

News from the GGOS DOI Working Group

Kirsten Elger^{ID} and the [GGOS Working Group on DOIs for Geodetic Data Sets](#)

EGU21-15081

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In 2019, the International Association of Geodesy's (IAG) Global Geodetic Observing System (GGOS) has established a **Working Group on “Digital Object Identifiers (DOIs) for Geodetic Data Sets”** to address challenges and to identify opportunities for improved coordination and advocacy for the use of DOIs within the geodetic community. **The Working Group is designated to establish best practices and advocate for the consistent implementation of DOIs across all IAG Services and in the greater geodetic community.**



Mission

Who we are

Why DOI?

Group Activities

Outside the box

Outcomes

Outlook

Mission

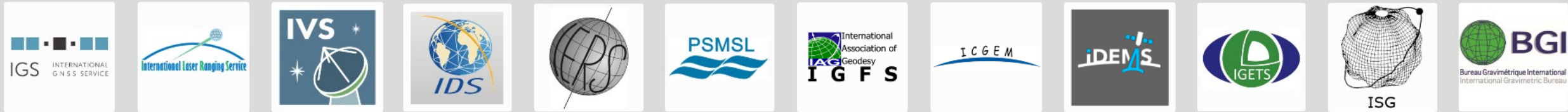
The WG seeks to establish best practices and advocate for the consistent implementation of DOIs across all IAG Services and in the greater geodetic community

GGOS DOI* Working Group - Motivation

Geodesy researchers are often **much more involved in operational aspects and data provision services** than researchers in other fields might be. Compared to other scientific disciplines, **geodesy researchers appear to be producing less “countable scientific” output.**

*DOI = digital object identifier

IAG Services (IAG = International Association for Geodesy)



Geodesy data and equipment therefore **require a structured and well-documented mechanism** which will enable **citability, scientific recognition and reward** that can be provided by assigning DOIs to data, data products and scientific software.

Objectives

- to **identify what the community needs from consistent usage of DOIs for data** in terms of being able to discover data, permanently cite data, and acknowledge the data providers
- to develop **recommendations for DOI minting strategies** for different geodetic data types and granularity across IAG Services (static, dynamic, observational data, data products, combination products, networks)
- to develop **recommendations for a consistent method for data citation** across all IAG Services, to support data providers, and to provide quantitative support detailing the use of geodetic data sets and other resources.
- to develop **recommendations for connecting metadata standards for data discovery** (e.g. DataCite, ISO19115) with community metadata standards (GeodesyML, Station Logs)

Who we are

- The **Working Group „DOIs for Geodetic Data Sets“** was established by the **Global Geodetic Observing System (GGOS)** in 2019
- It is directly associated with the GGOS Coordination Office
- GGOS Working Groups are planned for 4 years
- Members are international **representatives of IAG Services and geodetic data centers** that are involved with or interested in assigning DOIs to geodetic data
- We welcome associated members with an interest in the topic

IAG Services (IAG = International Association for Geodesy)



GGOS Working Group for Digital Object Identifiers (DOIs) for Geodetic Data Sets

Who we are 2/2

Members:

Markus Bradke

Pierre Fridez

Yehuda Bock



Jim Riley

Yusuke Yokota



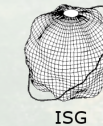
Carine Bruyninx

Daniela Thaller



Glenda Coetzer

Detlef Angermann



Mirko Reguzzoni

Laurent Soudarin



Daniela Carrion

Elizabeth Bradshaw



Elmas Sinem Ince



Sylvain Bonvalot



Vicente Navarro



Chair: Kirsten Elger (GFZ)

Philippe Lamothe

Dan Roman



Associate Members: Godfred Amponsah, Sandra Blevins, Roelf Botha, Allison Craddock, Michael Craymer, Basara Miyahara, Patrick Michael, Mike Pearlman, Nacho Romero, Christian Schwatke, Martin Sehnal, Lori Tyahla



Why DOI? Data Publications with DOI are Best Practice for FAIR Sharing Data

DOI-referenced datasets...

- are directly **accessible** via the DOI link (<https://doi.org/10.prefix/suffix>)
- link to the data used for research results → **reproducibility**
- Machine-readable standardised DOI metadata is exchangeable
→ **data discovery via catalogues**
- are **citable** in scholarly literature
→ **tracking**, → credit for researchers and institutions



Recent Agreements between Publishers, Repositories, Funders – Pathways for Open Science

Coalition On Publishing Data in the Earth and Space Sciences



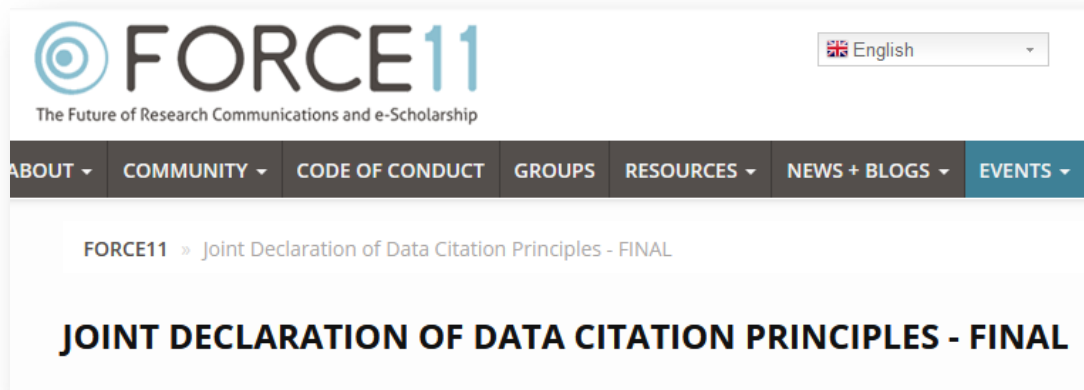
- **Data availability statement** required for articles
- **Citation of data in reference lists** allowed by journals
- Recommendation to use **domain repositories**
- **No data supplements** anymore (→ data publication via [domain] repositories)

ENABLING FAIR DATA COMMITMENT
STATEMENT IN THE EARTH, SPACE,
AND ENVIRONMENTAL SCIENCES

2018



How do I Cite Data?



