Towards FAIR GNSS data

EUREF Symposium – June 2, 2022

ROYAL OBSERVATORY OF BELGIUM

C. Bruyninx
A. Fabian
J. Legrand
A. Miglio
A. Moyaert

GHENT UNIVERSITY

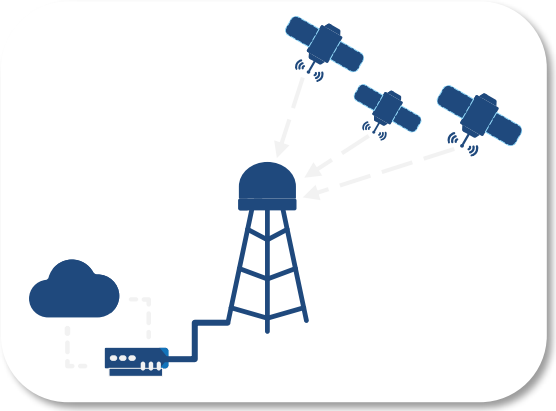
S. De Bodt
P. Oset Garcia
I. Van Nieuwerburgh

Meeting agenda

- FAIR GNSS data: why?
- FAIR-GNSS workflow & progress
- DOI & K. Elger invited talk
- Metadata
- API
- Questions & discussion

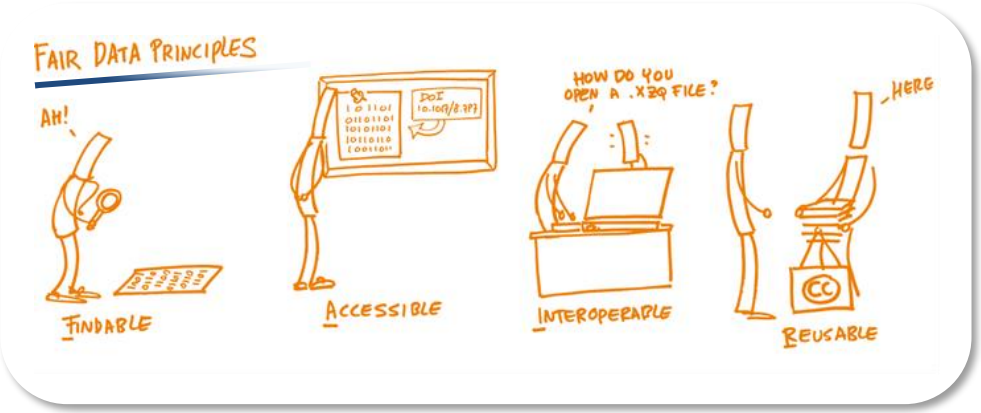
FAIR GNSS data: why?

GNSS data

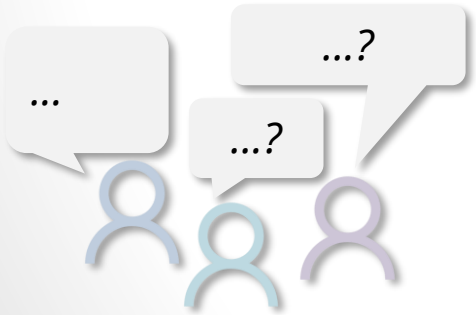


+

FAIR data principles



GNSS user community



...to respond to **GNSS user needs** as well as to **funders, policy makers and GNSS scientific organizations requests**

EU policy actions

eosc
European Open Science Cloud

GNSS organizations

IGS INTERNATIONAL GNSS SERVICE

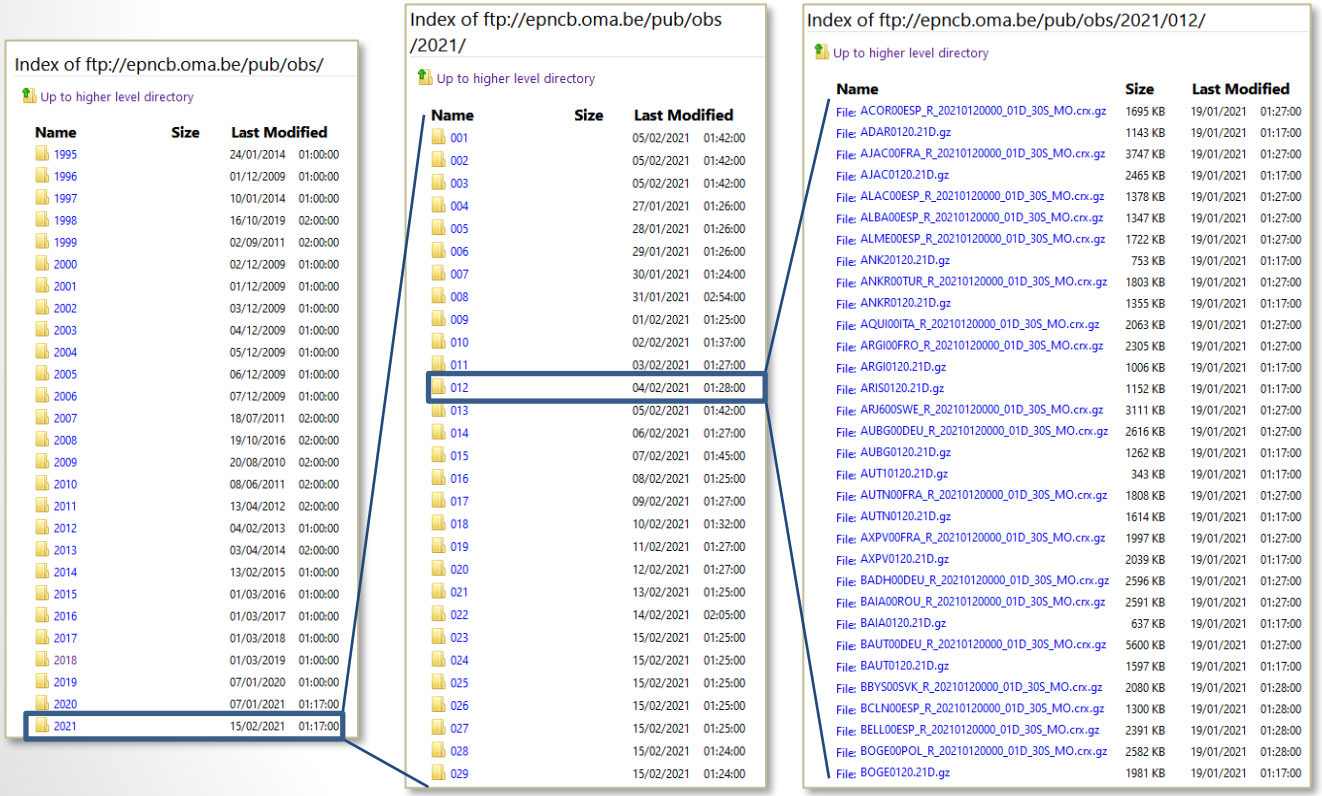
euref

GGOS Global Geodetic Observing System

Image by Patrick Hochstenbach (UGent), CC0 1.0

GNSS users: status of data repositories

How to **access** GNSS observation data at present?
...typically via **FTP services**



Index of ftp://epncb.oma.be/pub/obs/

Up to higher level directory

Name	Size	Last Modified
1995		24/01/2014 01:00:00
1996		01/12/2009 01:00:00
1997		10/01/2014 01:00:00
1998		16/10/2019 02:00:00
1999		02/09/2011 02:00:00
2000		02/12/2009 01:00:00
2001		01/12/2009 01:00:00
2002		03/12/2009 01:00:00
2003		04/12/2009 01:00:00
2004		05/12/2009 01:00:00
2005		06/12/2009 01:00:00
2006		07/12/2009 01:00:00
2007		18/07/2011 02:00:00
2008		19/10/2016 02:00:00
2009		20/08/2010 02:00:00
2010		08/06/2011 02:00:00
2011		13/04/2012 02:00:00
2012		04/02/2013 01:00:00
2013		03/04/2014 02:00:00
2014		13/02/2015 01:00:00
2015		01/03/2016 01:00:00
2016		01/03/2017 01:00:00
2017		01/03/2018 01:00:00
2018		01/03/2019 01:00:00
2019		07/01/2020 01:00:00
2020		07/01/2021 01:17:00
2021		15/02/2021 01:17:00

Index of ftp://epncb.oma.be/pub/obs/2021/

Up to higher level directory

Name	Size	Last Modified
001		05/02/2021 01:42:00
002		05/02/2021 01:42:00
003		05/02/2021 01:42:00
004		27/01/2021 01:26:00
005		28/01/2021 01:26:00
006		29/01/2021 01:26:00
007		30/01/2021 01:24:00
008		31/01/2021 02:54:00
009		01/02/2021 01:25:00
010		02/02/2021 01:37:00
011		03/02/2021 01:27:00
012		04/02/2021 01:28:00
013		05/02/2021 01:42:00
014		06/02/2021 01:27:00
015		07/02/2021 01:45:00
016		08/02/2021 01:25:00
017		09/02/2021 01:27:00
018		10/02/2021 01:32:00
019		11/02/2021 01:27:00
020		12/02/2021 01:27:00
021		13/02/2021 01:25:00
022		14/02/2021 02:05:00
023		15/02/2021 01:25:00
024		15/02/2021 01:25:00
025		15/02/2021 01:25:00
026		15/02/2021 01:25:00
027		15/02/2021 01:25:00
028		15/02/2021 01:24:00
029		15/02/2021 01:24:00

