

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

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DOI in scientific journal articles

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Wp index: A new substorm index derived from high-resolution geomagnetic field data at low latitude

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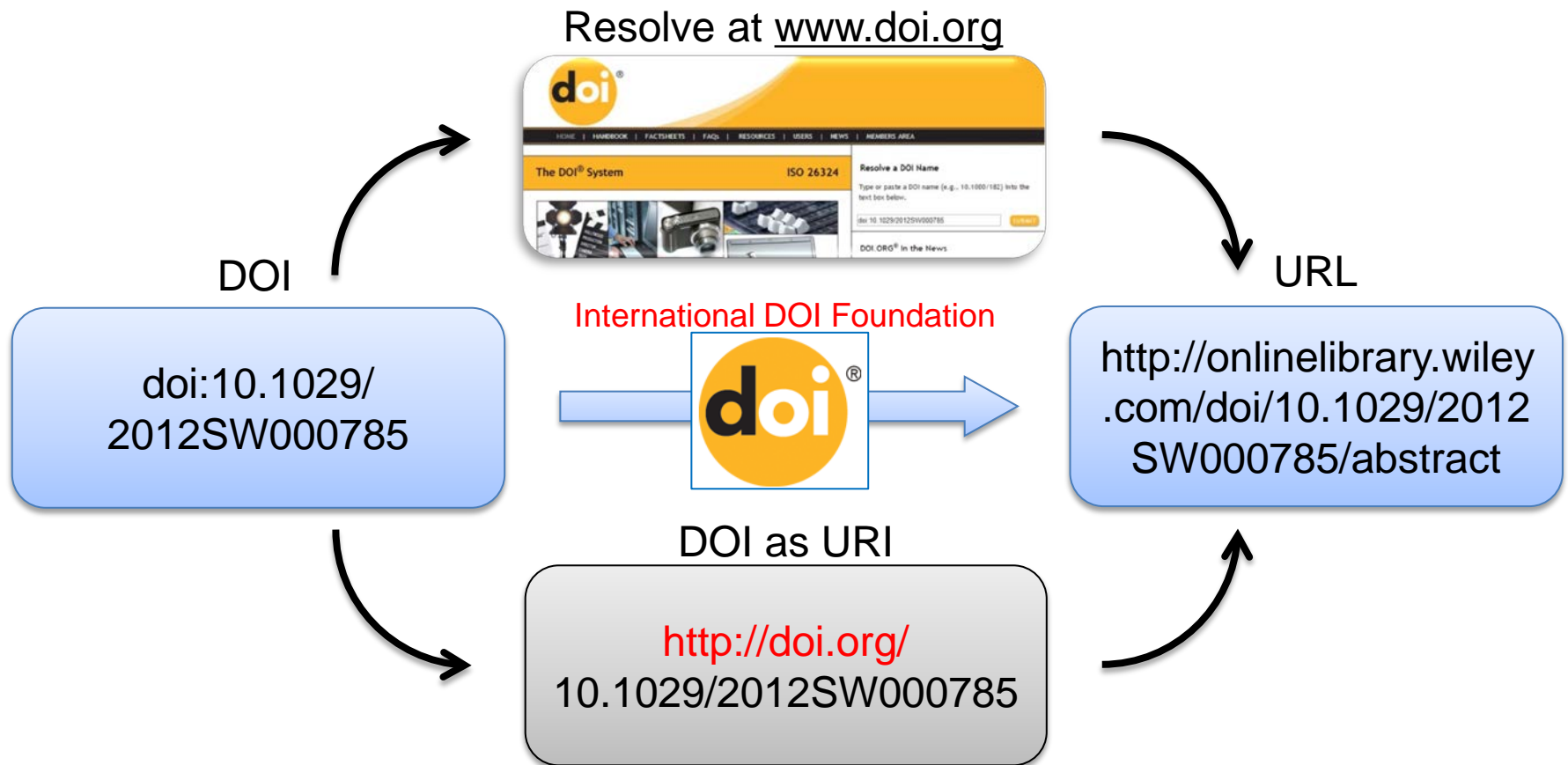
Received 27 February 2012; revised 6 June 2012; accepted 7 June 2012; published 1 August 2012.