Source: Data Citation Synthesis Group: Joint Declaration of Data Citation Principles. Martone M. (ed.) San Diego CA: FORCE11; 2014
<https://doi.org/10.25490/a97f-egykh>

“Data should be considered legitimate, citable products of research. Data citations should be accorded the same importance in the scholarly record as citations of other research objects, such as publications”

Citing Data DOIs in Articles

Hydrology and Earth System Sciences

An interactive open-access journal of the European Geosciences Union

EGU.eu | EGU Publications | EGU Highlight Articles | Contact | Imprint | Data publication

4. Data publication cites paper

Landscape-scale water balance monitoring with an iGrav superconducting gravimeter in a field enclosure

1. Cite data in the article

„Data availability: [...] Güntner et al. (2017) provided the data of iGrav006, both raw 1 s gravity records and [...] Wziontek et al. (2017) provided the raw gravity data of the two superconducting gravimeters [...] in Wettzell.”

References 2. Include reference in the references section

Güntner, A., Reich, M., Mikolaj, M., Creutzfeldt, B., Schroeder, S., Thoss, H., Klügel, T., and Wziontek, H.: Superconducting gravimeter data of iGrav006 and auxiliary hydro-meteorological data from Wettzell – Supplement to: Landscape-scale water balance monitoring with an iGrav superconducting gravimeter in a field enclosure, <https://doi.org/10.5880/igets.we.gfz.11.001>, 2017.

Wziontek, H., Wolf, P., Nowak, I., Richter, B., Rülke, A., and Wilmes, H.: Superconducting gravimeter data from Wettzell – Level 1, <https://doi.org/10.5880/igets.we.11.001>, 2017.

DOIs link to the data

Article DOI: <https://doi.org/10.5194/hess-21-3167-2017>

The screenshot displays the IGETS (International Geodynamics and Earth Tide Service) data portal. It features the IUGG and IAG-AIG logos. The main title is "Superconducting gravimeter data of iGrav006 and auxiliary hydro-meteorological data from Wettzell - Supplement to: Landscape-scale water balance monitoring with an iGrav superconducting gravimeter in a field enclosure". Below the title, the DOI is listed as <https://doi.org/10.5880/igets.we.11.001>. The page also includes a "Cite as:" section with the full citation details and a "Files" section with a link to download the data via ftp (registration required).

Group Activities

- **9 Dec 2019, 8:30-10:00: Kickoff:** physical meeting during the AGU Fall Meeting in San Francisco
- **Regular video conferences every 1-2 months**
- **Conference presentations:** EGU, GGOS Days, AGU, IAG GA, IVS GM
- living document: **Overview on geodetic data and products from IAG Services and DOI minting strategies**

Geodetic Data Sets and DOIs/ IAG Services **IGRF Umbrella**

Service	No of DOI	Repository	Data types	DOI minting strategies
ICGEM	27	GFZ Data Services	(1) global gravitational models - static (2) global gravitational models - temporal (3) topographic gravity field models (4) combined models (COST-G)I	(1, 3) DOIs for each model (2, 4) dynamic DOIs for growing time series of temporal models
IGETS	20	GFZ Data Services	(1) Level 1 and 2: time series for each station (2) Level 3: combined products for all stations (not yet available with DOI)	(1) one DOI for all Level 1 and Level 2 data from one Observatory (dynamic DOIs for growing time series) (2) one DOI for Level 3 data (in preparation) - globally combined product
ISG	18	GFZ Data Services	grids of local and regional geoid/quasi geoid undulations in IGS 2.0 format	DOIs for each model (quasi geoid, geoid), DOIs of the same project are cross referenced

Geodetic Data Sets and DOIs/ IAG Services: IGS

Service	No of DOI	Repository	Data types	DOI minting strategies
IGS AC	6	CODE (AIUB)	1) static reprocessing solution datasets for each reprocessing campaign 2) expanding data sets for sub-daily/daily/weekly solutions 3) changing datasets: datasets that are only available for a certain period of time, they exist only during a certain period (sliding time window), e.g. 1, 2, and 5-day predictions	1) one static DOI for each reprocessing dataset 2,3) DOIs for solution types: - final solutions -rapid solutions -ultra-rapid solutions
IGS ESA		ESA GSSC	GNSS data and products (RINEX, SINEX)	Collection level (different levels of granularity depending on the collection)
CDDIS, NASA GSFC (IGS, ILRS, IVS, IDS, GGOS)	88	CDDIS	Data and derived products from GNSS, SLR, VLBI, and DORIS	DOIs are assigned to collections, e.g., GNSS high-rate compact observation data.
UNAVCO/ GAGE IGS	~4000	UNAVCO	GNSS data and products (RINEX, SINEX) , SAR, TLS	1) 1 DOI per continuous GNSS Station (with possibility for composite DOI with Child DOIs for attribution changes over time). 2) DOIs available for ad hoc data sets of stations for publication 3) 1 DOI per GNSS campaign 4) 1 DOI per Level 2 product
		GFZ Data Services	GNSS Network, IGS products (ultra-rapid, rapid, final), mutli-gnss products, repro products, software (Semsys, GFZRNX)	DOIs for products, networks, campaigns and software


 Group activities


DOIs for Geodetic Data Sets: IAG Services/ Data Centers

Service	No of DOI	Repository	Data types	DOI minting strategies
IDS		CDDIS, DORIS central office	s. CDDIS, data and derived products	s. CDDIS, Doris central office is discussing about DOI minting services
IERS	-	-	SINEX files; EOP files, csv, https, xml	no DOIs assigned so far, but in preparation
ILRS	?	CDDIS; EUROLAS	Data and derived products from SLR. EUROLAS Data Provides SLR data and product of the ILRS synchronized with the CDDIS	DOIs via CDDIS, EUROLAS not yet
IVS		CDDIS, GFZ Data Services	VLBI data, products, related information; different format types	DOI assigned only to IVS combined contribution to ITRF2014 via GFZ Data Services, CDDIS ??
CDDIS, NASA GSFC (IGS, ILRS, IVS, IDS, GGOS)	88	CDDIS	Data and derived products from GNSS, SLR, VLBI, and DORIS	DOIs are assigned to collections, e.g., GNSS high-rate compact observation data.
GFZ Data Services (VLBI, GNSS, ICGEM, IGETS)			DOI minting services for geodetic products (static, dynamic, networks)	variable

Overview on DOIs for Geodetic Data Sets: Summary

- Most DOIs registered with DataCite (only ESA registers via CrossRef)
- Some data centres are serving several IAG Services (CDDIS, GFZ Data Services)
- DOI minting strategy for static data: easy, albeit different for different products (from ICGEM models to GNSS campaign data)
- DOI minting strategy for dynamic data: variable (GNSS stations, IGETS Observatory data, GNSS networks, GNSS reprocessing products)
- Open questions: DOI for software? Persistent Identifier for Instruments?
Is the DOI metadata across the data centers interoperable?