Index of ftp://epncb.oma.be/pub/obs/2021/012/

Up to higher level directory

Name	Size	Last Modified
File: ACOR00ESP_R_20210120000_01D_30S_MO.crx.gz	1695 KB	19/01/2021 01:27:00
File: ADAR0120.21D.gz	1143 KB	19/01/2021 01:17:00
File: AJAC00FRA_R_20210120000_01D_30S_MO.crx.gz	3747 KB	19/01/2021 01:27:00
File: AJAC0120.21D.gz	2465 KB	19/01/2021 01:17:00
File: ALAC00ESP_R_20210120000_01D_30S_MO.crx.gz	1378 KB	19/01/2021 01:27:00
File: ALBA00ESP_R_20210120000_01D_30S_MO.crx.gz	1347 KB	19/01/2021 01:27:00
File: ALME00ESP_R_20210120000_01D_30S_MO.crx.gz	1722 KB	19/01/2021 01:27:00
File: ANK20120.21D.gz	753 KB	19/01/2021 01:17:00
File: ANKR00TUR_R_20210120000_01D_30S_MO.crx.gz	1803 KB	19/01/2021 01:27:00
File: ANKR0120.21D.gz	1355 KB	19/01/2021 01:17:00
File: AQUI00ITA_R_20210120000_01D_30S_MO.crx.gz	2063 KB	19/01/2021 01:27:00
File: ARGI00FRO_R_20210120000_01D_30S_MO.crx.gz	2305 KB	19/01/2021 01:27:00
File: ARGI0120.21D.gz	1006 KB	19/01/2021 01:17:00
File: ARIS0120.21D.gz	1152 KB	19/01/2021 01:17:00
File: ARJ600SWE_R_20210120000_01D_30S_MO.crx.gz	3111 KB	19/01/2021 01:27:00
File: AUBG00DEU_R_20210120000_01D_30S_MO.crx.gz	2616 KB	19/01/2021 01:27:00
File: AUBG0120.21D.gz	1262 KB	19/01/2021 01:17:00
File: AUT10120.21D.gz	343 KB	19/01/2021 01:17:00
File: AUTN00FRA_R_20210120000_01D_30S_MO.crx.gz	1808 KB	19/01/2021 01:27:00
File: AUTN0120.21D.gz	1614 KB	19/01/2021 01:17:00
File: AXPV00FRA_R_20210120000_01D_30S_MO.crx.gz	1997 KB	19/01/2021 01:27:00
File: AXPV0120.21D.gz	2039 KB	19/01/2021 01:17:00
File: BADH00DEU_R_20210120000_01D_30S_MO.crx.gz	2596 KB	19/01/2021 01:27:00
File: BAIA00ROU_R_20210120000_01D_30S_MO.crx.gz	2591 KB	19/01/2021 01:27:00
File: BAIA0120.21D.gz	637 KB	19/01/2021 01:17:00
File: BAUT00DEU_R_20210120000_01D_30S_MO.crx.gz	5600 KB	19/01/2021 01:27:00
File: BAUT0120.21D.gz	1597 KB	19/01/2021 01:17:00
File: BBYS00SVK_R_20210120000_01D_30S_MO.crx.gz	2080 KB	19/01/2021 01:28:00
File: BCLN00ESP_R_20210120000_01D_30S_MO.crx.gz	1300 KB	19/01/2021 01:28:00
File: BELL00ESP_R_20210120000_01D_30S_MO.crx.gz	2391 KB	19/01/2021 01:28:00
File: BOGE00POL_R_20210120000_01D_30S_MO.crx.gz	2582 KB	19/01/2021 01:28:00
File: BOGE0120.21D.gz	1981 KB	19/01/2021 01:17:00

GNSS users: status of data repositories

How to **access** GNSS observation data at present?
…typically via **FTP services**

Available information not used for selecting files to be downloaded nor provided to the users with the downloaded RINEX files…

Index of ftp://epncb.oma.be/pub/obs/

Up to higher level directory

Name	Size	Last Modified
1995		24/01/2014 01:00:00
1996		01/12/2009 01:00:00
1997		10/01/2014 01:00:00
1998		16/10/2019 02:00:00
1999		02/09/2011 02:00:00
2000		02/12/2009 01:00:00
2001		01/12/2009 01:00:00
2002		03/12/2009 01:00:00
2003		04/12/2009 01:00:00
2004		05/12/2009 01:00:00
2005		06/12/2009 01:00:00
2006		07/12/2009 01:00:00
2007		18/07/2011 02:00:00
2008		19/10/2016 02:00:00
2009		20/08/2010 02:00:00
2010		08/06/2011 02:00:00
2011		13/04/2012 02:00:00
2012		04/02/2013 01:00:00
2013		03/04/2014 02:00:00
2014		13/02/2015 01:00:00
2015		01/03/2016 01:00:00
2016		01/03/2017 01:00:00
2017		01/03/2018 01:00:00
2018		01/03/2019 01:00:00
2019		07/01/2020 01:00:00
2020		07/01/2021 01:17:00
2021		15/02/2021 01:17:00

Index of ftp://epncb.oma.be/pub/obs/2021/

Up to higher level directory

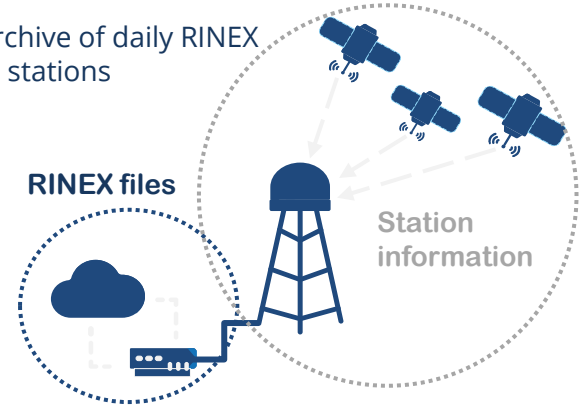
Name	Size	Last Modified
001		05/02/2021 01:42:00
002		05/02/2021 01:42:00
003		05/02/2021 01:42:00
004		27/01/2021 01:26:00
005		28/01/2021 01:26:00
006		29/01/2021 01:26:00
007		30/01/2021 01:24:00
008		31/01/2021 02:54:00
009		01/02/2021 01:25:00
010		02/02/2021 01:37:00
011		03/02/2021 01:27:00
012		04/02/2021 01:28:00
013		05/02/2021 01:42:00
014		06/02/2021 01:27:00
015		07/02/2021 01:45:00
016		08/02/2021 01:25:00
017		09/02/2021 01:27:00
018		10/02/2021 01:32:00
019		11/02/2021 01:27:00
020		12/02/2021 01:27:00
021		13/02/2021 01:25:00
022		14/02/2021 02:05:00
023		15/02/2021 01:25:00
024		15/02/2021 01:25:00
025		15/02/2021 01:25:00
026		15/02/2021 01:25:00
027		15/02/2021 01:25:00
028		15/02/2021 01:24:00
029		15/02/2021 01:24:00

Index of ftp://epncb.oma.be/pub/obs/2021/012/

Up to higher level directory

Name	Size	Last Modified
File: ACOR00ESP_R_20210120000_01D_30S_MO.crx.gz	1695 KB	19/01/2021 01:27:00
File: ADAR0120.21D.gz	1143 KB	19/01/2021 01:17:00
File: AJAC00FRA_R_20210120000_01D_30S_MO.crx.gz	3747 KB	19/01/2021 01:27:00
File: AJAC0120.21D.gz	2465 KB	19/01/2021 01:17:00
File: ALAC00ESP_R_20210120000_01D_30S_MO.crx.gz	1378 KB	19/01/2021 01:27:00
File: ALBA00ESP_R_20210120000_01D_30S_MO.crx.gz	1347 KB	19/01/2021 01:27:00
File: ALME00ESP_R_20210120000_01D_30S_MO.crx.gz	1722 KB	19/01/2021 01:27:00
File: ANK20120.21D.gz	753 KB	19/01/2021 01:17:00
File: ANKR00TUR_R_20210120000_01D_30S_MO.crx.gz	1803 KB	19/01/2021 01:27:00
File: ANKR0120.21D.gz	1355 KB	19/01/2021 01:17:00
File: AQUI00ITA_R_20210120000_01D_30S_MO.crx.gz	2063 KB	19/01/2021 01:27:00
File: ARGI00FRO_R_20210120000_01D_30S_MO.crx.gz	2305 KB	19/01/2021 01:27:00
File: ARGI0120.21D.gz	1006 KB	19/01/2021 01:17:00
File: ARIS0120.21D.gz	1152 KB	19/01/2021 01:17:00
File: ARJ600SWE_R_20210120000_01D_30S_MO.crx.gz	3111 KB	19/01/2021 01:27:00
File: AUBG00DEU_R_20210120000_01D_30S_MO.crx.gz	2616 KB	19/01/2021 01:27:00
File: AUBG0120.21D.gz	1262 KB	19/01/2021 01:17:00
File: AUT10120.21D.gz	343 KB	19/01/2021 01:17:00
File: AUTN00FRA_R_20210120000_01D_30S_MO.crx.gz	1808 KB	19/01/2021 01:27:00
File: AUTN0120.21D.gz	1614 KB	19/01/2021 01:17:00
File: AXPV00FRA_R_20210120000_01D_30S_MO.crx.gz	1997 KB	19/01/2021 01:27:00
File: AXPV0120.21D.gz	2039 KB	19/01/2021 01:17:00
File: BADH00DEU_R_20210120000_01D_30S_MO.crx.gz	2596 KB	19/01/2021 01:27:00
File: BAIA00ROU_R_20210120000_01D_30S_MO.crx.gz	2591 KB	19/01/2021 01:27:00
File: BAIA0120.21D.gz	637 KB	19/01/2021 01:17:00
File: BAUT00DEU_R_20210120000_01D_30S_MO.crx.gz	5600 KB	19/01/2021 01:27:00
File: BAUT0120.21D.gz	1597 KB	19/01/2021 01:17:00
File: BBYS00SVK_R_20210120000_01D_30S_MO.crx.gz	2080 KB	19/01/2021 01:28:00
File: BCLN00ESP_R_20210120000_01D_30S_MO.crx.gz	1300 KB	19/01/2021 01:28:00
File: BELL00ESP_R_20210120000_01D_30S_MO.crx.gz	2391 KB	19/01/2021 01:28:00
File: BOGE00POL_R_20210120000_01D_30S_MO.crx.gz	2582 KB	19/01/2021 01:28:00
File: BOGE0120.21D.gz	1981 KB	19/01/2021 01:17:00

Historical archive of daily RINEX data of EPN stations



RINEX files: information on file size, data owner, data quality metrics …

Stations: site log, data license (if provided), networks to which the station belongs …

GNSS scientific organizations

General need to **maximize interoperability and discoverability** of geodetic products and services…

IAG Reference Frame Sub-commission for Europe

…adopt FAIR data principles

EUREF 2021 Resolutions

Resolution No. 2.