[1] Geomagnetic field data with high time resolution (typically 1 s) have recently become more commonly acquired by ground stations. Such high time resolution data enable identifying Pi2 pulsations which have periods of 40–150 s and irregular (damped) waveforms. It is well-known that pulsations of this type are clearly observed at mid- and low-latitude ground stations on the nightside at substorm onset. Therefore, with 1-s data from multiple stations distributed in longitude around the Earth's circumference, substorm onset can be regularly monitored. In the present study we propose a new substorm index,

Citation: Nosé, M., et al. (2012), Wp index: A new substorm index derived from high-resolution geomagnetic field data at low latitude, *Space Weather*, 10, S08002, doi:10.1029/2012SW000785

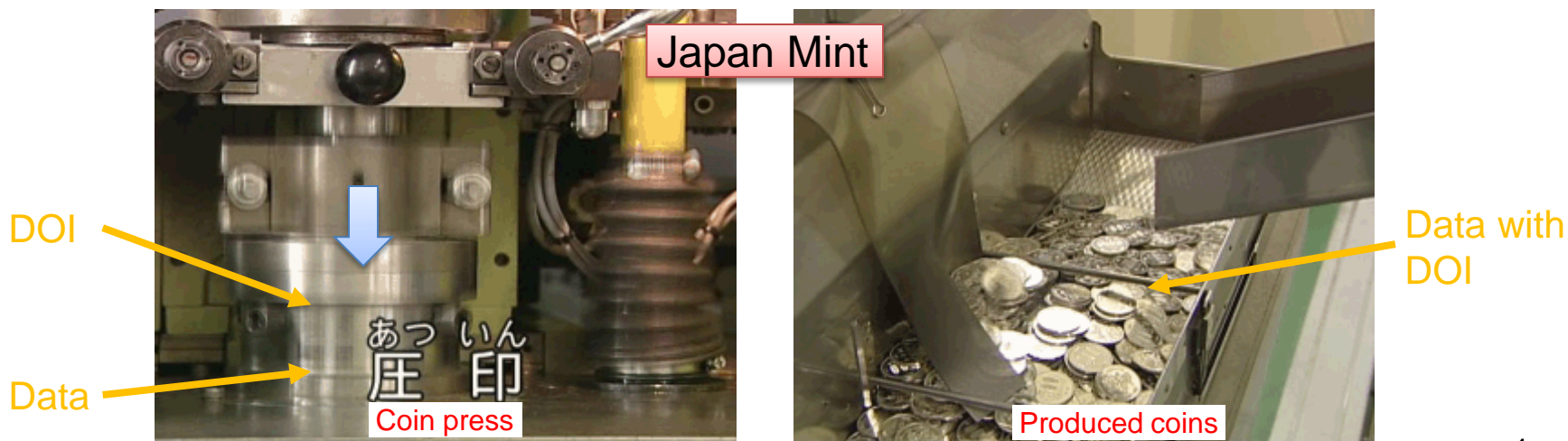
DOI (Digital Object Identifier)

- DOI is a persistent name that is resolved into URL, where users can obtain objects.
- International DOI Foundation (IDF) provides the system to resolve DOI.



DOI system and its extension to database

- The DOI system was originally developed by publishers.
 - There were a lot of types of identifiers/codes, such as CODEN, ISBN, ISSN, etc.
 - DOI was introduced as a common identifier.
- DOI started to come with publications since late 1990s. Now, more than 5000 publishers participate in the DOI system.
- **The next development of the DOI system is to extend it to database.**
- In various fields of Earth sciences, DOI is actually mint to database.
 - NASA/Earth Science Data and Information System, PAGAEA, NOAA/NGDC



Example of DOI-minting to Earth Science data in NOAA/NGDC

- EMAG2: Earth Magnetic Anomaly Grid (2-arc-minute resolution)

doi:10.7289/V5MW2F2P



http://www.ngdc.noaa.gov/nmmrview/metadata.jsp?id=gov.noaa.ngdc.mgg.geophysical_models:EMAG2&view=iso2html

