied using ground geomagnetic data with one minute resolution from low and equatorial latitudes.

Internationally, the work of the United States Geological Survey (USGS), is coordinated with global geomagnetism institutes through the International Real-time Magnetic Observatory Network (INTERMAGNET; http://www.intermagnet.org), a voluntary consortium dedicated to promoting the operation of observatories according to modern standards [Kerridge, 2001]. Long-term archives of observatory data are maintained in the World Data Center (WDC) system. Indian Institute of Geomagnetism is part of INTERMAGNET with credit of two magnetic observatories of Alibag and Jaipur. The World Data Centre for Geomagnetism, Mumbai as part of the World Data System (WDS) is established by the International Council of Scientific Unions (ICSU). The data and services at the WDC for geomagnetism, Mumbai are available for scientific use without restrictions. The WDC Mumbai activities and data preserving, digitization process will be presented as a member of WDS.

REFERENCES


THE DATA AND METADATA MANAGEMENT IN AUSTRALIAN BUREAU OF METEOROLOGY’S SPACE WEATHER SERVICES

Kehe Wang* and Colin Yuile

*Space Weather Services, Bureau of Meteorology, Australia

With explosive growth in the amount of space weather research data, the development, management and use of data and metadata is becoming increasingly important for data exploration, extraction, and inter-operations between various data centres. As a member of the ICSU World Data System, the Australian Bureau of Meteorology’s Space Weather Services (SWS) has developed metadata records based upon Space Physics Archive Search and Extract (SPASE) data model. SPASE was chosen after comparison with Australian and New Zealand metadata standard AS/NZS ISO 19115.1:2015, the Dublin Core Metadata Initiative (DCMI) and Australian Government Locator Service (AGLS). The SWS metadata records have been available from the SWS website, http://www.sws.bom.gov.au/World_Data_Centre/3/1, since 2016.

Due to historical and practical reasons, space weather related data are archived in different locations and institutions across many countries. In order to integrate distributed space research data, the United States and Japan have developed their metadata network. In USA, The SPASE effort is a Heliophysics community-based project with the goals of facilitating data search and retrieval across the Space and Solar Physics data environment with a common metadata language. It is a united space research metadata portal that collects and archives space research related metadata from 20 virtual observatories and repositories over the world. http://spase-group.org/registry/explorer/

ASWS (Australian Space Weather Services) has been registered as a unique Naming Authority with SPASE. 67 XML Metadata files of eight datasets, 20 instruments and 18 observatories of ASWS have been published with SPASE registry explorer via GitHub, which is a web-based Git or version control repository and Internet hosting service. https://github.com/hpde/ASWS. Figure 1 shows an ASWS Learmonth Spectrograph Metadata file.

Figure 1. ASWS Learmonth Spectrograph Metadata File with SPASE
The Bureau of Meteorology’s Space Weather Services (SWS) has accumulated and archived more than 2130GB space weather data recorded at stations maintained by the Bureau of Meteorology’s Space Weather Network (SWN). All real time data files are recorded locally and transferred to SWS head office in Sydney. SWS researcher use this real time data to issue space weather reports and make forecasts. The majority of this data will be automatically archived into the SWS World Data Centre (WDC), and then synced to SWS FTP server for public download. A copy of the files also replicated to the Bureau of Meteorology’s Data Centre located in Melbourne. Most of the SWS space weather datasets are stored in a text, binary or image file formats instead of in a relational database.

In addition to SWS storing a copy of its archived data into the Bureau’s Data Centre, the Bureau’s Data Catalogue also requires SWS to provide space weather metadata following the metadata standard adopted by the Bureau of Meteorology. The standard is AS/NZS ISO 19115.1:2015 - geographic information. The Bureau’s Data Catalogue has developed an online metadata editor and template. Currently, nine SWS space weather datasets have had metadata created online within the Bureau’s Data Catalogue website.

There are many space research related government agencies and universities in the world and they hold a wide range of space weather related data. Developing and utilizing metadata files enables researchers to cross-search between databases distributed over these institutions and overcomes the difficulty of collecting all original data into a single global data centre. Rather than setting up a global WDS metadata portal to hold as many metadata files as possible, we suggest sharing metadata among discipline related organisations by exchange and publishing metadata files in every organisation’s website. The metadata standards adopted by each organization or website may be different. However, it should not be a burden to give a link in the metadata files to the original data archived in each different organisation.

Metadata exchanges can be conducted simultaneously with the development of a global WDS metadata portal. The portal ought to contain as many as possible metadata files related to space weather and other disciplines research data, including; metadata about researchers, instruments, ground and space based observatories and services owned by all WDS members.

ACKNOWLEDGEMENTS

The author would like to thank Mr Todd King of the Institute of Geophysics & Planetary Physics, University of California, Los Angeles (UCLA) and Dr. Leonard Garcia of NASA, USA for their kind help in the development and publication of the Australian Space Weather Services (ASWS) metadata files with SPASE.

The author would like to thank Ms Kate Roberts of the Information Modelling and Data Catalogue, Bureau of Meteorology, Australia for her kind help in the development and publication of the Australian Space Weather Services (ASWS) metadata files with the Australian Bureau of Meteorology Data Catalogue.

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A COMPARISON BETWEEN THE GEOEFFECTIVENESS OF NORTH-SOUTH AND SOUTH-NORTH MAGNETIC CLOUD, AND AN ASSOCIATED PREDICTION

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Using 1995-2015 Wind in-situ solar wind plasma and magnetic field data, 217 magnetic clouds (MCs) were identified. The following pertinent results were found. (i) 120 MCs were N-S type (northward→southward, magnetic field, B rotated from northward to southward), and 97 MCs are S-N type. (ii) S-N MC\textsubscript{S,N} dominated N-S MC\textsubscript{N,S} in the periods of 1995-1999, 2001-2002, and 2014-2015. In contrast, N-S MC\textsubscript{N,S} dominated S-N MC\textsubscript{S,N} in the periods of 2000, and 2003-2013. (iii) The averages of storm intensity ($\langle Dst_{min} \rangle$) were -69, -57, and -84 nT for “All 217 MCs”, “120 N-S MCs”, and “97 S-N MCs” types, respectively. (iv) Confirmed with observations, that MC type depends on the phase of the magnetic solar cycle. Hence, on average, the S-N types trigger more severe storms (i.e., $Dst_{min} < -100$ nT). Also, from 1995 to 2009 the percentage of N-S types of MCs keeps increasing, and the percentage of S-N types decreasing. The percentage of S-N MCs starts increasing in the interval 2010-2015. Therefore, we expect to see a predominance of the S-N types of MCs for the coming few years. This means on average that more severe geomagnetic storms are expected in the near future. This is an interesting solar wind feature, and to be stressed in its application to “Space Weather Predictions”.

ACKNOWLEDGEMENTS

We are grateful to the Wind SWE and MFI teams, and Kyoto University (Dst data). This study is supported by the Chief of Naval Research (CCW).
TIME-VARYING HELIOSPHERIC SIZE DUE TO VARIATIONS IN SOLAR ACTIVITY

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Using a three-dimensional MHD simulation, we examine the time-varying outer heliospheric structure and distance to the heliopause. Voyager 2 solar wind observations show that a global merged interaction region (GMIR) with a ram-pressure of the order of several nPa normalized at 1 AU enters the distant solar wind at an average rate of about one per year. This series of GMIRs adds an additional perturbative increase to the solar-wind ram-pressure in the inner heliosheath, and it also reduces the surrounding interstellar medium pressure acting on the heliopause; consequently our simulation results in the distance to the heliopause being ~14 AU larger when compared to the case when a series of GMIRs is not taken into account. In addition, OMNI data shows that the solar-wind ram-pressure near the Earth increases from ~1.3 nPa in year 2010 and before to 1.7-2.4 nPa after that until the present time. These variations in the overall ram-pressure of the solar-wind are also included in our simulation. The inclusion of the time variable solar-wind ram-pressure and the series of GMIRs allows us to illustrate how the realistic distance to the heliopause varies in response to both long-time and short-time variability in solar activity.
THE DAYS WHEN AURORAE WERE SEEN IN JAPAN: TRACING BACK JAPANESE HISTORICAL DOCUMENTS BEYOND THE CARRINGTON EVENT

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In this presentation, we show the historical geomagnetic storms before the Carrington event indirectly observed as low latitude aurorae in Japan and buried in historical documents. The recent solar eruptions evidently show that the Sun can cause severe magnetic storms by their flares and CMEs even in its declining phase of the 11-year cycle activity. On our Sun, however, the data currently we have is not necessarily abundant. We have sunspot observations for 400 years since early 17th century (Owens, 2013) and flare observations for 160 years since the Carrington event in 1859 (e.g. Carrington, 1859; Tsurutani et al., 2003). The latter is also known to have caused one of the largest known magnetic storms in observational history (Tsurutani et al., 2003; Cliver & Dietrich, 2013). However, the observational data does not necessarily let us know how frequent or how large magnetic storms can be caused by solar flares, due to their relatively short coverage.

Historical documents however may overcome this difficulty. In the Carrington event, for example, we have witnessed great auroral displays in low latitude areas (Cliver & Dietrich, 2013). They were also the case in Japan and other East Asian countries as well (Hayakawa et al., 2016b). We therefore show how auroral displays were recorded in Carrington event and can be compared with the known magnetic observations in Tsurutani et al. (2003). The result shows that we can scale the magnitude of magnetic storms taken place before the Carrington event with equatorward extension of auroral displays. Therefore, we also show and examine the three variants of Japanese auroral drawings that are associated with a great magnetic storm previously mentioned by Willis et al. (1996) and Nakazawa et al. (2004). We then show survey results of auroral candidates in Rikkokushi, six Japanese Official Histories from the early 7th century to 887 to excavate previously unknown magnetic storms such as those shown in Figure 1 (see, Hayakawa et al., 2017c). We then compare them with the lunar phase to estimate how reliable they are, and compare these records with the contemporary TSI data from radioisotope data (Steinhilber et al., 2007) and sunspot records in contemporary China (Tamazawa et al., 2017). We also identify the observational sites to review possible auroral expansion to the magnetic equator. Our result shows not only candidates of magnetic storms captured in ancient Japanese historical records, but also the large absence of auroral records in late 7th century corresponding with the candidate of grand minimum (640-710; Usoskin et al., 2007), a similar tendency with the distributions of sunspot records in contemporary China.

We are currently constructing the database of historical observations of aurorae and sunspots to review pre-telescopic solar activity based on our relevant papers (Hayakawa et al., 2015, 2016a, 2016c, 2017c, 2017d; Kawamura et al., 2016; Tamazawa et al., 2017). Considering that historical documents allow us to trace back auroral records up until 567BC (Stephenson et al., 2004; Hayakawa et al., 2016c) and auroral drawings up until 771/772 (Hayakawa et al., 2017b), we believe that the database on such data buried in historical documents will cast new lights on the researches of the solar-terrestrial environment.

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Figure 1: The earliest record of auroral candidate in Japanese historical documents (courtesy: the National Archives of Japan).
WELCOME AND NOTE ON ICSU ROAP ACTIVITIES

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In behalf of the ICSU Regional Office for Asia and the Pacific (ICSU ROAP) and the Regional Committee for Asia and the Pacific (ICSU RCAP), we are happy to welcome you to the WDS Asia Oceania Conference 2017. Perhaps not all of you know about ROAP and RCAP, so please allow me to tell you about them.

ICSU has 26 member-countries in Asia and the Pacific region. Its regional office (ICSU ROAP) has been hosted by the Academy of Science Malaysia (ASM) since 2006 in Kuala Lumpur, where it is headed by a Director. Twice a year the ROAP convenes a meeting of the regional committee (ICSU RCAP) to discuss and decide on matters related to the priorities, activities, plans and budget as well as other issues relevant to ICSU concerns. The committee, RCAP consists of nine representatives from member countries and four ex-officio members including the ROAP Director, the ICSU Executive Director, an ICSU Executive Board Liaison, and a representative of ASM.

Currently, ROAP has three priority areas: a) Natural Hazards and Disaster Risk; b) Urban Health and Well-Being, focusing on Epigenetics; and Ecosystems that focuses on the Sustainability Initiatives in the Marginal Seas of South and East Asia (SIMSEA). Although WDS is not specifically mentioned in its priorities, ROAP has been involved through support and participation in events organized by WDS and CODATA. ROAP abides by the advisory note on “Sharing Scientific Data, with a Focus on Developing Countries” issued in 2011 by the ICSU Committee on Freedom and Responsibility in the Conduct of Science (CFRS). In Asia and the Pacific, WDS has eight members in China, three in Japan, two in Australia, one in Taiwan and one in India; it has no members in Southeast Asia. Among the hindrances to joining WDS given by some representatives of Southeast Asian countries are the need to get permission from government agencies for security reasons, the need to clarify with collaborating countries, and poor internet infrastructure. In addition to organizations involved in weather prediction, oceanographic data, hazards and risk assessments, those concerned with biodiversity assessment and conservation should be encouraged to join WDS. Among these are the ASEAN Centre for Biodiversity, hosted by the University of the Philippines in Los Banes and the Biodiversity Management Bureau of the Department of Environment and Natural Resources of the Philippines.

ACKNOWLEDGEMENTS

The assistance of Tengku-Sharizad Tengku-Daahan, Officer-in-Charge of ICSU ROAP in providing information about ROAP activities over the years is gratefully acknowledged.
ICSU-WDS: TRUSTWORTHY DATA SERVICES FOR SCIENCE

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The World Data System (WDS) is an Interdisciplinary Body of the International Council for Science (ICSU) created in 2008. ICSU-WDS builds on the 50+ year legacy of its predecessor bodies established by ICSU to manage data generated by the International Geophysical Year (1957–1958). It became clear after the International Polar Year (2007–2008) that these bodies were not able to respond fully to modern data needs, and they were thus replaced by the ICSU World Data System in 2009.

The mission of the World Data System is to support ICSU’s vision by promoting long-term stewardship of, and universal and equitable access to, quality-assured scientific data and data services, products, and information across a range of disciplines in the natural and social sciences, and the humanities. ICSU-WDS aims to facilitate scientific research under the ICSU umbrella by coordinating and supporting trusted scientific data services for the provision, use, and preservation of relevant datasets, while strengthening their links with the research community.

The strategy for achieving these objectives is outlined in the current five-year Strategic Plan 2014–2018, and includes three major targets:

1. Improve the trust in and quality of open Scientific Data Services
2. Nurture active disciplinary and multidisciplinary scientific data services communities
3. Make trusted data services an integral part of international collaborative scientific research

Member Organizations of ICSU-WDS are from wide-ranging fields and constitute the building blocks of a worldwide ‘community of excellence’ for scientific data. Not only do these Members participate towards advancing WDS goals; their data holdings, services, and products are the cornerstone of the federated data system.

As of May 2017, ICSU-WDS had 107 Member Organizations in four categories: 69 Regular Members (Organizations that are data stewards and/or data analysis services), 11 Network Members (Umbrella bodies representing groups of data stewardship organizations and/or data analysis services), 9 Partner Members (Organizations that contribute support or funding to ICSU-WDS and/or WDS Members), and 18 Associate Members (Organizations that are interested in the WDS endeavour but do not contribute direct funding or other material support).

Member Organizations are formally accredited into ICSU-WDS by the WDS Scientific Committee, who safeguard the trustworthiness of ICSU-WDS by certifying Regular and Network Members according to internationally recognized standards. Data sharing enables reuse of data and ultimately makes science more transparent. To ensure the quality and usability of shared data and to provide long-term preservation and access, sustainable data services are key components of scientific infrastructure. However, it is vital to guarantee the trustworthiness of a service to perform these functions, and certification by an appropriate authority is fundamental in promoting confidence in shared data resources. Partners and Associates are co-opted.

ICSU-WDS brings its Member Organizations together to coordinate their activities and through that process, to achieve an overall capability that transcends individual ones. Membership also increases exposure to potential users and collaborators internationally. It demonstrates that the Member Organizations have a strong and tangible commitment to open data sharing, data and service quality, and data preservation - all of which are increasingly considered prime requirements by science funders and are high on policymakers’ agendas since they benefit the scientific community, economy, and society in general.

The Research Data Alliance and ICSU’s Committee on Data for Science and Technology (CODATA) are two of the closest WDS collaborating and partner organizations. The three organizations have different but complementary foci and strengths, and have strong partnerships such as the International Data Week and SciDataCon. Together with other partners they are committed to advance data practices and science faster and further, and thus increase the benefit of research data for society.
FUTURE EARTH AND WDS – COLLABORATION AT INTERNATIONAL AND NATIONAL LEVELS

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Future Earth, an international research platform for global sustainability, is one of major science programmes of International Council for Science (ICSU). Future Earth aims to encourage synthesis of knowledge by collaboration across scientific disciplines and also by co-creation with stakeholders in the society, and to accelerate actions for transformation for sustainability of human life and the environment on the Earth. Interdisciplinary and transdisciplinary researches are actively conducted through Future Earth Global Research Projects (GRPs) and networking activities are even more encouraged by launching Knowledge-Action Networks (KANs).

Future Earth “Data Task Force” aims to serve for Future Earth science communities and also for data users in the society. Toward this end, the Data Task Force has initiated a survey to understand the needs and current situations of GRPs, which will be presented with the details by Dr. Kiko Yamada during this Conference. It also prioritizes collaboration with other data-related organizations and initiatives such as ICSU World Data System (WDS). At SciDataCon 2016, Future Earth organized a session with a title of “Future Earth Network for Scientific Information (and data) to support Sustainability (FENSIS)”, co-chaired by Prof. Mario Hernandez representing Future Earth Data Task Force. In that session, PAGES and GMBA, both Future Earth GRPs, discussed on data crowd-curation for collaborative paleoscience and the GMBA Mountain Portal towards a global map of mountain biodiversity, respectively. In January, 2017, the Data Task Force organized “International Co-Design Workshop on Earth Observation in Support of the Sustainable Development Goals – The Case of Urban Areas in Asia” in Tokyo, together with WDS, GEO, The University of Tokyo and several other organizations.

Japanese national academy, Science Council of Japan (SCJ) is a national member of ICSU, and has played key roles in establishing globally-distributed secretariat of Future Earth, and now it hosts one of five Global Hubs supported by Future Earth Japan Consortium (should be Japan National Committee at the time of Conference) which composed of more than 20 research and non-research organizations in Japan, including Research Institute of Humanity and Nature (RIHN) in Kyoto that hosts Future Earth Regional Center for Asia. SCJ has also been collaborating with WDS since the launching of its International Programme Office (IPO) at National Institute of Information and Communications Technology (NICT) in Tokyo in 2012. At various public events, SCJ invited representatives from WDS IPO, and IPO members have been active in SCJ’s Committee for Promotion of Future Earth and those related to Informatics. SCJ has been supporting both SciDataCon and Co-Design Workshop financially and logistically.

The collaboration of Future Earth and WDS are expected to be the basis for wide range of interdisciplinary and transdisciplinary researches and should be even more valuable when applied at regional and national levels. The presentations and exchange of knowledge and experiences at WDS Asia-Oceania Conference, 2017 are believed to be invaluable opportunities for both initiatives to find out and mobilize useful tools and common vehicles for collaboration in the both communities in Asia and in each country.

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THE ROLE OF THE REGIONAL CENTER FOR FUTURE EARTH IN ASIA

Hein Mallee

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Future Earth is a new international research platform providing the knowledge and support to accelerate the world’s transformations to a sustainable world. To address the unprecedented challenges facing the world, Future Earth pursues a new type of science that links disciplines, knowledge systems and societal partners to support the sustainability transition. It brings together 20+ pre-existing global environmental change core projects and is in the process of co-designing a number of new Knowledge-Action Networks that are to embody the inter- and transdisciplinary approach. The organizational structure and problem-conceptualization of Future Earth are largely global: the initiative is led by a Governing Council and supported by a Science Committee, Engagement Committee and globally distributed Secretariat. The core projects and Knowledge-Action Networks address global issues in a relatively uniform way across the globe. However, the drivers and consequences of environmental deterioration are not evenly distributed and, in order to address sustainability problems, they need to be understood in an historically-informed and region-specific fashion. Future Earth is therefore developing an organizational structure with regional centers and offices to ensure the incorporation of regional perspectives and to engage with researchers and societal stakeholders at the regional level. This paper briefly outlines the organizational structure of Future Earth, with a special emphasis on Asia.
SCOPE AND GOAL OF THE WDS ASIA-OCEANIA CONFERENCE, 2017

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The World Data System (WDS) is an interdisciplinary body of the International Council of Science (ICSU) with a mission to promote international collaborations on data stewardship, long-term preservation and provision of quality-assessed research data and data services. WDS is a membership organization federating scientific data centres, data services and networks thereof across a range of disciplines in the natural and social sciences as well as humanities. WDS has 108 members (70 Regular, 11 Network, 27 Partners and Associate Members) as of 1 September 2017, but the Asia-Oceania region comprises only 17 members (Table 1). The WDS Asia-Oceania Conference will bring together data practitioners, data repositories managers and researchers to reinforce the data stewardship community in the region and help establish a collaborative system for access to and dissemination of research data. In addition, the establishment of such a regional network will support existing international research priorities such those set by the International Council for Science (ICSU) through its programmes: Future Earth, the Integrated Research on Disaster Risk, and the Urban Health and Wellbeing. The main objectives of the first conference, to be held in 2017 (Kyoto, Japan), are:

1. Strengthen collaboration in the Asia-Oceania region to reinforce WDS-oriented activities
2. Build and expand WDS community in the Asia-Oceania region
3. Exchange experience on successful WDS trustworthy data-repositories certification and membership application
4. Encourage former ICSU World Data Centres to join WDS
5. Introduce advanced technologies to data management
6. Promote WDS-oriented activities in support of ICSU-led projects in the Asia-Oceania region.

