

News from the GGOS DOI Working Group

 **Kirsten Elger** and the **GGOS Working Group on DOIs for Geodetic Data Sets**

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In October 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”**.

Group members are representatives of IAG Services and geodetic data centres that are involved with or interested in assigning DOIs to geodetic data (c. 40 members and associated members).

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.



Group Activities and Strategy

- Discussions on **DOI-related topics** during regular video conferences: granularity, hierarchical DOIs, DOIs for products, FAIR, PID, metadata, ...
- Presentation of outcomes during EGU, GGOS Days, AGU, IAG GA, IVS GM, UAW, ...
- The group was established perfectly at the right time!
 - **There is a large interest in using DOIs for data across the geodetic community (FAIR principles, need for credit)**
 - **Increasing DOI-related activities internationally**
- **We cannot provide a single one-fits-all solution.** Different data may require different solutions

Outcomes: DOI for time series/ product types


- (1) DOIs for **product „types“** or **observational networks** are preferred to DOIs for individual data files (e.g. GNSS networks, reprocessing products, temporal gravity models, campaign data...)
- (2) These **DOIs for growing time series** shall 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- (3) DOIs for products that are rapidly „outdated“ (**rapid and ultra rapid products**) are **supported only if the data are archived for the long term.**

Outcome: Concept for DOI for Hierarchical Data Products

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

COMBINATION PRODUCT
 doi 10.5880/ICGEM.COST-G.001
COST-G 

ICGEM
COST-G Monthly GRACE(-FO) Series

doi 
 GravIs Gravity Information Service
 GFZ GERMAN RESEARCH CENTRE FOR GEOSCIENCES
 GRACE Geopotential GSM Coefficients GFZ RL06

AC GFZ, GERMANY

GRACE(-FO) MONTHLY GRAVITY FIELD SOLUTIONS FROM DIFFERENT ANALYSIS CENTERS

doi 
 Physical Oceanography Distributed Active Archive Center
 GRACE FIELD GEOPOTENTIAL COEFFICIENTS CSR RELEASE 6.0
 SHARE THIS PAGE
 1 Publication Cited this Dataset
 Citation metrics available for years (2015-2019)

AC CRS, US

doi 
 International Centre for Global Earth Models
 GFZ
 CNES/GRGS RL04 Earth gravity field models, from GRACE and SLR data

AC GRGS, FRANCE

doi 
 International Centre for Global Earth Models
 IAG
 ITSG-Grace2018 - Monthly, Daily and Static Gravity Field Solutions from GRACE

AC AIUB, SWITZERLAND

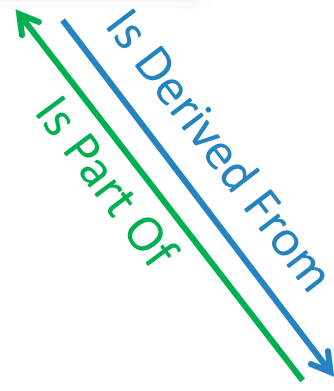
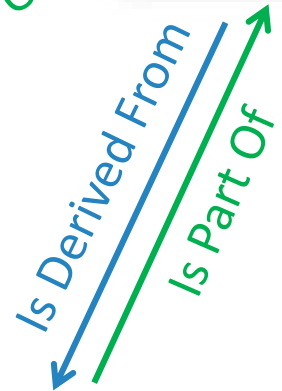
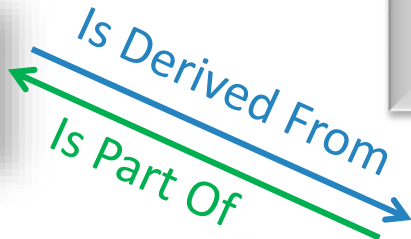
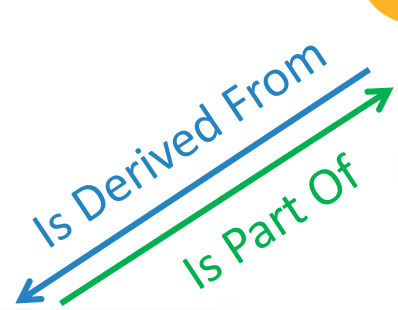
AC ITSG, AUSTRIA

Outcome: 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“.