Digital data

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-55.033333 -89.900000 -56.134989
-55.000000 -89.900000 -56.127400
-54.966667 -89.900000 -56.119808
-54.933333 -89.900000 -56.112213
-54.900000 -89.900000 -56.104616
-54.866667 -89.900000 -56.097016
-54.833333 -89.900000 -56.089413
-54.800000 -89.900000 -56.081806
-54.766667 -89.900000 -56.074197
-54.733333 -89.900000 -56.066584
-54.700000 -89.900000 -56.058968
-54.666667 -89.900000 -56.051348
-54.633333 -89.900000 -56.043725
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-54.500000 -89.900000 -56.013193
-54.466667 -89.900000 -56.004623
```

EMAG2: Earth Magnetic Anomaly Grid (2-arc-minute resolution)

doi:10.7289/V5MW2F2P

EMAG2 is a global Earth Magnetic Anomaly Grid compiled from satellite, ship, and airborne magnetic measurements. It is a significant update of our previous candidate grid for the World Digital Magnetic Anomaly Map. The resolution has been improved from 3 arc-minutes to 2 arc-minutes, and the altitude has been reduced from 5 km to 4 km above the geoid. Additional grid and track line data have been included, both over land and the oceans. Wherever available, the original shipborne and airborne data were used instead of precompiled oceanic magnetic grids. Interpolation between sparse track lines in the oceans was improved by directional gridding and extrapolation, based on oceanic crustal age model. The longest wavelengths (>330 km) were replaced with the latests CHAMP satellite magnetic field model MFG.

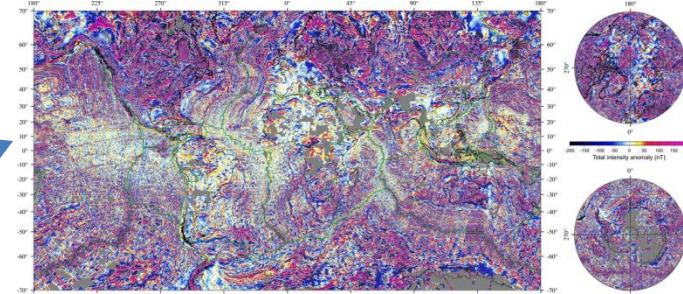