The IAG Reference Frame Sub-commission for Europe (EUREF)

considering that major funding bodies, including the European Commission, promote and require the implementation of FAIR (Findable, Accessible, Interoperable, and Reusable) data principles

and recognising that FAIR data principles increase the value and the reuse of digital resources, by humans as well as machines

encourages the EUREF community to adopt these principles in all aspects of data management

IGS INTERNATIONAL GNSS SERVICE

…need for geodetic **(meta)data standards:** renewed interest in GeodesyML and in the use of **controlled vocabularies/code lists**

new version of the **RINEX format (v4):** DOI, license, station metadata

In all files;

- Added three free text optional header lines to Table A2, Table A7, and Table A36 to support the FAIR data principles addressing the Finding, Accessing, Interoperability and Reusability of public data;
  - **DOI** – Digital Object Identifier
  - **LICENSE OF USE** – Data license
  - **STATION INFORMATION** – Link to station metadata

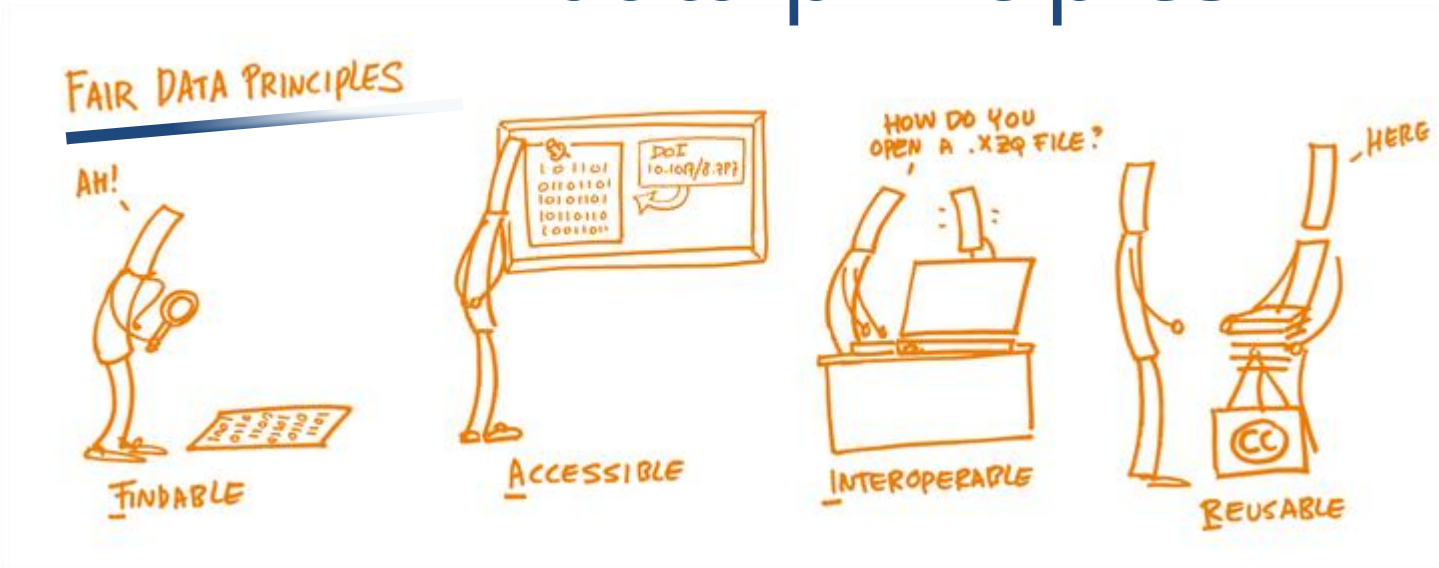
IGS/RTCM RINEX WG
1 December 2021

GGOS Global Geodetic Observing System

…Working Group on **Digital Object Identifiers (DOIs)** for geodetic data sets

Invited talk by K. Elger

FAIR data principles



FAIR data principles

To make data findable, assign **Persistent Identifiers** to data (e.g. DOIs), describe data with **metadata**: data about data, a machine-readable and structured form of documentation

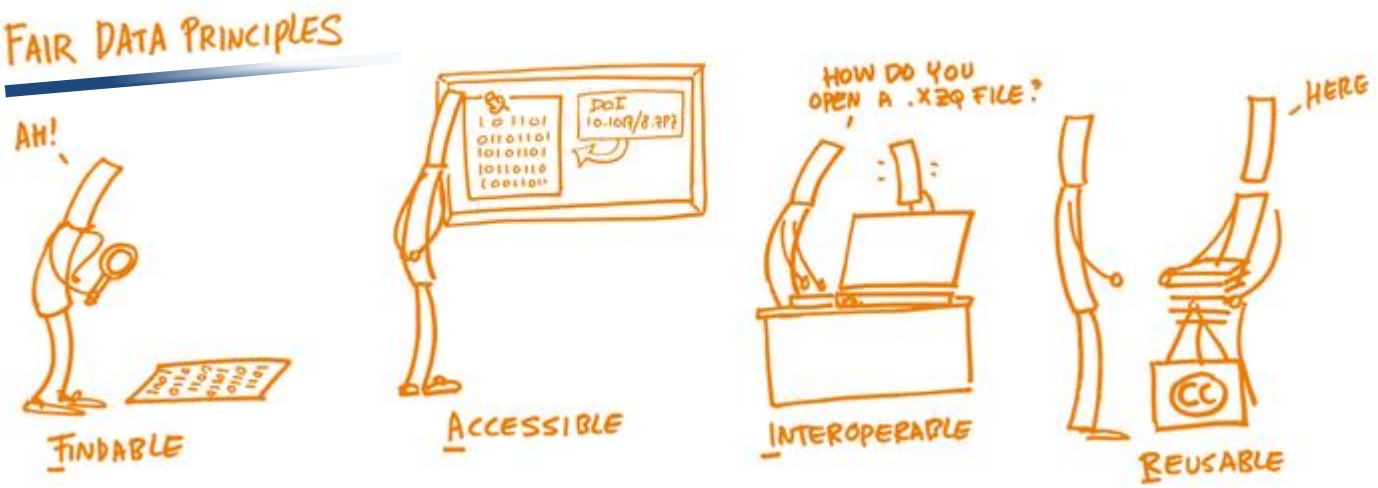
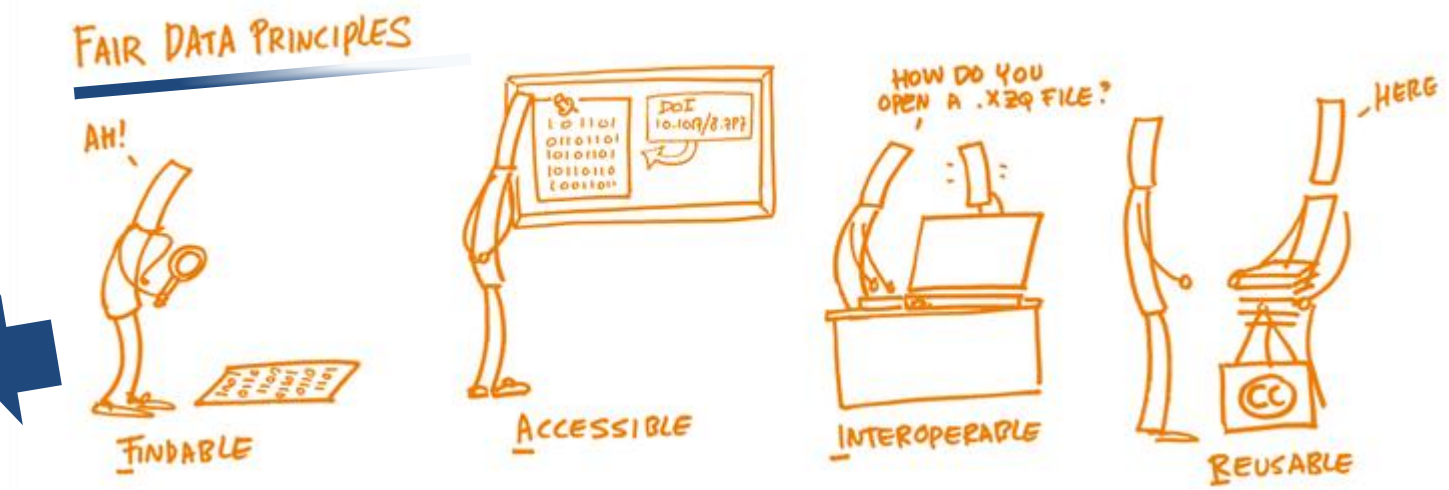


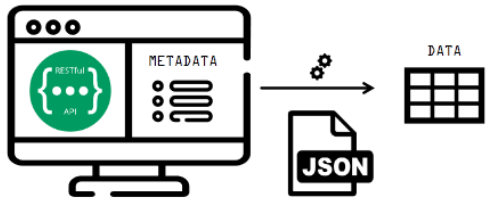
Image by Patrick Hochstenbach (UGent), CC0 1.0

FAIR data principles

To make data findable, assign **Persistent Identifiers** to data (e.g. DOIs), describe data with **metadata**: data about data, a machine-readable and structured form of documentation



