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.

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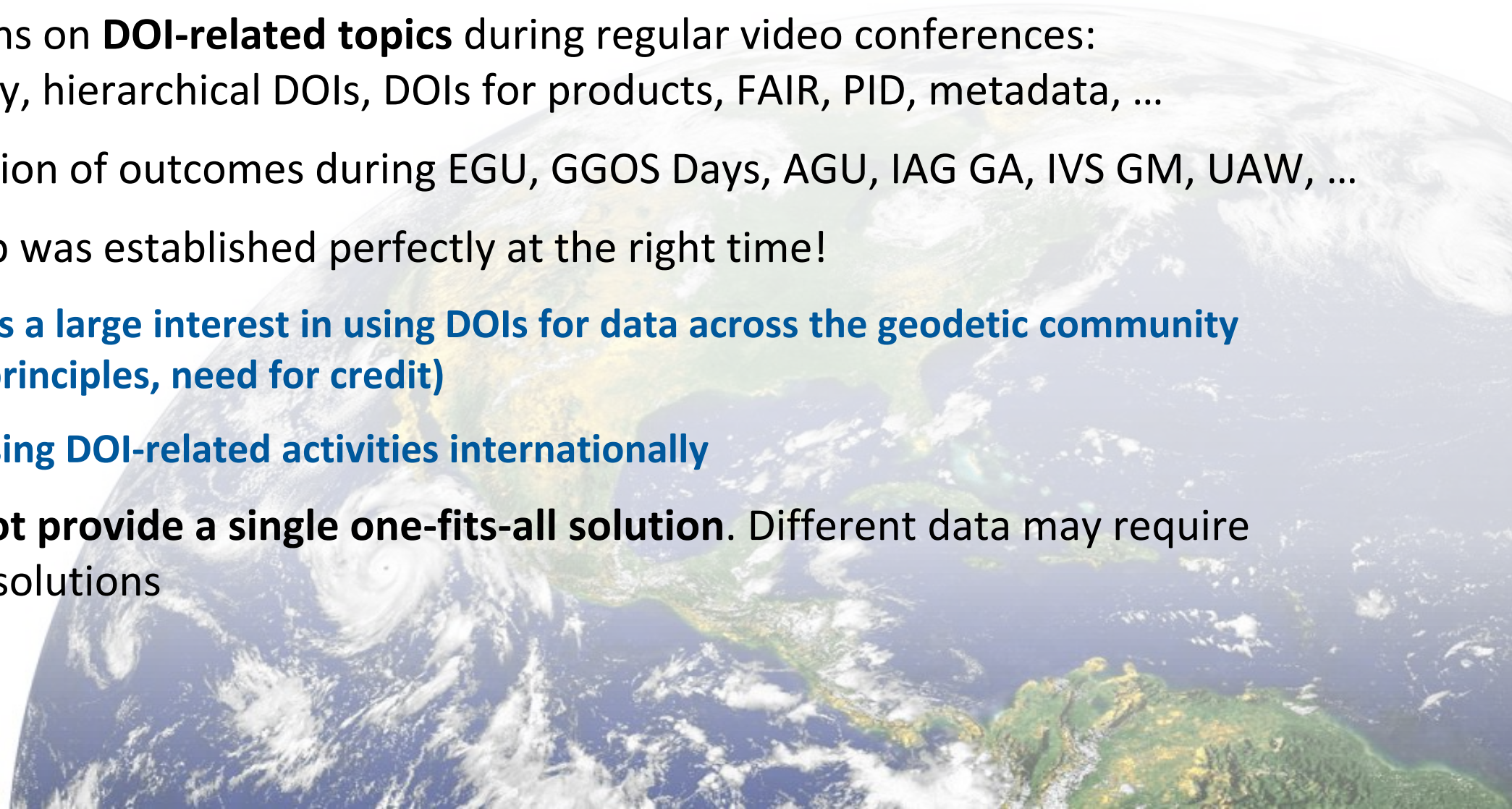
Group Activities and Strategy

- 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



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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(3) DOIs for products that are rapidly „outdated“ (**rapid and ultra rapid products**) **are supported** only **if the data are archived for the long term.**

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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