Get the Data

Access	Format(s)	Distributor(s) / Contact Info	Instructions / Constraints
download	Full Resolution Map		Use Limitation
EMAG2 Full Resolution Map	Format version: Version 2		Cite as: Stefan Maus (2009): EMAG2: Earth Magnetic Anomaly Grid (2-arc-minute resolution). National Geophysical Data Center, NOAA. Model, doi:10.7289/V5MW2F2P [access date]
PDF of Full Resolution Map of EMAG2 as a poster	Format specification: PDF of EMAG2 as a poster		
download	Full Resolution Map		
EMAG2 Full Resolution Map	Format version: Version 2		
PDF of Full Resolution Map of EMAG2 as a poster	Format specification: JPG of EMAG2 as a poster		
download	Full Resolution Map		
EMAG2 Full Resolution Map	Format version: Version 2		
JPG of Full Resolution Map of EMAG2 as a poster	Format specification: JPG of EMAG2 as an image		
download	Article		Produced by the NOAA National Geophysical Data Center. Not subject to copyright protection within the United States.
EMAG2 Full Resolution Map image	Format version: Version 2		
JPG of Full Resolution Map of EMAG2 as an image	Format specification: Preprint of manuscript "EMAG2: A 2-arc-minute resolution Earth Magnetic Anomaly Grid compiled from satellite, airborne and marine magnetic measurements", submitted for publication to <i>Geochem. Geophys. Geosyst.</i>		Not to be used for navigation. Although these

Landing Page

Data description,
Data format,
Link to data, etc.

Data plot



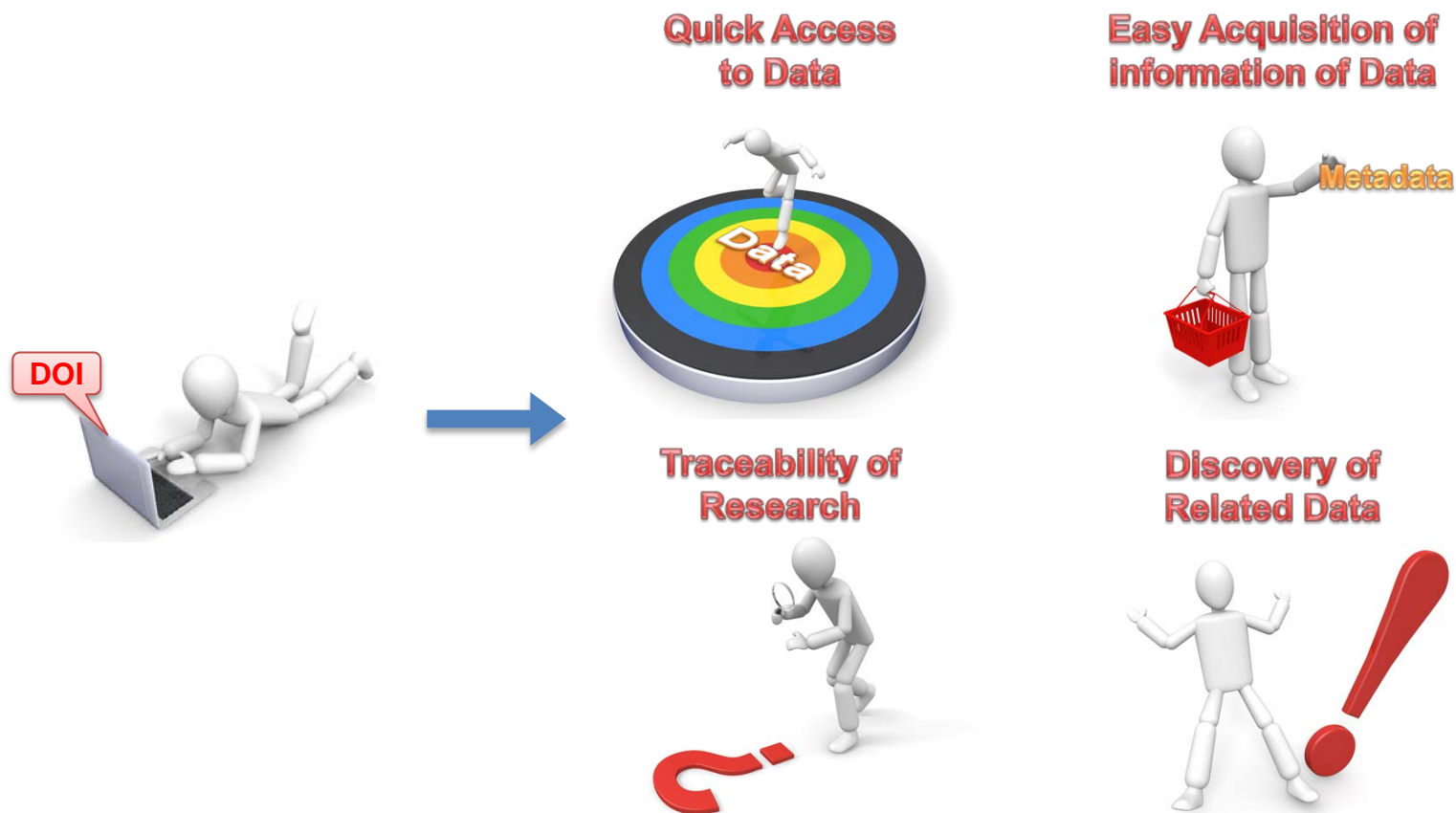
Instruction of data citation