Standard communications protocol to **retrieve metadata** e.g. HTTPS, FTP and **APIs (Application Programming Interface)**: a set of functions and procedures to allow applications to access repository data



FAIR data principles

To make data findable, assign **Persistent Identifiers** to data (e.g. DOIs), describe data with **metadata**: data about data, a machine-readable and structured form of documentation

Standard communications protocol to **retrieve metadata** e.g. HTTPS, FTP and **APIs (Application Programming Interface)**: a set of functions and procedures to allow applications to access repository data

Standards for metadata aka metadata schema: a community consensus on the relevant metadata for a specific purpose or domain. Use of **predefined, authorized terms i.e. controlled vocabularies**, taxonomies or ontologies

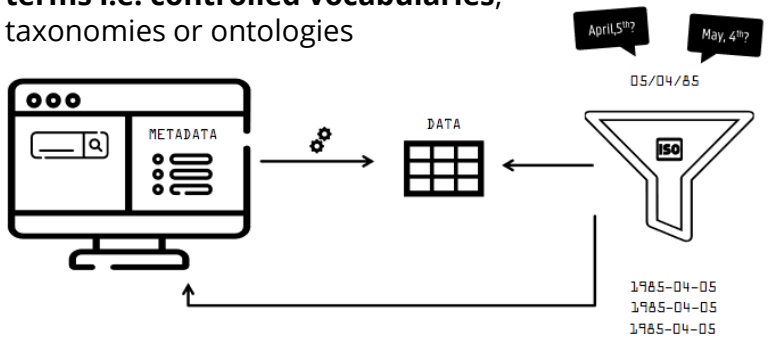


Image by Patrick Hochstenbach (UGent), CC0 1.0

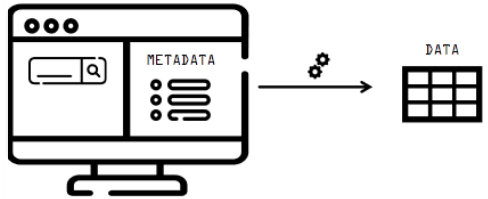
FAIR data principles

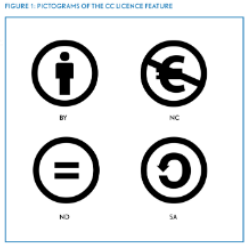
To make data findable, assign **Persistent Identifiers** to data (e.g. DOIs), describe data with **metadata**: data about data, a machine-readable and structured form of documentation

Standard communications protocol to **retrieve metadata** e.g. HTTPS, FTP and **APIs (Application Programming Interface)**: a set of functions and procedures to allow applications to access repository data

Standards for metadata aka metadata schema: a community consensus on the relevant metadata for a specific purpose or domain. Use of **predefined, authorized terms i.e. controlled vocabularies**, taxonomies or ontologies

License as metadata : license grants permission for data re-use under certain conditions

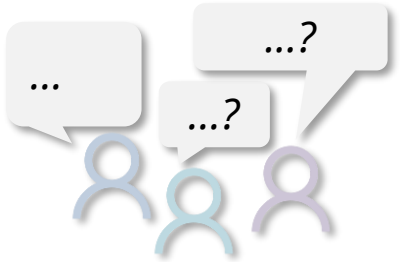




creative commons

FAIR GNSS data: why?

GNSS user community



- **search for and download data** (and site logs) from multiple stations
- get **data usage conditions**
- **acknowledge data providers**

GNSS organizations

- **interoperability & discoverability**
- **standards and controlled vocabularies**
- **metadata**
- **data license**
- **DOI**

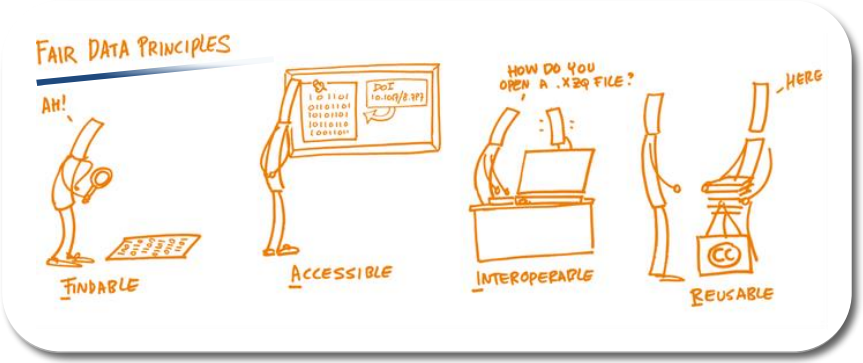
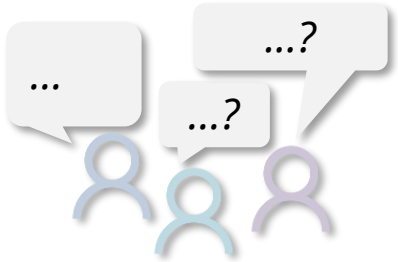


Image by Patrick Hochstenbach (UGent), CC0 1.0

FAIR GNSS data: why?

GNSS user community



- **search for and download data** (and site logs) from multiple stations
- get **data usage conditions**
- **acknowledge data providers**

GNSS organizations

- **interoperability & discoverability**
- **standards and controlled vocabularies**
- **metadata**
- **data license**
- **DOI**

...evolve **towards FAIR GNSS data**!

FAIR-GNSS

2021-2022 project (extended to mid-2023)

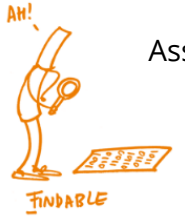
Belgian national project funded by Belgian Science Policy Office

Meeting agenda

- FAIR GNSS data: why?
- FAIR-GNSS workflow & progress
- DOI & K. Elger invited talk
- Metadata
- API
- Questions & discussion

FAIR-GNSS workflow

STEP 1 Assign a persistent identifier (PID)



DataCite

Globally unique and **persistent identifiers**

FAIR-GNSS workflow

STEP 1

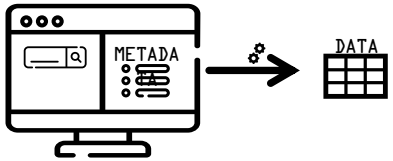
Assign a persistent identifier (PID)

DataCite

Globally unique and **persistent identifiers**

STEP 2

Data are described with rich metadata



Metadata, machine-readable and structured documentation

FAIR-GNSS workflow

STEP 1

Assign a persistent identifier (PID)

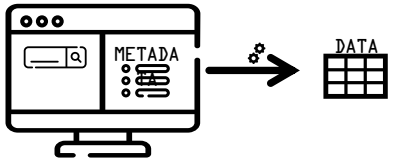
doi

DataCite

Globally unique and **persistent identifiers**

STEP 2

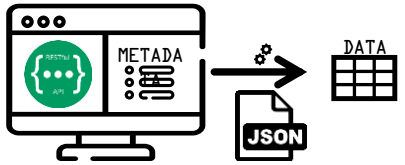
Data are described with rich metadata



Metadata, machine-readable and structured documentation

STEP 3

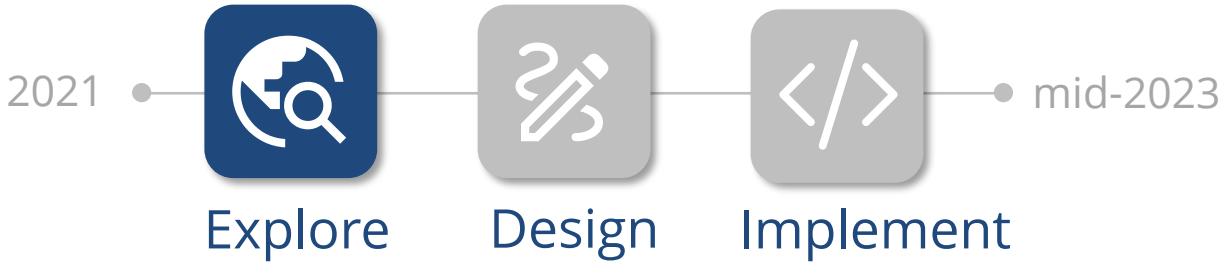
Standard communications protocol to retrieve (meta)data



APIs (Application Programming Interface)

FAIR-GNSS progress

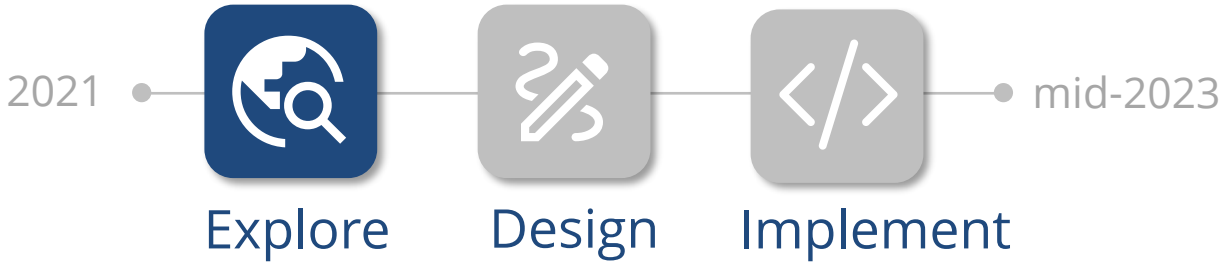
EUREF Symposium **2021**



- Overview of relevant FAIR data guidelines and data assessment tools/metrics
- Identification of **GNSS data issues** wrt **FAIR principles**