Outside the Box: Learning from Other Communities

One strategy of the GGOS DOI Working Group is to explore DOI minting and citation practices from other communities within the geodesy and beyond for potential adoption for geodetic data sets

Network DOIs

The seismic community developed the concept of network DOIs used for citation purposes. Individual data files may additionally be assigned with alternative persistent identifier (e.g. Handles)

Data Compilations

Data compilations provide means to include/ cite DOI-referenced data that are part of a larger data collection

PIDs for Instruments

The RDA*-derived concept for assigning persistent identifier to instruments already used by „early adopters“

Learning from Seismology

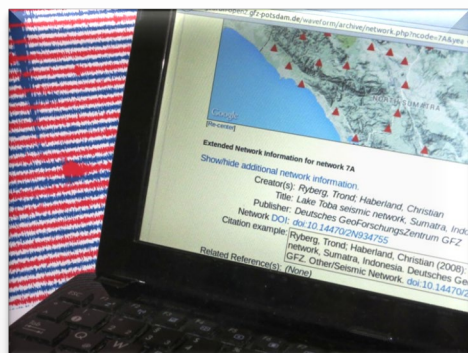
DOI for Seismic Networks



2015

Why Seismic Networks Need Digital Object Identifiers

<http://doi.org/10.1029/2015EO036971>



We hope that assigning seismic data networks a universal and easily cited digital identity will help bring data providers the recognition they deserve.

- **182 DOIs for seismic networks** (May 2020)
- **Metadata Standards:**
FDSN Recommendations for seismic networks (<https://doi.org/10.7914/d11596>)

DOI for GPS Networks?

partly adoptable and in practice



Challenge: GNSS networks are more complex than seismic networks: different agencies contribute to one network, one station can be part of several networks

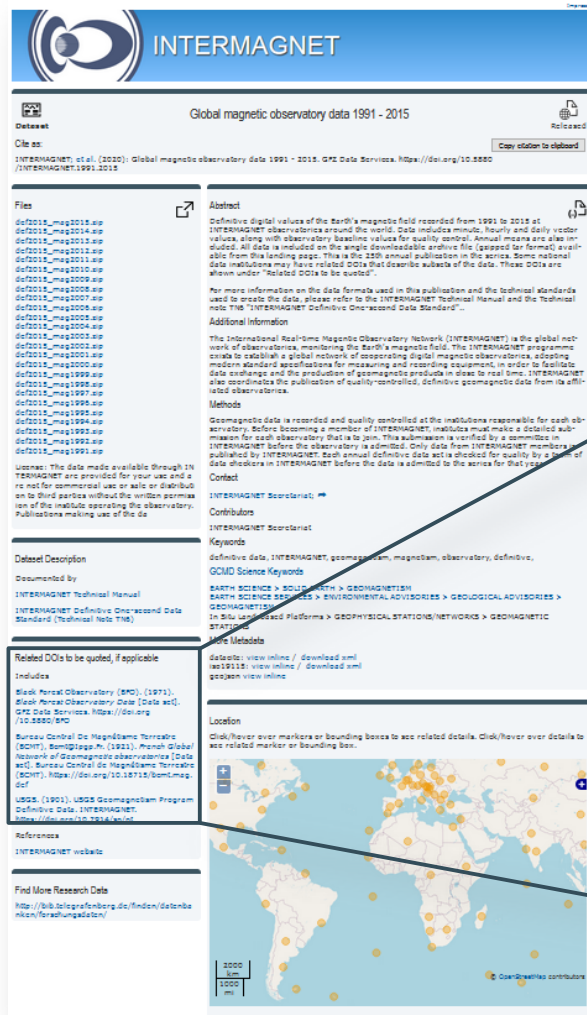


Data Compilations and Citation: Learning from Magnetic Observatories

Outside the box: data compilations

INTERMAGNET Global Magnetic Observatory Data 1991-2015

<https://doi.org/10.5880/INTERMAGNET.1991.2015>



**Authors: INTERMAGNET +
all Institutions operating
Geomagnetic Observatories
(160+), citable as
Intermagnet et al. (2020)**

Related DOIs to be quoted, if applicable

Includes

Black Forest Observatory (BFO). (1971). *Black Forest Observatory Data* [Data set]. GFZ Data Services. <https://doi.org/10.5880/BFO>

Bureau Central De Magnétisme Terrestre (BCMT), Bcmt@Ippg.Fr. (1921). *French Global Network of Geomagnetic observatories* [Data set]. Bureau Central de Magnétisme Terrestre (BCMT). <https://doi.org/10.18715/bcmt.mag.def>

USGS. (1901). USGS Geomagnetism Program Definitive Data. INTERMAGNET. <https://doi.org/10.7914/sn/nt>