Maus (2009): EMAG2: Earth Magnetic Anomaly Grid (2-arc-minute resolution). National Geophysical Data Center, NOAA. Model, doi:10.7289/V5MW2F2P [access date]

Benefit of DOI-minting to scientific database

For users

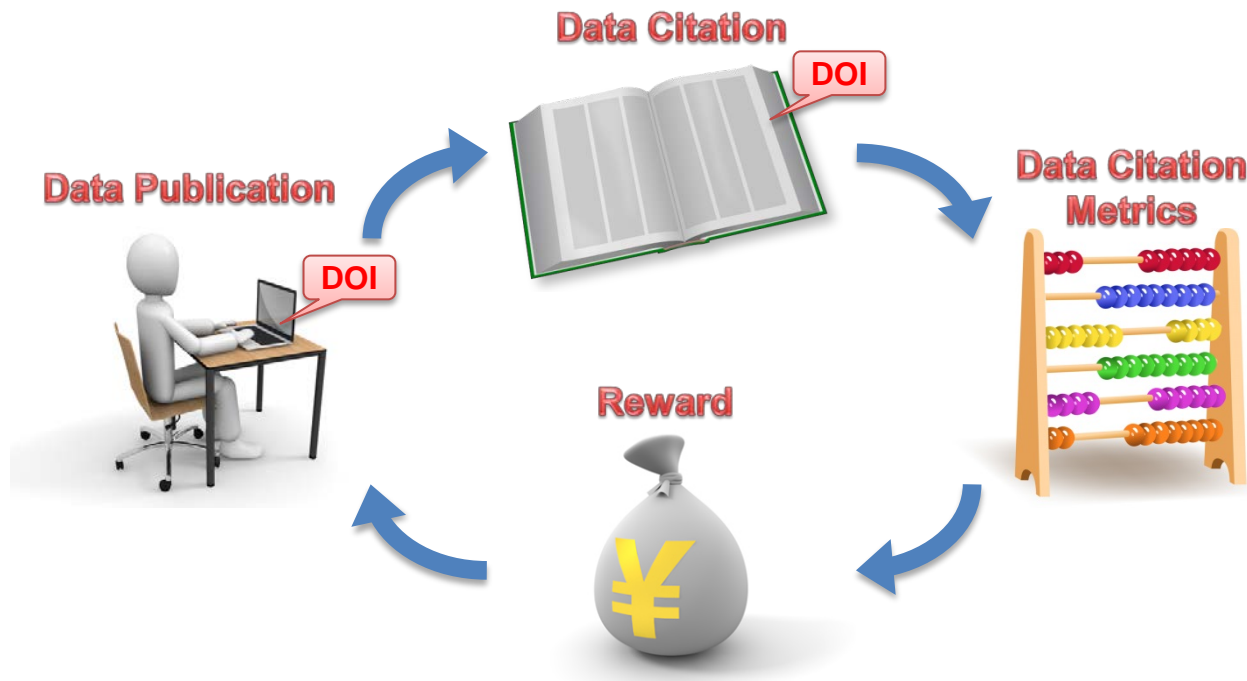
- Users can more easily locate the data used in the paper, obtain necessary information of the data (i.e., metadata), and validate the findings of the paper.
- Users can also easily discover datasets which are relevant to their interests but has not been noticed.



Benefit of DOI-minting to scientific database

For data providers/data centers

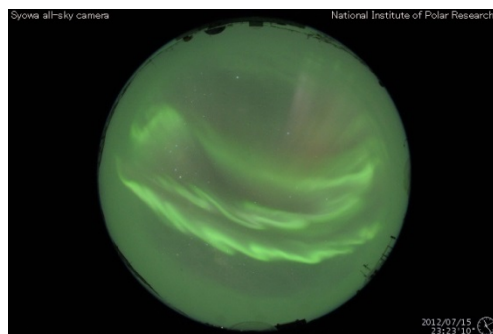
- Data providers can put necessary information about data (i.e., metadata) on their landing pages, and reduce labor to response to user's inquiries.
- Data providers **can gain professional recognition and rewards for their published data** in the same way as for traditional publications.
- Data centers **can receive proper credit of their work**, such as creating of data, formatting of data, management of database, adding new values to data by secondary data processing.



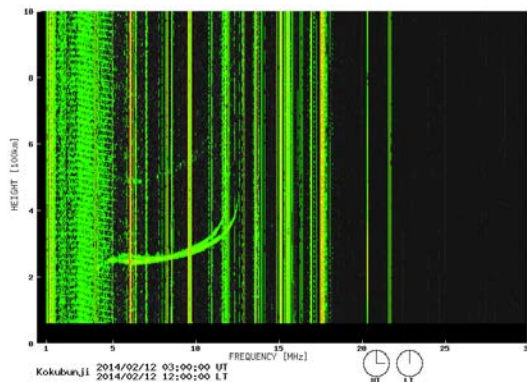
DOI-minting to STP database by WDCs in Japan

- Recognizing the importance of data citation, World Data Centers in Japan started discussion to mint DOI to their database in August 2013.
 - Integrated Science Data System Research Laboratory (NICT)
 - WDC for Aurora (National Institute of Polar Research)
 - WDC for Geomagnetism (Kyoto University)
 - WDC for Ionosphere and Space Weather (NICT)
 - WDC for Space Science Satellites (JAXA)

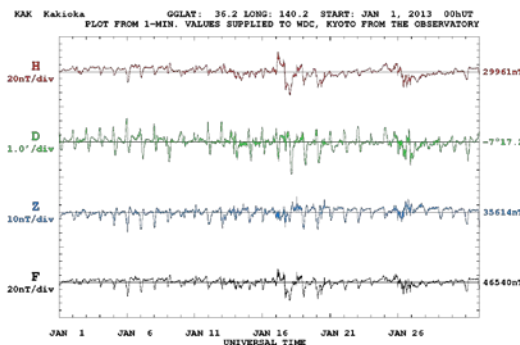