Table 1. WDS Members in Asia-Oceania Region (04/2017)

<table>
<thead>
<tr>
<th>WDS Member</th>
<th>Type of Member</th>
<th>Hosting Nation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDC for Space Weather, Australia</td>
<td>Regular</td>
<td>Australia</td>
</tr>
<tr>
<td>Australian Antarctic Data Centre</td>
<td>Regular</td>
<td>Australia</td>
</tr>
<tr>
<td>Southern Ocean Observing System</td>
<td>Partner</td>
<td>Australia</td>
</tr>
<tr>
<td>Chinese Astronomical Data Center</td>
<td>Regular</td>
<td>China</td>
</tr>
<tr>
<td>WDC for Renewable Resources and Environment</td>
<td>Regular</td>
<td>China</td>
</tr>
<tr>
<td>WDC for Oceanography, Tianjin</td>
<td>Regular</td>
<td>China</td>
</tr>
<tr>
<td>Chinese Space Science Data Center</td>
<td>Regular</td>
<td>China</td>
</tr>
<tr>
<td>Cold and Arid Regions Science Data Center at Lanzhou</td>
<td>Regular</td>
<td>China</td>
</tr>
<tr>
<td>WDC for Geophysics, Beijing</td>
<td>Regular</td>
<td>China</td>
</tr>
<tr>
<td>WFCC for MIRCEN World Data Centre for Microorganisms</td>
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<td>China</td>
</tr>
<tr>
<td>Global Change Research Data Publishing and Repository</td>
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<tr>
<td>Fish Database of Taiwan</td>
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<td>China Taipei</td>
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<tr>
<td>WDC for Geomagnetism, Mumbai</td>
<td>Regular</td>
<td>India</td>
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<tr>
<td>WDC for Geomagnetism, Kyoto</td>
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<td>Japan</td>
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<tr>
<td>WDC for Ionosphere and Space Weather</td>
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<td>Japan</td>
</tr>
<tr>
<td>Research Institute for Sustainable Humanosphere, Kyoto University</td>
<td>Regular</td>
<td>Japan</td>
</tr>
<tr>
<td>Korea Institute of Science and Technology Information (KISTI)</td>
<td>Associate</td>
<td>Korea</td>
</tr>
</tbody>
</table>
GEO IMPLEMENTATION OF DATA SHARING AND DATA MANAGEMENT PRINCIPLES

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The Group on Earth Observations (GEO), a global partnership of governments and organizations, envisions a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations. To maximize the value and benefits arising from Earth observation data, Ministers participating to the Mexico City Ministerial Summit of GEO endorsed a set of GEOSS Data Sharing Principles characterized by ‘Open Data by Default’, as well as GEOSS Data Management Principles which are based on discoverability, accessibility, usability, preservation and curation. This decision puts the GEO partnership at the forefront in the field of open data and emphasizes the domain of Earth observation in the worldwide open data movement. The next challenge consists in a wide and deep implementation of these principles.

As part of its effort to assist the community in the adoption of both sets of principles, GEO developed guidelines to describe ways in which implementation of the GEOSS Data Sharing Principles and GEOSS Data Management Principles can be achieved. Moreover, three levels of actions are identified to advance the implementation:

a) National level implementation. As GEO is a best effort based organization, it relies on the national Earth observation data provision agencies to define their own process and resource to the extent possible to align their data policies with GEOSS Data Sharing Principles and Data Management Principles. The role of GEO is to capture and highlight the best practices and inspire the rest through the following two means: one is collecting examples which demonstrate the value of open Earth observation data, the other is monitoring the data policy evolvement of GEO Members.

b) Infrastructure level implementation. The GEOSS Common Infrastructure (GCI) is the harbor of free and open Earth observation data contributed by GEO Members and Participating Organizations. As of August 2017, it holds more than 400 million data resources from 165 data providers. To ensure usability of data in GCI, GEO is setting a process to check compliance to Data Sharing Principles and Data Management Principles, wherein the WDS/DSA Core Certification of Trustworthy Data Repository can play a role.

c) Programme level implementation. The GEO Work Programme 2017-2019 includes around 60 activities, most of which target providing products and services by processing Earth observation data. These activities are required to use data compliant to Data Sharing Principles and Data Management Principles to the extent possible, and the derived data from these activities are also encouraged to share through GCI.

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WDS CHINA COMMON CLEARING HOUSE PROTOTYPE AND ITS APPLICATION IN RENEWABLE RESOURCE AND ENVIRONMENT DATA CENTER OF WORLD DATA SYSTEM (WDS-RRE)

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There are multiple data centers in China under the umbrella of the International Council for Science-World Data System (ICSU-WDS). Although WDS China data centers have made obviously progress and achievements in these years, due to the differences between subject areas and the lack of associative mechanism, WDS-China data portal and metadata exchange system has not built yet. In order to solve this problem, in this paper, the frame of WDS China Common Clearing House was preliminarily put forward and the prototype system was built. On the overall design, given the interaction and independence between data portal and metadata exchange system logically, the basic guiding ideology of design is to enable the two systems to interoperate and exchange information through service interface that conforms to international/national standards. (1) Data portal architecture. An open source management system was built based on TorCMS, releasing data contents, also providing access interface of XML and JSON format. For a great deal of geoscience data information with different dimensions, conceptual model of core metadata plus extended metadata was proposed. The core metadata used traditional relational database to storage. For each field in database there is a metadata item. The extended metadata used key-value way in NoSQL pattern to storage. (2) Metadata exchange system. A separate metadata server was built based on pycsw open standards. The metadata capture module was built based on data harvesting. Through the above development WDS China Common Clearing House has had functions including document releasing and updating, Wiki knowledge releasing and updating, user right management, website full-text retrieval, back-end information statistics, system of online presentation, metadata releasing/push interface, etc. At present the established prototype system has already preliminarily applied in the Renewable Resource and Environment data center of World Data System (WDS-RRE).

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The authors would like to express appreciations for support from WDS world data centers in China, National Science & Technology Infrastructure of China, Data Sharing Platform of Earth System Science of China. Thanks the guide and support from Dr. Mustapha Mokrane and Dr. Rorie Edmunds.

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DATA INTEGRATION AND ANALYSIS SYSTEM (DIAS): RECENT ACTIVITIES TOWARD OPEN SCIENCE

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Data Integration and Analysis System (DIAS) has continued its activity as one of core research data platforms in Japan in the field of earth environmental science and related fields for more than ten years. After successful completion of the first and second phases, DIAS entered into the third phase, started from FY 2016, with more focus on “open science.” It is a movement to change the whole procedure or culture of science more “open” in many respects, and DIAS has started new activities to meet the requirement and expectation of research data platform in the age of open science, as summarized below.

First, DIAS is transforming its platform to become compatible with FAIR (Findable, Accessible, Interoperable, and Re-usable) data principle, such as assigning Digital Object Identifier (DOI) to datasets. We defined a workflow to assign DOI from March 2017, with appropriate granularity for the utility of datasets such as data citation.

Second, DIAS is coordinating with paper authors and journal editors to make sure that research data deposited on DIAS can be used as evidence data for papers, and primary data for data papers, with appropriate data management policy. Although DIAS does not have an official certificate of trustworthy data repositories, we are referring to the requirement of standard certificates so that DIAS can be considered as trustworthy from stakeholders.

Third, DIAS is re-considering its role in research communities in Japan, especially in terms of our role to disseminate research data from Japan to global research communities. Research data supported by Japanese research funding may be better to be managed by Japanese infrastructure, and DIAS should play an important role as a domain data repository for earth environmental data. The original focus of DIAS was to collect relevant datasets for data-driven research within DIAS’s core data analysis platform, but our new role may be to add a new focus on datasets produced from Japan and relevant for data-driven research in global research communities.

Fourth, DIAS is expanding to a trans-disciplinary research so that domain scientists and computer scientists can work with people outside of academia. DIAS works with citizens for data collection and learning in the sense of citizen science. DIAS works with governments so that datasets and knowledge can be utilized for data-driven policy making in the area of disaster reduction, biodiversity conservation, and so on. Moreover, DIAS started to work with industry to implement a sustainable model to solve societal challenges. To collaborate with many types of stakeholders, we are responsible to raise the transparency of workflow and organization to a higher level.

Lastly, DIAS is open to international contribution using our datasets and systems. As an example, DIAS provided relevant information to Sri Lanka as a response to severe flooding in May 2017. On top of DIAS infrastructure, EDITORIA (Earth Observation Data Integration and Fusion Research Initiative) and ICHARM (International Centre for Water Hazard and Risk Management) collaboratively built real-time weather and flood simulation system for Sri Lanka to be used for disaster response and training for capacity building.

These activities suggest that DIAS is not only a research data repository, but also a research data and community platform that enables data-driven actions with scientific evidences based on trans-disciplinary collaboration. Open science is a keyword to drive these transformations, but the final goal of creating a sustainable model is still not clear. Good practices for sustainable human resources, computing infrastructure and financial support, is better to be shared across similar activities in the world so that we can find good solutions.

ACKNOWLEDGEMENTS

I thank people in the DIAS open science working group, Dr. Masatoshi Yoshikawa, Dr. Toshiyuki Shimizu, Dr. Hiroko Kinutani, Mrs. Yoko Nakahara and Dr. Masafumi Ono, for helpful discussion.
WORLD DATA CENTER FOR MICROORGANISMS: THE GLOBAL COOPERATION ON MICROBIAL BIG DATA

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Microbial resources are one of the most important natural resources in the world, which is the scientific basis to support the development of biotechnology and life sciences. WFCC-MIRCEN World Data Centre of Microorganisms (WDCM), which once hosted in Australia and Japan and then moved to China in 2010, plays a crucial role in providing a database of microorganisms, analysis of the function and establishing a platform of international communication.

WDCM launches the international project Global Catalogue of Microorganisms (GCM) to construct a data management system and a global catalogue to help organize, unveil and explore the data resources of culture collection worldwide. Now 112 international culture collections from 43 countries and regions joined GCM. GCM provides a comprehensive view on the microbiological material made accessible online by public collections, and the function of Analyzer of Bio-resources Citation.

Future developments such as “BIG DATA” technology including semantic web or linked data will allow the system to provide more flexible data integration broader data sources. Linking WDCM strain data to broader data sets such as environmental, chemistry and research literature can add value to data mining and targeting microorganisms as potential sources of new drugs or industrial products.

Cooperation with other organizations and institutions promoted broad utilization of WDCM data platform. The WDCM is exploring collaboration with the World Health Organization (WHO) for the establishment of a database allowing influenza virus information integration. Moreover, the WDCM database is able to provide services for the implementation of the TRUST code of conduct to allow culture collections to comply with the Convention on Biological Diversity and Nagoya protocol for Access and Benefit Sharing. The unique strain identifier available through the WDCM will and the further utilization of information extracted by ABC implements key provisions of the Nagoya Protocol and provides required transparency, legal certainty while lowering transaction costs and reducing administrative and governance burdens.

The WDCM will work with Research Infrastructures, Publishers, Research funders, Data holders and individual collections and scientists to ensure data interoperability and provide the environment for enhanced tools for research and development. WDCM is prone to evolve and continue. WDCM now started the development of the data platform to microbiome.
AOSWA, ASIA-OCEANIA SPACE WEATHER ALLIANCE

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The Asia Oceania Space Weather Alliance (AOSWA) was established in 2010 for encouraging cooperation and sharing information among institutes in mainly Asia-Oceania region concerned with and interested in space weather. Asia-Oceania has become one of the most important regions for space utilities and require close communication and cooperation.

Regional activities for space weather research are active in American and European areas, on the other hand, it used to be relatively small in Asia-Oceania area. In addition, there are some difficulty to exchange data, for example total electron contents (TEC) data estimated from GNSS observation. This is original motivations to establish AOSWA.

AOSWA Secretariat is managed by the Space Environment Laboratory of the National Institute of Information and Communications Technology of Japan. The Secretariat’s functions are organizing meetings and making practical arrangements for them, maintaining registries of associates and keeping them informed about matters related to the AOSWA framework through the web, newsletters and mailing lists, which allows to improve close communications and cooperation among various institutes.

AOSWA has biannual face-to face meetings. The latest one was held on Oct. 2016 in Jeju island, hosted by Radio Research Agency (RRA), Korea. Next meeting will be hosted by LAPAN, Indonesia and planed on 2018 or 2019. On 2016, LAPAN Indonesia joined the International Space Environment Service (ISES) as a regional warning center (RWC). KMITL, Thailand and ANKGASA, Malaysia are also interested in joining ISES. These can be said one of outcome of AOSWA.

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CONSTRUCTION AND DEVELOPMENT OF CHINESE SPACE SCIENCE DATA CENTER (CSSDC) AND ITS INTERNATIONAL COOPERATION IN RECENT YEARS

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The Chinese Space Science Data Center (CSSDC) was established in 1988, which belongs to the National Space Science Data Center of Chinese Academy of sciences. CSSDC joined WDC in 1989 and successfully applied to become a regular member of WDS in 2013. Over the past 10 years, CSSDC has undertaken many major tasks and engineering tasks at the national level, including Strategic Priority Program on Space Science, Meridian Project, International Space Weather Meridian Circle Program, Solar-Terrestrial Astronomical Research Network, etc. It has made great progress and innovation in cardinal facilities, data resources, data standards, data application services and so on. Up to now, CSSDC has built more than 10 core databases, 231 data sets, the cumulative amount of resources amounted to 8.8TB, covering many fields of discipline, including solar terrestrial space physics, space astronomy, planetary science and space experiments.

With the rapid growth of CSSDC data resources, and also in order to comply with the development needs of the big data era, CSSDC successfully broke through the past data collection, processing and publishing work style, and become a center which get data resources, knowledge resources, tools, cloud storage, cloud computing and other infrastructure together. At the same time, CSSDC has worked out our own space science flight project life cycle related to data management over the life cycle (see Figure 1), and developed a data hierarchical structure of organization (see Figure 2). CSSDC has made remarkable achievements in the past two years of service. It provides services to more than 1500 people and hundreds of units, with data services of more than 300 GB. what's more, it guarantees the smooth implementation of the four satellite missions including Dark Matter Particle Explorer, Quantum Experiments at Space Scale (QUESS), Shijian-10 and Hard X-ray Modulation Telescope.

In recent years, CSSDC is also actively carry out international cooperation projects, such as the development and construction of ground segment data processing and management system in Space-based multi-band astronomical Variable Objects Monitor and Solar Wind Magnetosphere Ionosphere Link Explorer, the development and construction of South American Data Center of “international space weather meridian circle program”. These international cooperation projects have promoted the position and influence of CSSDC in international counterparts, and have enriched CSSDC’s international data resources, and expanded CSSDC’s data service in the world.

In the future, CSSDC will continue to combine domestic and international cooperation, and focus on the field of data resources, data support applications, disciplines services and other core tasks to build an authoritative data center in the field. Also we will precisely serve the space scientific research, and promote knowledge discovery and technological innovation in the field of space science.
DEVELOPMENT PLAN OF THE FUTURE EARTH DATA SERVICE / SYSTEM

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Future Earth is a major international research platform providing the knowledge and support to accelerate transformations to a sustainable world. Future Earth is built on many decades of international research on global environmental change. From this intellectual base Future Earth is coordinating Global Research Projects (GRPs) and is launching Knowledge-Action Networks (KANs) to catalyze new interdisciplinary scientific sustainability research.

Future Earth is conscious that data is one of the main components that bring researchers together. On the other hand, effectively merging earth sciences data with socioeconomic data will significantly push forward the current sustainability research and associated results. If such data is in addition effectively shared among research domains, this will accelerate the research of both data contributors and users.

In order to encourage the flow of data and information among all the different stakeholders Future Earth has set up a “Data Task Force”, of which aim is to provide a service to all stakeholders (interdisciplinary scientists, decision makers and society) working with Future Earth about data and information openness, accessibility, sharing, etc. This implies proper data documentation, associated data meta-data, data platforms, e-infrastructures, etc. To best reflect GRPs needs and situations, the task force is planning to first assess feasible solutions then define requirements of users and services by conducting questionnaire survey to all GRPs (Figure 1, Table 1).

Fortunately there are many existing initiatives that have large experience dealing with all these data related issues: UN data related activities, GEO/GEOSS and the National Space Agencies, the Belmont Forum e-infrastructure, CODATA, WDS, CIESIN, DIAS, etc. The Future Earth Data Task Force has initiated partnerships with all these initiatives in order to join forces, avoid duplication and make the best use of existing research resources. Working closely with these partners Future Earth is identifying best practices that will then be used as the main data principles and data guidelines of that Future Earth will provide as a service to all its members.

![Figure 1 Project flow of the task force](image)

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Preparation</td>
<td>Specify the project.</td>
</tr>
<tr>
<td>2. Assessment</td>
<td>Find a feasible solution.</td>
</tr>
<tr>
<td>3. Survey and adopt data policy</td>
<td>Collect examples of data policies and/or guidelines to adopt.</td>
</tr>
<tr>
<td>4. Review</td>
<td>Review solution to continue or terminate the project.</td>
</tr>
<tr>
<td>5. Survey</td>
<td>Collect information on all GRPs on their data and willingness to contribute to determine requirements of the service.</td>
</tr>
<tr>
<td>5. Development</td>
<td>Develop a service along with data policy</td>
</tr>
</tbody>
</table>

Table 1 Planned Tasks
Abst. Oral

Abst. Oral

FRAMEWORKS, STANDARDS, AND TRUST: SUPPORTING DISASTER RISK - DBAR WORKING GROUP APPROACH

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There is a growing expectation that research output, being increasingly open, standardised, and managed in formal research data infrastructures, will be useful to policy and decision makers without much additional intervention and modification (Chen et al., 2017, OECD, 2012). We believe that this is unlikely to be feasible in the majority of cases (Hugo & Rogers, 2017). There is, then, a need for mechanisms whereby scientific evidence and operational observation data can be translated into decision and policy support metrics or indicators. The difficulty in achieving this has been highlighted more than a decade ago (Reid, 2004).

There are several reasons why improved access to scientific evidence, in particular, does not lead to improved decision and policy support:

• The language, (vocabularies, semantics, and heuristics) adopted by the research community in a specific discipline may not translate into meaningful implementation language (Preston et al., 2015);
• The researchers may not be in a position of influence (which includes aspects such as writing policy briefs, undertaking personal initiatives, and building up public or industry concern and interest) (Fox and Sitkin, 2015);
• The frequency, timing, and/or certainty associated with research output is at odds with decision and policy-making cycles. Research typically progresses until there is a defensible level of certainty in statistical assessment of a result, while policy and management decisions are made within a regular cycle or as events require;
• Scientists are not trained for, or measured by, the typical work required for decision and policy support: synthesis of scenarios and cost-benefits of such scenarios given sometimes significant uncertainty in the input data, and the need to balance cross-disciplinary concerns. Scientists tend to be specialists, while decision and policy support require a generalist approach;
• Observation data is increasingly commoditized and no longer requires direct handling by scientists - examples being satellite observation data, weather data, and the like;
• In the field of disaster risk specifically, scientists are potentially liable should their warnings (or lack thereof) lead to loss of infrastructure, lives, and livelihoods, and in some countries, the process of issuing warnings is regulated (Alemanno and Lauta, 2014);
• Open availability of data and information, without value judgement, moderation, or expert interpretation often do more harm than good (Watanabe, 2012).

Several examples of frameworks aimed at translation of science into policy exist. These are sometimes formal - such as the very detailed framework developed by IPCC for translating climate science into policy - (IPCC, 2007), but also informal - such as the work to develop Essential Biodiversity Variables, loosely designed to support several Aichi Targets (Pereira et al., 2013), and the UN Sustainable Development Goals (UN, 2016).