Cite as:
INTERMAGNET; Altay-Sayan Branch of Geophysical Survey of Siberian Branch of Russian Academy of Sciences (Russia); Bureau Central de Magnétisme Terrestre, BCMT (France); Beijing Ming Tomba Geomagnetic Observatory Center; Institute of Geology and Geophysics, Chinese Academy of Sciences (China); Bogazici University, Kandilli Observatory and Earthquake Research Institute (Turkey); British Antarctic Survey (United Kingdom); British Geological Survey (United Kingdom); Centre de Recherche en Astronomie Astrophysique et Géophysique (Algérie); Department of Geophysics, Faculty of Science, University of Zagreb (Croatia); Dirección Meteorológica de Chile (Chile); École et Observatoire des Sciences de la Terre (France); Finnish Meteorological Institute (Finland); Fundació Observatori de l'Ebre (Spain); Geodetic and Geophysical Research Institute of the Hungarian Academy of Sciences (Hungary); Geological and Geophysical Institute of Hungary (Hungary); Geological Institute of Romania (Romania); Geological Survey of Sweden (Sweden); Geophysical Center of the Russian Academy of Sciences (Russia); Geophysical Institute of Slovak Academy of Sciences; Geophysical Institute of the Bulgarian Academy of Sciences (Bulgaria); Geoscience Australia (Australia); GFZ German Research Centre for Geosciences (Germany); Government of South Georgia and the South Sandwich Islands; Halliburton Sperry Drilling (United States of America); Indian Institute of Geomagnetism (India); Institut de Physique du Globe de Paris (France); Institut de Recherche pour le Développement (France); Institut Polaire François Paul Émile Victor (France); Institute of Cosmophysical Researches and Radio Wave Propagation FEB RAS (Russia); Institute of Geology and Geophysics, Chinese Academy of Sciences (China); Institute of Geophysics of the Vietnamese Academy of Science and Technology (Vietnam); Institute of Geophysics, Academy of Sciences of Czech Republic (Czech Republic); Institute of Geophysics, National Academy of Sciences of Ukraine (Ukraine); Institute of Geophysics, Polish Academy of Sciences (Poland); Institute of Geophysics, Ural Branch of the Russian Academy of Sciences (Russia); Institute of Solar-Terrestrial Physics of Siberian Division of Russian Academy of Science (Russia); Institute of the Ionosphere, National Center of Space Researches and Technologies (Kazakhstan); Instituto Geofísico del Perú (Peru); Instituto Geográfico Nacional (Spain); Irish Meteorological Service (Ireland); Japan Meteorological Agency (Japan); Karlsruhe Institute of Technology (Germany); Korea Meteorological Administration (South Korea); Lanzhou Institute of Seismology of the China Earthquake Administration (China); Ludwig Maximilians University Munich (Germany); National Antarctic Scientific Center; Ministry of Education and Science of Ukraine (Ukraine); National Geophysical Research Institute (India); National Meteorological Service of Argentina (Argentina); National Space Institute, Technical University of Denmark (Denmark); Natural Resources of Canada / Geological Survey of Canada (Canada); Real Instituto y Observatorio de la Armada (Spain); Royal Meteorological Institute (Belgium); Schmidt Institute of Physics of the Earth of Russian Academy of Sciences (Russia); South African National Space Agency (South Africa); Swedish Institute of Space Physics (Sweden); The Institute of Geological & Nuclear Sciences Ltd (New Zealand); The Ministry of Natural Resources, Environment and Meteorology (Samoa); U.S. Geological Survey (USA); Universidad Nacional de La Plata (Argentina); University of Oulu (Finland); University of Stuttgart (Germany); Yu. G. Shafar Institute of Cosmophysical Research and Aeronomy, Siberian Branch of the Russian Academy of Sciences (Russia); Institute of Geology and Mineral Exploration-IGME (Greece); National Institute of Geophysics, Geodesy and Geography of the Bulgarian Academy of Sciences (NIGGG-BAS) (Bulgaria); National Center for Geophysical Research of Lebanon (Lebanon); Institut et Observatoire Géophysique d'Antananarivo IOGA (Madagascar); Universidad Autónoma de México, Instituto de Geofísica (Mexico); Evotvos Lorand Geophysical Institute of Hungary (Hungary); Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation (Russia); Alfred Wegener-Institut AWI (Germany); Arctic and Antarctic Research Institute AARI (Russia); Observatorio Nacional (Brazil); ZAMG - Zentralanstalt fuer Meteorologie und Geodynamik (Austria); Bundesamt fuer Seeschifffahrt und Hydrographie (Germany); Republic Geodetic Institute (Serbia); Geomagnetic Institute Grocka (Serbia); Addis Ababa University AAU (Ethiopia); École et Observatoire des Sciences de la Terre EOST (France); Istituto Nazionale di Geofisica e Vulcanologia INGV (Italy); Danish Meteorological Institute DMI (Denmark); Institut Polaire François Paul Émile Victor IPEV (France); Maldives Meteorological Service (Republic of Maldives); China Earthquake Administration of Guangdong province (China); Directorate General of Telecommunications DGT MOTC (Taiwan); National Research Institute of Astronomical and Geophysical NRIAG (Egypt); Saint-Petersburg branch of the Russian Academy of Sciences (Russia); Pulkovo Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation of the Russian Academy of Sciences IZMIRAN SpB branch (Russia) (2020); global magnetic observatory data 1991 - 2015, GFZ Data Services. <https://doi.org/10.5880/INTERMAGNET.1991.2015>

Related Work:

Citation of existing DOIs for magnetic data in the metadata:

- **Black Forest Observatory Data** (interdisciplinary DOI for all BFO data)
- **French Global Network of Geomagnetic Observatories** (several observatories)
- **USGS Geomagnetic Programme** (several observatories)

