

## Recent activity of data publication and data citation in the international community of geomagnetism

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The DOI (digital object identifier) system was originally developed by publishers and introduced as a common identifier for publication in late 1990s. Now, more than 5000 publishers participate in the DOI system. DOI is applicable not only for usual publication articles but also for any objects such as a piece of online content (e.g., PDF files, movie files, etc.) or a physical asset (e.g., DVD, an item of equipment, rock samples, etc.). Therefore, it can be mint to research data or database. Minting DOI to scientific database can be considered as data publication, since the database is identified with DOI. Data publication and data citation with DOI provide much benefit to both researchers and data providers: (1) Researcher 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; and (2) Data providers can gain professional recognition and rewards for their labors of publishing and managing data set, according to results of data publication and data citation, in the same way as traditional publications.

Recognizing the importance of data publication and data citation, solar-terrestrial physics (STP) data centers in Japan have been working to mint DOI to their database (i.e., to register DOI on their database). We participated from October 2014 in a 1-year pilot program for DOI-minting to science data launched by Japan Link Center, which is one of the DOI registration agencies. In the pilot program, a procedure of the DOI-minting for STP data was established. As a result of close collaboration with Japan Link Center, the first case of data-DOI in Japan (doi:10.17591/55838dbd6c0ad) was created in June 2015. As of July 2019, there are 18 data-DOIs for the STP data in Japan. Four of them are related to geomagnetic field data: the Dst index (doi:10.17593/14515-74000), the AE index (doi:10.17593/15031-54800), the Wp index (doi:10.17593/13437-46800), and magnetotelluric data at Muroto, Japan (doi:10.17593/13882-05900).

In the International Association of Geomagnetism and Aeronomy (IAGA), scientists who are working for data centers or observatories started discussion about DOI-minting to their data and a task force was formed in August 2013. In the latest International Union Geodesy and Geophysics (IUGG) General Assemblies that was held at Montreal, Canada, in July 2019, the task force reported “Present Status of Data Publication and Data Citation of Geomagnetic Data/Indices” that is available from <https://www.ngdc.noaa.gov/IAGA/vdat/>. The report found that there are different types of activities of data publication in individual data centers or observatories. In addition to data publication, it was also found that data citation started to be actually implemented in some international journal articles. In the field of geophysics including seismology, interests to the DOI-minting are rapidly growing. At the IUGG General Assemblies, an inter-association symposium entitled “Geoscience data licensing, producing, publication and citation” was held. In this symposium, 3 invited talks, 12 contributed talks, and 6 posters

presented actual practices and future plans of data licensing, producing, publication, and citation of scientific data, and possible related topics. The international effort will be continued for such topics regarding scientific data in geophysics.