In the paper, we propose a semantic framework for Risk and Vulnerability, and explain how the framework could assist with the development of loosely coupled, decision-ready variables for a number of risk and vulnerability-related hazards. In addition, a proposal is made in respect of the certification required within such a loosely coupled architecture, and the necessity for trust to be verifiable for the contributors to the architecture.

The semantic framework addresses aspects of proper definition and derivation of variables (in practice working towards essential variables for risk and vulnerability), the state of readiness or usability of data services (moving from raw data to ‘analysis ready’ and ‘indicator’ or ‘decision ready’ data), and aspects of trust in the value chain. The semantic framework is supported by guidance and best practice in respect of standards and specifications for participating data providers and decision support platforms.

The outputs of this work will be submitted to the Disaster Risk Working Group of the Digital Belt and Road (DBAR) initiative, and hopefully lead to enhanced use of scientific evidence and data services in support of risk
and vulnerability assessment, monitoring, and mitigation. It is also anticipated that the case study for Risk and Vulnerability can be extended to include other research themes in the Future Earth initiative.

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The authors wish to acknowledge contributions from the South African Weather Service (Prof Hannes Rautenbach), National Disaster Management Centre (Mr Dechlan Pillay), the Department of Environmental Affairs (Dr T Makholela and Mr T Ramaru), and Ms A le Roux and Mr G Mans of the CSIR Built Environment, all of whom have assisted with discussion and refinement of the semantic framework. The work is financially supported by the South African Department of Science and Technology.

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In 2012, the Philippines launched a responsive program to install locally manufactured and locally developed rain and water level sensors all over the country in strategic sites. The program, called the Nationwide Operational Assessment of Hazards (NOAH), developed an early warning capability for the entire Philippines using near-real time sensors to complement forecasts of PAGASA, the country’s weather bureau. Through the parallel, complementary efforts of the Emergency Distribution of Hydro-Meteorological Devices in Hard-hit Areas in the Philippines (HYDROMET) and the Deployment of Early Warning System in Disaster-Prone Areas (DEWS) projects, there are now around 1,700 sensing instruments deployed nationwide. This large-scale network of sensors stream data every 10-15 minutes to a data repository and computing back-end infrastructure established by the Advanced Science and Technology Institute of the Department of Science and Technology (DOST-ASTI). Known as the Computing and Archiving Research Environment (CoARE), this facility supports multiple data integration for various projects and provides a high performance computing environment that enable the processing of sensor data for weather monitoring, modeling and forecasting. The near real time processed data are made available to communities through a web platform (http://noah.up.edu.ph; http://noah.dost.gov.ph) and via iOS and Android mobile apps for ease of access. Open access to these real-time data provide timely information to communities and has proven invaluable in the “last mile” efforts of the country for disaster prevention and mitigation.

ACKNOWLEDGEMENTS

We would like to acknowledge the invaluable support given by the Department of Science and Technology (DOST) in providing the direction and necessary funding in creating this modern and innovative early warning system for the Philippines.

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ECOLOGICAL TOPICS OF THE SIMSEA’S ACTIVITIES IN FUTURE EARTH

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Two ecological topics from the activities of SIMSEA (Sustainability Initiative in Marginal Seas of South and East Asia) in Future Earth are presented in relation to the WDS’ activities. Firstly, the JSPS Multilateral Core University Program “Coastal Marine Science (2001-2010)” was conducted by Atmosphere and Ocean Research Institute, The University of Tokyo, Japan with cooperation of distinguished 326 scientists from six Asian countries, Indonesia, Malaysia, Philippines, Thailand, Vietnam, and Japan. The program covered the following four research items; 1. Water circulation and the process of material transport in the coastal areas and marginal seas of Asia, 2. Ecology and oceanography of harmful marine microalgae, 3. Pollution of hazardous chemicals in the coastal marine environment and their ecological effect, and 4. biodiversity studies in the coastal waters in the four research groups such as (1) benthos, (2) seagrasses and macroalgae, (3) plankton, and (4) fishes. Since 2001, the members published more than 800 original scientific papers, 150 reports and articles, and 17 books such as Fishes of Bitung, Northern Tip of Sulawesi, Indonesia (Kimura & Matsuura, 2003), Fishes of Andaman Sea, West Coast of Southern Thailand (Kimura et al., 2009), Mankind and the Oceans (Miyazaki et al. 2005) and Coastal Marine Science in Southeast Asia (Nishida et al., 2011). This program was followed by COMSEA (Establishment of Research and Education Network on Coastal Marine Science in Southeast Asia, 2011-2015) and RENSEA(Research and Education Network on coastal ecosystems in Southeast Asia, 2016-2018). As future step of the activities in this program, it is necessary to establish a reasonable and functional data-base of the scientific activities and sample materials, and data-service for scientists and public people. Secondly, since 2004, Japanese colleagues have organized Bio-logging Science using advanced technology for understanding behavior of animals and their environmental condition without killing them. Various kinds of data-loggers (eg. W2000L-3MPPD3GT, Little Leonardo Limited Co.) and camera-loggers (eg. DSL-II, Little Leonardo Limited Co.) have been developed, aiming to diminish size as well as to improve the data quality and quantity. These devices have been applied for animals of the world such as whales, seals, sea birds, sea turtles, fishes, and so on. As Bio-logging Science provides interesting knowledge beyond existing scientific boundaries and potential adaptation of the animals for environmental selection against global climate change, I strongly recommend that comprehensive innovation of methodology with satellite-linked system should be necessary for extending bio-logging studies. And it is also very important to establish a reasonable and functional data-base and data-service system. In conclusion, the SIMSEA’s activities in Future Earth are considered to enforce the WDS’ activities.

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DATA FOR MONITORING CARBON CYCLE CHANGE IN THE ASIA-PACIFIC USING AN INTEGRATED OBSERVATION, MODELING AND ANALYSIS SYSTEM

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There is an increase in number of observational platforms, such as satellites, aircrafts, ships, and ground stations, for monitoring atmospheric greenhouse gases (GHGs) and their surface fluxes. National or regional inventories of GHG emissions have also been prepared at greater resolution in space and time. However, due to uncertainties in modeling tools, and limited observational data coverage, high uncertainty still remains in global or regional sources/sinks estimations.

The Center for Global Environmental Research, National Institute for Environmental Studies has been developing an integrated carbon observation and analysis systems based on satellite, airborne and ground-based observations, and atmospheric and terrestrial carbon cycle models. Atmospheric observations are greatly enhanced using GHG observing satellites and aircraft observations recently. Transport modeling, inverse modeling, and assimilation methods are being developed and improved for better utilization of observational data from the Asia-Pacific region. Global and regional surface fluxes are estimated and constrained by both “top-down” approach using inverse models and “bottom-up” approach using surface flux observation network data (e.g. AsiaFlux) and upsampling with terrestrial ecosystem models.

Current progress will be presented in better constraints of global, continental, and regional carbon budgets, and detection of carbon cycle change particularly in the Asia-Pacific. Discussions are included how to solve the following questions in the next steps: 1) How can the current capabilities of top-down and bottom-up approaches contribute to reduce uncertainties in the estimates of large anthropogenic emissions?; 2) What are the key target regions or events in the Asia-Pacific that we need to focus on? (e.g. El Niño-induced droughts, extreme forest fires in Southeast Asia, and peat degradations in tropical and boreal regions); 3) How should the current capabilities of observation, modeling and analysis systems be integrated into an operational system for long-term monitoring of changes in regional, continental, and global GHGs budgets?; and 4) How can we provide scientific knowledge and data timely for evaluating mitigation and adaptation policies?

ACKNOWLEDGEMENTS

This is based on the outcomes of a three-year project (FY2014-2016) conducted by members from National Institute for Environmental Studies (NIES), Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Meteorological Research Institute (MRI), and Center for Environmental Remote Sensing, Chiba University with a financial support from the Environment Research and Technology Development Fund (No. 2-1401) by the Ministry of the Environment, Japan.

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USING HEALTH INFORMATION SYSTEM TO ASSESS PUBLIC HEALTH IMPACTS OF DISASTERS: A RETROSPECTIVE STUDY OF PAKISTAN EARTHQUAKE 2015

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Background: Over the last two decades, earthquakes across the world have taken millions of human lives and caused countless injuries. Since 2005, in Pakistan alone, more than 0.1 million people lost their lives, and millions of others suffered physical and psychological injuries due to natural disasters. However, limited information is available on how these natural disasters, such as earthquakes, impact healthcare institutions and communities and how the aftereffects of these events are reflected in global health indicators.

Objective: We aim to assess how earthquakes impact communities’ public health and healthcare service providers’ institution by using select global health indicators.

Methods: We used a retrospective cohort study designed by retrieving ten districts’ monthly data regarding parts of the population that attended public health facilities for primary health care services, which include antenatal care, immunization, vector-borne diseases (malaria), waterborne diseases (diarrhoea or dysentery), and airborne diseases (tuberculosis). These ten districts have a combined population of 7.8 million. As the result of an earthquake, more than 75,000 deaths and 180,000 injuries were recorded in the 2005 Kashmir earthquake, and 275 deaths and 1,980 injuries were recorded in the earthquake of October 2015. For our study, the ten districts were organized into two main groups, each group including five districts each, with the determining criteria being the most affected and least affected by the earthquake in terms of injuries, deaths, and collapsed structures. Monthly data over six years, from January 2011 to November 2016, was retrieved from the District Health Information System (DHIS) database, which has a reporting compliance of 100% for the study sites, and maintain health data of 7.8 million people. Using specific indicators, we employ a time-series, retrospective analysis to assess earthquake-induced public health risks and vulnerabilities.

Results: We determine, uniquely, that the geographic area most affected by the earthquake in 2015 is the area with the highest tuberculosis (TB) prevalence rate. Further, the number of confirmed cases and even deaths from malaria remain extremely low after the earthquake incident; however, at the same time, the suspected malaria incidence rate is significantly higher. From the data collected in both regions, pneumonia appears to have slight cyclical variations in its incidence rate depending on the season.

Conclusions: By analyzing selected health indicators before and after the earthquake, it is clear that earthquakes impact public health and cause various vulnerabilities. Some indicators are significantly affected by the earthquake while others are not considerably affected at all. Although it is likely not possible to do a real-time analysis in the time of an earthquake, we conclude that a retrospective analysis can somewhat mitigate the adverse impact of an earthquake on a community’s public health and the institutions that provide health services to communities by using global health indicators.

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WDS CHINA COMMON CLEARING HOUSE prototype and its application in WDS-RRE

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There are multiple data centers in China under the umbrella of the International Council for Science-World Data System (ICSU-WDS). Although WDS China data centers have made obviously progress and achievements in these years, due to the differences between subject areas and the lack of associative mechanism, WDS-China data portal and metadata exchange system has not built yet. In order to solve this problem, in this paper, the frame of WDS China Common Clearing House was preliminarily put forward and the prototype system was built. On the overall design, given the interaction and independence between data portal and metadata exchange system logically, the basic guiding ideology of design is to enable the two systems to interoperate and exchange information through service interface that conforms to international/national standards. (1) Data portal architecture. An open source management system was built based on TorCMS, releasing data contents, also providing access interface of XML and JSON format. For a great deal of geoscience data information with different dimensions, conceptual model of core metadata plus extended metadata was proposed. The core metadata used traditional relational database to storage. For each field in database there is a metadata item. The extended metadata used key-value way in NoSQL pattern to storage. (2) Metadata exchange system. A separate metadata server was built based on pycsw open standards. The metadata capture module was built based on data harvesting. Through the above development WDS China Common Clearing House has had functions including document releasing and updating, Wiki knowledge releasing and updating, user right management, website full-text retrieval, back-end information statistics, system of online presentation, metadata releasing/push interface, etc. At present the established prototype system has already preliminarily applied in the Renewable Resource and Environment data center of World Data System (WDS-RRE).

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IMPORTANCE OF HIGH-QUALITY DATA FOR DEVELOPING TSUNAMI RISK ASSESSMENT TOOLS: A COMPARISON OF DATA FROM JAPAN AND ASEAN COUNTRIES

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Actual disaster data is important for future risk assessment and disaster planning and management. The data can be obtained from field surveys right after the disasters. However, quality level of such risk assessment tools that will be further developed strongly depends on quality of the data from field surveys. This abstract presents the quality of an example among the tsunami risk assessment tools, namely fragility functions that reflects the quality of the disaster data. Tsunami fragility functions are defined as empirical relationships between vulnerability (i.e. damage probability) and tsunami hazard (i.e. flow depth). The 2004 Indian Ocean tsunami and the 2011 Great East Japan tsunami are two good examples for a comparison. The 2004 tsunami affected many Southeast and South Asian countries. Large numbers of buildings in Thailand and Indonesia were totally destroyed or damaged. There was a limitation due to number of surveyed damaged buildings (some hundreds or thousands) as well as detail information of each building. Therefore, the fragility functions (i.e. for Thailand) were developed using remote sensing technology to interpret building damage. Nevertheless, the damage could be only interpreted as a building was washed away or not using roofs as judgement criteria. As results, the developed fragility functions for Thailand can only explain building damage characteristics for only one type of damage where building types were also not possible to be verified from the satellite images (Suppasri et al., 2011). On the other hand, Japanese government put large effort on field survey of damaged buildings from the 2011 tsunami. The database has more than 200,000 buildings with detailed information such as tsunami flow depth, building materials, number of stories, building functions and construction year (Suppasri et al., 2013). These kinds of information allow the detailed fragility functions for the mentioned categories and further detailed risk assessment became possible. Therefore, it is very important to promote developing such standard or guideline for collecting high-quality disaster survey data in ASEAN countries.

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This study was funded by JSPS Bilateral Joint Research Projects “Proposing new building design guideline for Thailand based on building damage and seismic and tsunami fragility functions - Lessons from recent earthquakes and tsunamis in Japan and Thailand -” (grant no. 17000941) and JSPS Grant-in-Aid for Young Scientists (B) “Applying developed fragility functions for the Global Tsunami Model (GTM)” (grant no. 16K16371).

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CHALLENGES FOR IMPLEMENTING OPEN SCIENCE POLICY IN JAPAN INCLUDING FUTURE EARTH


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Open Science Policy in Japan has been developed and implemented with revolution of recent scholarly communication. It started from Open Access recommendation by Japan Science and Technology Agency (JST, funding agency) in 2013, discussion and report by the Cabinet Office (2015) to the description in the 5th Science and Technology Basic Plan (2016). Science Council of Japan (2016) also published a report and EU and Japan lead the working party for Open Science in the G7 Science and Technology Minister Meeting (2016).

There have been already some activities related to Open Science and there are various obstacles to promote Open Science “in general.” Reviewing current implementation of Open Science Policy in Japan mainly focusing on Ministry of Education, Culture, Sports, Science and Technology (MEXT) through, it mainly focuses on Open Research Data. With recognition of the importance of domain-based or project-based implementation, requiring Data Management Plan (DMP) for each research project would be effective before setting any mandate for Open Science.

In 2017, Japan Society for Promoting Science released Open Access policy (JSPS) and JST launched Open Science policy. Both of them have been carefully watching and monitoring researchers’ attitude in Japan to promote Open Science with adequate speed. With consideration of global trends, Japan still has to advocate Open Science as a beneficial issue for researchers, administrators and citizens.

Japan also has to support communities who wish to exploit it earlier since it would be a good chance to re-invent new mode of Science or create a new paradigm of Research which Asian countries would commit to proactively. Developing Research Data Management Platform like National Institute of Informatics (NII) with pilot universities, potentially expanding Japan’s over 700 institutional repositories, would get various insights toward a future of Open Science infrastructure driven by Open Research Data.

On the other hand, multi-stakeholder involvement with various sectors is also crucial to implement Open Science. With some success by committing to Open Science Research Agenda Setting such as Future Earth, SDGs and related activities, there is still a gap among stakeholders and it is difficult especially how to connect societal visions to each agenda of science, technology and industry development with practical manners or even how to get researchers to recognize its importance.

Currently each policy has to encourage each stakeholders to exploit potential of Open Science and, beyond that, it also has to seek any chance to integrate them and design a future framework of Science Technology and Industry with possibly a new style of stakeholder engagements, which is ideally associated with the vision of Open Science infrastructure driven by Open Research Data.
IUGONET ACTIVITIES FOR DATA SHARING OF UPPER ATMOSPHERIC DATA AND CAPACITY BUILDING

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We introduce activities to provide infrastructure and opportunity for upper atmospheric research and to promote interdisciplinary study, which have been made by Inter-university Upper atmosphere Global Observation NETwork (IUGONET) project. IUGONET is a Japanese inter-university project, which was established in 2009 by Tohoku University, Nagoya University, Kyoto University, Kyushu University, and National Institute of Polar Research to develop the infrastructure for sharing their upper atmospheric data, including solar and planetary data (Hayashi et al., 2013).

We have developed two tools, i.e., a metadata database and an analysis software for the upper atmospheric data (Tanaka et al., 2013; Abe et al., 2014). The metadata database enables users to cross-search various kinds of the upper atmospheric data distributed across the IUGONET members. A new metadata database, IUGONET Type-A, which was released in November 2016, provides one-stop services such as searching data, showing information of the data (i.e., metadata and quick-look plot of the data), finding interesting phenomena, interactively visualizing the data, and leading users to more detailed data analysis by using a dedicated analysis software, Space Physics Environment Data Analysis Software (SPEDAS). SPEDAS is a grass-roots software that was written by Interactive Data Language (IDL) and was developed by scientists and programmers of the Space Sciences Laboratory at the UC Berkeley, the Institute of Geophysics and Planetary Physics (IGPP) at UCLA and other contributors. It is capable of dealing with data from multiple satellite and ground-based missions. We have provided a plug-in software for SPEDAS, which allows users to analyze the data obtained by the IUGONET members with various instruments, such as solar telescope, ionospheric and atmospheric radars, imagers, riometers, magnetometers, and so on. In addition, we hold data analysis workshops to explain how to use these IUGONET tools and data in Japan and sometimes foreign countries several times a year. In particular, we are planning to have workshops in Nigeria, Africa, and Indonesia, South East Asia in FY2017, in collaboration with a project of the Core-to-Core Program of the Japan Society for the Promotion of Science (JSPS), “Study of GNSS satellite anomaly in the Asian and African equatorial region”. We believe that the IUGONET tools should be useful for the capacity building in Asia and Africa.

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THE DATA-ORIENTED ACTIVITY AT THAI SPACE WEATHER INFORMATION CENTRE

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At present King Mongkut’s Institute of Technology Ladkrabang (KMITL), Chulalongkorn University, Chiangmai University, NICT as well as Kyoto University, Japan have cooperated to install a number of ionospheric monitoring equipment such as ionosondes, all-sky imager, magnetometer as well as GNSS receivers in various locations of Thailand such as Chiangmai, Chumphon, Bangkok and Phuket. Other GPS networks and ionosonde stations exist, whereby each network is owned and operated independently. For example, the Department of Land has 11 stations, the Royal Thai Navy owns three ionosonde stations, the Thai Meteorological Department houses 5-7 GPS receivers and the Aeronautical Radio of Thailand owns 3-4 GPS receivers. We aim to create the database of GPS data and ionospheric parameters in the Thailand location. The data-oriented activity at Thai Space Weather Information Center is hosted at KMITL at http://iono-gnss.kmitl.ac.th/. This activity presents the current status of GNSS and ionospheric monitoring networks and the efforts to create a GNSS and ionospheric database in Thailand. These data are important for the study of the ionosphere, Troposphere, GPS/GNSS technology, Geodesy and applications on the aeronautical navigation, satellite communication, earthquake study among others. In our plan, the data center with collaboration among various universities and agencies is being foreseen. At present, Thailand GNSS and Ionospheric Data Center is collecting the data from each GPS receiver as well as the ionosonde stations by using the script at each station to send the raw data through the internet.
VLF MONITORING SYSTEM FOR CHARACTERIZING THE LOWER LAYER IONOSPHERIC REGION

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International Heliophysical Year (IHY; 2007-2009) has a remarkable impact to the space and earth electromagnetism research and society. For Malaysian perspectives, it acts as a spiral point to the expanding of space weather-related researchers. The research activities involve installation of real-time Magnetic Data Acquisition System of Circum-pan Pacific Magnetometer Network, i.e. MAGDAS/CPMN for space weather study and application, which was deployed for the International Heliophysical Year (IHY; 2007-2009). In addition to MAGDAS system, to understand the characteristics of lower ionospheric layer (60-150 km) during space weather events, a multi-frequencies data acquisition monitoring platform has been developed. VLF (3 – 30 kHz) normally used for long distance communication which use lower ionospheric layer as reflection medium during long wave propagation (S. N. A. Ahmad et.al., 2015). The variation of this layer due to space weather events influences the performance of received signal at the receiver stations (M. Indira Devi et.al., 2008 and T.Afifah et.al., 2016). Several types of VLF-UHF antenna (Dipole, Loop and Yagi-Uda) have been developed to monitor the frequencies within these ranges.