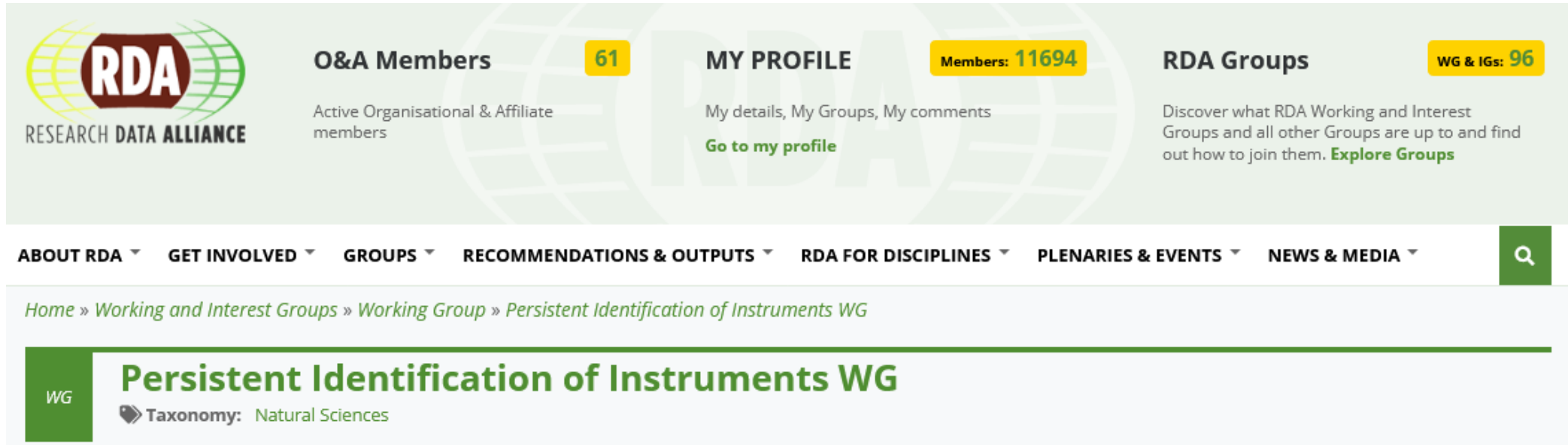


GFZ Example: PIDs for Seismic Stations

- **Challenge:** Unique way to identify individual instruments and link them properly to data and software. How to achieve full data provenance? How to do it in a way that could be interoperable with other disciplines by means of standard vocabularies?
- **Approach:** Use globally unique and resolvable Persistent Identifiers (PIDs). Include these identifiers in systems and workflows for seismic data and data publications at GFZ (Geophysical Instrument Pool GIPP, GEOFON, LIS/ GFZ Data Services).
- **Services:**
 - Landing pages for instruments and stations
 - Calibration functions
 - Links to seismic experiments (→GIPP experiment database)
 - Links to data generated with the instruments
 - In prep: links to instrument PIDs in data publications



RDA Working Group: PIDs for Instruments



The screenshot shows the RDA website header with the RDA logo (Research Data Alliance) and navigation links: ABOUT RDA, GET INVOLVED, GROUPS, RECOMMENDATIONS & OUTPUTS, RDA FOR DISCIPLINES, PLENARIES & EVENTS, and NEWS & MEDIA. The main content area highlights the 'Persistent Identification of Instruments WG' (WG & IGs: 96) under the 'MY PROFILE' section (Members: 11694). The breadcrumb trail reads: Home » Working and Interest Groups » Working Group » Persistent Identification of Instruments WG. The page title is 'WG Persistent Identification of Instruments WG' with a taxonomy of 'Natural Sciences'.

Output: metadata schema and prototype schema for implementation with **DataCite** (DOIs) and **ePIC** (handles) as representative persistent identifier systems (endorsed by RDA)

Stocker, M., Darroch, L., Krah, R., Habermann, T., Devaraju, A., Schwardmann, U., D'Onofrio, C. and Häggström, I., 2020. **Persistent Identification of Instruments**. Data Science Journal, 19(1), p.18. <http://doi.org/10.5334/dsj-2020-018>

PIDINST WG: outcome

- Two parallel discussions in the context of international organizations.
- Within the RDA WG more than 13 communities are collaborating.
- **A new metadata scheme based on collected requirements.**
- We (GFZ) followed recommendations and implemented most of them using **EPIC PIDs (Handles)** locally created.
- Some members of the RDA WG started discussions with Datacite (using DOIs).
- It could be feasible to implement a similar scheme into a standard Datacite format.
- However, **there will be some differences and it will take time.**

PIDs for Seismic Stations: Metadata Elements



RDA approach

- Identifier
 - identifierType
- LandingPage
- Name
- Owner
 - ownerName
 - ownerContact
 - ownerIdentifier
- Manufacturer
 - manufacturerName
 - manufacturerIdentifier
 - modelName
- Description
- InstrumentType
- VariableMeasured
- Date
 - dateType
- RelatedIdentifier
 - relatedIdentifierType
 - relationType
- AlternateIdentifier
 - alternateIdentifierType

GFZ GIPP Databases

Experiment Database

Grant Number

Experiment Name

find in Abstract

Experimenttype

Program

Person

Institute

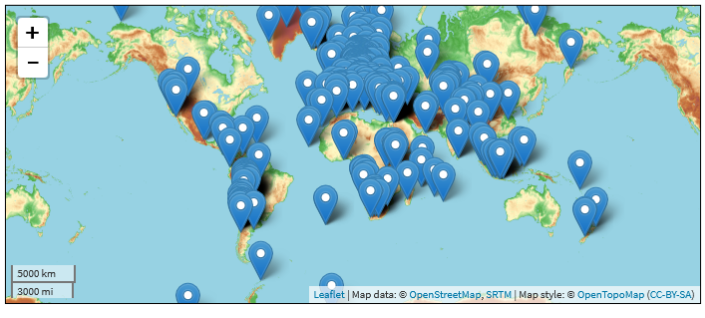
Time Range

Has Data? ☐

Coordinates

North

West East



Experimenttype: ☐ Seis passive seismology ☐ CSS controlled source seismology ☐ MT magnetotelluric / electromagnetic

Data: ☐ Data with DOI / online available ☐ Data offline stored

Number of Results: 451

← Previous 1 2 3 4 5 6 7 8 9 Next →

202108 - MESS ☐ Seis
[2021-03-24 - 2021-06-30]
By: Michael Dietze, Thomas Hoffmann