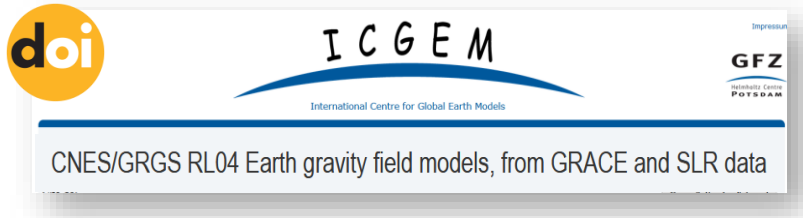
ICGEM

COST-G Monthly GRACE(-FO) Series

GRACE(-FO) 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

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

Is Derived From / Is Part Of

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

podaac Physical Oceanography Distributed Active Archive Center

doi

GRACE FIELD GEOPOTENTIAL COEFFICIENTS CSR RELEASE 6.0

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1 Publication Cited this Dataset

Citation metrics available for years (2015-2019)

AC CRS, US

doi

ICGEM International Centre for Global Earth Models

GFZ Potsdam

CNES/GRGS RL04 Earth gravity field models, from GRACE and SLR data

AC GRGS, FRANCE

ICGEM International Centre for Global Earth Models

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ITSG-Grace2018 - Monthly, Daily and Static Gravity Field Solutions from GRACE

doi

AC AIUB, SWITZERLAND

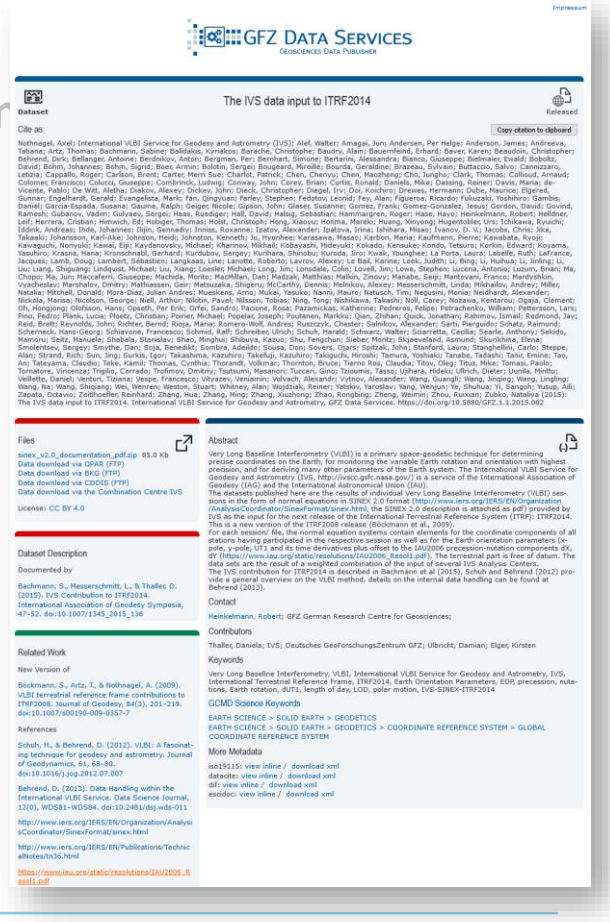
AC ITSG, AUSTRIA

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**) cor
    - DOI for each technique-specific AC contribution; **containing…**
      - DOI for each space-geodetic station, correlator, operations center,…



