Inaugural Editorial of the *Digital Journal of Global Change Data Repository*

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Abstract: The *Digital Journal of Global Change Data Repository* was officially launched in June 2020. This is for matching to the *Journal of Global Change Data & Discovery* which was launched in March 2017. Both of them are parts of the Global Change Research Data Publishing & Repository (GCdataPR). The monthly peer reviewed bilingual digital journal focuses its mission on publishing global change research datasets. As a regular member of World Data System (WDS) and Data Publishing and Repository Center of China GEO, the GCdataPR was initialed in June 2014. The inaugural editorial illustrated the reason why change the pre-print dataset repository into a peer review digital journal. The preparation, mission, tasks of the *Digital Journal of Global Change Data Repository* were elaborates in detail.

Key words: Digital Journal of Global Change Data Repository; Journal of Global Change Data & Discovery; data publishing and repository; inaugural editorial

The *Digital Journal of Global Change Data Repository* was officially launched in June 2020. This is for matching to the *Journal of Global Change Data & Discovery*[1] which was launched in March 2017. Both of them are parts of the Global Change Research Data Publishing & Repository (GCdataPR), one is for publishing data papers and articles and other one is for publishing datasets. The *Digital Journal of Global Change Data Repository* is superintended by Chinese Academy of Sciences, and co-sponsored by Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences and Geographic Society of China. The monthly peer reviewed bilingual digital journal focuses its mission on publishing global change research datasets. As a regular member of World Data System (WDS) and Data Publishing and Repository Center of China GEO, the GCdataPR was initialed in June 2014, why should we improve the data repository into peer reviewed digital journal?

1 From Open Data to Publishing Data

The research article publishing has a history of more than 100 years, while the research data publishing has just begun. From the World Data Center established by the International Geophysical Year (IGY)[2] in 1957, to the DOI System[3] in 2005, and then to *Earth System Science Data* (ESSD)[4] launched by the Copernicus in 2009, the then to *Digital Journal of Global Change Data Repository* launched in 2020, the research data has embarked on a road

of data publishing for more than half a century.

1.1 Open Data

In 1957, ICSU launched the International Geophysical Year (IGY) program. One of the important tasks of the project is to establish the "World Data Centers" (WDC), WDC-A, WDC-B, WDC-C and later WDC-D were identified separately. The main task of the WDC is to collect data in the earth science and astronomy and provide data sharing services in the global scale. In this stage, the focus of data sharing is metadata sharing. In 1990, the US Global Change Research Act of 1990[5] made a full and open data policy. Following, the World Meteorological Organization (WMO) and a series of international programs have clearly adopted the open data policy[6]. In 2003, China launched the "Scientific Data Sharing Engineering" project (SDSE), followed by the "National Science and Technology Infrastructure Platform"[7]. The implementations of these projects were greatly promoting open data activities. Open data has become a strong voice[8].

1.2 Dataset with Digital Object Identifier (DOI)

In 2004, ICSU organized a panel to make a priority area assessment on scientific data and information and published on ICSU report of the CSPR Assessment Panel on Scientific Data and Information, International Council for Science. The panel indicated that: the scientific community should give credit to the quality data, as well as the data authors for their contributors to the data sharing[9]. In 2005, the DOI foundation was established and the DOI System was developed. Then, the open data mechanism was soon replaced by data registration with DOI. In 2012, DOI was approved to be the International Standard by the International Standard Organization (ISO)[10]. The research data management entered the era of registration of DOI.

1.3 Journal on Data Papers

In 2009, *Earth System Science Data* (ESSD，2009) was born, which was published by the Copernicus Publications (ISSN :1866-3508, eISSN:1866-3516). It is the first journal on data papers in the world. Following, *Scientific Data* (2014)[11], *Acta Geographica Sinica* (2014, Supplement) [12], *Geoscience Data Journal* (2014)[13], *China Scientific Data* (2015) [14], *Geology in China* (2017, Supplement) [15], *Polar Data Journal* (2017)[16], *Journal of Global Change Data* & *Discovery* (2017), *Journal of Big Agriculture Data* (2019)[17], etc.

1.4 Peer Reviewed Data Papers Match Pre-print Datasets

During the last 15 years from 2005 to 2020, there are four ways in exploring the road of data publishing:

(1) The dataset is openly available with the DOI registration without data paper

Most regular members of the World Data System (WDS) and national data centers go this way. For example, Pangaea[18] is the world data center (regular member of WDS). In addition to the world data center, there are also some data repositories do the same way. Such as figshare[19], Dryad[20], zenodo[21], etc.

(2) Peer reviewed data papers published in a data journal, these data papers were matched with pre-print datasets, which were archived in distributed repositories, the open data policy made them linked to each other in an open network environment. *Earth System Science Data*, *Scientific Data*, and *Geoscience Data Journal* are the cases.