15° Cube3 intern
15° 3-D Geophone

Instrument Database

Code

Serial No

Inventar No

Pid

Status

Owner

Program

Dualuse ☐

Hazmat

Manufacturer

Name	Manufacturer	CountryOfOrigin	Dualuse	Amount
Instrument categories			no	
Seismic sensors			no	
Short-period sensors (>1Hz)			no	
Mark L-4C-3D 1Hz Geophone 3-C	Sercel		no	231
4.5Hz Geophone 3-C	Sensor Netherland / HGS (India)	IN	no	594
4.5Hz Geophone vertical			no	
10Hz Geophone vertical (Müller clips)			no	
Intermediate period sensors (1Hz - 60s)			no	
GÜRALP CMG-40T	GÜRALP	GB	no	13
GÜRALP CMG-3ESP Compact	GÜRALP	GB	no	164
Trillium Compact Posthole	Nanometrics	CA	no	18
Broadband sensors (>60s)			no	
GÜRALP CMG-3T	GÜRALP	GB	no	12
GÜRALP CMG-3ESP	GÜRALP	GB	no	30
Nanometrics Trillium 120 PA	Nanometrics	CA	no	20
Nanometrics Trillium Compact	Nanometrics	CA	no	203

Metadata for 451 experiments since the 1970s,
links to DOI when available

Metadata for >3800 individual instruments, PIDs for
seismic stations implemented, beyond in progress

GIPP Example: PIDs for Seismic Stations

Mark L-4C-3D 1Hz Geophone 3-C

Instrument categories		Seismic sensors	Short-period sensors (>1Hz)	Mark L-4C-3D 1Hz Geophone 3-C
Code	MS-1006			
InventarNo	03234			
SerialNo	1006			
Location	F052			
Status	OK			
Deliverydate	1992-12-17			
Type	3CH-1Hz			
Condition				
Calibration				
Owner	gipp			
Instrumentcategory	Mark L-4C-3D 1Hz Geophone 3-C			
Manufacturer	Sercel			

GIPP Instrument Database: Instrument Type overview page

Code	Name	Manufacturer	Program	Owner	Status
MS-1006	Mark L-4C-3D 1Hz Geophone 3-C	Sercel	gipp	GFZ.sec22	OK
MS-1007	Mark L-4C-3D 1Hz Geophone 3-C	Sercel			OK
MS-1008	Mark L-4C-3D 1Hz Geophone 3-C	Sercel			OK
MS-1009	Mark L-4C-3D 1Hz Geophone 3-C	Sercel			OK

List of individual instruments

GIPP Instrument Database

Instrument categories		Seismic sensors	Short-period sensors (>1Hz)	Mark L-4C-3D 1Hz Geophone 3-C
Code	MS-1006			
Pid	http://hdl.handle.net/11708/01473DD6-6473-4A84-9837-CDBD0E71ACD5			
InventarNo	03234			
SerialNo	1006			
Status	OK			
Program	gipp			
Owner	GFZ.sec22			
Location				
Deliverydate				
Comment				
Country of Origin				
Manufacturer	Sercel			
Dualuse	no			

Overview of specific instrument with PID (= ePIC Handle)

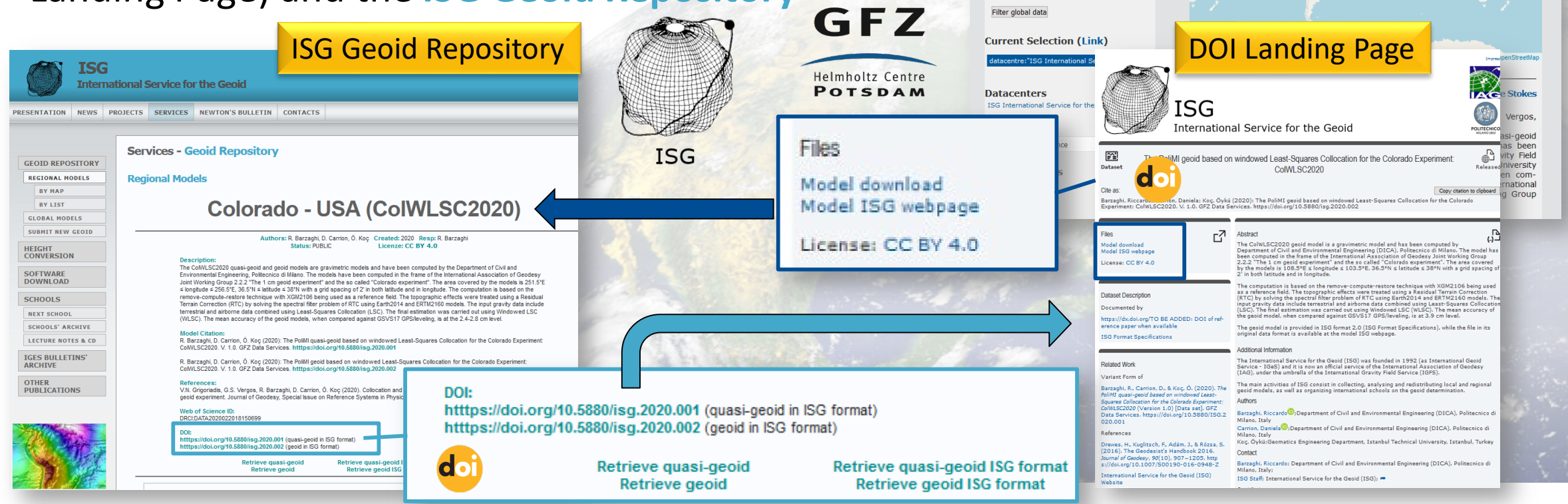
<https://gipp.gfz-potsdam.de/instruments/>

Outcomes: First Agreements

- (1) DOIs for **product „types“** or **observational networks** are preferred to DOIs for individual data files
- (2) These **DOIs for growing time series** mainly serve **for citation purposes** and not for identifying individual data streams (similar to DOIs for seismic networks)
- (3) DOIs for products that are rapidly „outdated“ (**rapid and ultra rapid products**) are **supported only if the data are archived for the long term by the datacentre.**

Outcomes: New DOI Service for ISG Geoid Models

- Collaboration **ISG/GFZ Data Services**
- DOIs for geoid models in ISG 2.0 Format
- **Cross-links** between **GFZ Data Services** (DOI Landing Page) and the **ISG Geoid Repository**



Described in: Reguzzoni, M. et al (2021). **Open access to regional geoid models: the International Service for the Geoid**. Earth System Science Data, 13(4), 1653–1666. <https://doi.org/10.5194/essd-13-1653-2021>