To date, the developed VLF receiver system in Malaysia located at UPSI, UKM and Banting are able to capture the transmitted signal from several VLF transmitter located at NWC, Australia (21.8S, 114.2W) in frequency 19.8 kHz, 3SB, China (39.26N, 103.20E) in frequency 20.6 kHz, JJI, Japan (32.09N, 130.83E) in frequency 22.2 kHz and VTX, India (08.23N, 77.45E) in frequency 18.2 kHz. All the receiver stations require good maintenance mechanisms to ensure all the equipment at the site stations are working and sending their real-time data to the dedicated server (Nur Ain Zakaria et.al., 2017). The parallel data transmission system has been developed to transfer data from VLS receiver to the computer and as well as transfer data between computer and remote server. This system integrates interaction between VLF receiver equipment and embedded systems which open many distributed network of devices that can be communicated for data transferring.

We are in the process of expanding the number of receiver station in Malaysia and maybe abroad with a good international collaboration in future. Our working group is also planning to explore the possibilities to provide open access data to all interested research communities in the spirit to stimulate the human capital development in the area of Space and Earth Electromagnetism.

ACKNOWLEDGEMENTS

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APHRODITE-2 ACTIVITIES: FOR BETTER PRESENTATION OF EXTREME RAINFALL EVENTS

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The Asian Precipitation -- Highly Resolved Observational Data Integration Towards Evaluation of Water Resources (APHRODITE) project (Yatagai et al., 2009, 2011a, 2011b) is an international cooperative program collecting and analyzing daily rain gauge observations from thousands of Asian stations in addition to those reported to WMO Global Telecommunication System (GTS), creating 57 year (1950-2007) daily precipitation dataset. It is open to public at APHRODITE website (http://st.hirosaki-u.ac.jp/~aphrodite2/english).

APHRODITE started its feasibility study from 2005, and in the following 5 years, international collaboration, data publishing, capacity building and many research activities had been carried out. APHRODITE datasets are widely used for climate analysis, model evaluation, extreme events analyses, and many other purposes.

Since the frequency of extremely heavy rainfall and drought events is increasing in this decade, APHRODITE data are expected to be used in the evaluation of these extreme events. However, current APHRODITE products need improvement in terms of different “end-of-day” time of observational data used in grid analysis for the better presentation of extreme events. APHRODITE-2 starts in 2016, utilizing data from geostationary meteorological satellites, and rainfall radars, by statistical technique, we apply a time adjustment within APHRODITE-2 to develop new products.

APHRODITE-2 makes effort of capacity building for the Asian National Hydro-Meteorological services (NHMs). The APHRODITE-2 workshop will be held on September 11-14, 2017, at Chiba University. Expected participants are young staff members of NHMs and researchers. In the workshop, we will provide the participants with the opportunity for acquiring skills of quality control and gridding analyses through using exactable programs of APHRODITE. Over 100 people from 19 countries apply and 25 will participate in the workshop. The participants will be asked to bring rain gauge data of their countries to the workshop so as to apply their skills to NHMs operations. The rain gauge data brought by participants to the workshop will be permitted us to use them in our new products. Since good research collaboration with Department of Hydrometeorology of Nepal are kept from the era of APHRODITE and 15 or more staff members there will participate in the APHRODITE-2 workshop, an additional workshop will be held in Kathmandu in November 2017. In the workshop, following program is planned,

-Data handling and conversion (for gridding analyses)
-Quality control (explanation, checking data and feedback from the participants)
-Gridding analyses using AphroSystem (provide 0.05-degree grid product for each participant’s country).

We will report the progress of the workshop.

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OPEN SCIENCE AND RESEARCH DATA SHARING IN JAPAN AND INTERNATIONAL SCENES

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Since the G8 Science Ministers’ Meeting in UK 2013, Open Science policy and practice have been intensively discussed in related countries. Research Data Sharing is an essential element in implementation of Open Science. There have been various approaches for this activity by several bodies, like academic committees ICSU-World Data System (WDS) and Committee of Science and Technology Data (CODATA), an international forum RDA (Research Data Alliance) in connection to G8 Group of Senior Officials (GSO)’s data infrastructure working group, and recently Global Science Forum of OECD (Organization of Economic Cooperation and Development), etc. The first official stakeholder in Japan who responded to the G8-2013 decision was Cabinet Office, which has played a leading role in Japan to publish the first national guiding principle of Open Science for Japan (March 2015). In 2016 G7 Science and Technology Ministers’ Meeting was held in Japan, including the Open Science session as one of its six main themes.

Recognizing that our scientific knowledge in past has been accumulated on “print technology” basis (books, articles) for more than 300 years, advantage of digital technology and electronic information and communication technology (ICT) infrastructure is today being emphasized in terms of high-speed and huge-volume data processing although it has only a 70-year history.

Taking Open Science as an increasingly important international priority, sharing scientific knowledge and scientific research data must be an infrastructure for research and findings, and also results and output from the scientific community. Science, as the broadest definition of this term, is now required to be a common social infrastructure to make everyday livings, and also be essential for future improvement of the Society, citizen activities, and the economy.
OPEN SCIENCE AND OPEN DATA IN S. KOREA: RESEARCHER’S PERSPECTIVE

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In the age of digitalization, “open science” becomes new phenomena in which scientists open up their research process as well as research outputs in daily life, using various digital tools (EC 2016, OECD 2016). A substantial amount of researchers in South Korea began to publish open access journals and deposit their papers and reports to publicly accessible online repositories, and a large number of research communities started to share research data with peers in virtual platforms (Shin et al. forthcoming). Given the emerging phenomena, this presentation overviews global as well as local conditions of open science phenomena, and identifies Korean researchers’ perceptions and attitudes toward open science, based on the results of recent studies. In particular, this talk elaborates key issues addressed by Korean researchers regarding open data, as a part of open science. Lastly, it presents practical as well as theoretical implications drawn from the findings.

ACKNOWLEDGEMENTS

This presentation is based on the tentative results of an ongoing project, “Policy Measures to Promote Open Science in S. Korea”(PI: Shin, E.J.), which is funded by the Science and Technology Policy Institute (STEPI). My travel to the conference has been made possible by the generous support of WDS Asia-Oceania Conference 2017 SOC.

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RESEARCH DATA INFRASTRUCTURE IN CHINESE ACADEMY OF SCIENCES

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In 1986, with the approval of the State Planning Commission (now National Development and Reform Commission), Chinese Academy of Sciences (CAS) started research databases project to promote data collection, management and sharing, and this project has been supported continuously for the past 30 years. In 2003, this project got fund from the Ministry of Science and Technology (MOST) as one of National science and technology resource sharing service platforms.

With the fund of CAS and MOST, CAS research data work is fully developing, and research data infrastructure is initially built, and all those achievements can be accessed by visited database portal which is www.csdb.cn. In this research data infrastructure, research data is the core and surrounded by six parts, which are hardware and software fundamental environment, technology system, standard system, service system, data application, and some practices to promote data sharing.

Now the Research data infrastructure in CAS shares research data up to 655TB, and has 52PB storage capacity which provides cloud storage and cloud computing service. The technology system, standard system and service system are basically mature, and application of sharing data is remarkable.

Research data infrastructure in CAS is gradually formed in practice, and it is applied to other data management cases.

This talk will focus on the research data infrastructure in CAS, especially on the research data, technology system, standard system, service system, and some practices to promote data sharing.
EXPLORING FURTHER THAN OPEN RESEARCH DATA:
PARTICIPATORY AND TRANSDISCIPLINARY ASPECTS OF OPEN
SCIENCE

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In the OECD report (2015), open science 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.” This definition was provided after the first mention of open scientific research data in the 2013 G8 Science Ministers Statement. In Japan, the national policy was set along this baseline (e.g., Cabinet Office of Japan 2015), and it was followed by funding agencies, universities, and research institutions. Open research data are expected to accelerate collaborative open innovation and also guarantee transparency of research activities to help prevent data fabrication or plagiarism (Kitamoto 2017).

In contrast to this top-down approach, there is another school of open science, which weighs on participatory citizen science. For instance, Kyōto Daigaku Kojishin Kenkyūkai (2017) invites non-experts to participate in the transcription of historical seismic records in Japan through a web-based platform, and has transcribed more than 2.3 million letters during the first six months. Such a participatory bottom-up approach is sometimes associated with crowd funding, exemplified by the Sanmannenmae-no Kōkai Tettei Saigen Project (2017) to gather donations from a number of small donors.

Between these top-down and bottom-up approaches, the application of open science has good potential in issue-driven research, such as research in the fields of environmental sustainability science and health science. To provide a good solution to socio-environmental issues, a transdisciplinary approach is needed in which researchers (or experts) collaborate with those from different fields and also societal actors (or stakeholders) through the process of co-designing the research agenda, co-production of knowledge, and co-dissemination of results, based on equal dialogue and deliberation to enhance mutual learning (Lang et al., 2012; Mauser et al. 2013). It is noted that pro bono individuals, or skilled volunteers such as ICT engineers and social entrepreneurs, have been actively involved in solution-oriented projects through civic-tech style workshops, in which they use open data to create a solution. It is also noted that bridging agents who assist to bridge gaps in problem understanding between different actors are always present in transdisciplinary projects. It is therefore anticipated that bridging agents plays an important role in transdisciplinary open science. However, the roles and functions of bridging agents in open science still remains to be clarified.

With an awareness of this situation, a multi-stakeholder workshop was held in Kyoto in January 2017. The workshop aimed at overviewing the current issues of open science from the multifaceted viewpoints of 37 participants, representing natural and social scientists, governmental officials, local municipality officials, industry managers and employees, pro bono individuals, and librarians, through an unconference-style dialogue, during which the topics for group talk were decided by participants ad hoc. One of the group talks revealed the necessity of conventionalizing open science in each domain of research. Another group talk shed light on two functions of citizen science: the co-development of data infrastructure and the actions for social transformation. Another group pointed out the importance of capacity building of bridging agents who facilitate the bidirectional interaction of knowledge systems between researcher communities and other societal actors. This paper recommends the actions required to promote open science in light of participatory and transdisciplinary aspects, by reviewing the results of the workshop.

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Science and technology innovation has always been present in Asia, but its application in disaster risk reduction (DRR) has been differential. In Asia, globally significant hotspots of disasters and economic development have emerged in which the application of science and technology in DRR has become an essential requirement for informed decision making. Science has supported establishment and implementation of major international initiatives in DRR, including the Hyogo Framework for Action 2005–2015 (HFA). The more recent Sendai Framework for Disaster Risk Reduction 2015–2030 recognizes the importance of science and technology in all of its priority action areas, and subsequent global and regional forums and conferences have reconfirmed science and technology’s importance. To perceive and monitor the progress of science and technology in DRR, a qualitative assessment of different countries is made using three major attributes: (1) science-based decision making; (2) investment in science and technology; and (3) the intensity of science’s link to the public. This assessment exercise points out several strengths and weaknesses in science and technology application; the method can be employed to develop future multi-stakeholder and multidisciplinary science and technology plans at the country level. To implement regional and national activities, a set of 15 recommendations is put forward, which will strengthen the collective regional “science voice” in DRR. The data-driven nature of the scientific research on disasters demands open access to data as it is impossible to fully understand the cause and impact of a disaster event without consulting multiple types of data. There is a strong need for international cooperation based on open data is crucial to the advancement of scientific research on disasters. The International Council for Science (ICSU) has successively established the World Data Centre (WDC) and the Committee on Data for Science and Technology (CODATA) for information collection, exchange, service and sharing. ICSU is devoted to researching, observing and evaluating relevant data and information as well as their relations with decision-making, with open access of data comprising an important aspect; CODATA is committed to uplifting the quality, reliability, management and accessibility of data that holds great significance for the whole scientific community. Integrated Research on Disaster Risk (IRDR) is collaborating on CODATA on disaster related data issues, which is a major working group in IRDR.

**KEYWORDS**

DRR policy making, Science innovation, Science investment, Sendai Framework, Technology application
TOWARDS OPEN SCIENCE IN ENVIRONMENTAL RESEARCH

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The National Institute for Environmental Studies undertakes a broad range of environmental research in an interdisciplinary and comprehensive manner. NIES is running five problem-solving research programs as well as a Disaster Environment Research Program under the Forth Medium-and-Long-Term Plan started in April 2016. Additionally, NIES is carrying out research projects that include consolidating the institute's research foundation through basic research, data acquisition and analysis, preservation and provision of environmental samples, and other efforts. Collecting, processing, and disseminating environmental information are also our important mission and promoting open science is added to our goals in this plan’s term.

There are many concerns in making environmental data to the public such as the quality assurance, lack of incentives, storage and display, privacy/ethical issues, data versioning, data granularity, negative data, etc. To remove these barriers to open data, NIES has started several approaches. Firstly, we are trying to develop institutional policies and roadmaps towards open science. Secondly, we have a plan for building an institutional repository. Thirdly, we have been giving seminars to provide NIES staffs basic knowledge required to proceed open science.

When managing research data at NIES, one of the major challenges is how to handle multiple steps of research flow. Many environmental researches consist of multiple steps such as sampling, monitoring and simulation. We must keep track of the relationship among products from these multiple steps, and we must establish the system to manage non-digital materials such as certified reference materials produced at the final step of some researches. We hope to integrate the institutional repository, the data repository (database), and the database of non-digital materials as a future data management system.

In this presentation, we will introduce the global environmental database (GED) maintained by the Center for Global Environmental Research (CGER), contributing to the global environmental research field, one of the 9 basic research fields of NIES. CGER conducts strategic environmental monitoring of greenhouse gases by using aircraft, ships, terrestrial monitoring stations, forest observation sites and other facilities in the Asia-Pacific region and Siberia. The GED serves as a fundamental database of CGER covering global environmental problems with an emphasis on global warming and climate change. GED provides collected observational and inventory data along with information on global environmental issues and the outcomes of its research to the general public in an easily understandable form, and promotes open access to scientific information. Quality controlled open data are provided in original format or NASA Ames format. The Quick Plot function allows views of the data at a glance. DOI has been minted for the datasets on demand since September, 2016. Continuously updated data at semi real time (hourly) are provided. Web APIs (application programming interface) are available to allow an access to our real-time data. GED also includes tools for processing and analyzing data such as trend analysis, trajectory and footprint calculation. As a next step, we plan to develop a research data management system to operate the data archiving, metadata management, and DOI minting. For the future, we would like to discuss about the effective division of roles between commercially available data sharing services and governmental data management platforms.
THE FRAMEWORK OF OAIS AND ITS APPLICATION ASSUMPTION IN WORLD DATA CENTER FOR RENEWABLE RESOURCES AND ENVIRONMENT (WDS-RRE)

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The long-term preservation of scientific data is significant for scientific communities. How to effectively manage the scientific data is an urgent problem to be solved. The Open Archival Information System (OAIS) reference model has been widely researched and applied in the field of digital file preservation as the basic framework for the long-term preservation and utilization of digital information. The paper analyzes three information packages and six functional modules which are more primary to the OAIS reference model. We discuss in details about the origin and implementation of these modules, investigate the technical methods and consideration on system design. Meanwhile, the standard and concept of OAIS reference model are introduced into the World Data Center for Renewable Resources and Environment in WDS (WDS-RRE) based on the deep analysis of the functional model, information model, interoperation model and long-term storage management policy of OAIS reference model. Finally, this paper designed a data management process in WDS-RRE, which tracks and responds to OAIS initiatives. It is expected this ideal can provide reference for the construction of long-term preservation of scientific data in WDS-RRE.

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VOCABULARY BROKER FOR CROSS-DOMAIN SEARCH AND MASHUP OF DATA AND INFORMATION WITHIN AN AI-BASED KNOWLEDGE NETWORK

Bernd Ritschel

The Semantic Web based Vocabulary Broker (VB) is designed as a toolbox for cross-domain mashup of data and information with the objective to support trans-disciplinary, integrative work in science and education as well as industries and decision management. Furthermore, the VB plays an essential role within AI-based knowledge networks, such as the planned WDS knowledge network connecting different WDCs. The different parts of the VB toolbox operate and interact within a framework of components, rules and guidelines. Domain specific concept based vocabularies -modelled as terminological SKOS ontologies- used for the tagging of data properties and features are the foundation of the VB application. IUGONET data, as an example, which demonstrates the power of the VB, is described by metadata using standards consisting of data properties and appropriate keywords. IUGONET metadata is based on the SPASE standard. Most of the IUGONET data properties are tagged by keywords from SPASE vocabulary. DBPedia is a Linked Data project which contains a subset of Wikipedia data and information. The Vocabulary Broker connects the IUGONET and DBPedia data repositories as distributed resources within a knowledge network, using distributed controlled keyword based queries.
CROSS-CAMPUS COLLABORATIONS ENABLE MORE
TRUST-WORTHY DATA SHARING AT THE UNIVERSITY OF ILLINOIS

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The University of Illinois at Urbana-Champaign established a campus program, called the Research Data Service (RDS), to support researchers in their efforts to manage and steward research data created at the University. The RDS at Illinois was conceived of as a program that would involve many units on campus, including administrative units such as the Office of the Vice Chancellor for Research, as well as service units such as Information Technology (IT) and the Library. Cross-campus collaborations between the RDS and these units have proven to be time-intensive but imperative to the development of support for research data on our campus.

After a year of development, the RDS launched a public data repository, called the Illinois Data Bank (databank. illinois.edu; Fallaw, et al. 2016), in 2016. The Illinois Data Bank serves as a data publishing platform that centralizes, preserves, and provides persistent and reliable access to Illinois research. While our researchers use domain repositories wherever possible, the Illinois Data Bank is particularly important for Illinois research data that does not have an associated domain repository, whether it be due to topic, format, or size.

As the Illinois Data Bank was developed, and as we continue to refine the service, our cross-campus collaborations participated in several ways. Examples include policy development, user testing, and provision of storage infrastructure—all of which have enabled a more robust, resilient, and effective service. This presentation will cover how these different collaborations at Illinois contributed to our data infrastructure to create a more trustworthy data repository. The Core Trustworthy Data Repositories Requirements (Edmunds, et al. 2016) will be used to reflect on where collaborations at Illinois have made the biggest impact and also highlight areas for future development and collaboration.

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RESEARCH DATA MANAGEMENT SERVICES IN LIBRARY IN ACADEMIC LIBRARIES PERCEPTIONS

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This study highlights perception of a Research Data Management (RDM) perspectives and provides conceptual framework and role of the academic library in developing RDM. This paper also explores the systems development of RDM service by considering the data discovery services, academic scholarships, knowledge creation, discovery application and sharing of information in the university environment.

RDM initiative in university library being the heart of the knowledge life cycle and centre and centre ingredients to the scholarships of discovery integration, teaching and learning applications. This paper explores the ways of implementing and integrating open source software for creating libraries. It also investigates the perception of academic libraries researchers on the subject. Academic libraries data collection, processing, and curation can be performed efficiently and also minimizes the costs. The academic library helps to create research data policy and or strategy from an institutional perspective. The university has to established minimum mechanism to support their staff with academic libraries. And also discussed RDM infrastructure using open source software in academic library integrated several open source to implement the RDM system and reviewed types of CMS (content management software) providing researchers to upload data as well as the data searchers to use the provided their own research. It concludes with the significance of advantages of sharing research data in the concept of open access to publication freeing research data make it available.

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THE CORE TRUST SEAL: DATA REPOSITORY CERTIFICATION

I G Dillo

Data Archiving and networked Services (DANS), Anna van Saksenlaan 51, 2593 HW, The Hague, The Netherlands.

OPEN DATA AND DATA SHARING

Research funding in recent years often comes with the condition to make some of the resulting data openly available. Most researchers appreciate the benefits of sharing research data, but on an individual basis they may be reluctant to share their own data. Why are some researchers hesitant to share? And what are the most important motivations of researchers who do share their data?(1)

THE CONCEPT OF TRUST AND REPOSITORY CERTIFICATION

National and international funders are increasingly likely to mandate open data and data management policies that call for the long-term storage and accessibility of data. Open data and data sharing can only become a success if we put the concept of trust central stage. The certification of digital repositories is an important means to provide this trust to the different stakeholders involved.

If we want to be able to share data, we need to store them in a trustworthy digital repository. Data created and used by scientists should be managed, curated, and archived in such a way to preserve the initial investment in collecting them. Researchers must be certain that data held in archives remain useful and meaningful into the future. Funding authorities increasingly require continued access to data produced by the projects they fund, and have made this an important element in Data Management Plans. Indeed, some funders now stipulate that the data they fund must be deposited in a trustworthy repository.