(3) The datasets and the data papers were published by the same publisher, one is official journal for publishing data papers and one is repository for linking the per-print datasets. The cases include *Acta Geographica Sinica* (2014, Supplement), *Journal of Global Change Data & Discovery* (2017), *Geology in China* (2017, Supplement), *Polar Data Journal* (2017) etc. The cases by this method are mostly adopted by data centers, such as *Polar Data Journal* and *Journal of Global Change Data & Discovery*, both sponsors are world data centers.

(4) *China Scientific Data* (2015) publishing the data papers uses both ways to link the datasets, Science Data Bank, the data repository of *China Scientific Data* and several distributed data centers in China.

1.5 Data Citation Bias Against Dataset

Research data includes metadata, dataset and data paper. The dataset is the most important part for the data re-using. Generally, users pay more attention to the datasets than data papers. However, a common phenomenon is that the data users usually only cite data papers, but rarely cite datasets in most research articles. This phenomenon is called "data citation bias". Use the following case to illustrate this phenomenon.

On 30 October 2018, Beck, H. E., *et al*., published "Present and future Köppen-Geiger climate classification maps at 1-km resolution", its data paper was published at *Scientific Data*, while the dataset was achieved at the figshare with DOI: 10.6084/m9.figshare.6396959. The figshare indicated the data citation as the following: Beck, Hylke E.; E. Zimmermann, Niklaus; McVicar, Tim R.; Vergopolan, Noemi; Berg, Alexis; Wood, Eric F. (2018): Present and future Köppen-Geiger climate classification maps at 1-km resolution. figshare. Dataset. https://doi.org/10.6084/m9.figshare.6396959[22], *Scientific Data* noticed the data paper citation as: Beck, H., Zimmermann, N., McVicar, T., et al. Present and future Köppen-Geiger climate classification maps at 1-km resolution. Sci Data 5, 180214 (2018). https://doi.org/10.1038/sdata.2018.214[23].

As of June 2020, the dataset at figshare has attracted 20,105 browsers and 6,458 downloads, but it was cited only once. On the contrary, data papers published in *Scientific Data* were cited 305 times in the same period. There is a difference of 300 times between them. Although data center managers repeatedly appeal to the academic communities to solve the problem of dataset citation, the phenomenon of data citation bias against dataset is still quite common.

1.6 Differences Between Dataset Publishing and Dataset Repository

There are several reasons causing the data citation bias against dataset, including the data users do not follow the requirements of the data repository. Of course, there is also the vague understanding that data repository is equal to data publishing, and there is also the applicability of citation standard for publication to dataset.

In recent years, for the sake of rapid publication of academic articles, the pre-print platform has emerged. Such as arXiv[24], BioRxiv[25], medRxiv[26], ChemRxiv[27], F1000[28], figshare[19], Peerage of Science[29], engrXiv[30], PeerJ Preprints[31], etc.

The pre-print platform provides a convenient and fast opportunity for academic exchange of research products that have not been accepted by academic journals. These pre-print manuscripts are also registered with DOI. Many of the papers are later published in official academic journals with different DOI registration. When the pre-printed paper was referred, most scholars do not cite it, but only cite the references when they were peer reviewed and

formal published by journals. The practices of pre-print platforms give us an enlightenment that academic papers can be open accessed on a pre-print platforms first, such as figshare, however, academic papers should be published in peer review journals formally. So, is the dataset deposited and published in figshare also a pre-print or pre-publish of the datasets? If the dataset in figshare is similar to the pre-print of academic paper in figshare, this makes it very easy to understand why the "Present and future Köppen-Geiger climate classification maps at 1-km resolution" dataset has only one cite in figshare, while the data papers published in the *Scientific Data* had 300 times more cites. The enlightenment of this case is that the dataset with DOI at figshare may only be the first step, like manuscripts, it can be considered as pre-publish of dataset. If the dataset needs to have the same academic status as the data paper, it needs to be formally published in a peer review journal as the data paper.

According to the Publication Administration Law of P. R. China (the 4th revision, 2016) , the Publishing Activities include the publication, printing or re-production, distribution of newspapers, periodicals, books, audio-visual products and electronic publications (Article 2); all publications should be published by publishers (Article 9); all publishers have to obtain the approval from the administrative department of the State Council in charge of publication and the publication license (Article 15); the publishers shall implement the system of editor's responsibility to ensure that the contents published in the publication comply with the Publication Administration Law of P. R. China (Article 24); the Department in charge of publication administration under the State Council shall be responsible for the supervision and administration of the publication activities (Article 50), etc.