FAIR-GNSS progress

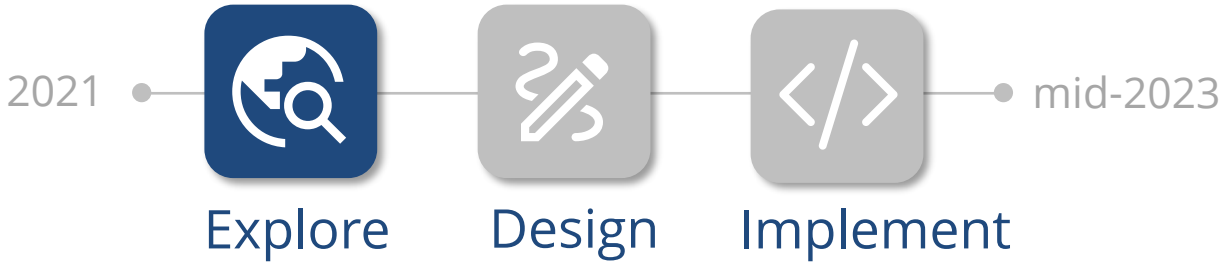
EUREF Symposium **2021**



- Overview of relevant FAIR data guidelines and data assessment tools/metrics
- Identification of **GNSS data issues** wrt **FAIR principles**
- How GNSS observation data and station information data are organized at ROB

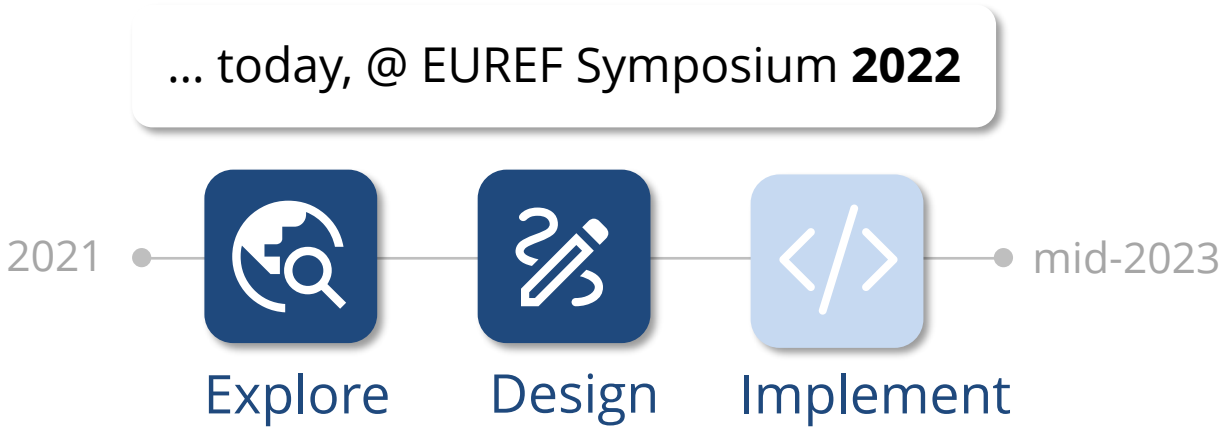
FAIR-GNSS progress

EUREF Symposium **2021**



- Overview of relevant FAIR data guidelines and data assessment tools/metrics
- Identification of **GNSS data issues** wrt **FAIR principles**
- How GNSS observation data and station information data are organized at ROB
- Explore:
  - user perspective on GNSS **metadata**
  - existing **metadata standards** (if any) for GNSS data
  - use of **metadata** within the GNSS community (including use of **PID/DOI**)

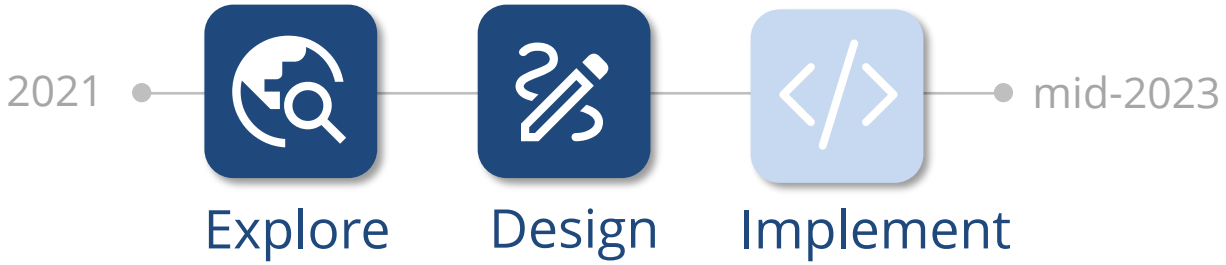
FAIR-GNSS progress



- Select/implement the most appropriate **metadata schemas** for GNSS data:
  - DOI: relevant **DOI metadata** (based on DataCite schema) for GNSS datasets
  - RINEX data: **DCAT-based application profile**
  - Station information: **extended GeodesyML**

FAIR-GNSS progress

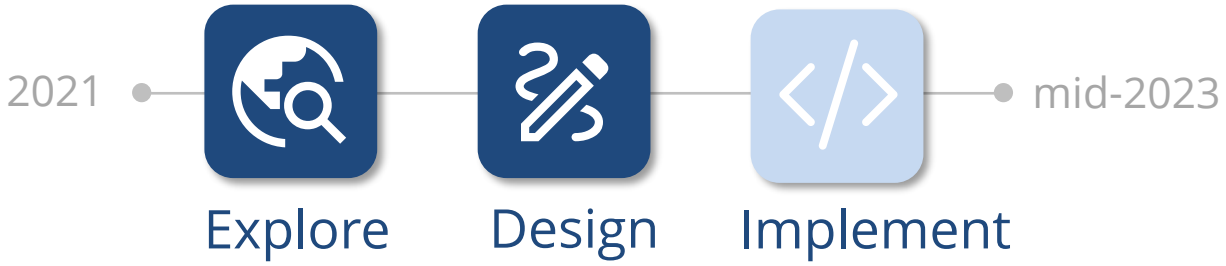
... today, @ EUREF Symposium **2022**



- Select/implement the most appropriate **metadata schemas** for GNSS data:
  - DOI: relevant **DOI metadata** (based on DataCite schema) for GNSS datasets
  - RINEX data: **DCAT-based application profile**
  - Station information: **extended GeodesyML**
- Feedback & interactions with: GGOS WG on DOI, IGS IC and GeodesyML developers, ESA

FAIR-GNSS progress

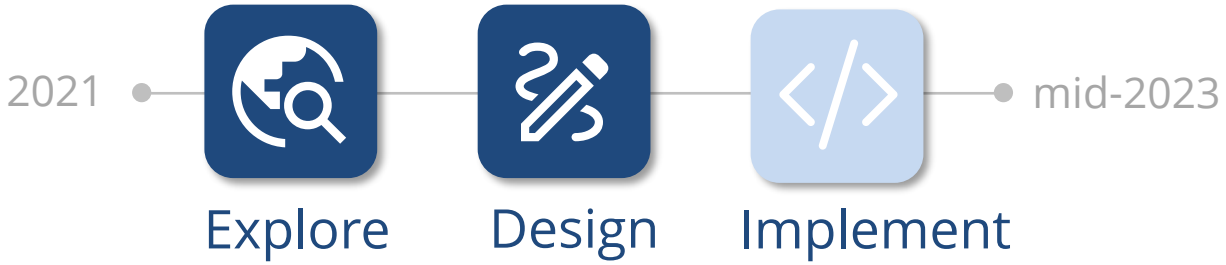
… today, @ EUREF Symposium **2022**



- Select/implement the most appropriate **metadata schemas** for GNSS data:
  - DOI: relevant **DOI metadata** (based on DataCite schema) for GNSS datasets
  - RINEX data: **DCAT-based application profile**
  - Station information: **extended GeodesyML**
- Feedback & interactions with: GGOS WG on DOI, IGS IC and GeodesyML developers, ESA
- GNSS databases validation, restructuring and mapping to prepare GNSS data

FAIR-GNSS progress

… today, @ EUREF Symposium **2022**



- Select/implement the most appropriate **metadata schemas** for GNSS data:
  - DOI: relevant **DOI metadata** (based on DataCite schema) for GNSS datasets
  - RINEX data: **DCAT-based application profile**
  - Station information: **extended GeodesyML**
- Feedback & interactions with: GGOS WG on DOI, IGS IC and GeodesyML developers, ESA
- GNSS databases validation, restructuring and mapping to prepare GNSS data
- Select **API use cases** for GNSS data access

Meeting agenda

- FAIR GNSS data: why?
- FAIR-GNSS workflow & progress
- DOI & K. Elger invited talk
- Metadata
- API
- Questions & discussion

ROYAL OBSERVATORY OF BELGIUM

Kirsten Elger
invited talk

GGOS
Global Geodetic Observing System

GHENT UNIVERSITY

Towards FAIR GNSS data

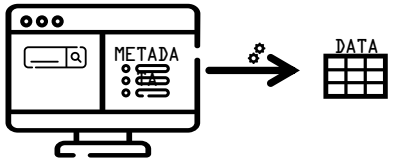
STEP 1

Assign a persistent identifier (PID)

Globally unique and **persistent identifiers**

STEP 2

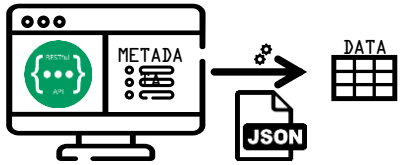
Data are described with rich metadata



Metadata, machine-readable and structured documentation

STEP 3

Standard communications protocol to retrieve (meta)data



APIs (Application Programming Interface)

ROYAL OBSERVATORY OF BELGIUM

Towards FAIR GNSS data EUREF Symposium June 2, 2022

GHENT UNIVERSITY

DOIs for GNSS data

Most obvious choice: Digital Object Identifiers provided by DataCite

Digital Object Identifiers (DOIs) for data

DOI is a character string (standardized by ISO) used to uniquely identify an object such as journal articles, research reports and data sets, e.g.