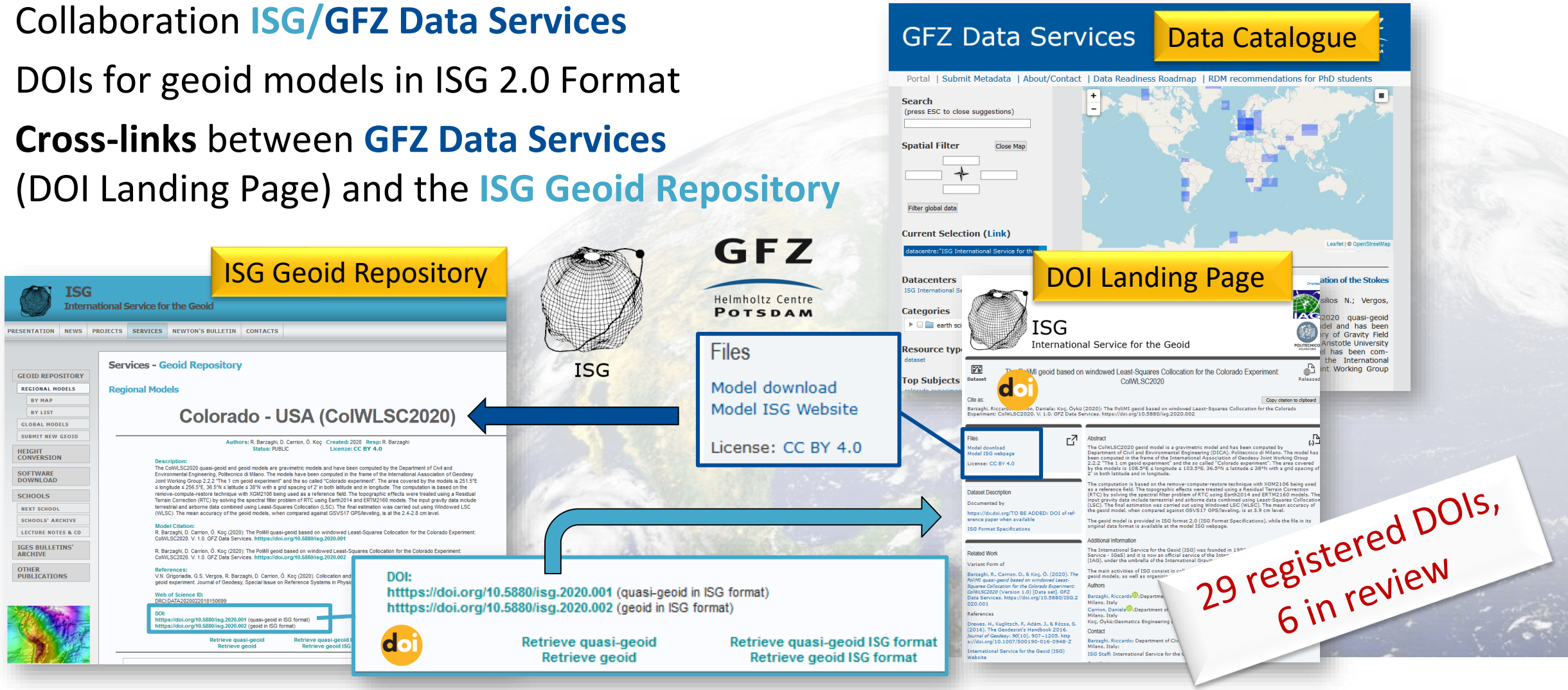
(2) All contributors within the Technique Services (stations, ACs, CCs, DCs,…) are **co-authors in the DOI of the Technique's Combination Product**:

- 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"

courtesy: Daniela Thaller (BKG)

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**



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

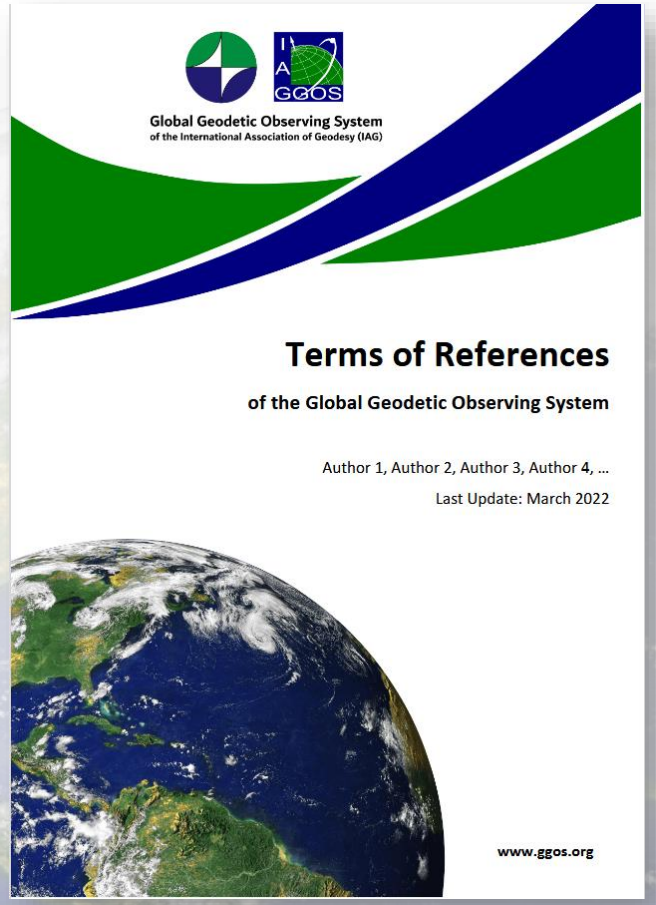
Outcome: DOIs for GGOS (Text) Publications