COMBINATION PRODUCT
 doi 10.5880/ICGEM.COST-G.001
COST-G

ICGEM
COST-G Monthly GRACE(-FO) Series



doi
 GravIS
 Gravity Information Service
 GRACE Geopotential GSM Coefficients GFZ RL06

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AC AIUB, SWITZERLAND

AC ITSG, AUSTRIA

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

DOIs for entire processing chain of ITRF2020: Two steps



(1) Hierarchy of processing chain can be reflected by DOIs:

- DOI for each TRF (ITRF, DTRF, JTRF); containing/ citing...
- DOI for each intra-technique combined contribution (IDS, IGS, ILRS, IVS) containing/ citing...
- DOI for each technique-specific AC contribution; containing...
- DOI for each space-geodetic station, correlator, operations center,...

(2) All contributors within the Technique Services (stations, ACs, CCs, DCs,...) are co-authors in the DOI of the Technique's Combination Product:

- Example when generating ITRF2014: Combined IVS contribution
 - About 300+ authors = all contributors within IVS (= „IVS Associates“)
 - Citation: "Nothnagel, A., et al.; International VLBI Service for Geodesy and Astrometry (IVS); 2015: The IVS data input to ITRF2014. International VLBI Service for Geodesy and Astrometry, GFZ Data Services. <https://doi.org/10.5880/GFZ.1.1.2015.002>"

The screenshot shows the GFZ Data Services website for the dataset 'The IVS data input to ITRF2014'. It includes a list of authors, a detailed abstract, and metadata. The abstract states: 'Very Long Baseline Interferometry (VLBI) is a primary space-geodetic technique for determining precise coordinates on the Earth, for monitoring the variable Earth rotation and orientation with highest precision, and for deriving many other parameters of the Earth system. The IVS Service for Geodesy and Astrometry (IVS, https://ivsvic.gfz.de) is a service of the International Association of Geodesy (IAG) and the International Astronomical Union (IAU). The dataset published here are the results of individual Very Long Baseline Interferometry (VLBI) sessions in the form of normal equations in SINEX 2.0 format (https://www.iers.org/iers/Conventions/Pubs/ivsvic/combined/combined.html). This SINEX 2.0 dataset is the input to the next release of the International Terrestrial Reference System (ITRS), ITRF2014. This is a new version of the ITRF2008 release (Blokman et al., 2009). For each session, the normal equation system contains elements for the coordinate components of all stations having participated in the respective session as well as for the Earth orientation parameters, pole, ω -pole, UT1 and its time derivatives plus offset to the IAU2000 precession-nutation components dx , dy (https://www.iers.org/iers/Conventions/ITRS2008/ITRS2008.html). The terrestrial part is free of datum. The data sets are the result of a weighted combination of the input of several IVS Analysis Centers. The IGS contribution for ITRF2014 is described in Bachmann et al. (2015). Bachmann et al. (2015) provide a general overview on the VLBI method, details on the internal data handling can be found at Behrend (2013).

Contact
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Contributors
Thaller, Daniela; IVS; Deutsches Geoforschungszentrum GFZ; Ulbricht, Damian; Elger, Kirsten