Concept for DOI for Hierarchical Data Products

Individual monthly field solutions are produced by a number of **International Analysis Centres (AC)** and are later combined to the **COST-G combination product** which represents a „best fit model“

COMBINATION PRODUCT



GRACE MONTHLY GRAVITY FIELD SOLUTIONS FROM DIFFERENT ANALYSIS CENTERS



AC GFZ, GERMANY



AC CRS, US



AC GRGS, FRANCE



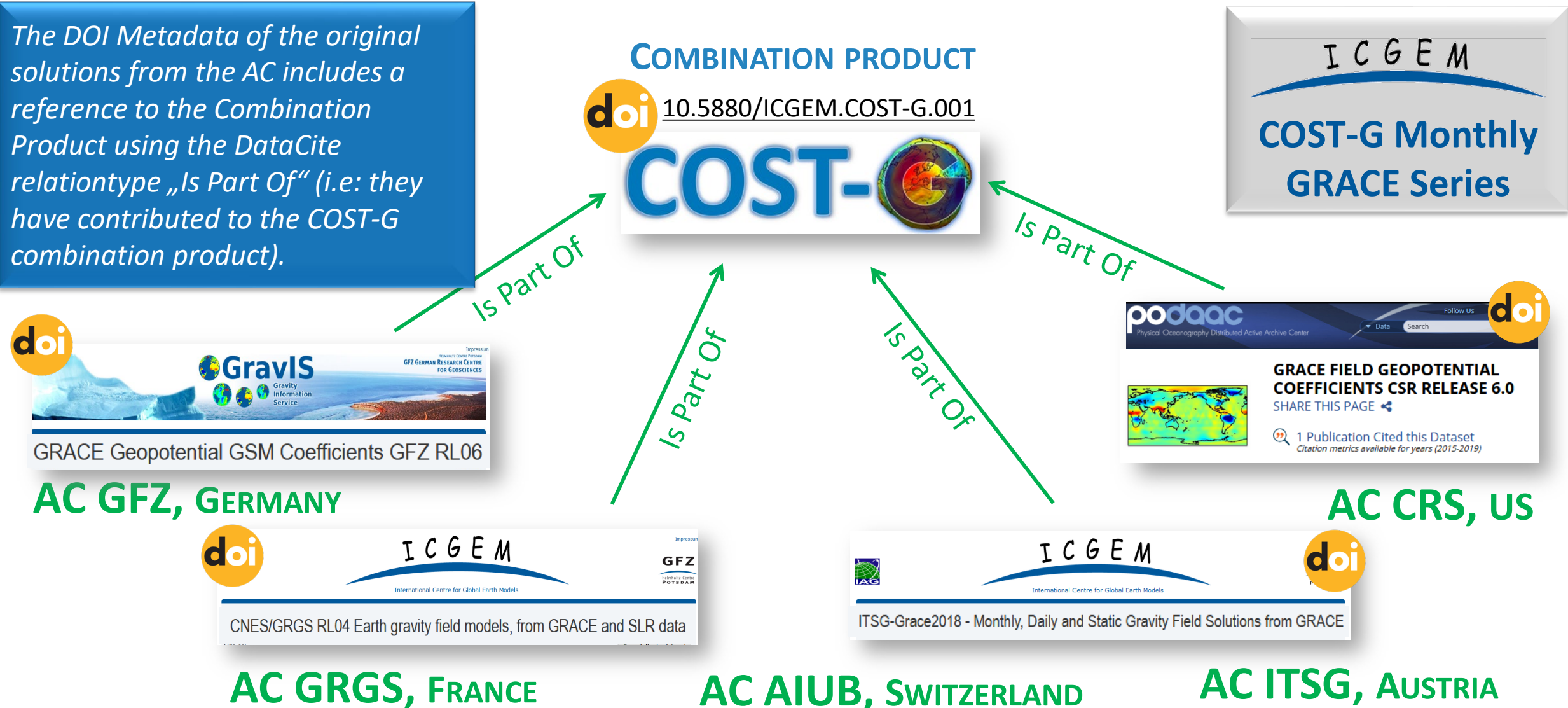
AC AIUB, SWITZERLAND

AC ITSG, AUSTRIA

COST-G = Combination Service for Time-variable Gravity Fields; **AC** = Analysis Center