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)

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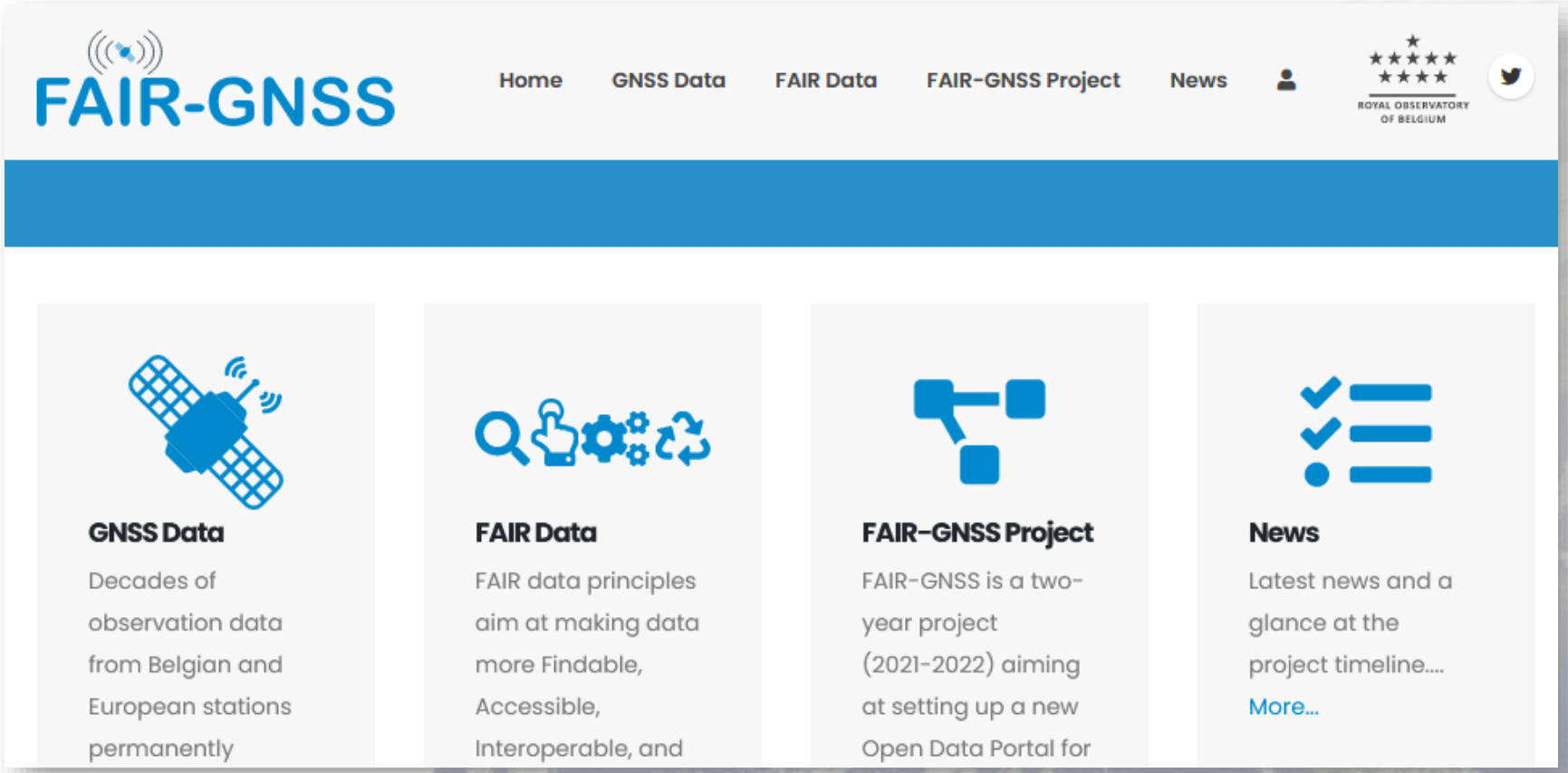
FAIR-GNSS Project 2021-2022