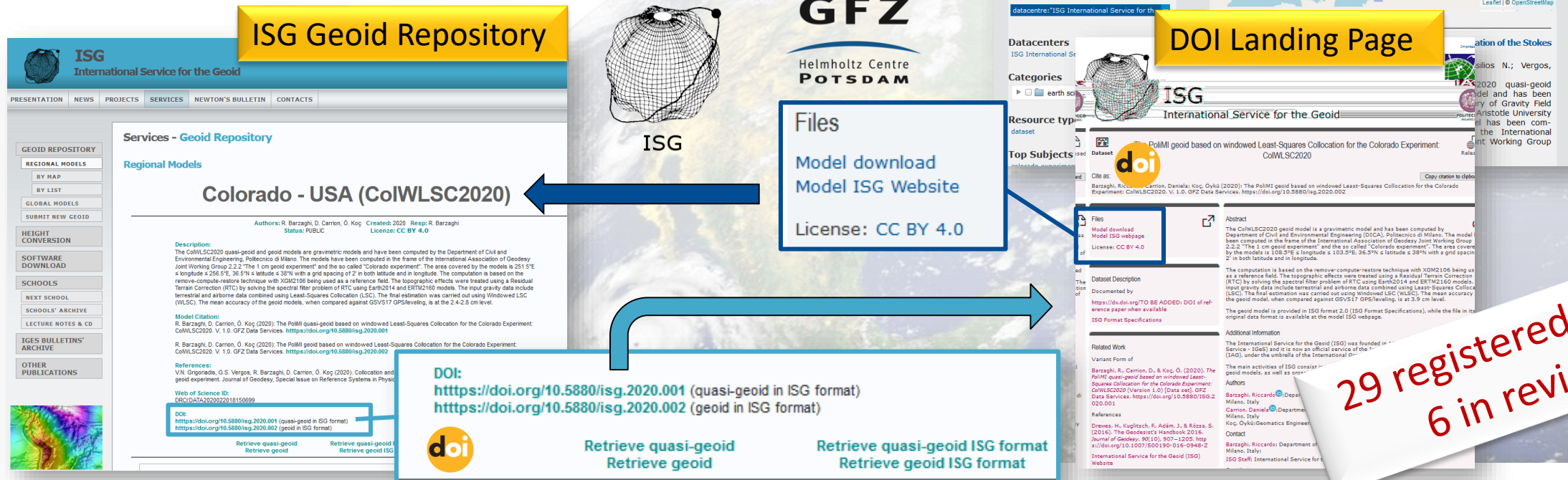
Keywords
Very Long Baseline Interferometry, VLBI, International VLBI Service for Geodesy and Astrometry, IGS, International Terrestrial Reference Frame, ITRF2014, Earth Orientation Parameters, Earth rotation, J2010, length of day, LOD, polar motion, IVS-SINEX-ITRF2014

GCMD Source Keywords
EARTH SCIENCE > SOLID EARTH > GEODETICS > COORDINATE REFERENCE SYSTEM > GLOBAL COORDINATE REFERENCE SYSTEM

More Metadata
doi:10.5880: view online / download xml
dataset: view online / download xml
diff: view online / download xml
eodocid: view online / download xml

Outcome: 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**



**29 registered DOIs,
6 in review**

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>

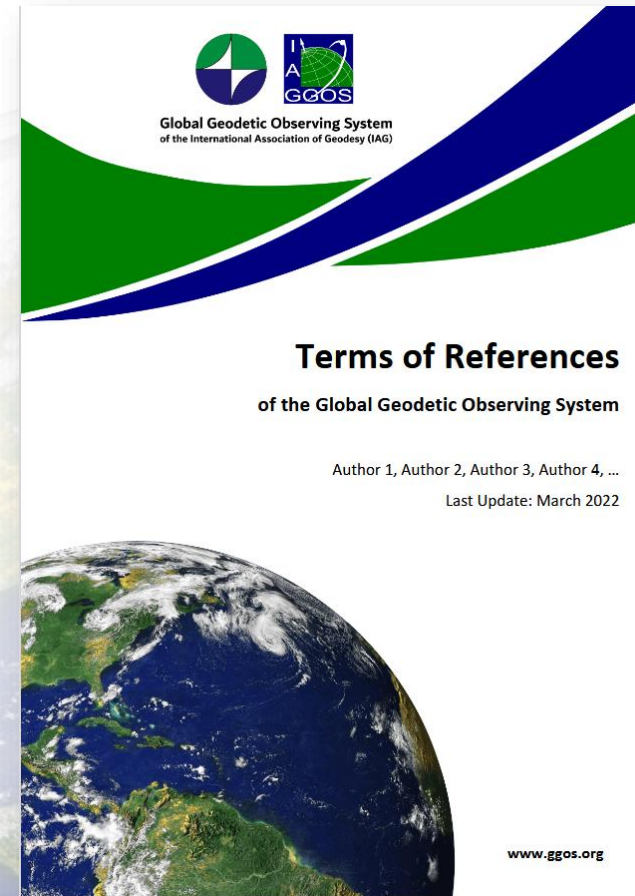
Outcome: DOIs for GGOS (Text) Publications