So, the critical differences between the dataset publishing and repository with DOI in China include at least: (1) the dataset publisher has to obtain the publishing license approved by the Publishing Administrative Department of the State Council, the dataset repository is no such requirement; (2) the dataset publisher should implement the editorial responsibility system, and the scientific practice is to go through peer review to ensure that the published content conforms to the purpose of the publication; while the dataset repository may not exactly follow the procedure; (3) the dataset publisher have to accept the annual inspection and review of the published works by the Administrative Department of the State Council, while the dataset repository does no have such procedures.

In addition, the feedback of the dataset publishing is also an ignored big problem. Scholars published papers (including data papers published in data journals) are included in the research performance assessment system. However, scientists put their datasets in an open accessed data repository with DOI are not included in the research performance assessment system in most research institutes and universities in China.

2 Inauguration of *Digital Journal of Global Change Data Repository*

In order to make the dataset publishing environment and mechanism works, the Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences and the Geographical Society of China have jointly made a series of preparations since 2013.

2.1 DOI Registration

In 2013, the Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences got DOI: 10.3974 by Wanfang Data Ltd.[32] and Crossref[33].

2.2 Provide a Practical Case for the Nairobi Data Sharing Principle

In June 2014, the Global Change Research Data Publishing & Repository (GCdataPR) was online, which consisted of 20 datasets and 20 data papers published at *Acta Geographica Sinica* (2014) by both Chinese and English. This is the first data publishing system in China for publishing data papers with a journal and datasets with DOI.

In August 2014, CODATA Task Group on Preservation of and Open Access to S&T Data in/for/with Developing Countries cooperated with UNESCO, Kenyan Ministry of Information and Communication and number of international organizations to hold the International Workshop of "Open data for science and sustainability in developing countries". The Data Sharing Principles in Developing Countries (or The Nairobi Data Sharing Principles) [34] is one of the outcomes of the Nairobi SSDC workshop. The case on Global Change Research Data Publishing & Repository was one of evidences to have a common understanding for the Nairobi Data Sharing Principles.

2.3 Regular Member of World Data System

The World Data System, an Interdisciplinary Body of the International Science Council (ISC), was established in 2008 based on the World Data Center created in the International Geophysical Year (IGY, 1957–1958). It is consisted of Regular Member, Network Member, Partner Member and Associate Member.

The World Data System issued the data sharing principles[35]:

(1) Data, metadata, products, and information should be fully and openly shared, subject to national or international jurisdictional laws and policies, including respecting appropriate extant restrictions, and in accordance with international standards of ethical research conduct.

(2) Data, metadata, products, and information produced for research, education, and public-domain use will be made available with minimum time delay and free of charge, or for no more than the cost of dissemination, which may be waived for lower-income user communities to support equity in access.

(3) All who produce, share, and use data and metadata are stewards of those data, and have responsibility for ensuring that the authenticity, quality, and integrity of the data are preserved, and respect for the data source is maintained by ensuring privacy where appropriate, and encouraging appropriate citation of the dataset and original work and acknowledgement of the data repository. And the data should be labeled "sensitive" or "restricted" only with appropriate justification and following clearly defined protocols, and should in any event be made available for use on the least restrictive basis possible.

Based on the WDS Data Sharing Principles, the data sharing policy of Global Change Research Data Publishing & Repository was made in 2014[36] as following:

Data from the Global Change Research Data Publishing & Repository includes metadata, datasets (data products), and publications (in this case, in the *Journal of Global Change Data & Discovery*). Data sharing policy includes: (1) Data are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use Data subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute Data subject to written permission from the GCdataPR Editorial Office and the issuance of a Data redistribution license; and (4) If Data are used to compile new datasets, the 'ten per cent principal' should be followed such that Data records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset. And then the Guidelines of Global

Change Research Data Publishing & Repository was made.

From 2014 to 2016, 160 datasets were openly available for free download through the GCdataPR platform. The GCdataPR was approved to be the WDS Regular Member in September 2016[37].

2.4 China GEO Data Publishing Center and GEOSS Contributor

The Group on Earth Observations, GEO was formed in 2003, China is one of the founder members[38]. One of the important task is establishing the GEOSS Five categories of GEO activities were identified, including GEO Flagship, GEO Initiatives, GEO Community Activities, Regional GEOs and Foundational Tasks. The GCdataPR, as the China GEO Data Publishing Center, joins the GEO Foundational Tasks and to be one of the contributors for the GEOSS since 2016.

2.5 Data Citation Index

In 2016, The Clarivate Analytics accepted the GCdataPR to join the Data Citation Index (DCI) of Web of Science, it makes all datasets published in the GCdataPR searchable by DCI[39].

2.6 Best Case of Big Data Products, Services and Solutions (2016)

In 2016, 50 best practices and cases on big data products, services and solutions were awarded among the 451 cases in China, the GCdataPR is one of them and the only one in scientific research, education[40].

2.7 High Stating Point Journal of the Excellence Program of Chinese Academic Journals

In 2019, the proposal on creating the *Digital Journal of Global Change Data Repository* was evaluated to be the High Stating Point Journal of the Excellence Program of Chinese Academic Journals[41].