https://doi.org/10.24414/ROB-EUREF-HDC

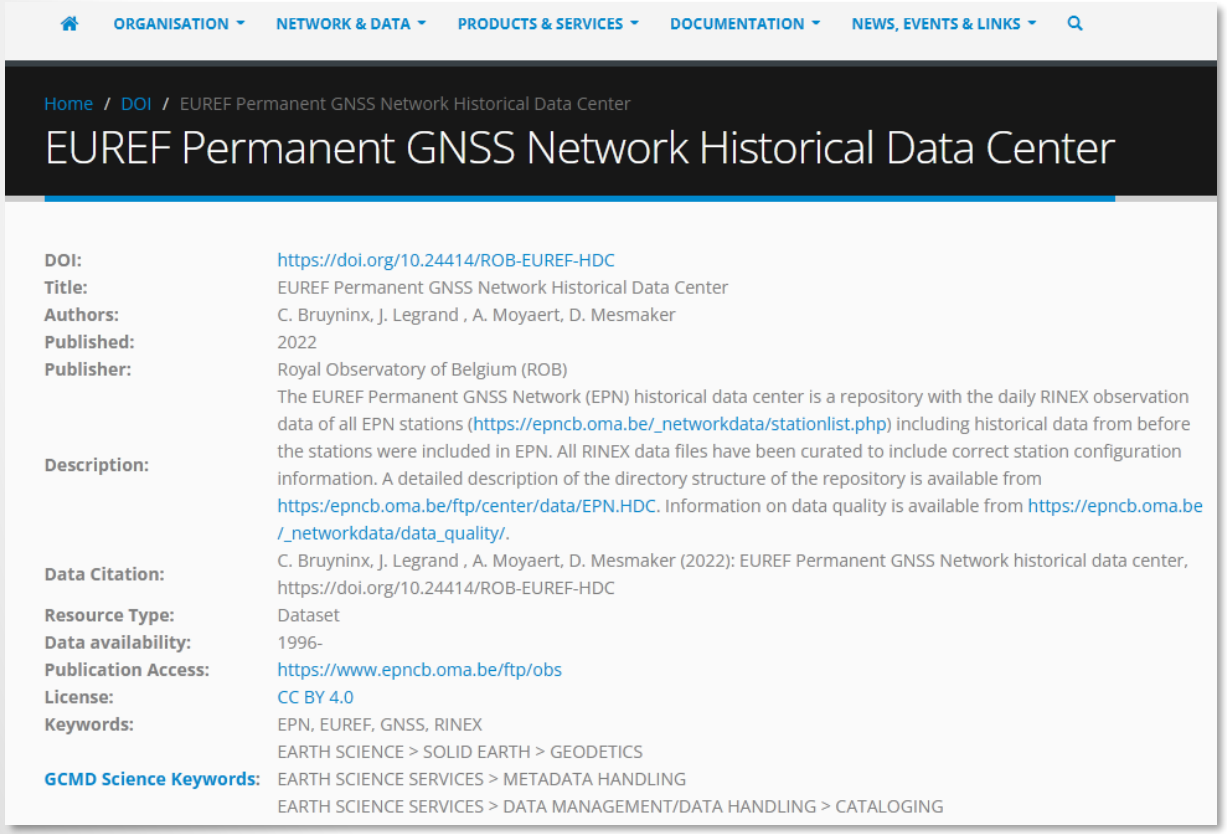
Prefix **Suffix**

- Seismological community: FDSN recommendations and DOI naming
- UNAVCO (...already minting DOIs for GNSS datasets), GFZ, CDDIS, EPOS, ROB, ...
- GGOS Global Geodetic Observing System working group on DOI: a common approach to assign DOI to geodetic data and products
- Data citations and open research data assessment metrics MAKE DATA COUNT

DOIs for GNSS data

https://doi.org/10.24414/ROB-EUREF-HDC

DOI landing page



ORGANISATION NETWORK & DATA PRODUCTS & SERVICES DOCUMENTATION NEWS, EVENTS & LINKS

Home / DOI / EUREF Permanent GNSS Network Historical Data Center

EUREF Permanent GNSS Network Historical Data Center

DOI:	https://doi.org/10.24414/ROB-EUREF-HDC
Title:	EUREF Permanent GNSS Network Historical Data Center
Authors:	C. Bruyninx, J. Legrand , A. Moyaert, D. Mesmaker
Published:	2022
Publisher:	Royal Observatory of Belgium (ROB)
Description:	The EUREF Permanent GNSS Network (EPN) historical data center is a repository with the daily RINEX observation data of all EPN stations (https://epncb.oma.be/_networkdata/stationlist.php) including historical data from before the stations were included in EPN. All RINEX data files have been curated to include correct station configuration information. A detailed description of the directory structure of the repository is available from https:/epncb.oma.be/ftp/center/data/EPN.HDC. Information on data quality is available from https://epncb.oma.be/_networkdata/data_quality/.
Data Citation:	C. Bruyninx, J. Legrand , A. Moyaert, D. Mesmaker (2022): EUREF Permanent GNSS Network historical data center, https://doi.org/10.24414/ROB-EUREF-HDC
Resource Type:	Dataset
Data availability:	1996-
Publication Access:	https://www.epncb.oma.be/ftp/obs
License:	CC BY 4.0
Keywords:	EPN, EUREF, GNSS, RINEX
GCMD Science Keywords:	EARTH SCIENCE > SOLID EARTH > GEODETICS EARTH SCIENCE SERVICES > METADATA HANDLING EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > CATALOGING

DOIs for GNSS data

https://doi.org/10.24414/ROB-EUREF-HDC

DOI landing page

ORGANISATION ▾ NETWORK & DATA ▾ PRODUCTS & SERVICES ▾ DOCUMENTATION ▾ NEWS, EVENTS & LINKS ▾

Home / DOI / EUREF Permanent GNSS Network Historical Data Center

EUREF Permanent GNSS Network Historical Data Center

DOI:	https://doi.org/10.24414/ROB-EUREF-HDC
Title:	EUREF Permanent GNSS Network Historical Data Center
Authors:	C. Bruyninx, J. Legrand , A. Moyaert, D. Mesmaker
Published:	2022
Publisher:	Royal Observatory of Belgium (ROB)
Description:	The EUREF Permanent GNSS Network (EPN) historical data center is a repository with the daily RINEX observation data of all EPN stations (https://epncb.oma.be/_networkdata/stationlist.php) including historical data from before the stations were included in EPN. All RINEX data files have been curated to include correct station configuration information. A detailed description of the directory structure of the repository is available from https:/epncb.oma.be/ftp/center/data/EPN.HDC. Information on data quality is available from https://epncb.oma.be/_networkdata/data_quality/.
Data Citation:	C. Bruyninx, J. Legrand , A. Moyaert, D. Mesmaker (2022): EUREF Permanent GNSS Network historical data center, https://doi.org/10.24414/ROB-EUREF-HDC
Resource Type:	Dataset
Data availability:	1996-
Publication Access:	https://www.epncb.oma.be/ftp/obs
License:	CC BY 4.0
Keywords:	EPN, EUREF, GNSS, RINEX
GCMD Science Keywords:	EARTH SCIENCE > SOLID EARTH > GEODETICS EARTH SCIENCE SERVICES > METADATA HANDLING EARTH SCIENCE SERVICES > DATA MANAGEMENT/DATA HANDLING > CATALOGING

XML file – DataCite schema

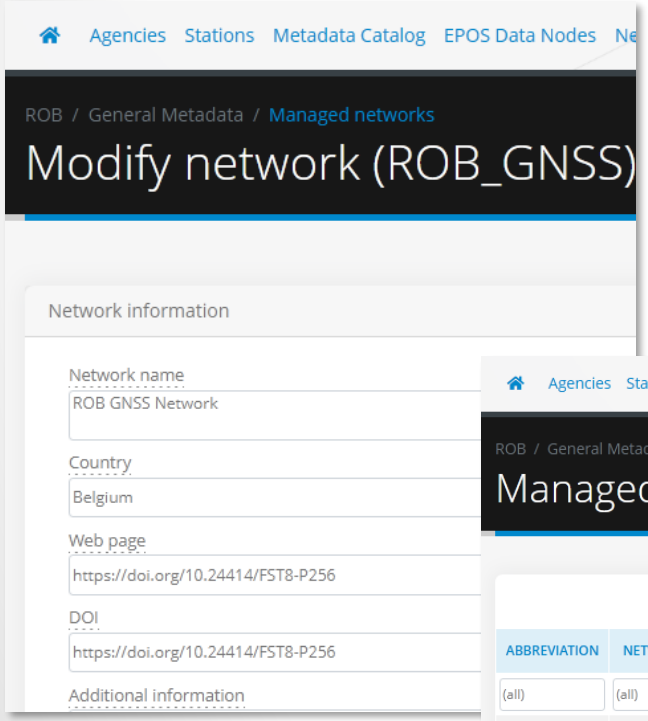
```
<resource xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://datacite.org/schema/kernel-4" xsi:schem
https://schema.datacite.org/meta/kernel-4/metadata.xsd">
  <identifier identifierType="DOI">10.24414/ROB-EUREF-HDC</identifier>
  <creators>
    <creator>
      <creatorName nameType="Personal">Bruyninx, Carine</creatorName>
      <givenName>Carine</givenName>
      <familyName>Bruyninx</familyName>
      <nameIdentifier nameIdentifierScheme="ORCID" schemeURI="https://orcid.org">https://orcid.org/0000-0001-6492-394
      <affiliation>Royal Observatory of Belgium</affiliation>
    </creator>
    <creator>
      <creatorName nameType="Personal">Legrand, Juliette</creatorName>
      <givenName>Juliette</givenName>
      <familyName>Legrand</familyName>
      <nameIdentifier nameIdentifierScheme="ORCID" schemeURI="https://orcid.org">https://orcid.org/0000-0002-9502-904
      <affiliation>Royal Observatory of Belgium</affiliation>
    </creator>
    <creator>
      <creatorName nameType="Personal">Moyaert, Ann</creatorName>
      <givenName>Ann</givenName>
      <familyName>Moyaert</familyName>
      <affiliation>Royal Observatory of Belgium</affiliation>
    </creator>
    <creator>
      <creatorName nameType="Personal">Mesmaker, Dominique</creatorName>
      <givenName>Dominique</givenName>
      <familyName>Mesmaker</familyName>
      <affiliation>Royal Observatory of Belgium</affiliation>
    </creator>
  </creators>
  <titles>
    <title xml:lang="en">EUREF Permanent GNSS Network Historical Data Center</title>
  </titles>
  <publisher xml:lang="en">Royal Observatory of Belgium</publisher>
  <publicationYear>2022</publicationYear>
  <subjects>
    <subject>EPN</subject>
    <subject>EUREF</subject>
    <subject>GNSS</subject>
    <subject>RINEX</subject>
    <subject xml:lang="en" schemeURI="https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/" s
    SCIENCE &gt; SOLID EARTH &gt; GEODETICS</subject>
    <subject xml:lang="en" schemeURI="https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/" s
    SCIENCE SERVICES &gt; METADATA HANDLING</subject>
    <subject xml:lang="en" schemeURI="https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/" s
    SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; CATALOGING</subject>
    <subject xml:lang="en" schemeURI="https://gcmd.earthdata.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/" s
    SCIENCE SERVICES &gt; DATA MANAGEMENT/DATA HANDLING &gt; DATA ACCESS/RETRIEVAL</subject>
  </subjects>
  <resourceType resourceTypeGeneral="Dataset">Dataset</resourceType>
  <dates>
    <date dateType="Available">1996/</date>
  </dates>
  <rightsList>
    <rights xml:lang="en" schemeURI="https://spdx.org/licenses/" rightsIdentifierScheme="SPDX" rightsIdentifier="CC-B
    rightsURI="https://creativecommons.org/licenses/by/4.0/"/>
  </rightsList>
  <descriptions>
```