Concept for DOI for Hierarchical Data Products

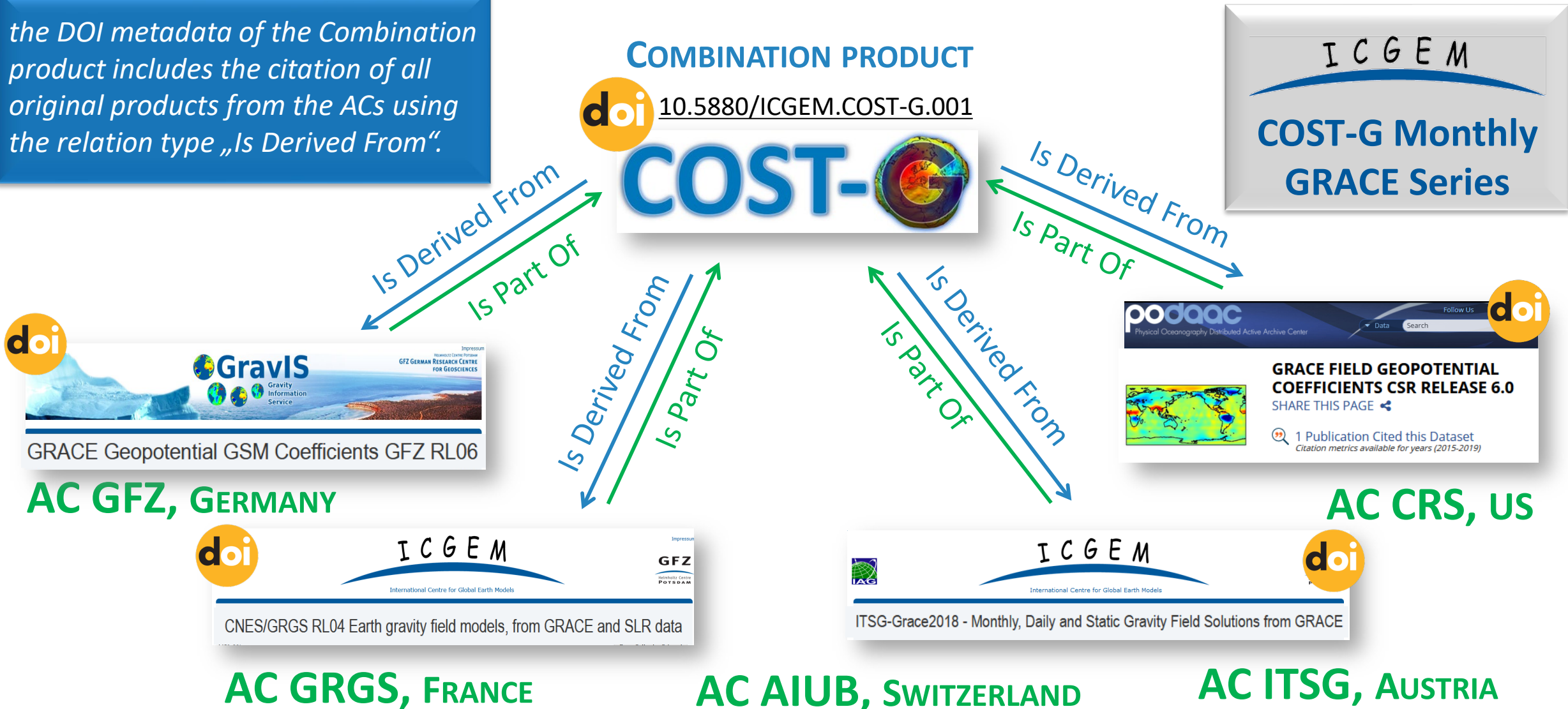
The DOI Metadata of the original solutions from the AC includes a reference to the Combination Product using the DataCite relationtype „Is Part Of“ (i.e: they have contributed to the COST-G combination product).



COST-G = Combination Service for Time-variable Gravity Fields; AC = Analysis Center

Concept for DOI for Hierarchical Data Products

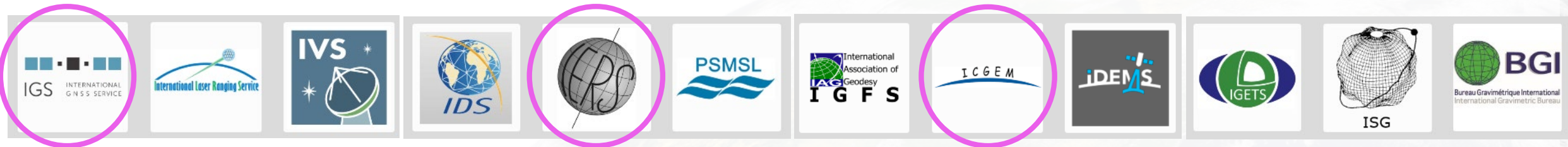
the DOI metadata of the Combination product includes the citation of all original products from the ACs using the relation type „Is Derived From“.



COST-G = Combination Service for Time-variable Gravity Fields; AC = Analysis Center

Outlook and Ongoing Discussion

- For which IAG Services could the **hierarchical DOI concept** be applied?

[more](#)


- Metadata for geodetic data:** What metadata are used and in which standard? It is possible to combine discovery metadata (e.g. DataCite, ISO19115, OGC) and geodesy metadata (**GeodesyML**, station logs)?
- Can we identify and recommend **controlled vocabularies** for geodetic data?
- Discussion on including **ROR** in geodetic metadata (GeodesyML)

DOI for Hierarchical Products – Thoughts about IGS Adoption

- **Status: IGS Orbit and Clock products** (<https://www.igscb.org/>): ultra-rapid, rapid, final
- **Status: Different Originators: IGS products are combination products of 5-9 institutional products provided by Analysis Centers** (CODE, NRCan/GSD, ESA/ESOC, GFZ, Czech Geodetic Observatory, JPL, MIT, NOAA/NGS, SIO, USNO, UPC, BKG, WHU)



IGS Analysis Centers independently analyze the IGS data set and submit their solutions to a Coordinator, who combines the submissions into a single IGS product.

- **Status: Different Products:** The individual products by the Analysis Centers may include several GNSS satellites, whereas IGS provides different products for different satellites (GPS-only, GLONASS-only)
- **Aim: How can we assure that all participating groups and the ISG are receiving the deserved credit/ citation for their work?**

DOI for Hierarchical Products – Thoughts about IGS Adoption

IGS Final Products of Analysis Centers included in the IGS Final Product

Dach, R.; et al (2020). **CODE final product series for the IGS**. Published by Astronomical Institute, University of Bern.
<https://doi.org/10.7892/boris.75876.4>



Männel, B.; et al. (2020): **GFZ final product series for the International GNSS Service (IGS)**. GFZ Data Services.
<https://doi.org/10.5880/GFZ.1.1.2020.002>



IGS Combination Product

- **Citing all sources is good scientific practice** and required by the CC BY 4.0 Licence of the originating DOI referenced datasets
- Consequently....**the Final IGS combination product should cite the existing DOIs** – how could this be implemented?

DOI for Hierarchical Products – Thoughts about IGS Adoption

Possible solution?

- Create **one DOI** for the IGS Final Product (e.g. **10.5880/IGS.Final_GPS-only**)
- Authors: **IGS plus all Analysis Center/ scientists involved?**
- **Inclusion of DOIs of CODE, GFZ and possibly other products from IGS Analysis Center in the metadata (related identifier)**

CODE

```
<relatedIdentifier relationType=„HasPart“  
relatedIdentifierType=„DOI">10.7892/boris.75876.4></relatedIdentifier>
```

GFZ

```
<relatedIdentifier relationType=„HasPart“  
relatedIdentifierType=„DOI">10.5880/GFZ.1.1.2020.002></relatedIdentifier>
```

This scenario seems appropriate for many products accross several IAG Services and will be further discussed in the group