Aurora all-sky camera
(WDC for Aurora)



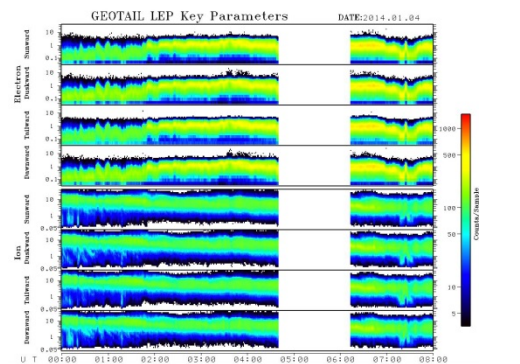
Ionograms
(WDC for Ionosphere
and Space Weather)



Magnetograms
(WDC for Geomagnetism)



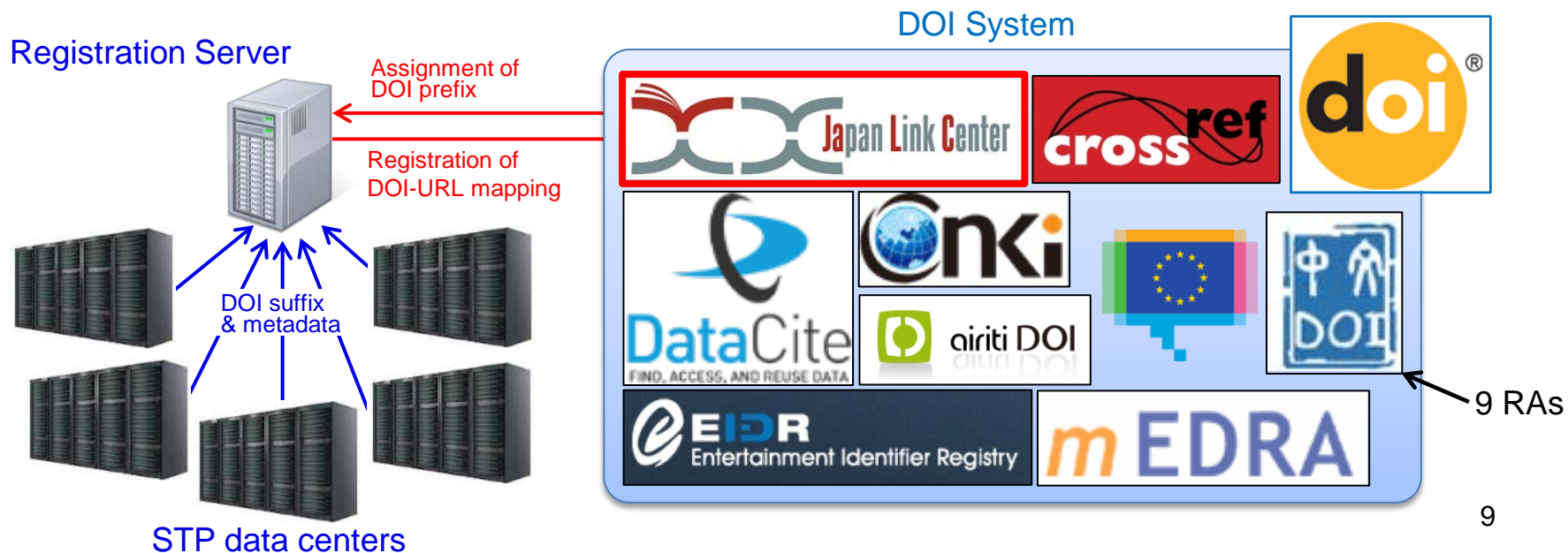
Satellite data of energetic
particle
(WDC for Space Science
Satellite)



Registration agency for DOI minting

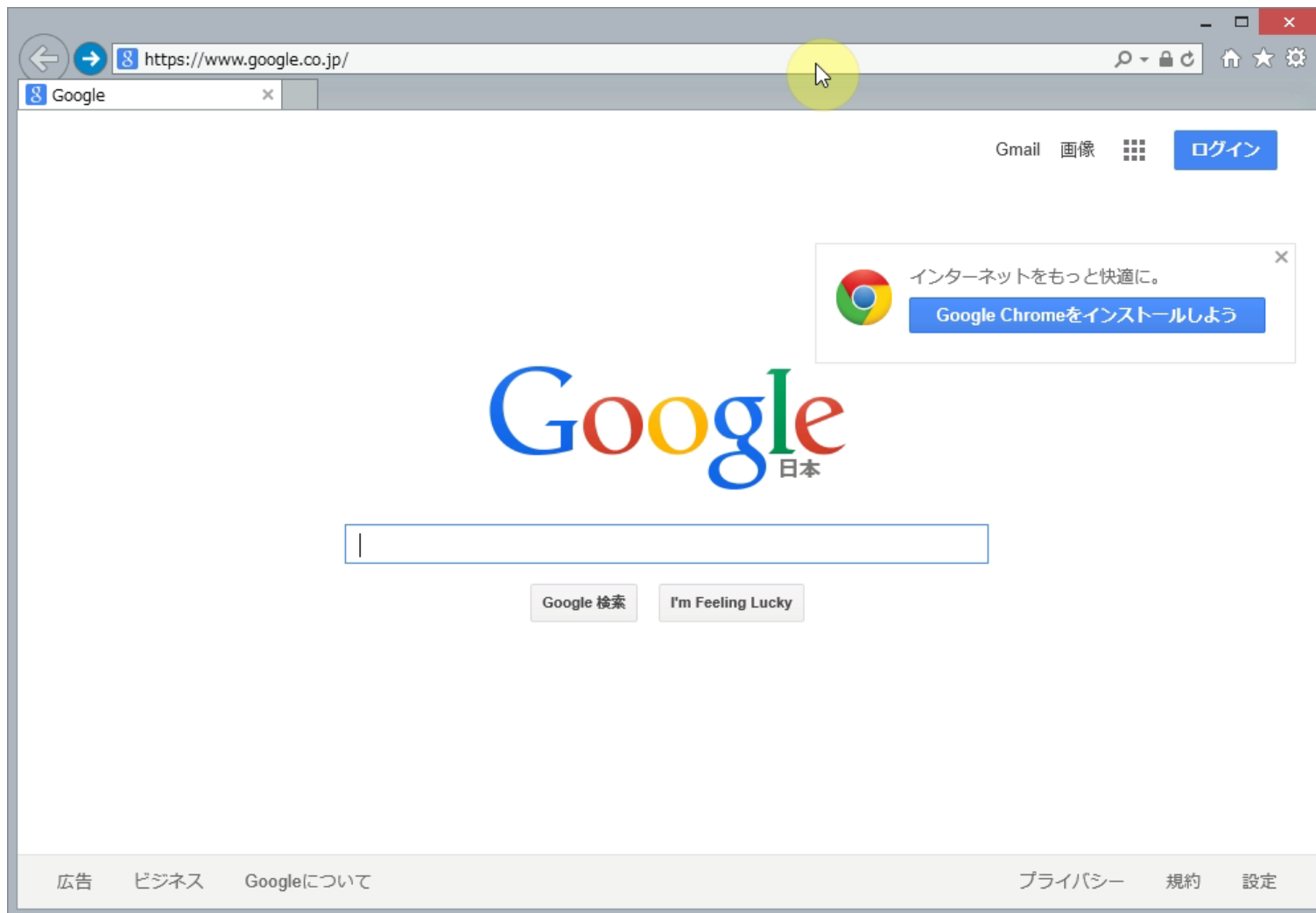
- DOI-URL mapping should be registered to a relevant “Registration Agency (RA)” which is qualified by International DOI foundation.
- Japan Link Center (JaLC) is a proper agency in our case, because JaLC handles scientific and academic metadata and content in Japan.
- We participate in the pilot program of DOI minting from October 2014.
- A registration server is developed to share among data centers.
- JaLC assigns a DOI prefix and data centers determine DOI suffix.

doi:10.12345/abcdefghijkl987
prefix suffix



Demonstration of DOI resolution

- Resolution of DOI registered during the pilot program (Conversion to URL)
(1) dx.doi.org/10.14977/06.550ea56ddb03b → (2) Landing Page (URL)
→ (3) Data Page (Dst Index)



First cases of data DOI and data citation in Japan

- A practical case of DOI minting was made on July 6, 2015, resulting in **the first case of data DOI in Japan**.
 - doi:10.17591/55838dbd6c0ad
 - Data contents are “Mesospheric wind velocity data (30min. mean) observed with MF radar at Poker Flat, Alaska”.
- The above DOI is cited in Acknowledgments of a JGR article, providing **the first case of data citation in Japan**.