Sustainability of repositories raises a number of challenging issues in different areas: organizational, technical, financial, legal, etc. Certification can be an important contribution to ensuring the reliability and durability of digital repositories and hence the potential for sharing data over a long period of time. By becoming certified, repositories can demonstrate to both their users and their funders that an independent authority has evaluated them and endorsed their trustworthiness.

Within the tiered framework of certification standards that has developed over the last decade core level certification has been embraced by a large number of repositories around the globe. Within the framework of the Research Data Alliance the ICSU World Data System (WDS) and the Data Seal of Approval (DSA) have developed a unified catalogue of requirements.(2) The group built on inherent complementarity between the criteria previously established by the two organizations to harmonize unified and universal requirements reflecting the core characteristics of trustworthy data repositories. The first new CoreTrustSeals (CTS) have already been acquired.

FAIR DATA IN TRUSTWORTHY DIGITAL REPOSITORIES

The condition to make data resulting from publicly funded research openly available has the effect that more and more data are rapidly becoming available. Therefore, there also is a growing demand for quality criteria for research datasets.

The CTS requirements and the FAIR principles get as close as possible to giving quality criteria for research data. They do not do this by trying to make value judgements about the content of datasets, but rather by qualifying the fitness for data reuse in an impartial and measurable way.
In 2014 the FAIR Guiding Principles (Findable, Accessible, Interoperable and Reusable) were formulated. The well-chosen FAIR acronym is highly attractive. In a relatively short term, the FAIR data principles have been adopted by many stakeholder groups, including research funders.

The FAIR principles are remarkably similar to the underlying principles of DSA (2005): the data can be found on the Internet, are accessible (clear rights and licenses), in a usable format, reliable and are identified in a unique and persistent way so that they can be referred to. Essentially, CTS presents quality criteria for digital repositories, whereas FAIR targets individual datasets.

Bringing the ideas of the CTS and FAIR together offers an operationalization that can be implemented in any certified Trustworthy Digital Repository.

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X-RAYS FROM A KYOTO MILLENNIUM SUPERNOVA REMNANT (SNR)

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This paper reports on the Origin of the Galactic Cosmic Rays, the abundances of heavy elements and asymmetric distribution of the heavy elements in the ejecta of the supernova remnants. The data are taken with the ASCA and Suzaku satellite in a historical type I a supernova SN1006 (Koyama et al, 1995, Uchida et al 2013, Yamaguchi et al. 2008). The results are compared with the historical reports in AD 1230 in the diary of Meigetsuki, a national treasure of Japan (Fujiwara, T. 1232). The results demonstrate that the old historical record gives very important implications on the modern astronomy. This paper reports the details on these issues.

ACKNOWLEDGEMENTS

The author express his sincere thanks to all the members of the ASCA and Suzaku satellites, the fourth and fifth X-ray satellite of Japan.

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Yamaguchi et al. 2008, PASJ, 60, 141
WDS COMMITTEE, SCIENCE COUNCIL OF JAPAN

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4National Institute of Information and Communications Technology, Koganei 184-8795, Japan

WDS Committee, Science Council of Japan (http://takashiwatanabe.wixsite.com/wds-japan-en) is a national committee for ICSU World Data System (WDS, https://www.icsu-wds.org/), and organizing WDS-oriented activities in Japan. This committee has been established in 2011 by expanding former World Data Center (WDC) Committee of the Council to cover much wider disciplines after the fundamental idea of WDS (Watanabe, 2009). The principal members of the WDS Committee are representatives of former seven WDCs and other data centers having interest in the activity of WDS. Representatives of CODATA National Committee of Science Council of Japan are also involved in discussions on collaboration between WDS and CODATA. We also invited data scientists and domain scientists conducting data analysis to introduce opinions of principal data users of our data holdings. Annual domestic WDS symposia have been held since 2011, and a series of international symposia have been organized by the WDS Committee biannually since 2011 also (Table 1). The principal activities of the WDS Committee are:

1. Establish WDS-oriented community in Japan
2. Promote discussions for long-term preservation and provision of data archives
3. Support Open-Data related activities in Japan
4. Promote domestic and international symposia relating to WDS activities (Table 1)
5. Provide a portal of databases opened by members of the Committee, particularly those of former WDCs in Japan (Table 2), provisionally at http://takashiwatanabe.wixsite.com/wds-japan-en/data-portal

Although Japan has a long history of data activity under ICSU since the creation of the system of WDC in the IGY era (Korsmo, 2009) some of the former WDCs in Japan have gotten difficulty to move to WDS mainly by change of interest of host organizations and lack of human resources. It will be important to have a mechanism assure long-term preservation and provision of data holdings of these former WDCs. The data portal operated by the WDS Committee is a platform in trial to resolve the problem, as seen in Table 2. Data holdings of these former WDCs can be accessed from the Web page of WDS Committee whose URL is given above.

ACKNOWLEDGEMENTS

We would acknowledge collaborations received from members of the WDS Committee of the Science Council of Japan and representatives of data centers having interest in the endeavor of WDS.

REFERENCES


Table 1: International symposia promoted by the WDS Committee, Science Council of Japan

<table>
<thead>
<tr>
<th>WDS Conference</th>
<th>Date</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>The 1st ICSU World Data System Conference - Global Data for Global Science</td>
<td>3 - 6 Sep. 2011</td>
<td>Kyoto University, Kyoto, Japan</td>
</tr>
</tbody>
</table>

Table 2: Data portals operated by members of WDS National Committee, Japan

<table>
<thead>
<tr>
<th>Data Portal</th>
<th>Host organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDC for Geomagnetism, Kyoto (WDS Regular Member)</td>
<td>WDC for Geomagnetism, Kyoto, Data Analysis Center for Geomagnetism and Space Magnetism, Graduate School of Science, Kyoto University [<a href="http://wdc.kugi.kyoto-u.ac.jp/index.html">http://wdc.kugi.kyoto-u.ac.jp/index.html</a>]</td>
</tr>
<tr>
<td>WDC for Ionosphere and Space Weather (WDS Regular Member)</td>
<td>National Institute of Information and Communications Technology (NICT) [<a href="http://wdc.nict.go.jp/IONO/wdc/index.html">http://wdc.nict.go.jp/IONO/wdc/index.html</a>]</td>
</tr>
<tr>
<td>WDC for Cosmic Rays</td>
<td>Institute of Space-Earth Environmental Research, Nagoya University [<a href="http://cidas.isee.nagoya-u.ac.jp/WDCCR/">http://cidas.isee.nagoya-u.ac.jp/WDCCR/</a>]</td>
</tr>
<tr>
<td>WDC for Aurora</td>
<td>National Institute of Polar Research, Japan (NIPR) [<a href="http://polaris.nipr.ac.jp/~aurora/">http://polaris.nipr.ac.jp/~aurora/</a>]</td>
</tr>
<tr>
<td>WDC for Scientific Satellites</td>
<td>Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (ISAS/JAXA) [<a href="http://www.darts.isas.jaxa.jp/index.html.en">http://www.darts.isas.jaxa.jp/index.html.en</a>]</td>
</tr>
<tr>
<td>Kakioka Geomagnetic Observatory,</td>
<td>Kakioka Geomagnetic Observatory, Japan Meteorological Agency (JMA) [<a href="http://www.kakioka-jma.go.jp/en/index.html">http://www.kakioka-jma.go.jp/en/index.html</a>]</td>
</tr>
<tr>
<td>Astronomical Observation Data Service/Analysis Service Portal</td>
<td>Astronomical Data Center, National Astronomical Observatory, Japan (NAOJ) [<a href="http://www.adc.nao.ac.jp/E/index-e.htm">http://www.adc.nao.ac.jp/E/index-e.htm</a>]</td>
</tr>
<tr>
<td>JAMSTEC Databases</td>
<td>Japan Agency for Marine-Earth Science and Technology (JAMSTEC) [<a href="http://www.jamstec.go.jp/e/">http://www.jamstec.go.jp/e/</a>]</td>
</tr>
<tr>
<td>ICSWSE Database</td>
<td>International Center for Space Weather Science and Education, Kyushu University [<a href="http://data.icswse.kyushu-u.ac.jp/">http://data.icswse.kyushu-u.ac.jp/</a>]</td>
</tr>
<tr>
<td>Inter-university Upper atmosphere Global Observation NETwork (IUG-ONET)</td>
<td>Tohoku University, National Institute of Polar Research, Nagoya University, Kyoto University, and Kyushu University [<a href="http://www.iugonet.org/?lang=en">http://www.iugonet.org/?lang=en</a>]</td>
</tr>
<tr>
<td>Arctic Data Archive System (ADS)</td>
<td>National Institute of Polar Research (NIPR) [<a href="https://ads.nipr.ac.jp/portal/index.action">https://ads.nipr.ac.jp/portal/index.action</a>]</td>
</tr>
<tr>
<td>RISH Data Server (WDS Regular Member)</td>
<td>Research Institute for Sustainable Humanosphere (RISH), Kyoto University [<a href="http://database.rish.kyoto-u.ac.jp/index-e.html">http://database.rish.kyoto-u.ac.jp/index-e.html</a>]</td>
</tr>
</tbody>
</table>
WDS CHINA DATA CENTERS INTRODUCTION

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There are 9 regular member data centers in China under the umbrella of the International Council for Science-World Data System (ICSU-WDS). They are Chinese Astronomical Data Center, WDC-Renewable Resources and Environment, WDC – Oceanography at Tianjin, World Data Centre for Microorganisms, Chinese Space Science Data Center, Cold and Arid Regions Science Data Center at Lanzhou (CARD), WDC for Geophysics at Beijing, Global Change Research Data Publishing and Repository (GCdataPR), and Fish Database of Taiwan. The poster gives a whole picture of 8 data centers in China mainland, including the host agency, development history, main field, core data resources, special services and its domestic and international profile of each centers. Their main contributions for the international communities are summarized and highlighted. For example, Chinese Astronomical Data Center has become the members of International Virtual Observatory Alliance since 2002. There are more than 19000 users at present. WDC-Renewable Resources and Environment has organized several times of international young scientist training in the past few years. It also charged for the design and development of the WDS China Common Clearing House Prototype. WDC – Oceanography at Tianjin is responsible for the management of national marine data and information resources, and providing guidance and scientific stewardship for the national marine data and information. World Data Centre for Microorganisms is a vehicle for networking microbial resource centers of various types of microbes. It also serves as an information resource for the customers of the microbial resource centers. Chinese Space Science Data Center provides services for serials of space science plan, e.g. Space-based multiband astronomical Variable Object Monitor, Solar wind Magnetosphere Ionosphere Link Explorer, International Space Weather Meridian Circle Project, etc. Cold and Arid Regions Science Data Center at Lanzhou (CARD) has been the scientific data depositories of a serial of international academic journals, e.g., Science Report, PLOS ONE, etc. WDC for Geophysics at Beijing provides plenty of long-term, continuous geophysical observation data, such as the earliest ionospheric data in China since 1946, the earliest geomagnetic data in China since 1897, etc. It hosts the mirror sites of Madrigal Database and DIDDbase. Global Change Research Data Publishing and Repository (GCdataPR) advocates an innovative data sharing approach which integrates metadata, data products and data papers together.

ACKNOWLEDGEMENTS

The authors would like to express appreciations for support from WDS world data centers in China, National Science & Technology Infrastructure of China, and CODATA-China Committee.

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http://www.icsu-wds.org/.
http://www.wds-china.org/.
DATA CITATION FOR ANTARCTIC SCIENCES IN JAPAN

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The Polar Environmental Data Science Center (PEDSC) has a significant task to archive and deliver the data obtained from polar regions by Japanese related activities. Summary information (metadata) of all the archived data are available to involved polar communities, together with more general interests by public domain. The compiled metadata describe various science research disciplines (space and upper atmospheric sciences, meteorology and glaciology, geosciences and biosciences) from both long- and short-term projects in the Arctic and Antarctic, in which the majority are data from Japanese Antarctic Research Expedition (JARE) (Kanao et al., 2014). These science branch cover almost studies on environmental changes and earth evolution viewed from polar region. Inside the portal server for scientific metadata (http://scidbase.nipr.ac.jp/), 380 records have been compiled as of July 2017.

Regarding these compiled metadata for all science branches, a sophisticated system that can automatically attribute the Digital Object Identifier (DOI) are recently equipped inside the portal server. The DOIs can be requested to “DataCite (https://www.datacite.org/)” through a gateway interface provided by “Japan Link Center (JaLC; https://japanlinkcenter.org/)”. The JaLC is Japanese organization authorized as one of the Registration Agency (RA) which can provide the DOIs. Under the adequate evaluation procedures, the metadata and their associated data with enough quality of publication procedure could be attributed by their DOIs with a “prefix” of “10.17592”. Under the DOI auto-numbering rule, the “suffix” part of the DOIs (i.e., the character string ordering) is generated arbitrary in a manner defined by the metadata portal. After receiving offers to obtain DOIs from the data providers/managers, quality of individual data can be strictly evaluated by involved “data management committee”, followed by attributing their DOIs for those with sufficient level of quality for opening/publishing the data into public domain. There are several evaluation terms before assignment of the DOIs; regarding data quality, publishing methodology, long-term maintenance strategy, and their data policy, etc.; these evaluation items should be overcome in both the description of the metadata itself and the quality of corresponding actual dataset.

Promoting data citation procedure introduced here could be a model case with an effective framework for long-term strategy of publication and preservation of polar data among global system. Moreover, the approach of data citation conducted by this study could have a potential as socially relevant applications to the public domain, in addition to polar community (Parsons & Fox, 2013; Lawrence et al., 2011).

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to many collaborators involving polar data management, in particular to the member of PEDSC, data committee on SCAR, IASC, WDS, CODATA and IPY.

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DOI: 10.2481/dsj.IFPDA-05

Lawrence, B., Jones, C., Matthews, B., Pepler, S., & Callaghan, S. (2011) Citation and peer review of data: Moving towards formal data publication. International Journal of Digital Curation. 6(2).

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The National Institute of Polar Research (NIPR) has launched Polar Data Journal, a new data journal in January, 2017. Polar Data Journal is a free-access and peer-reviewed online journal. It is dedicated to publishing original research data/datasets, furthering the reuse of high-quality data for the benefit to polar sciences.

Polar Data Journal aims to cover a broad range of research disciplines involving polar regions, especially the earth sciences and life sciences domain. The journal primarily publishes data papers, which provide detailed descriptions of research data/datasets (e.g., Methods, Data Records, and Technical Validation). It is not required that the data papers published in this journal depict any new scientific findings; hence, the journal also welcomes submissions describing valuable existing data/datasets that have not been published to date.

Some key features of the new journal are as follows:
- Polar Data Journal is a peer-reviewed journal that aims to provide high-quality data to researchers.
- It is a free-access journal.
- Polar Data Journal is thoroughly edited using an online editing system for quick publishing.
- The journal content is reviewed by an editing committee, which will disclose the reviewer’s reports in each article of a volume.

The platform of Polar Data Journal is powered by WEKO (JAIRO Cloud), which is developed and operated by the National Institute of Informatics (NII), Japan.

For more information, please visit https://pdr.repo.nii.ac.jp/
POLLEN RESOURCES OF APIS ANDRENIFORMIS SMITH FROM SEVERAL BARANGAYS IN PUERTO PRINCESA CITY, PALAWAN, PHILIPPINES

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¹Environmental Biology Division, Institute of Biological Sciences, University of the Philippines Los Baños, College, Los Baños, Laguna, Philippines
²Professor 1, Environmental Biology Division, Institute of Biological Sciences, University of the Philippines Los Baños, College, Los Baños, Laguna, Philippines

Sixteen colonies of Apis andreniformis Smith from eight (?) selected barangays in Puerto Princesa City (PPC), Palawan, Philippine were used in the study. Pollen from the honey and midgut of representative bees were extracted to determine the bee species’ pollen sources and preferences. Twenty-six palynomorphs belonging to 21 genera and five families were recognized. Common Palawan plant, Begonia laciniata Roxb. was most abundant and was the primary pollen resources. Secondary pollen sources were Eucalyptus globulus Labill. and Araceae type, while majority were considered as important minor pollen. The diversity of flora identified indicates non-selectivity of food sources. Interactions between floral characteristics such as structure may have played an important role in the species’ food preference. Bees may have been more attracted to those that offer easy access to the rewards.

ACKNOWLEDGEMENTS

The authors would like to thank the locals in Puerto Princesa City, Palawan, Philippines for helping us during the sample collection; Alejandro C. Fajardo Jr., for providing some of the reagents, glassware, and other laboratory materials and other technical assistance needed in this research; and the International Foundation for Science, for the partial funding.
A NEW BRANCH OF CHINESE SPACE SCIENCE DATA CENTER (CSS-DC) – SCIENTIFIC DATA MINING FOR SPACE SCIENCE

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The Dark Matter Particle Explorer and the Hard X-ray Modulation Telescope, supported by the Chinese Academy of Sciences (CAS) Strategic Priority Program (SPP) on Space Science, are currently working in orbit, sending back intense scientific data. Much more space science satellite missions, e.g., the Einstein Probe, Advanced Space-based Solar Observatory, Space Variable Object Monitors, etc., that are fully or partially supported by CAS in the next 5 years, will be expected to produce more abundant science data. Chinese Space Science Data Center (CSSDC) provides application support services of data for these scientific satellite missions, building disciplinary database, data processing toolset and cloud computing platform. The experiences from the project construction and the data management enable us to foresee that the massive heterogeneous data produced by these space science missions will pose a great challenge to the scientific data analysis. In this context, the data scientists in CSSDC start to search for cooperation with astrophysicists and establish a new branch of CSSDC – scientific data mining for space science, devoted to apply the advanced data mining methods to the space science researches. We have carried out some preliminary explorations, such as representation learning for galaxy classification and the exploration for new type of galaxy, reconstruction of the dark energy equation of state via variational autoencoder. These studies provide the basis for the data mining in the CAS space science missions.
THE OUTLOOK OF BIG DATA APPLICATION IN AGRICULTURE IN CHINA

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Agriculture is a vital industry in China, employing over 300 million farmers. Despite rapid development of China’s agriculture, it still faces several challenges, like expanding population, low efficiency, decreased arable land, and increasing labor cost, etc. The only way to revolutionize China’s agriculture pattern and current challenges it faced should be from technology innovation, especially ICTs, such as Big Data. Obviously, agriculture is one of largest playgrounds for big data in the future. The data ranges from soil, weather, water, seed, fertilizers, and pests etc. which generate volumes of data every day. Big data and the Internet of Things (IoT) platforms will be the key enabler to revolutionize China’s agriculture. This poster provides a brief outlook on China’s agriculture from the area of crop, livestock, orchard, fishery with the potential application of big data in the future.
INFORMATIONAL WEBSITE FOR OBSERVATION NETWORKS OF GREENHOUSE GASES AND RELATED MATERIALS IN THE ASIA-PACIFIC REGION

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Asia is one of the world's largest producers of greenhouse gases (GHG) and air pollutants. Long-term observations of GHG and related materials have been conducted in Japan and the Asia-Pacific region over 20 years. There are many satellite observations of global GHG concentrations in recent years. In order to improve the accuracy of their observation, validations by ground-based measurements are needed. In the Asia-Pacific region, however, observation sites are still sparse. It is important to collect the information and provide the data set of the existing observation sites. For their effective use, databases are also required.

In this presentation, we introduce a website to collect and provide information of observation sites for GHG and related materials in the Asia-Pacific. These observations are conducted not only by NIES but also by other organizations in the Asia-Pacific region. These are divided into several categories such as atmospheric monitoring and ecosystem monitoring, etc. This site provides geographical distributions of observation sites for each category on a map as shown in Figure 1 (Station Map). Information of each observation site, such as the institution, the location, and the observation parameters, is provided in a table with search functions as shown in Figure 2 (Station Table).

The main goals of this site are to promote effective utilization of the existing observation data, to help developing strategies for new observation networks and to promote international joint researches. This will thus contribute to improve the accuracy of the inventories of GHG and related materials in the Asia-Pacific region.

Figure 1. Station Map shows the geographical distribution of the observation sites for each category.