EPN HDC & DOIs for GNSS datasets

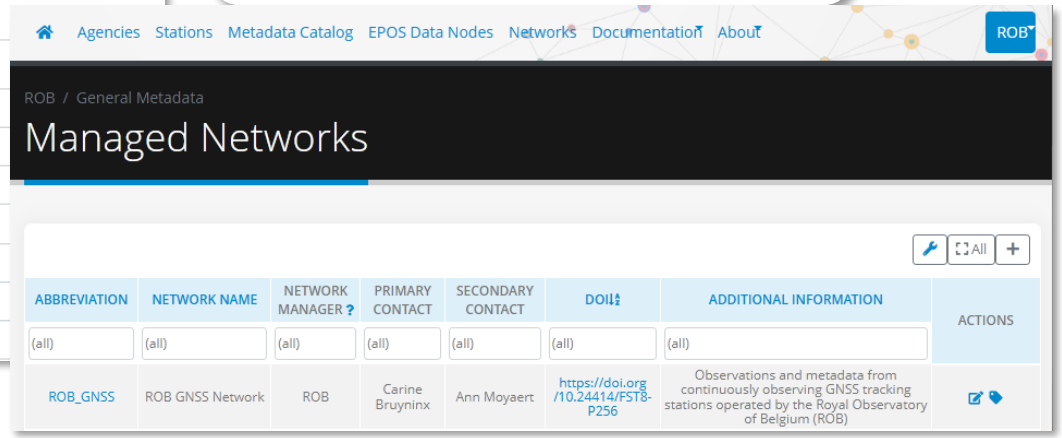
Station managers will be able to **insert DOIs for daily RINEX dataset** of their stations in an **upcoming version of M³G**

EPN HDC & DOIs for GNSS datasets

Station managers will be able to **insert DOIs for daily RINEX dataset** of their stations in an **upcoming version of M³G**



(only possible for GNSS networks, at present)



EPN HDC & DOIs for GNSS datasets

Station managers will be able to **insert DOIs for daily RINEX dataset** of their stations in an **upcoming version of M³G**

Station managers **unable to mint DOIs**:

- ROB will offer to mint DOIs for GNSS data in EPN HDC:
  - **proposed DOI metadata** based on (extended) GeodesyML
  - DOI metadata validated by the station managers
  - DOI minted by ROB

Proposed DOI metadata

Under discussion within the GGOS WG on DOIs

Values from IGS site log/ (extended) GeodesyML	DataCite metadata schema v.4.4	XML
	resourceType (M)	`Dataset`
1.Site Identification of the GNSS Monument Site Name/ <geo:siteIdentification> <geo:siteName>	*title (M)*	`<title xml:lang="en">ELIS00ATA – GNSS station at Princess Elisabeth Station Antarctica </title>`
12. Responsible Agency (if different from 11) Agency/ <geo:siteOwner gml:id="siteOwner">.. <gmd:organisationName>	*creator (M)*	`<creator> <creatorName nameType="Organizational"> Royal Observatory of Belgium </creatorName> <nameIdentifier schemeURI="https://ror.org/" nameIdentifierScheme="ROR"> https://ror.org/00hjks330</nameIdentifier> </creator>`
<geo:license codeSpace= "urn:gnss-metadata.eu:gnss:license" codeList= "https://gnss-metadata.eu/GeodesyML_ext/codelists/ license-codelists.xml" codeListValue="CC-BY-4.0"> <![CDATA[CC-BY-4.0]]> </geo:license>	*rights (O)*	`<rights xml:lang="en" schemeURI="https://spdx.org/licenses/" rightsIdentifierScheme="SPDX" rightsIdentifier="CC-BY-4.0" rightsURI="https://creativecommons.org/licenses/by/4.0/"/>`

Meeting agenda


FAIR GNSS data: why?


FAIR-GNSS workflow & progress


DOI & K. Elger invited talk


Metadata


API


Questions & discussion

ROYAL OBSERVATORY OF BELGIUM

Towards FAIR GNSS data

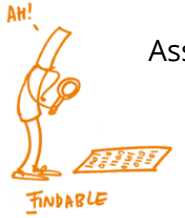
EUREF Symposium

June 2, 2022

GHENT UNIVERSITY

Towards FAIR GNSS data

STEP 1

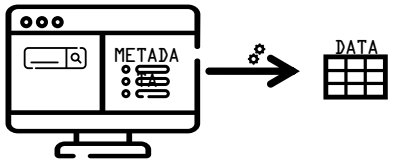


Assign a persistent identifier (PID)

Globally unique and **persistent identifiers**

STEP 2

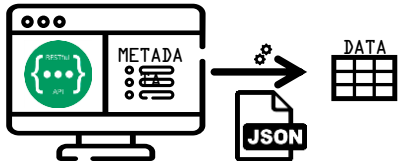
Data are described with rich metadata



Metadata, machine-readable and structured documentation

STEP 3

Standard communications protocol to retrieve (meta)data



APIs (Application Programming Interface)

ROYAL OBSERVATORY OF BELGIUM

Towards FAIR GNSS data EUREF Symposium June 2, 2022

GHENT UNIVERSITY

Rich metadata for GNSS data

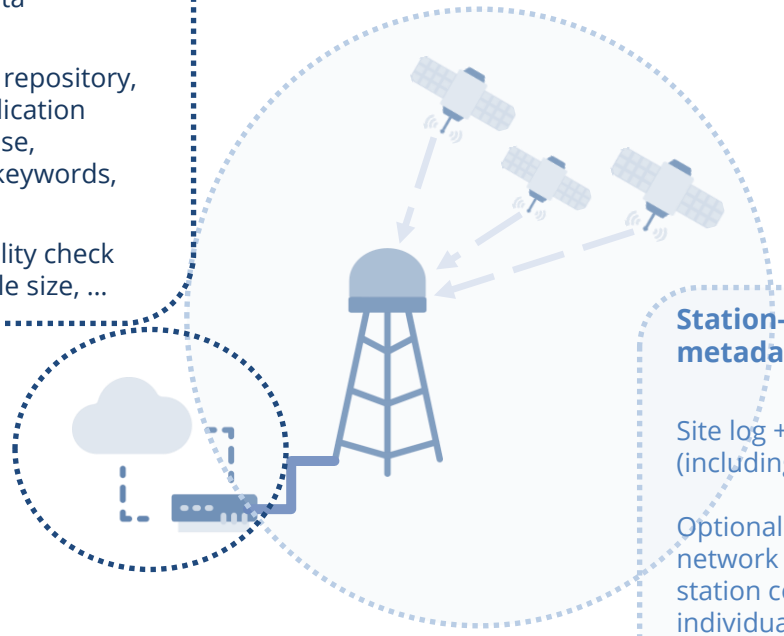
Advantages of **rich metadata**:

- provide all the information a user needs to know when **querying or downloading data**
- easy discovery and harvesting of specific data by machines (**standardized vocabulary and format**)
- **Interoperability** with other data sets
- several metadata **exchange formats** can be provided (user can select the most suitable)

RINEX-specific metadata (i.e. created on-the-fly upon data download):

Data identifier, repository, creation & publication date, data license, summary and keywords,

Optionally: quality check results, MD5, file size, ...



Station-specific metadata:

Site log + DOI (including data license)

Optionally: GNSS network to which station contributes, individual antenna calibration, ETRS89 coordinates, ...