 - Kinoshita, T., Y. Murayama, and S. Kawamura (2015), Tidal modulations of mesospheric gravity wave kinetic energy observed with MF radar at Poker Flat Research Range, Alaska, *J. Geophys. Res.*, 120, doi:10.1002/2014JD022647.

The screenshot shows a web browser window with the URL www2.nict.go.jp/isd/doi-landingpage/wds/10.17591_55838dbd6c0ad.html. The page title is "Mesospheric wind velocity data (30min. mean) observed with MF radar at Poker Flat, Alaska". The main text describes the data collection process and provides a citation: "Citation: Alaska Project of NICT (CRL)-GI/UA/F, Mesospheric wind velocity data (30min. mean) observed with MF radar at Poker Flat, Alaska, doi:10.17591/55838dbd6c0ad". It also lists general characteristics such as parameters, processing level, latitude (65.1), longitude (-147.5), temporal resolution (30 minutes), start date (1998-10-16T01:45:00), and stop date (-PT1D).

Landing page of the first “Data DOI” in Japan

The screenshot shows the first page of a research article from the Journal of Geophysical Research: Atmospheres. The article title is "Tidal modulations of mesospheric gravity wave kinetic energy observed with MF radar at Poker Flat Research Range, Alaska" by Takerari Kinoshita, Yasuhiro Murayama, and Seiji Kawamura. The abstract discusses the interactions between gravity waves and atmospheric tidal waves. The article is published online on 14 JUN 2015.

The first “Data Citation” article in Japan