2.8 Data Repository identified by the *Acta Geographica Sinica* and AGU

In 2016, the editorials of GCdataPR and *Acta Geographica Sinica* jointly signed a declaration on research data and discovery paper jointly publishing. In 2019, American Geophysical Union (AGU) created a data finder tool, which aims to supply practical solutions for the use of the FAIR data principles throughout the research data life cycle[42]. The function of the repository finder is for querying repositories relevant to open data activities. In which, 122 repository were listed at the Finder, the GCdataPR is one of them. AGU indicated that the selected repositories are qualified to the criteria of the FAIRsFAIR Project. Besides, there are 67 journals joint the GCdataPR data publishing partnership program.

2.9 GCdataPR Was Awarded the WSIS Prize, 2018 (e-Science Champion)

The World Summit on the Information Society (WSIS) 2018 was held from March 19–23 in Geneva. Winners and Champions in each of 18 categories were voted, the GCdataPR was one of them, the only one in research data publishing and repository[43].

2.10 The Peer Reviewed *Digital Journal of Global Change Data Repository*

The pre-print version of the *Digital Journal of Global Change Data Repository* was online in June 2014, while the peer reviewed *Digital Journal of Global Change Data Repository* was published in June 2020 with permission by the National Press and Publication Admini-

stration of P. R. China. The International Standard Serial Number of the journal is ISSN 2096-868X, and the CN serial numbering of the journal is CN 11-9377/P.

3 Mission, Tasks and Procedure

3.1 Mission

The peer reviewed *Digital Journal of Global Change Data Repository* is part of the Global Change Research Data Publishing and Repository[44] together with the *Journal of Global Change Data & Discover*y. It aims to promote high-quality and reliable global change research data publishing, long term archiving and life time openly available accessing. The disciplinary repository covers multiple subjects, such as geography, natural resources, ecology, environment, sustainable development, etc. The bilingual journal is published in both Chinese and English. In using and implementing the WDS and GEO data sharing principles, as well as the FAIR principles, the *Digital Journal of Global Change Data Repository* will update its data publishing and sharing guidelines, including procedures, network with journals and citation data bases, etc.

3.2 Tasks

The tasks of the *Digital Journal of Global Change Data Repository* are:

Task 1: Publish the updated datasets

According to the international academic regulations, consensus on research data, the journal encourages the original datasets publishing with the property review and fast online.

Task 2: The content of the datasets covers the latest research datasets support science as well as basic datasets benefiting societies.

The global change research is a field where scientific discovery and social development are closely integrated. The publication of global change scientific research datasets should not only publish basic and discovery data, but also the datasets promoting social sustainable development. So, three major contents should be included in the datasets, they are the items of data encyclopedia, the original discovery data and the datasets benefiting the society.

Task 3: Long term preservation and life time services

As the most important part of a regular member of the World Data System, the Data Publishing Sub-Center of the National Earth Observation Scientific Data Center of China, and the China GEO Data Publishing Center, the *Digital Journal of Global Change Data Repository* is the unshakable and critical task to keep the datasets long term preservation and life time services.

Task 4: Inter-operational through internet

The *Digital Journal of Global Change Data Repository* is an open digital journal. The datasets publication involves a series of publication systems, such as the data paper journals, research discovery article journals, data dissemination platform, data application platform, etc. It is an important task for the *Digital Journal of Global Change Data Repository* to promote and strengthen the inter-operational status, especially in the data formats, data file packages, as well as the data geo-locations etc. to make sure to implementation FAIR principles (Findable, Accessible, Inter-operational and Re-usable).

Task 5: Enhancing international cooperation

Global change research datasets cover different scales, such as local, regional, national,

regional and global. The authors, editorial board members, reviewers and users of this journal come from different countries, especially users from more than a hundred of countries. Therefore, one of the important tasks of the journal is to promote international cooperation and strengthen international academic exchanges.

3.3 Method

The *Digital Journal of Global Change Data Repository* is carried out in two ways: online network version and offline CD-ROM version. The offline CD edition adopts the mode of bilingual in both Chinese and English. The online version takes Chinese and English as one web page respectively and the bilingual version is published through internet exchange and interconnection.

3.4 Settle the Pre-print Datasets from June 2014 to May 2020 in GCdataPR

The GCdataPR has pre-printed more than 600 datasets from June 2014 to May 2020. All of these datasets will reviewed again one by one according to the data publishing procedure of the *Digital Journal of Global Change Data Repository*. Keep two versions of the datasets, one is the pre-print version and one is the formal published version. A common problem is that the pre-printed version of the datasets online before June 2020 are not marked with references and need to be supplemented after they are included in the official publication. The publication time of dataset is calculated according to DOI registration date, and the volume is arranged in chronological order.

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