Figure 2. Station Table provides information of each observation site with search functions by using the selected area and observation parameters.
DATABASE OF JLTER (JAPAN LONG-TERM ECOLOGICAL RESEARCH NETWORK): FUNCTIONS AND EFFORTS FOR THE OPEN DATA

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A Long-Term Ecological Research (LTER) program was originally established in 1980 by the National Science Foundation to support research on long-term ecology in the United States. The LTER network was founded with the recognition that long-term and broad-scale research is necessary to understand various environmental phenomena. This necessity has become increasingly pressing with the increased human effects on populations, communities, ecosystems, and the biosphere. Following the activity by the US-LTER, in 1993 international LTER networks initiated global activities to develop mutual linkages and assemble knowledge among the world’s LTER networks (International Long Term Ecological Research Network, 2011). The International Long-Term Ecological Research (ILTER) is a “network of networks,” a global network of research sites located in a wide array of ecosystems worldwide that is used to help understand environmental change across the globe. Currently, 37 countries (networks) are affiliated with ILTER (Africa 2; Central/South America 3; East Asia-Pacific 7; Europe 24; North America 2).

JaLTER (Japan Long-Term Ecological Research network) was established in 2006 to provide scientific knowledge, which contributes to conservation, advancement and sustainability of environment, ecosystem services, productivity and biodiversity for a society in Japan by conducting long-term and interdisciplinary research in ecological science including human dimensions. JaLTER has nation wide network of ecological observation sites, which consists of 54 field sites including university forests, lake and marine observatories, and agricultural experimental sites. JaLTER is closely linked with ILTER Network. Own database, JaLTER Data Base is managed and operated in the Center for Global Environmental Research in National Institute for Environmental Studies. We use the Metacat system as a database server application, which handles EML (Ecological Metadata Language) for data organization and searching processes.

Since the establishment of JaLTER, the Committee for Large and Long-term Ecological Research of the Ecological Society of Japan has worked with JaLTER to encourage ecological scientists to make networks for field observations and monitoring. At the same time, in order to build up the framework for data opening by ecological scientists not only for the research communities, but also for the public and governments, the committee and JaLTER have worked cooperatively to establish the publishing procedure of Data Papers. The reason of this cooperation has been due to mutual benefits: Ecological Society of Japan can facilitate to open ecological data previously stored individually and/or institutionally through the data base facility of JaLTER, and JaLTER can yield high quality data through the authorization by editorial board of the Ecological Research.

Since the beginning of the Data Paper editorial, twenty-five data papers have been published in Ecological Research, and several manuscripts are currently under review. Those included datasets related to forest ecosystems, lake ecosystems, and agricultural ecosystems. Most of them were made by field oriented monitoring, and one consists of remote sensing data. Review process of data paper is performed mainly to evaluate the quality (accuracy and usefulness) of metadata and the organization of datasets.

ACKNOWLEDGEMENTS

We thank E. Maita of the National Institute of Environmental Studies and the executive group of the Japan Long-Term Ecological Research Network for their contributions to the JaLTER database activities.

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REPRODUCIBLE AND SHAREABLE DATA VISUALIZATION METHOD

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2 National Institute of Information and Communications Technology
3 Japan Aerospace Exploration Agency, Institute of Space and Astronautical Science
4,5 Graduate School of Information Science and Electrical Engineering, Kyushu University

Data management technology is becoming more and more important to promote scientific development in the society brimming with data. We improved the data visualization web service of earth, planetary and space sciences (Cross-Cutting Comparisons; C3 [Imai et al., 2016]) as the system controlled by the human-understandable query string (QS) to make reproducible and shareable charts.

All the charts have a QS in an address bar. On the World Wide Web, a QS is the part of a uniform resource locator (URL), which follows a separating character, usually a question mark (?) in a URL. The structure of the QS of C3 is as follow: header + selection + extraction + (analytic method). The QS consists of three parts separated by plusses (+). The header part includes information of language of the chart and the system version of C3, the selection part has information of metadata and figure type. The information of data extraction (e.g., time period, location and altitude) is described in the extraction part.

By explicitly showing the inputted setting in an orderly manner in the QS, it is easy to understand how the chart is made. By including information of data handling procedures in the QS in an orderly manner, the chart is easy to understand, remake and share via text-based communication tools.

ACKNOWLEDGEMENTS

C3 is maintained by the Center for Science-satellite Operation and Data Archive (C-SODA) at the Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA). This work was supported by JSPS KAKENHI Grant Number 15H02787.

REFERENCES

*Standard journal article*
CURRENT STATUS AND PERSPECTIVE OF DIGITAL ARCHIVES OF TAIWAN FISHES

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The Fish Database of Taiwan (fishdb.sinica.edu.tw) was established in the early 1990s and has collected and integrated information such as classification, distribution, specimens, and references on 3,200 fishes of Taiwan. The contents include species descriptions (2,811 species), specimens (54,364 lots) images (3,862 ecological photos and 991 videos), skeletal X-rays (1,868 species), otoliths (1,386 species), COI gene sequences (2,447 pieces), and georeferenced data (235,000 records); all are made accessible online and constantly updated. Besides providing academic services to promote academic exchanges and raise research quality, the database also has popular science materials, underwater real-time monitoring, and marine conservation information so that it can contribute to the research, education, and management of marine resources.

In 1994, we started a long-term partnership with the global FishBase and continue to actively collaborate with other international biodiversity databases and projects, including GBIF, COL, and EOL. We conduct cross-strait collaboration with China to exchange fish specimen data and establish a parallel list of traditional and simplified Chinese fish names. The repatriation of 228 type specimens of Taiwan fishes from more than ten institutions abroad is another achievement. Currently, the database has more than 450 thousands visits per month (including search engines), and is the only member of WDS that comes from Taiwan.

As to the value-added creations and applications, many educational materials, e.g. Taiwan Fish Multimedia Dictionary, Taiwan Fish Culture and Nature Knowledge Base, Intellectual Restaurant, Augmented Reality Knowledge Cards, e-books and e-magazines, Taiwan Seafood Guide, ichthyological terms and definitions, governmental fisheries statistics, and allowed/prohibited aquatic checklists had also been compiled. Also, a cell phone version of The Fish Database of Taiwan had been developed to conform to the trend of querying real-time data.

The next steps will be providing some fish-related cultural information as well as integrating the molecular identification data of fish eggs and juveniles in Taiwan waters, so that the early life history of Taiwan fishes could be understood more and further used for limiting fisheries, MPA, and resources administration.

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http://fishdb.sinica.edu.tw
THIRTEEN YEARS DAILY AND ANNUAL MEAN LAND SURFACE TEMPERATURE AND FROST NUMBER INDEX DATASET OVER THIRD POLE BASED ON MODIS INSTANTANEOUS LST PRODUCTS

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The Qinghai-Tibet plateau (QTP), called as “the third pole of the earth” is the water tower of Asia not only feed tens of millions of people, but also maintain fragile ecosystems in arid region of northwestern China. Temporal-spatially complete representations of land surface temperature are required for many purposes in environmental science, especially in third pole where the traditional ground measurement is difficult and therefore the data is sparse. Although the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument has been designed to provide improved monitoring for land surface temperature (LST) since 2000, it is instantaneous and susceptible to the influence of clouds. A temporal-spatially complete representation of land surface temperature is still not available in third pole.

In this study, a pragmatic data processing method proposed by Ran et al. (2015) was used in this study to estimate the daily mean LST, MAST, as well as freezing index, thawing index, and SFN based on the original MOD11A1 and MYD11A1 LST product. It realized the spatial expansion of daily mean LST using spatial interpolated daily LST amplitude based on the assumption that the arithmetic average of the daytime and nighttime LSTs can represent the daily mean LST with an acceptable error, and the LST daily amplitude is more homogeneous than LST itself. This assumptions are usually well established (Mitchell and Jones, 2005; Liu et al., 2006). Therefore, the instantaneous LST value at any time and any pixel are full used to estimate daily mean LST. After the processing use the method mentioned above, the daily mean LST is enhanced and then a gap filling procedure was used to retrieve the remaining missing values and reconstruct the time serial of daily mean LST based on a new robust smoothing algorithm, i.e. penalized least square regression based on discrete cosine transforms (DCT), which explicitly utilizes information from time-series to predict the missing values (Garcia, 2010). A more detailed description of this scheme can be found in Ran et al., (2015) and Ran et al., (2017a).

This paper released the datasets of daily mean LST, mean annual land surface temperature (MAST), freezing and thawing indices (the degree-day totals above and below 0℃), and surface frost number (SFN) during 2004 to 2016 from the quartic daily MODIS Terra/Aqua LST products with a resolution of 1 km using a robust data processing algorithm. A total of 29 full year LST measurements at 9 radiance-based sites in QTP are used to validate the estimated daily mean LST and MAST. Results show that the systematic error is remains for daily mean LST and MAST, with a bias of -1.73℃ (±3.38℃) and -2.07℃ (±1.05℃), respectively. The systematic overestimation of the daily mean LST lead to a underestimation of frost number. The underestimation of SFN for warm area is more than that for cold area. The overestimation of the DDT and underestimation of DDF both contribute to the underestimation of SFN.

The dataset is potential useful for various studies, including climatology, hydrology, meteorology, ecology, agriculture, public health, and environmental monitoring in third pole and around regions. The trend analysis of the time series MAST shows that the cold region is warming but the arid region is cooling in the past 13 years over third pole. Comprehensive analysis indicates that the warming cold region cooling the arid region mainly via hydrological cycle.

This is part of the paper Ran et al. (2017b), which have been submitted to Earth System Science Data.
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ATMOSPHERIC RADAR OBSERVATION DATABASE AT RISH, KYOTO UNIVERSITY

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The MU (Middle and Upper atmosphere) radar installed in Shigaraki, Shiga, Japan (34.85N, 136.10N) is one of the most powerful and multi-functional VHF-band atmospheric radar with an active phased array system consisted of 475 antenna elements (Fukao et al., 1985a, b). The MU radar has a monostatic circular antenna with a diameter of 103 m, which can be divided to 25 independent subarrays. The MU radar has been operated since 1984. Aiming at monitoring detailed structure inside the radar range volume, the MU radar imaging observation system has installed in 2004 (Hassenpflug et al., 2008). We can switch the operational frequency between 46.0 MHz to 47.0 MHz in every Inter-Pulse Period (IPP). The receiver system is also upgraded to 29-channel digital receivers. The received signal of each sub-array can be independently detected, and combined in the digital processing. This new feature enables us the multifunctional observation of Coherent Radar Imaging (CRI) and Frequency domain Interferometric Imaging (FII) techniques. The databases for tropospheric and lower stratospheric observations (altitude: 2-25 km), mesospheric observations (60-90 km), ionospheric observations (200-600 km), and meteor trail observations (80-100 km) are published in http://www.rish.kyoto-u.ac.jp/mu/en/database.html.

The Equatorial Atmosphere Radar (EAR) is a VHF-band atmospheric radar located in Kototabang (100.32E, 0.20S), West Sumatra, Indonesia (Fukao et al., 2003). It is operated by collaboration between the Research Institute for Sustainable Humanosphere (RISH), Kyoto University and National Institute of Aeronautics and Space of Indonesia (LAPAN) since 2001. The EAR is a large monostatic radar which operates at 47.0 MHz with peak output power of 100 kW which is 1/10 of the MU radar. The EAR uses a quasi-circular antenna array, approximately 110 m in diameter, which consists of 560 three-element Yagi antennas. Each antenna is driven by a solid-state transmitter-receiver module. This system configuration allows the antenna beam to be steered electronically up to 5,000 times per second. The scientific objective of the EAR is to advance knowledge of dynamical and electrodynamical coupling processes in the equatorial atmosphere from the near-surface region to the upper atmosphere. The equatorial atmosphere over Indonesia is considered to play an important role in global change of the Earth’s atmosphere. The databases for tropospheric and lower stratospheric observations (altitude: 2-20 km), and ionospheric field-aligned irregularity (FAI) observations (80-500 km) are published in http://www.rish.kyoto-u.ac.jp/ear/data/ and http://www.rish.kyoto-u.ac.jp/ear/data-fai/, respectively.

Various instruments (i.e., L-band lower troposphere radar, meteor wind radar, MF radar, lower thermosphere profiler radar, Rayleigh Raman lidar, etc.) have also been operated in the Shigaraki MU Observatory in Japan and in the Equatorial Atmosphere Observatory in Indonesia. These data as well as the MU radar and EAR data are provided through Inter-university Upper Atmosphere Global Observation NETwork (IUGONET; http://www.iugonet.org/). They correspond to Data Analysis Software SPEDAS/UDAS, which provides an integrated analysis platform for Solar-Terrestrial Physics.

REFERENCES

IONOSPHERIC TOTAL ELECTRON CONTENT VARIABILITY OVER LOW, MID AND HIGH LATITUDES

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Total electron content (TEC) is an ionospheric parameter that describes the major impact of the ionosphere on the propagation of radio waves which is crucial for terrestrial and Earth space communication including Global Positioning System (GPS). For this analysis we employed a dual frequency GPS receiver at low, mid and high latitude stations viz IISC, Bangalore, India (13.02° N, 77.57°E), GUAO, Urumqi, China (43.82°N, 87.60°E) and NYAL, NY-Alesund, Norway (78.92°N, 11.86°E) respectively, we used one year of data for a high solar activity period of 24th solar cycle i.e. during January 2012 to December 2012. TEC values obtained from the SOPAC (Scripps Orbits and Permanent Array Center) data archive of the IGS (International GNSS (Global Navigation Satellite Systems) Service) for all the stations show large variations. From our analysis we observed that TEC achieves its highest values during the months of October and March at low latitude, during the month of April and May at mid latitude and during the September and March at high latitude while the lowest values of TEC were recorded at all the station in December month. Similarly, the highest values of TEC are recorded during the equinox season while the lowest values are recorded in the month of winter. This research obtains a practical approach to study the ionospheric variability at low, mid, and high latitude.

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IONOSPHERIC RESPONSE OF SOUTHERN HEMISPHERE TO SEVERE GEOMAGNETIC STORMS DURING SOLAR CYCLE 23

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The ionosphere is a highly coupled neutral plasma system where photochemistry and plasma dynamics plays an important role. The variations of ionospheric parameters can be regular having distinct periodicity of 11 years, 1 year, 6 months or 24 hours or sudden caused principally by geomagnetic storms due to the coupling of earth’s magnetic field and solar events. (Maruyama et al., 2004). Studies on these sudden ionospheric variations are essential as it plays a crucial role in radio wave propagation, satellite tracking and navigation. In the present study, the spatial and temporal variations of the ionospheric F₂ layer critical frequency (foF₂) in response to intense geomagnetic storms of 23rd solar cycle (1996-2008) over five stations of southern hemisphere are studied. The severe geomagnetic storms of the cycle was identified from the Disturbance Storm Time index (Dst) such that Dst ≤ -200 nT. The analysis reveals a domination of negative ionospheric response for all stations during the main phase of the geomagnetic storm followed by an enhancement during the recovery phase. The ionospheric foF₂ effects are more dominant after the main phase of the storm when the Dst dips to its modest minimum than during the sudden storm commencement of the storm. A pre-storm enhancement is also noticed for equatorial station in some cases of extreme geomagnetic storms. Mid and high-mid latitude stations shows a pattern of foF₂ variation similar to that of Dst with modest time lag.

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REFERENCES

THE GLOBAL CHARACTERISTIC OF A MAGNETIC CROCHET AND SOME STATISTIC RESULTS

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Geomagnetic crochet is believed to be directly related to solar flares. Relevant studies are important to understand the influence of solar eruptions on near-earth space environment, and to develop space weather forecasting techniques. In this paper, using the data from the geomagnetic station of Shandong University (Weihai), the Intermagnet Geomagnetic chain and the Meridian Space Weather Monitoring Project, the GOES satellite and the digital ionosonde system, we investigate a geomagnetic crochet associated with a M5.6 solar flare. Our conclusions are listed as follows. The characteristics of geomagnetic crochet were different between the northern and southern hemispheres and prenoon/postnoon, and the geomagnetic response had about 3 minutes’ delay in comparison to the peak time of the solar flare. Geomagnetic disturbance was not obvious at night. We used the data of more than 50 magnetic stations located in the dayside hemisphere and found that the amplitude of geomagnetic crochet had a normal distribution, with the maximum being near noon. At last, we used geomagnetic data to get the crochet current system $S_s$ during the event and the quiet current system $S_q$ during quiet days. Our statistical study on the geomagnetic crochets and solar flares from 1996 to 2015 shows that the X-class flare is most likely the cause of magnetic crochets, and the possibility is about 42%; most magnetic crochets are caused by M-class flares; smaller flares, like A-, B-, C-class flares are hardly associated with magnetic crochets.

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ANALYSIS AND DESIGN OF GEOGRAPHIC ENVIRONMENT DATABASE OF NATURAL FOCUS DISEASE

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The distribution and spread of natural focus disease are closely related to the geographical environment. China has a vast territory, complex and diverse natural environment, abundant flora and fauna, the pathogen host and the media are widely distributed. In recent years, with the development of China’s economy, the construction of new urbanization and the increase of people’s outdoor activities, the probability of human entry into the natural foci and infection by pathogens is increasing. There is an urgent need to carry out research on the relationship between natural focus disease and geographical environment. In order to establish a scientific database to support this study, this study is based on the general understanding of natural focus disease and geographical environment, combing the elements of geographical and environmental data that need to be collected and sorted, including terrain, landform, temperature, precipitation, vegetation, Soil, and ecosystem types etc. For the application requirements of natural focus diseases and geographical visualization mapping and analysis, establish the index system of geographical environment element; based on network database and information system technology, a database system of environmental factors related to natural foci of natural focus disease was designed.

Key word: natural focus disease; geographical environment; data reorganization; database
DATA MANAGEMENT PROGRESS AT WDC FOR GEOPHYSICS, BEIJING

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Among all kinds of ionospheric data, ionogram from the vertical sounding measurement is the one with longest history for ionospheric observation and research. Wuhan ionospheric observatory (30.5°N, 114.6°E) is the oldest ionosonde station in China. It started to operate in 1946 and has made continuously ionospheric vertical sounding for nearly 70 years since then. A large amount of ionogram data have been accumulated, among which 46 years’ data were stored in analog way, including 11 years on coordinate papers (1946-1956) and 35 years on 35mm film (1957-1991). Since 2009, the WDC for Geophysics, Beijing has made an effort to archive and digitize the analog ionograms. The film ionograms were scanned into images and converted to digital ionogram. The ionospheric parameters and electron density profiles were retrieved from manually ionogram scaling. The main purpose of this work is to preserve the valuable historical data in digital format and make better use of the digitized data for long term ionospheric research. A series of analysis methods and software have been developed for displaying, annotating, checking and converting the ionogram images. 1,160,000 film ionograms from 1957 to 1991 and 95,000 coordinate paper ionograms during 1946-1956 in Wuhan, China are digitized and archived.

Aiming at managing and sharing the ionosphere data and its derivatives of different stages and different types, a data sharing system has been designed. The core metadata standard of ionosphere data is developed. The system is realized under J2EE environment using programming languages such as JSP. It provides users with various data querying mode according to the relation among types of ionosphere data, and also with many other functions such as online data viewing, automatic generation of data report and statistic figure.

Besides the processing of ionospheric data, we have also dealt with the historical geomagnetic data, meteor radar data, and GNSS data. The historical geomagnetic data have been converted to the IAGA2002 Data Exchange Format. The GNSS data have been converted to Rinex format. Then, all the data stored by WDC for Geophysics, Beijing can be easily shared to the users.

We also host the mirror sites of Madrigal Database (http://madrigal.iggcas.ac.cn/) and DIDBase (http://www.epp.ac.cn/DIDBase.asp). The Madrigal Database is an upper atmospheric science database used by groups throughout the world and it is developed by the MIT Haystack Observatory. The DIDBase is created by the University of Massachusetts Lowell. It provides accurate specification of the electron density in the Earth’s ionosphere at more than 60 locations in the world.

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ACTIVITIES OF THE WORLD DATA CENTER FOR GEOMAGNETISM, KYOTO

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The World Data Center for Geomagnetism Kyoto is operated by the Data Analysis Center for Geomagnetism and Space Magnetism (DACGSM). DACGSM is also in charge of student education as well as scientific research on Geomagnetism, Space Magnetism and related Informatics. As a member of the WDS, it is also our task to collect geomagnetic data from all over the globe and make them open to the public. For that purpose, we join the INTERMAGNET and operate a GIN (Geomagnetic Information Node). Our mission here in Kyoto, therefore, can be said three-fold, namely, ‘education’, ‘research’ and ‘data service’. Among those regular activities, IUGONET, derivation of AE/Dst indices and new geomagnetic data acquisition in logistically remote places are classified into the activities proper to WDC for Geomagnetism, Kyoto. IUGONET, Inter-university Upper atmosphere Global Observation NETwork, is a project among universities and research institutions and has been constructing a data system with a common metadata database for synthetic use of distributed databases among the institutions. We are now collaborating with ESPAS, an EU’s data system similar to the IUGONET. We are working with German colleague in Potsdam (Mr. B. Ritschel and Prof. G. Neher) to develop a “Vocabulary Broker” as a basic component of interoperability. One of our new activity is an effort to promote “data publication” in Japan, and we are collaborating with JaLC (Japan Link Center) and NICT (National Institute of Information and Communications Technology). We are also trying to promote “Open Science Data” having domestic workshops.