The screenshot shows the Acknowledgments section of the article. It states: "Poker Flat MF radar is operated jointly by National Institute of Information and Communications Technology and Geophysical Institute of University of Alaska, Fairbanks. The Poker Flat MF radar was manufactured by ATRAD Pty, Australia. The data of MF radar is available at SALMON (System for Arctic middle/upper atmosphere Observation data network) of National Institute of Information and Communications Technology, Japan. **The dataset can be referred as doi:10.17591/55838dbd6c0ad.** MERRA data are available from NASA. We thank Kaoru Sato for her fruitful discussions. We also thank Ulrike Langematz and anonymous reviewers for providing constructive comments."

Extraction of data citation

Summary

- World Data Centers in Japan have been working to mint DOI to STP database since August 2013.
 - **Integrated Science Data System Research Laboratory** (NICT)
 - **WDC for Aurora** (National Institute of Polar Research)
 - **WDC for Geomagnetism** (Kyoto University)
 - **WDC for Ionosphere and Space Weather** (NICT)
 - **WDC for Space Science Satellites** (JAXA)
- We participate in **the pilot program for DOI-minting to science data** launched by Japan Link Center.
 - A registration server is developed to share among data centers.
 - In the pilot program, a procedure of the DOI-minting for STP data is established.
- A practical case of DOI minting was made in July 2015, which is the first case of data DOI in Japan.
- The first case of data citation in Japan is also made.
- DOI-minting to science data will be continued for **geomagnetic field data** and **ionospheric data** stored in the data centers.