DOI assignment to GGOS Documents

- „GGOS Strategic Plan“
- „GGOS Implementation Plan“
- Possibly: „GGOS Terms of References“
(with reference to the Geodesist’s Handbook)

IAG Documents

- Travaux – General and Technical Reports
- Chapters of the Geodesist’s Handbook
(to be discussed with Springer-Nature)
- Rinex format description?



- Uniform layout
→ **GGOS Report Series**
- Collaboration between **GGOS** (publisher) or **IAG** (publisher) and **GFZ Data Services** (distributor)

FAIR-GNSS Project 2021-2022



Funded by



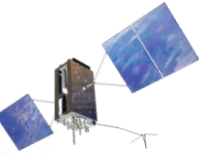
The screenshot shows the FAIR-GNSS website homepage. At the top left is the FAIR-GNSS logo with a satellite icon. The navigation menu includes Home, GNSS Data, FAIR Data, FAIR-GNSS Project, News, a user profile icon, the Royal Observatory of Belgium logo, and a Twitter icon. Below the navigation is a blue horizontal bar. The main content area features four columns:

- GNSS Data:** Decades of observation data from Belgian and European stations permanently.
- FAIR Data:** FAIR data principles aim at making data more Findable, Accessible, Interoperable, and...
- FAIR-GNSS Project:** FAIR-GNSS is a two-year project (2021-2022) aiming at setting up a new Open Data Portal for...
- News:** Latest news and a glance at the project timeline... [More...](#)

- Coordinator: Royal Observatory of Belgium (ROB)
- EUREF, EPOS, IGS
- Turning GNSS products into FAIR Digital Objects
- Contribute to the standardization of GNSS data citation
- New Open Data Portal for European and Belgian GNSS data

Complexity of GNSS Data with respect to networks

- A GNSS network may be managed by one agency, but not all agencies organise their GNSS stations as networks
- Not all GNSS stations are associated with a network (also a strict hierarchical organisation of GNSS networks would require a central coordination for network codes)
- some networks have different licenses for different product types of the same network
- Some networks are only making parts of the data available
- Some stations are part of several networks
- ...