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LONG-TERM ARCHIVE SYSTEM FOR UNIVERSITY-WIDE RESEARCH DATA PRESERVATION

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In 2013 and 2014, Japanese academia was shocked by high-profile incidents of scientific misconduct. Members of the academy at research institutes and their colleagues at government offices and academic societies were called upon to help with the urgent reconstruction and development of policy, guidelines, and procedures to ensure research integrity. In particular, a mandate for preservation of research data more than 10 years was issued for both researchers and research institutes. For many researchers, it is a natural assumption that their research data should be kept for as long as possible, protected from data loss and corruption due to any accidental or artificial reason. However, this becomes extremely difficult to achieve when data preservation is mandated to every researcher. Ensuring the availability and integrity of research data for more than 10 years goes beyond an individual researcher’s personal IT skills. Because of such circumstances, Kyoto University and its central IT division (Institute for Information Management and Communication, IIMC) decided to develop and provide a long-term data preservation system.

IIMC designed a stable and cost-effective research data archiving system in FY2016. This system consists of an enterprise content management (ECM) system and an optical disc storage system. The schematic concept is shown in Fig. 1. ECM provides user interface for document management, such as “access control and auditing”, “metadata tagging”, “revision management” and “searchable content and metadata.” However, it is difficult to secure research data for the long-term with ECM due to the shorter lifetime of ECM system hardware, software and database structure compared to the required time for preservation. This problem could be solved by connecting ECM with other long-term preservation archiving systems in which retrieved data is archived on classical and open data formats and file systems. For this system, the IIMC utilizes an Oracle WebCenter Content (OWCC) and FUJITSU Eternus DA700 data archiver. OWCC is an instance of ECM software which provides the requisite functions mentioned above. The DA700 is a disc array system consisting of an Archival Disc. The Archival Disc is ‘write once read many (WORM)’ media and guarantees more than 50 years of data preservation time. Moreover, discs are assembled in a cartridge and may incorporate RAID5 or 6 to improve redundancy.

The typical scenario for data operation and archiving is as follows.

1. Users can create folders and upload their research data on OWCC. Users may organize their research data using OWCC functionality, such as tagging metadata, utilizing revision control, or sharing collaborators for local use.
2. A user can issue the ‘archive’ command on any folder under his/her administration. The archive command retrieves all content within a given folder and its descendants. These contents are copied to DA700 with additional information such as metadata, an access control list, etc. If content has several revisions on OWCC, the content’s owner can choose copying the latest version only or all revisions to DA700.
3. When the data copy from OWCC to DA700 is finished, index information on DA700 is included with the source content as metadata. Additionally, the access to the source content on OWCC is set to ‘read only,’ including for the owner of the content. This process ensures the contents on OWCC and DA700 are the same. The content owner may retrieve write or administrative access control with several steps on OWCC, and make a copy on DA700 again. This feature enables the user to keep archive revisions on DA700, as well as reducing frequent copying to DA700.

Under the system operation policy, no user can access the data archived in DA700. This means that the data in DA700 is treated as a ‘dark archive’ and also ensures fairness in the research data preservation procedure.
MANAGEMENT OF MARINE-EARTH SCIENCE DATA AND SAMPLES IN JAMSTEC

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The Data Management and Engineering Department of CEIST receives, collects and archives various data/samples collected by JAMSTEC through its research activities related to marine and earth surveys and observations, controls data quality, and develops and operates a data release system. Based on the Basic Policies on the Handling of Data and Samples by JAMSTEC, enacted in FY2007, we are managing and archiving data and samples obtained using JAMSTEC vessels and research submersibles/autonomous underwater vehicles carried by JAMSTEC vessels, and developing and operating an observational data release system. Researchers may access to the Data and Sample Research System for Whole Cruise Information (DARWIN) and find information for data, rock samples, and sediment core samples obtained by research vessels and submersibles, and links to related databases. JAMSTEC E-library of Deep-sea Images (J-EDI) provides an access to variety of unique deep-sea images. We have joined the Tohoku Ecosystem-Associated Marine Sciences (TEAMS)—a program launched in February 2012 for surveys and research on marine ecosystems around 2011 Tohoku earthquake region—and are developing a data management system for disseminating and providing research results and information obtained in this program and building data sharing/release systems. Release of biodiversity information is also our major task. We comprehensively distribute JAMSTEC-owned biological information using the Biological Information System for Marine Life (BISMaL), which handles information on diversity and distribution of marine organisms, collect information on diversity of marine organisms around Japan, and widely release it after systematically organizing it. Since 2010, JAMSTEC has been serving as a Japanese node in the Ocean Biogeographic Information System (OBIS), and providing BISMaL data to OBIS. In light of the fact that OBIS was placed under the umbrella of the International Oceanographic Data and Information Exchange (IODE), a system managed by the Intergovernmental Oceanographic Commission of UNESCO (UNESCO/IOC), in January 2015, JAMSTEC was recognized as an IODE Associate Data Unit (ADU).
ICSWSE/MAGDAS DATA ACTIVITY

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MAGnetic Data Acquisition System (MAGDAS) Project (PI: Dr. A. Yoshikawa) is a worldwide ground magnetometer network operated by International Center for Space Weather Science and Education (ICSWSE), Kyushu University (http://www.icswse.kyushu-u.ac.jp/). Currently, 74 magnetometers and 3 FM-CW (Frequency Modulated Continuous Wave) radars have been installed for the purpose of conducting research in space physics and related fields. We also use MAGDAS data for other applications, space weather nowcasting and forecasting report, education/capacity building called “MAGDAS School”, and so on. MAGDAS instruments send observational data to ICSWSE in near real-time via the Internet. We provide various kind of information for space weather research and education developed by MAGDAS data from portal site for our data (http://data.icswse.kyushu-u.ac.jp/). One of our products, EE-index is proposed to monitor temporal and long-term variations of the equatorial electrojet by using MAGDAS magnetometers installed equator region. In addition, we provide MAGDAS information via optimized metadata database and analysis software developed by IUGONET (Inter-university Upper Atmosphere Observation NETwork). Of course, we are also promoting to worldwide data sharing, for example, in cooperation with SuperMAG project. In this paper, we will introduce the MAGDAS project and our current data activity.

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FITSWEBQL: A PREVIEW SYSTEM FOR RADIO-ASTRONOMY FITS CUBE FILES

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The poster showcases a new experimental version 3 of the interactive ALMA WebQL web service in operation at the Japanese Virtual Observatory (http://jvo.nao.ac.jp/index-e.html). As the size of the publicly released ALMA datasets keeps growing it has become necessary to update the ALMA web service yet again in order to deal with recent increases in data volumes. Whilst version 2 - introduced in 2016 - made it possible to preview smoothly in a web browser 25 GB-large FITS files, version 3 lays foundations towards supporting an interactive preview of terabyte-class FITS files. In addition to handling larger files, ALMAWebQL3 also improves support for real-time spectrum updates through tackling the latency problem in two ways. First, it introduces an adaptive frame rate control: monitoring the network latency and local web browser responsiveness, and reducing the FPS as and when necessary. Secondly, end user’s mouse movements are tracked in real time with the Kalman Filter, which is then used to predict the future target mouse position after taking into account network latency and computation time. By predicting mouse movements with the Kalman Filter, the two data streams (FITS spectrum updates over the network and local FITS image zooming in a browser) are close to being kept synchronised. Another innovation is the replacement of the lossless but inefficient PNG image format with a highly efficient but lossy HEVC-based BPG (Better Portable Graphics). This allows us to serve images over bandwidth-constrained connections, better supporting the East-Asian scientific community.

Accompanying ALMAWebQL3 is the FITSWebQL Personal Edition: a version of the ALMAWebQL server software made to run on local end-user computers (laptops, desktops), independent of the Japanese Virtual Observatory. It is freely available for download at http://jvo.nao.ac.jp/~chris/fitswebql.html. The software can be compiled and run on Linux, macOS and Windows 10 Linux Subsystem (Bash on Windows).

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DAGIK EARTH: AN EDUCATION AND PUBLIC OUTREACH ACTIVITY USING OPEN DATA SETS OF EARTH AND PLANETARY SCIENCES

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Dagik Earth is an education and public outreach activity to enjoy the scientific outputs on the Earth and planets with three-dimensional digital globe in classrooms, science museums and home. The three-dimensional presentation system is easy to use and low-cost with a standard PC with Windows or Mac, and a standard PC projector. The software is provided by Dagik Earth project with free of charge for education and scientific usages. The Dagik Earth application is available for iOS devices. More than ten science museums use it as a regular exhibition. It is also frequently used in science and school festivals. Any white spheres, such as balloons, balance balls, and lamp shades, can be used as a spherical screen. The users improvise the system using their own equipment according to the purpose and environment of the exhibition. The system of Dagik Earth used at an exhibition in the National Museum of Nature and Science, Tokyo was shown in Figure 1. This exhibition was held in a science fair, “Museum for teachers”. A 2m balloon was used as the spherical screen. The contents of Dagik Earth cover wide field of science. The number of contents of Dagik Earth is more than 150. They are categorized into five fields, “Atmosphere/Ocean”, “Earth’s surface/interior”, Planets/Moons”, “Geo-space”, and “Misc.”. Most of them were developed using the open data sets of Earth and planetary sciences. The data was obtained from the databases of the open data, and visualized in equirectangular projection format for the Dagik Earth software. The descriptions of the data and the database are displayed in the caption on the screen. It intends to lead the Dagik Earth users who are interested in the data to the databases for their own intensive usage of the data sets. Dagik Earth is used in various purposes, and the various types of data is used for the Dagik Earth contents. Dagik Earth gets benefit from the open data policy of various data sets, including WDS data. We think that it is successful if the community of the data users and providers of Dagik Earth can connect the science data to the public. The home page of Dagik Earth is http://earth.dagik.org/english. Some of the contents can be displayed on Web browsers from http://dagik.org/dow/index-english.html.

Figure 1. An exhibition using Dagik Earth in the National Museum of Nature and Science, Tokyo

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IOC STRATEGIC PLAN FOR OCEANOGRAPHIC DATA AND INFORMATION MANAGEMENT (2017-2021) AND IODE

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The IOC Strategic Plan for Oceanographic Data and Information Management (2017-2021) was discussed and approved at the 29th session of UNESCO Intergovernmental Oceanographic Commission (IOC) Assembly in June 2019 and is now published as IOC Manuals and Guides No. 77. The vision of this Strategy Plan is to achieve: “A comprehensive and integrated ocean data and information system, serving the broad and diverse needs of IOC Member States, for both management and scientific use.”. The following five outputs will be expected to achieve the strategy plan through a number of targeted activities and related actions:

1. Improved ability to integrate national, regional and global data systems.
2. Improved capability and functionality of systems in the centres managing oceanographic data and information.
3. Promote free and open access to oceanographic data and information and adherence to IOC Oceanographic Data Exchange policy.
4. Address the needs of both the scientific users and society at large for the demand for access to quality data and information.
5. Strengthened capacity to manage oceanographic data and information.

The International Oceanographic Data and Information Exchange (IODE) was established in 1961 at the 1st session of IOC Assembly to enhance marine research, exploitation and development, by facilitating the exchange of oceanographic data and information between participating Member States, and by meeting the needs of users for data and information products. Since its establishment, IODE has been playing important role world widely in oceanographic data and information management in cooperation with National Oceanographic Data Centers established in Member States and World Data Centers of ICSU. The IODE has been now recognized as a family of World Data System (WDS) of ICSU. To ensure achievement of the objectives of the Strategy Plan, the close cooperation with the IOC programmes and partners is required.

Details of the Strategy Plan will be introduced in the poster.

REFERENCES

When the solar activity is high and the magnetic field in the solar wind is suitable to the Earth’s magnetic field, the solar wind pass through the magnetic field and effect to near-Earth space, satellite, space station, or radio infrastructures. We monitor the condition of sun, solar wind and near-Earth space. This is the space weather. For example of space weather application, ICAO, International Civil Aviation organization, UN is now planning to use space weather information in civil aviation to keep stable use of the communications and satellite positioning and avoid hard radiation exposure.

Japan has contributed to space weather researches for nearly a century. Work on space weather research began in 1915 at the Hiraiso branch (known as the Hiraiso Solar Observatory, National Institute of Information and Communications Technology (NICT) and closed in 2016). Ionospheric research for stable radio telecommunications started before World War II, and radio wave propagation forecasting service began in the 1940s. Routine ionospheric observation by ionosondes has been conducted in Japan and Antarctica since 1957, which is the International Geophysical Year (IGY). NICT has been operating a space weather forecasting service as one of the International Space Environment Service (ISES) Space Weather Information Centers since 1989. NICT had hosted and operated the WDC for Ionosphere since 1957 and have been operating the WDC for Ionosphere and Space Weather (WDC-ISW) under the auspices of ICSU WDC since 2012. NICT collects and archives data and information on ionosphere and space weather, and makes them available to the public. Published data are used by a wide range of users including public organizations, research institutions, and universities.

Recently, we have been replacing the current 10C type ionosondes with Vertical Incidence Pulsed Ionospheric Radar 2 (VIPIR2) ionosondes which can separate the O-mode and X-mode ionospheric echoes automatically. In addition to ionosonde observations, we have developed two-dimensional total electron content (TEC) observation technique over Japan using the dense GNSS network, GEONET since mid-1990s. The TEC maps are now available on a real-time basis using streaming data of GEONET. We have developed ionospheric storm monitoring system based on the real-time observation data and a new ionospheric storm scale, I-scale, which is defined using the long-term ionospheric data in Japan (Nishioka et al., 2017). In this presentation, we will introduce recent activity and future plan of ionospheric observation in NICT.

REFERENCES

11 September 2017 – Tokyo, Japan and The Hague, Netherlands

The ICSU World Data System (ICSU-WDS) and the Data Seal of Approval (DSA) are pleased to announce the launch of a new certification organization: CoreTrustSeal.

CoreTrustSeal offers to any interested data repository a core level certification based on the DSA–WDS Core Trustworthy Data Repositories Requirements catalogue and procedures. This universal catalogue of requirements reflects the core characteristics of trustworthy data repositories and is the culmination of a cooperative effort between DSA and WDS under the umbrella of the Research Data Alliance to merge their data repositories certifications.

CoreTrustSeal Data Repository certification replaces the DSA certification and WDS Regular Members certification. The CoreTrustSeal Data Repository online certification tool will become available before the end of 2017. New DSA applications will then be channeled through CoreTrustSeal. It is also expected that previously DSA-certified repositories will transition to CoreTrustSeal as they renew their certification. Likewise, WDS now requires its Regular Members applying for, or renewing membership to gain CoreTrustSeal Data Repository certification.

CoreTrustSeal is governed by a Standards and Certification Board composed of elected members representing the Assembly of Reviewers and appointed members representing the wider data repositories stakeholders. An ad hoc Board established by WDS and DSA is assuming its responsibilities until the founding Board is designated. An Advisory Committee will be also appointed to assist the CoreTrustSeal Board fulfill its mission and objectives.

CoreTrustSeal is a community based non-profit organization promoting sustainable and trustworthy data infrastructures. It is currently supported by a distributed Secretariat with in-kind contributions from WDS and DANS (Data Archiving and Networked Services) in the Netherlands.

Driven by the commitments to offer professional certification tools and services to data repositories and to support volunteer qualified reviewers conduct audits in optimum conditions, CoreTrustSeal is developing a sustainable business model. As an initial step a modest fee to cover administrative costs will be charged as of January 2018.

The CoreTrustSeal certification is envisioned as the first step in a global framework for repository certification which includes the extended level certification (nestor-Seal DIN 31644) and the formal level certification (ISO 16363). Ultimately, CoreTrustSeal will also endeavour to provide core level certification for other research entities such as data services and software.

For more information check out the CoreTrustSeal website.
An Introduction to the Core Trustworthy Data Repositories Requirements

The Core Trustworthy Data Repository Requirements were developed by the DSA–WDS Partnership Working Group on Repository Audit and Certification, a Working Group (WG) of the Research Data Alliance. The goal of the effort was to create a set of harmonized common requirements for certification of repositories at the core level, drawing from criteria already put in place by the Data Seal of Approval (DSA) and the ICSU World Data System (ICSU-WDS). An additional goal of the project was to develop common procedures to be implemented by both DSA and ICSU-WDS. Ultimately, the DSA and ICSU-WDS plan to collaborate on a global framework for repository certification that moves from the core to the extended (nestor-Seal DIN 31644), to the formal (ISO 16363) level.

Importance of Certification

National and international funders are increasingly likely to mandate open data and data management policies that call for the long-term storage and accessibility of data. If we want to be able to share data, we need to store them in a trustworthy data repository. Data created and used by scientists should be managed, curated, and archived in such a way to preserve the initial investment in collecting them. Researchers must be certain that data held in archives remain useful and meaningful into the future. Funding authorities increasingly require continued access to data produced by the projects they fund, and have made this an important element in Data Management Plans. Indeed, some funders now stipulate that the data they fund must be deposited in a trustworthy repository.

Sustainability of repositories raises a number of challenging issues in different areas: organizational, technical, financial, legal, etc. Certification can be an important contribution to ensuring the reliability and durability of data repositories and hence the potential for sharing data over a long period of time. By becoming certified, repositories can demonstrate to both their users and their funders that an independent authority has evaluated them and endorsed their trustworthiness.

Core Certification and its Benefits

Nowadays certification standards are available at different levels, from a core level to extended and formal levels. Even at the core level, certification offers many benefits to a repository and its stakeholders.

Core certification involves a minimally intensive process whereby data repositories supply evidence that they are sustainable and trustworthy. A repository first conducts an internal self-assessment, which is then reviewed by community peers. Such assessments help data communities—producers, repositories, and consumers—to improve the quality and transparency of their processes, and to increase awareness of and compliance with established standards. This community approach guarantees an inclusive atmosphere in which the candidate repository and the reviewers closely interact.

In addition to external benefits, such as building stakeholder confidence, enhancing the reputation of the repository, and demonstrating that the repository is following good practices, core certification provides a number of internal benefits to a repository. Specifically, core certification offers a benchmark for comparison and helps to determine the strengths and weaknesses of a repository.

Completing a self-assessment is very useful even if a repository does not wish to apply for core certification since it enables an appraisal of the repository’s internal procedures, which can be examined with respect to relevant criteria and updated where necessary. The current status of the repository is therefore made apparent, and can also serve for prospective accreditation. By submitting the application for review, the
repository’s procedures and documentation are additionally evaluated by external professionals, taking into account the specific aims and context; thus, the repository gains independent insights on how it may evolve and mature to further increase its trustworthiness. Finally, core certification offers a solid foundation for the repository to apply for a higher-level certification in the future.

With these benefits in mind, we encourage repositories to explore core certification, including the Core Trustworthy Data Repositories Requirements presented here: https://doi.org/10.17026/dans-22n-gk35.

**Governance**

DSA and ICSU-WDS agree to ongoing collaboration to ensure effective stewardship of their common requirements and common procedures. To that end, the DSA Board and WDS Scientific Committee will meet periodically to review and update the common requirements and common procedures and to issue new versions.
Background & General Guidance

The Core Trustworthy Data Repositories Requirements are intended to reflect the characteristics of trustworthy repositories. As such, all Requirements are mandatory and are equally weighted, standalone items. Although some overlap is unavoidable, duplication of evidence sought among Requirements has been kept to a minimum where possible. The choices contained in checklists (e.g., repository type and curation level) are not considered to be comprehensive, and additional space is provided in all cases for the applicant to add ‘other’ (missing) options. This and any comments given may then be used to refine such lists in the future.

Each Requirement in the Catalogue is accompanied by guidance text to assist applicants in providing sufficient evidence that their repositories meet the Requirement, outlining the types of information that a reviewer will expect in order to perform an objective assessment. Furthermore, the applicant must indicate a compliance level for each of the Requirements:

- 0 – Not applicable
- 1 – The repository has not considered this yet
- 2 – The repository has a theoretical concept
- 3 – The repository is in the implementation phase
- 4 – The guideline has been fully implemented in the repository

Compliance levels provide a useful part of the self-assessment process, but all applicants will be judged against statements supported by appropriate evidence; not against self-assessed compliance levels. In this regard, if the applicant believes a Requirement is not applicable, the reason for this must be documented in detail. Note also that compliance levels 1 and 2 can be valid for internal self-assessments, while certification may be granted if some guidelines are considered to be at level 3—in the implementation phase—since the Requirements include an assumption of a repository’s continuous improvement.