Funded by

ROYAL OBSERVATORY OF BELGIUM

belspo



- 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

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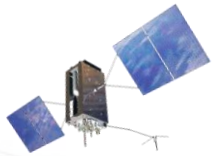
PI: Carine Bruyninx (ROB, GGOS DOI WG)

https://fair-gnss.oma.be/

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 coodination 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
- …

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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)

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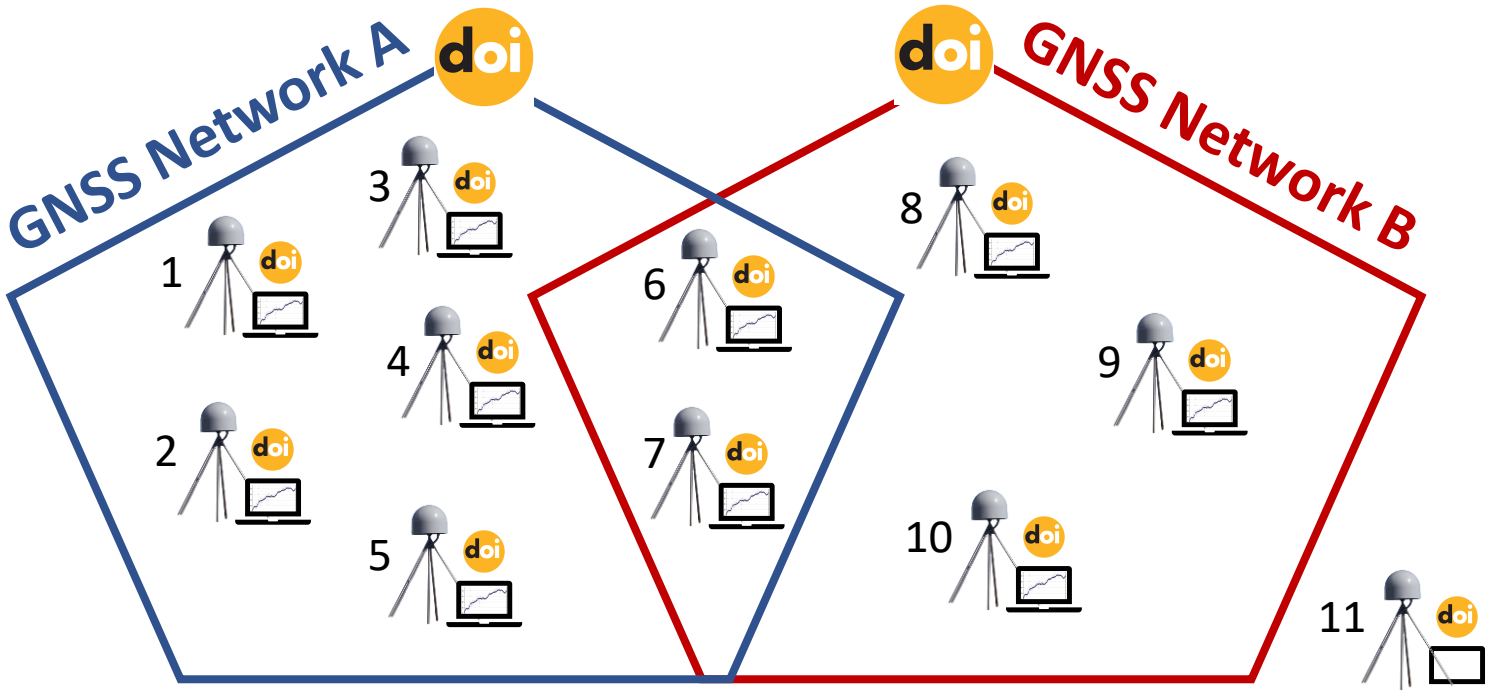
Proposed Solution

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 A has **5** parts

Station 11 is not part of any network

Development of Metadata recommendations for GNSS Data

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Persistent Identifier (PID) → Key for FAIR data

for data, software, texts

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

List of funders with DOIs

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

uniquely identifying persons

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

New PID for Institutions

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

→ PIDs ARE RESOLVABLE AND MACHINE-ACTIONABLE

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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 Recommendatations for seismic network DOIs (https://doi.org/10.7914/D11596)

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

Thank you for your attention!!

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