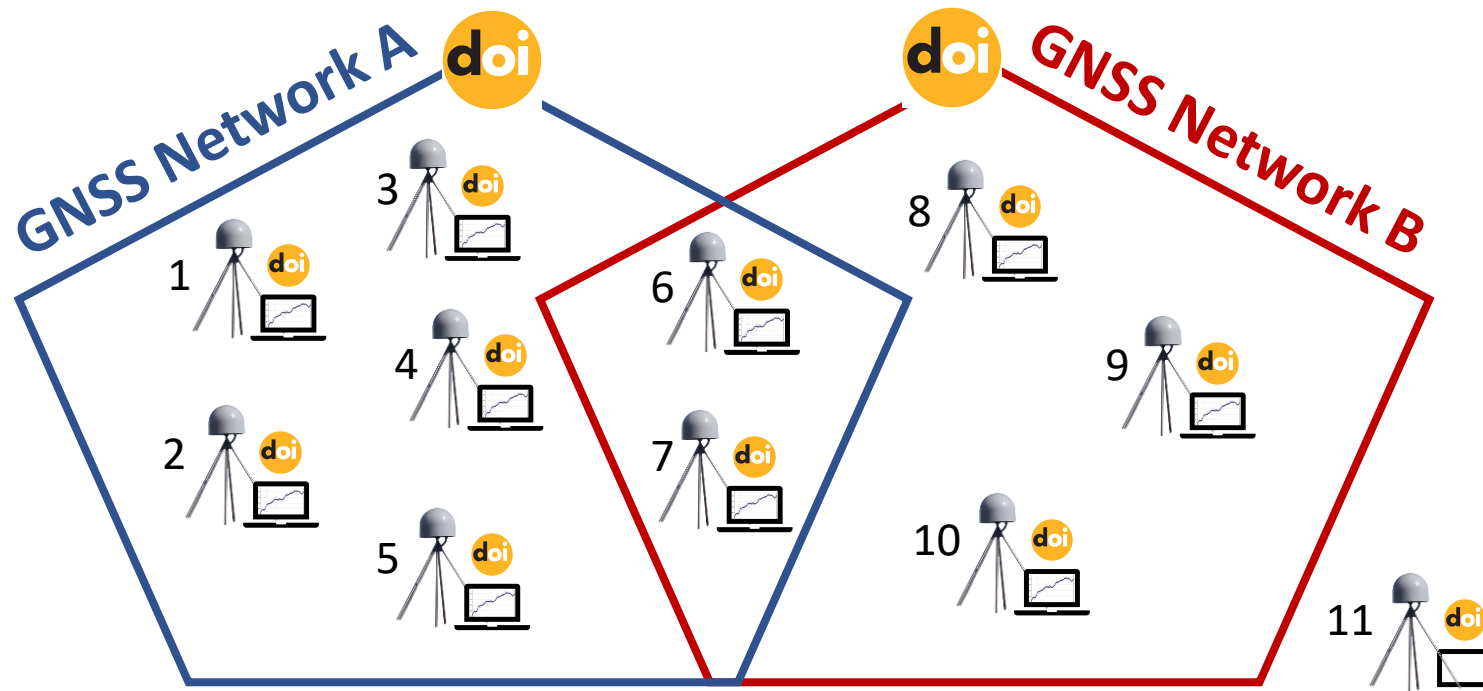
GNSS Data: Proposed Solution

- One **DOI** for the ongoing **data** measured with one **GNSS station**
- Different data products derived from the station may have different DOIs (with individual licences)



Proposed Solution

1. DOIs are assigned to the data of GNSS stations (resourceType = dataset)
2. GNSS stations are part of networks (relatedIdentifier IsPartOf, HasPart)



Relations in DOI metadata:

Stations 1-7 are part of **Network A**

Stations 7-10 are part of **Network B**

Stations 6-7 are part of
Network A and Network B

Network A has 7 parts

Network B has 5 parts

Station 11 is not part of any network

Development of Metadata recommendations for GNSS Data



Persistent Identifier (PID) → Key for FAIR data



for data, software, texts

<https://doi.org/10.5880/GFZ.1.1.2021.001> (Data)



Crossref
Funder Registry

List of funders with DOIs

<https://doi.org/10.13039/501100001659> (DFG - Germany)

ORCID

Connecting Research
and Researchers

uniquely identifying
persons

<https://orcid.org/0000-0001-5140-8602> (Kirsten Elger)

ROR

New PID for Institutions

<https://ror.org/04z8jg394> (GFZ Potsdam)

→ PIDs ARE RESOLVABLE AND MACHINE-ACTIONABLE

Metadata recommendations for GNSS Data: Strategy

(1) Initial discussions with FAIR GNSS project and members of the the GGOS Infrastructure group that are currently further developing GeodesyML; (2) discuss results with GGOS DOI WG

- The FAIR Principles (Findable, Accessible, Interoperable, Reusable) are key guidelines
- Retrieve as much metadata from site logs or GeodesyML
- Include PIDs, like ROR, ORCID, DOI in DataCite metadata and in GeodesyML and define relation types
- Develop recommendations of content for specific DataCite fields that can be also used beyond GNSS data (e.g. repository = publisher, agency = creator, local partners = contributors)
- Expected output: **Document describing the recommendations**, similar to the FDSN Recommendations for seismic network DOIs (<https://doi.org/10.7914/D11596>)



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

Thank you for your attention!!

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