Responses must be in English. Although attempts will be made to match reviewers to applicants in terms of language and discipline, this is not always possible. If evidence is in another language, an English summary must be provided in the self-assessment.

Because core certification does not involve a site visit, the Requirements should be supported by links to public evidence. Nevertheless, it is understood that for reasons such as security, it may not always possible to include all information on an organization’s website, and provisions are made within the certification process for repositories who want sensitive parts of their evidence to remain confidential.

Repositories are required to be reassessed every three years. It is recognized that while basic systems and capabilities evolve continuously according to technology and user needs, they may not undergo major changes in this timeframe. However, the Trustworthy Repository ISO standard (ISO 16363) has a five-year review cycle, and a shorter period is considered necessary for a core trust standard to allow for possible modifications and corrections. Hence, an organization with well-managed records and business processes should reasonably expect to be able to submit an application with only minimal revisions after three years, unless the Requirements themselves have been updated within the intervening period.

Glossary of Terms

Please refer to the Core Trustworthy Data Repositories Requirements Glossary: https://goo.gl/rQK5RN.
Requirements

Background Information

Context

R0. Please provide context for your repository.

– Repository Type. Select all relevant types from:
  ● Domain or subject-based repository
  ● Institutional repository
  ● National repository system, including governmental
  ● Publication repository
  ● Library/Museum/Archives
  ● Research project repository
  ● Other (Please describe)

Comments

– Brief Description of the Repository’s Designated Community

– Level of Curation Performed. Select all relevant types from:
  A. Content distributed as deposited
  B. Basic curation – e.g., brief checking, addition of basic metadata or documentation
  C. Enhanced curation – e.g., conversion to new formats, enhancement of documentation
  D. Data-level curation – as in C above, but with additional editing of deposited data for accuracy

Comments

– Outsource Partners. If applicable, please list them.

– Other Relevant Information

Response

Guidance:
To assess a repository, reviewers need some information about the repository to set it in context. Please select from among the options and provide details for the items that appear in the Context requirement.

(1) Repository Type. This item will help reviewers understand what function your repository performs. Choose the best match for your repository type (select all that apply). If none of the categories is appropriate, feel free to provide another descriptive type. You may also provide further details to help the reviewer understand your repository type.

(2) Repository’s Designated Community. This item will be useful in assessing how the repository interacts and communicates with its target community. Please make sure that the response is specific—for example, ‘quantitative social science researchers and instructors’.

(3) Level of Curation. This item is intended to elicit whether the repository distributes its content to data consumers without any changes, or whether the repository adds value by enhancing the content in some way. All levels of curation assume initial deposits are retained unchanged and that edits are only made on copies of those originals. Annotations/edits must fall within the terms of the licence agreed with the data producer and be clearly within the skillset of those undertaking the curation. Thus, the repository will be expected to demonstrate that any such annotations/edits are undertaken and documented by appropriate experts and that the integrity of all original copies is maintained. Knowing this will help reviewers in assessing other certification requirements. Further details can be added that would help to understand the
levels of curation you undertake.

(4) **Outsource Partners.** Please provide a list of Outsource Partners that your organization works with, describing the nature of the relationship (organizational, contractual, etc.), and whether the Partner has undertaken any trustworthy repository assessment. Such relationships may include, but are not limited to: any services provided by an institution you are part of, storage provided by others as part of multicopy redundancy, or membership in organizations that may undertake stewardship of your data collection when a business continuity issue arises. Moreover, please list the certification requirements for which the Partner provides all, or part of, the relevant functionality/service, including any contracts or Service Level Agreements in place. Because outsourcing will almost always be partial, you will still need to provide appropriate evidence for certification requirements that are not outsourced and for the parts of the data lifecycle that you control. Qualifications/certifications—including, but not limited to, the DSA or WDS certifications—are preferred for outsource partners. However, it is not a necessity for them to be certified. We understand that this can be a complex area to define and describe, but such details are essential to ensure a comprehensive review process.

(5) **Other Relevant Information.** The repository may wish to add extra contextual information that is not covered in the Requirements but that may be helpful to the reviewers in making their assessment. For example, you might describe:

- The usage and impact of the repository data holdings (citations, use by other projects, etc.).
- A national, regional, or global role that the repository serves.
- Any global cluster or network organization that the repository belongs to.
Organizational Infrastructure

I. Mission/Scope

R1. The repository has an explicit mission to provide access to and preserve data in its domain.

Compliance Level:

Response

Guidance:
Repositories take responsibility for stewardship of digital objects, and to ensure that materials are held in the appropriate environment for appropriate periods of time. Depositors and users must be clear that preservation of, and continued access to, the data is an explicit role of the repository.

For this Requirement, please describe:
- Your organization’s mission in preserving and providing access to data, and include links to explicit statements of this mission.
- The level of approval within the organization that such a mission statement has received (e.g., approved public statement, roles mandated by funders, policy statement signed off by governing board).

II. Licenses

R2. The repository maintains all applicable licenses covering data access and use and monitors compliance.

Compliance Level:

Response

Guidance:
Repositories must maintain all applicable licenses covering data access and use, communicate about them with users, and monitor compliance. This Requirement relates to the access regulations and applicable licenses set by the data repository itself, as well as any codes of conduct that are generally accepted in the relevant sector for the exchange and proper use of knowledge and information. Reviewers will be seeking evidence that the repository has sufficient controls in place according to the access criteria of their data holdings, as well as evidence that any relevant licences or processes are well managed.

For this Requirement, please describe:
- License agreements in use.
- Conditions of use (distribution, intended use, protection of sensitive data, etc.).
- Documentation on measures in the case of noncompliance with conditions of access and use.

Note that if all data holdings are completely public and without conditions imposed on users—such as attribution requirements or agreement to make secondary analysis openly available—then it can simply be stated.

This Requirement must be read in conjunction with R4 (Confidentiality/Ethics) to the extent that ethical and privacy provisions impact on the licenses. Assurance that deposit licences provide sufficient rights for the repository to maintain, preserve, and offer access to data is covered under R10 (Preservation Plan).
III. Continuity of access

R3. The repository has a continuity plan to ensure ongoing access to and preservation of its holdings.

Guidance:
This Requirement covers the measures in place to ensure access to, and availability of, data holdings, both currently and in the future. Reviewers are seeking evidence that preparations are in place to address the risks inherent in changing circumstances.

For this Requirement, please describe:
- The level of responsibility undertaken for data holdings, including any guaranteed preservation periods.
- The medium-term (three- to five-year) and long-term (> five years) plans in place to ensure the continued availability and accessibility of the data. In particular, both the response to rapid changes of circumstance and long-term planning should be described, indicating options for relocation or transition of the activity to another body or return of the data holdings to their owners (i.e., data producers). For example, what will happen in the case of cessation of funding, which could be through an unexpected withdrawal of funding, a planned ending of funding for a time-limited project repository, or a shift of host institution interests?

Evidence for this Requirement should relate more to governance than to the technical information that is needed in R10 (Preservation plan) and R14 (Data reuse), and should cover the situation in which R1 (Mission/Scope) changes. This Requirement contrasts with R15 (Technical infrastructure) and R16 (Security) in that it covers full business continuity of the preservation and access functions.

IV. Confidentiality/Ethics

R4. The repository ensures, to the extent possible, that data are created, curated, accessed, and used in compliance with disciplinary and ethical norms.

Guidance:
Adherence to ethical norms is critical to responsible science. Disclosure risk—for example, the risk that an individual who participated in a survey can be identified or that the precise location of an endangered species can be pinpointed—is a concern that many repositories must address. Evidence sought is concerned with not only having good practices for data with disclosure risks, but also the necessity to maintain the trust of those agreeing to have personal/sensitive data stored in the repository.

For this Requirement, responses should include evidence related to the following questions:
- How does the repository comply with applicable disciplinary norms?
- Does the repository request confirmation that data collection or creation was carried out in accordance with legal and ethical criteria prevailing in the data producer’s geographical location or discipline (e.g., Ethical Review Committee/Institutional Review Board or Data Protection legislation)?
- Are special procedures applied to manage data with disclosure risk?
- Are data with disclosure risk stored appropriately to limit access?
- Are data with disclosure risk distributed under appropriate conditions?
Are procedures in place to review disclosure risk in data, and to take the necessary steps to either anonymize files or to provide access in a secure way?
Are staff trained in the management of data with disclosure risk?
Are there measures in place if conditions are not complied with?
Does the repository provide guidance in the responsible use of disclosive, or potentially disclosive data?

Evidence for this Requirement should be in alignment with provisions for the procedures stated in R12 (Workflows) and for any licenses in R2 (Licences).

### V. Organizational infrastructure

**R5. The repository has adequate funding and sufficient numbers of qualified staff managed through a clear system of governance to effectively carry out the mission.**

**Compliance Level:**

**Response**

**Guidance:**
Repositories need funding to carry out their responsibilities, along with a competent staff who have expertise in data archiving. However, it is also understood that continuity of funding is seldom guaranteed, and this must be balanced with the need for stability.

For this Requirement, responses should include evidence related to the following:

- The repository is hosted by a recognized institution (ensuring long-term stability and sustainability) appropriate to its Designated Community.
- The repository has sufficient funding, including staff resources, IT resources, and a budget for attending meetings when necessary. Ideally this should be for a three- to five-year period.
- The repository ensures that its staff have access to ongoing training and professional development.
- The range and depth of expertise of both the organization and its staff, including any relevant affiliations (e.g., national or international bodies), is appropriate to the mission.

Full descriptions of the tasks performed by the repository—and the skills necessary to perform them—may be provided, if available. Such descriptions are not mandatory, however, as this level of detail is beyond the scope of core certification.
VI. Expert guidance

**R6. The repository adopts mechanism(s) to secure ongoing expert guidance and feedback (either in-house, or external, including scientific guidance, if relevant).**

Compliance Level:

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**Guidance:**

An effective repository strives to accommodate evolutions in data types, data volumes, and data rates, as well as to adopt the most effective new technologies in order to remain valuable to its Designated Community. Given the rapid pace of change in the research data environment, it is therefore advisable for a repository to secure the advice and feedback of expert users on a regular basis to ensure its continued relevance and improvement.

For this Requirement, responses should include evidence related to the following questions:

- Does the repository have in-house advisers, or an external advisory committee that might be populated with technical members, data science experts, and disciplinary experts?
- How does the repository communicate with the experts for advice?
- How does the repository communicate with its Designated Community for feedback?

This Requirement seeks to confirm that the repository has access to objective expert advice beyond that provided by skilled staff mentioned in R5 (Organizational infrastructure).
Digital Object Management

VII. Data integrity and authenticity

R7. The repository guarantees the integrity and authenticity of the data.

Response

Guidance:
The repository should provide evidence to show that it operates a data and metadata management system suitable for ensuring integrity and authenticity during the processes of ingest, archival storage, and data access.

Integrity ensures that changes to data and metadata are documented and can be traced to the rationale and originator of the change.

Authenticity covers the degree of reliability of the original deposited data and its provenance, including the relationship between the original data and that disseminated, and whether or not existing relationships between datasets and/or metadata are maintained.

For this Requirement, responses on data integrity should include evidence related to the following:

- Description of checks to verify that a digital object has not been altered or corrupted (i.e., fixity checks).
- Documentation of the completeness of the data and metadata.
- Details of how all changes to the data and metadata are logged.
- Description of version control strategy.
- Usage of appropriate international standards and conventions (which should be specified).

Evidence of authenticity management should relate to the following questions:

- Does the repository have a strategy for data changes? Are data producers made aware of this strategy?
- Does the repository maintain provenance data and related audit trails?
- Does the repository maintain links to metadata and to other datasets? If so, how?
- Does the repository compare the essential properties of different versions of the same file? How?
- Does the repository check the identities of depositors?

This Requirement covers the entire data lifecycle within the repository, and thus has relationships with workflow steps included in other requirements—for example, R8 (Appraisal) for ingest, R9 (Documented storage procedures) and R10 (Preservation plan) for archival storage, and R12–R14 (Workflows, Data discovery and identification, and Data reuse) for dissemination. However, maintaining data integrity and authenticity can also be considered a mindset, and the responsibility of everyone within the repository.
VIII. Appraisal

R8. The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for data users.

Compliance Level:

Response

Guidance:
The appraisal function is critical in determining whether data meet all criteria for inclusion in the collection and in establishing appropriate management for their preservation. Care must be taken to ensure that the data are relevant and understandable to the Designated Community served by the repository.

For this Requirement, responses should include evidence related to the following questions:

- Does the repository use a collection development policy to guide the selection of data for archiving?
- Does the repository have quality control checks to ensure the completeness and understandability of data deposited? If so, please provide references to quality control standards and reporting mechanisms accepted by the relevant community of practice, and include details of how any issues are resolved (e.g., are the data returned to the data provider for rectification, fixed by the repository, noted by quality flags in the data file, and/or included in the accompanying metadata?)
- Does the repository have procedures in place to determine that the metadata required to interpret and use the data are provided?
- What is the repository’s approach if the metadata provided are insufficient for long-term preservation?
- Does the repository publish a list of preferred formats?
- Are quality control checks in place to ensure that data producers adhere to the preferred formats?
- What is the approach towards data that are deposited in non-preferred formats?

This Requirement addresses quality assurance from the viewpoint of the interaction between the depositor of the data and metadata and the repository. It contrasts with R11 (Data quality), which addresses metadata and data quality from the viewpoint of the Designated Community.

IX. Documented storage procedures

R9. The repository applies documented processes and procedures in managing archival storage of the data.

Compliance Level:

Response

Guidance:
Repositories need to store data and metadata from the point of deposit, through the ingest process, to the point of access. Repositories with a preservation remit must also offer ‘archival storage’ in OAIS terms.

For this Requirement, responses should include evidence related to the following questions:

- How are relevant processes and procedures documented and managed?
- What levels of security are required, and how are these supported?
- How is data storage addressed by the preservation policy?
- Does the repository have a strategy for backup/multiple copies? If so, what is it?
- Are data recovery provisions in place? What are they?
- Are risk management techniques used to inform the strategy?
- What checks are in place to ensure consistency across archival copies?
X. Preservation plan

R10. The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.

Response

Guidance:
The repository, data depositors, and Designated Community need to understand the level of responsibility undertaken for each deposited item in the repository. The repository must have the legal rights to undertake these responsibilities. Procedures must be documented and their completion assured.

For this Requirement, responses should include evidence related to the following questions:

- Is a preservation plan in place?
- Is the 'preservation level' for each item understood? How is this defined?
- Does the contract between depositor and repository provide for all actions necessary to meet the responsibilities?
- Is the transfer of custody and responsibility handover clear to the depositor and repository?
- Does the repository have the rights to copy, transform, and store the items, as well as provide access to them?
- Are actions relevant to preservation specified in documentation, including custody transfer, submission information standards, and archival information standards?
- Are there measures to ensure these actions are taken?

XI. Data quality

R11. The repository has appropriate expertise to address technical data and metadata quality and ensures that sufficient information is available for end users to make quality-related evaluations.

Response

Guidance:
Repositories must work in concert with depositors to ensure that there is enough available information about the data such that the Designated Community can assess the substantive quality of the data. Such quality assessment becomes increasingly relevant when the Designated Community is multidisciplinary, where researchers may not have the personal experience to make an evaluation of quality from the data alone. Repositories must also be able to evaluate the technical quality of data deposits in terms of the completeness and quality of the materials provided, and the quality of the metadata.

Data, or associated metadata, may have quality issues relevant to their research value, but this does not preclude their use in science if a user can make a well-informed decision on their suitability through provided documentation.

For this Requirement, please describe:
XII. Workflows

R12. Archiving takes place according to defined workflows from ingest to dissemination.

Response

Guidance:
To ensure the consistency of practices across datasets and services and to avoid ad hoc and reactive activities, archival workflows should be documented, and provisions for managed change should be in place. The procedure should be adapted to the repository mission and activities, and procedural documentation for archiving data should be clear.

For this Requirement, responses should include evidence related to the following:
- Workflows/business process descriptions.
- Clear communication to depositors and users about handling of data.
- Levels of security and impact on workflows (guarding privacy of subjects, etc.).
- Qualitative and quantitative checking of outputs.
- Appraisal and selection of data.
- Approaches towards data that do not fall within the mission/collection profile.
- The types of data managed and any impact on workflow.
- Decision handling within the workflows (e.g., archival data transformation).
- Change management of workflows.

This Requirement confirms that all workflows are documented. Evidence of such workflows may have been provided as part of other task-specific Requirements, such as for ingest in R8 (Appraisal), storage procedures in R9 (Documented storage procedures), security arrangements in R16 (Security), and confidentiality in R4 (Confidentiality/Ethics).
XIII. Data discovery and identification

**R13. The repository enables users to discover the data and refer to them in a persistent way through proper citation.**

**Compliance Level:**

**Response**

**Guidance:**
Effective data discovery is key to data sharing, and most repositories provide searchable catalogues describing their holdings such that potential users can evaluate data to see if they meet their needs. Once discovered, datasets should be referenceable through full citations to the data, including persistent identifiers to ensure that data can be accessed into the future. Citations also provide credit and attribution to individuals who contributed to the creation of the dataset.

For this Requirement, responses should include evidence related to the following questions:
- Does the repository offer search facilities?
- Does the repository maintain a searchable metadata catalogue to appropriate (internationally agreed) standards?
- Does the repository facilitate machine harvesting of the metadata?
- Is the repository included in one or more disciplinary or generic registries of resources?
- Does the repository offer recommended data citations?
- Does the repository offer persistent identifiers?

XIV. Data reuse

**R14. The repository enables reuse of the data over time, ensuring that appropriate metadata are available to support the understanding and use of the data.**

**Compliance Level:**

**Response**

**Guidance:**
Repositories must ensure that data can be understood and used effectively into the future despite changes in technology. This Requirement evaluates the measures taken to ensure that data are reusable.

For this Requirement, responses should include evidence related to the following questions:
- Which metadata are required by the repository when the data are provided (e.g., Dublin Core or content-oriented metadata)?
- Are data provided in formats used by the Designated Community? Which formats?
- Are measures taken to account for the possible evolution of formats?
- Are plans related to future migrations in place?
- How does the repository ensure understandability of the data?

The concept of ‘reuse’ is critical in environments in which secondary analysis outputs are redeposited into a repository alongside primary data, since the provenance chain and associated rights issues may then become increasingly complicated.

Reuse is dependent on the applicable licenses covered in R2 (Licenses).
Technology

XV. Technical infrastructure

R15. The repository functions on well-supported operating systems and other core infrastructural software and is using hardware and software technologies appropriate to the services it provides to its Designated Community.

Compliance Level: 

Response

Guidance:
Repositories need to operate on reliable and stable core infrastructures that maximizes service availability. Furthermore, hardware and software used must be relevant and appropriate to the Designated Community and to the functions that a repository fulfils. Standards such as the OAIS reference model specify the functions of a repository in meeting user needs.

For this Requirement, responses should include evidence related to the following questions:
- What standards does the repository use for reference? Are these international and/or community standards (e.g., Spatial Data Infrastructure (SDI) standards, OGC, W3C, or ISO 19115)? How often are these reviewed?
- How are the standards implemented? Are there any significant deviations from the standard? If so, please explain.
- Does the repository have a plan for infrastructure development? If so, what is it?
- Is a software inventory maintained and is system documentation available?
- Is community-supported software in use? Please describe.
- For real-time to near real-time data streams, is the provision of around-the-clock connectivity to public and private networks at a bandwidth that is sufficient to meet the global and/or regional responsibilities of the repository?

XVI. Security

R16. The technical infrastructure of the repository provides for protection of the facility and its data, products, services, and users.

Compliance Level: 

Response

Guidance:
The repository should analyze potential threats, assess risks, and create a consistent security system. It should describe damage scenarios based on malicious actions, human error, or technical failure that pose a threat to the repository and its data, products, services, and users. It should measure the likelihood and impact of such scenarios, decide which risk levels are acceptable, and determine which measures should be taken to counter the threats to the repository and its Designated Community. This should be an ongoing process.

For this Requirement, please describe:
- Procedures and arrangements in place to provide swift recovery or backup of essential services in the event of an outage.
- Your IT security system, disaster plan, and business continuity plan; employees with roles related to security (e.g., security officers); and any risk analysis tools (e.g., DRAMBORA) you use.

This Requirement describes some of the aspects generally covered by others—for example, R12
(Workflows)—and is supplementary to R9 (Documented storage procedures).

Applicant Feedback

Comments/feedback

These requirements are not seen as final, and we value your input to improve the core certification procedure. To this end, please leave any comments you wish to make on both the quality of the Catalogue and its relevance to your organization, as well as any other related thoughts.

Response