Rich metadata for GNSS data

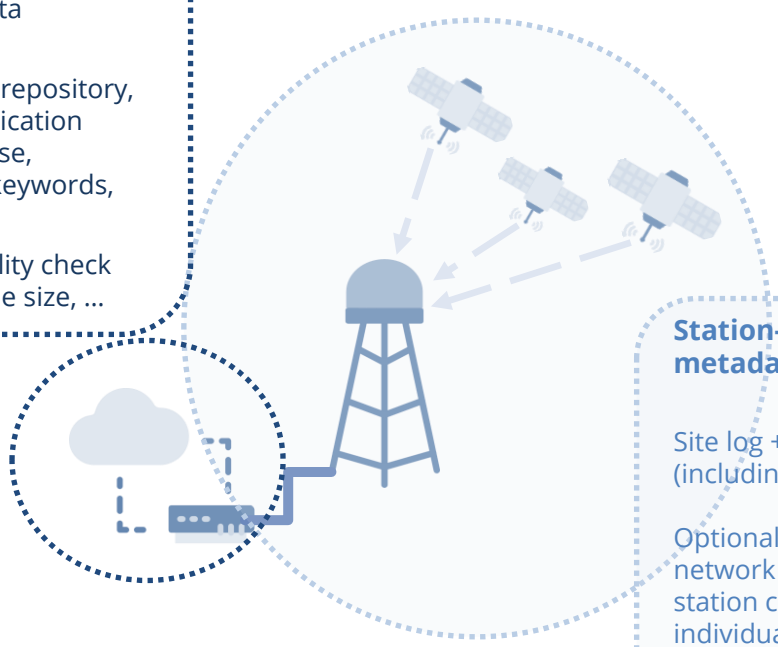
Advantages of **rich metadata**:

- provide all the information a user needs to know when **querying or downloading data**
- easy discovery and harvesting of specific data by machines (**standardized vocabulary and format**)
- **Interoperability** with other data sets
- several metadata **exchange formats** can be provided (user can select the most suitable)

RINEX-specific metadata (i.e. created on-the-fly upon data download):

Data identifier, repository, creation & publication date, data license, summary and keywords,

Optionally: quality check results, MD5, file size, ...



Station-specific metadata:

Site log + DOI (including data license)

Optionally: GNSS network to which station contributes, individual antenna calibration, ETRS89 coordinates, ...

Proposal for a RINEX-specific metadata schema

Proposal for station-specific metadata

Station information: relevant metadata

Station-specific metadata:

Site log + DOI (including data license)

Optionally: GNSS network to which station contributes, individual antenna calibration, ETRS89 coordinates, ...

... considering

- **FAIR data principles**
  - include **license** information
  - include **provenance information**
  - **standardization via code list files**
- **user requests** when querying and/or downloading station information

...extend an existing **metadata schema** to exchange GNSS station information: **GeodesyML**

GeodesyML

- a Geography Markup Language (GML) application schema for transfer of geodetic information
- aligned with international standards (ISO19115-1:2014 and the GML developed within the OGC)

Station information: relevant metadata

Station-specific metadata:

Site log + DOI (including data license)

Optionally: GNSS network to which station contributes, individual antenna calibration, ETRS89 coordinates, ...

... considering

- **FAIR data principles**
  - include **license** information
  - include **provenance information**
  - **standardization via code list files**
- **user requests** when querying and/or downloading station information

...extend an existing **metadata schema** to exchange GNSS station information: **GeodesyML**

Australian Government
Geoscience Australia

GeodesyML

- a Geography Markup Language (GML) application schema for transfer of geodetic information
- aligned with international standards (ISO19115-1:2014 and the GML developed within the OGC)

Station information: extended GeodesyML

…provenance information:
e.g. publisher, **track modifications**,
data license,
GNSS networks.
identifiers (ROR or ORCID)

controlled terminology/ code lists for:

- tectonic plates,
- receiver firmware,
- GNSS data centers, networks,
- types of changes in the site log,

…

Get all this extra information when downloading GeodesyML files
e.g. from M³G

For example:

`geo:license` as a new property of the `geo:Document` GeodesyML class +
an associated **code list file**
`license-codelists.xml`

```
<codelistItem>
    <CodeListDictionary gml:id='GeodesyML_LicenseTypeCode'>
        <gml:description>File License information</gml:description>
        <gml:identifier codeSpace='urn:gnss-metadata.eu:gnss:license'>GeodesyML_LicenseTypeCode</gml:identifier>

            <codeEntry>
                <CodeDefinition gml:id='LicenseTypeCode_CC-BY-4.0'>
                                        <gml:description xlink:href="https://creativecommons.org/licenses/by/4.0/"/>
                    <gml:identifier codeSpace='urn:gnss-metadata.eu:gnss:license'>CC-BY-4.0</gml:identifier>
                                        <gml:name codeSpace='urn:gnss-metadata.eu:gnss:license'>Creative Commons Attr
                </CodeDefinition>
            </codeEntry>


                        <codeEntry>
                <CodeDefinition gml:id='LicenseTypeCode_CC0'>
                                        <gml:description xlink:href="https://creativecommons.org/publicdomain/zero/1.
                    <gml:identifier codeSpace='urn:gnss-metadata.eu:gnss:license'>CC0-1.0</gml:identifier>
                                        <gml:name codeSpace='urn:gnss-metadata.eu:gnss:license'>Creative Commons Zero
                </CodeDefinition>
            </codeEntry>

    </CodeListDictionary>
</codelistItem>
```

Metadata

Station information: extended GeodesyML

…provenance information:
e.g. publisher, **track modifications**,
data license,
GNSS networks.
identifiers (ROR or ORCID)

controlled terminology/ code lists for:

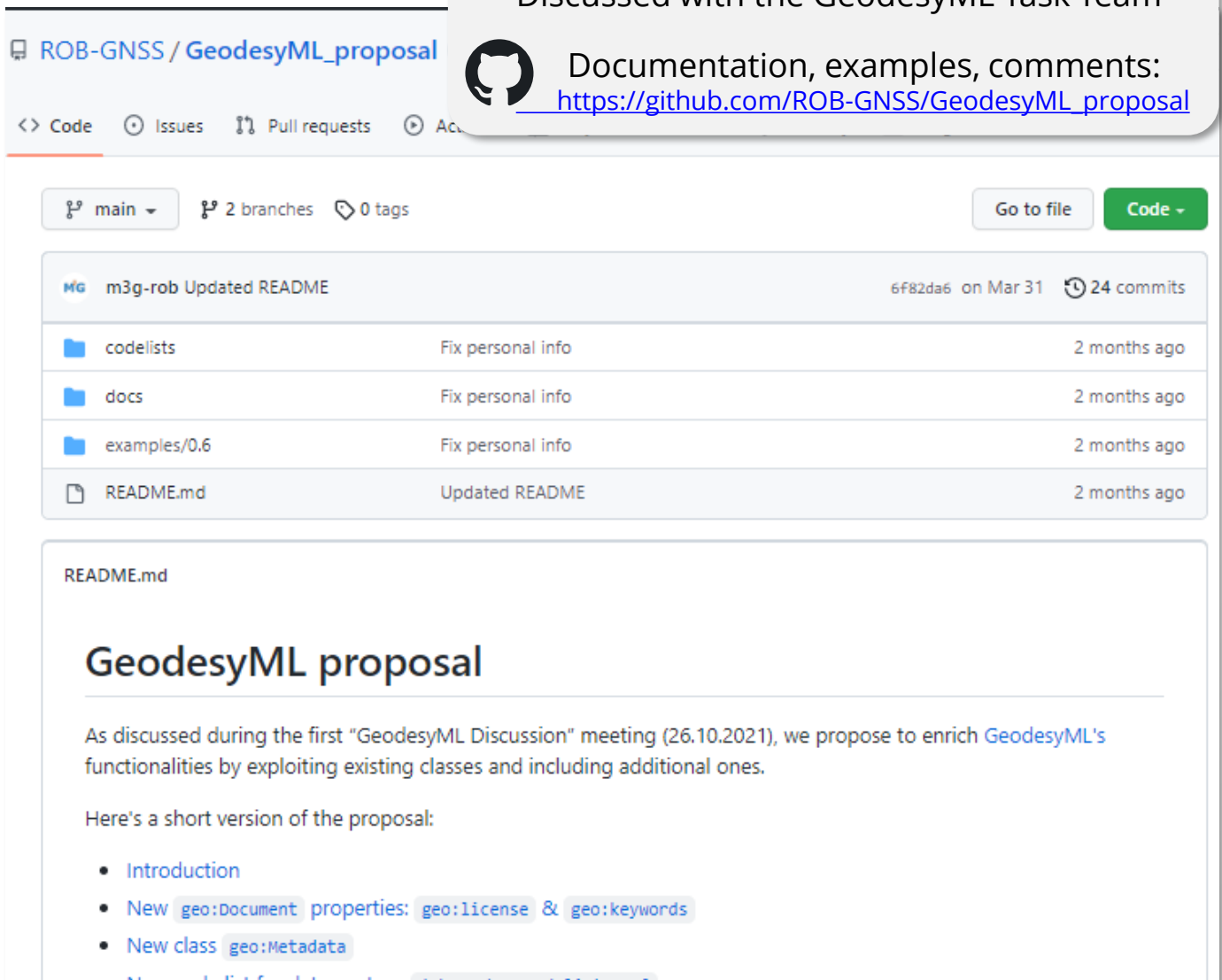
- tectonic plates,
- receiver firmware,
- GNSS data centers, networks,
- types of changes in the site log,

…

Ongoing:
implementation started +
new GeodesyML repo @IGS

Discussed with the GeodesyML Task Team

Documentation, examples, comments:
https://github.com/ROB-GNSS/GeodesyML_proposal



ROYAL OBSERVATORY OF BELGIUM

Towards FAIR GNSS data

EUREF Symposium

June 2, 2022

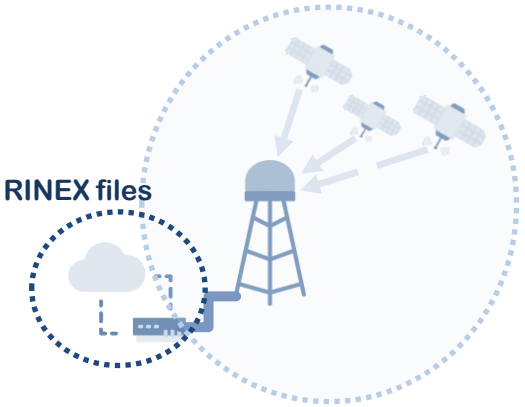
GHENT UNIVERSITY

RINEX files: identify relevant metadata

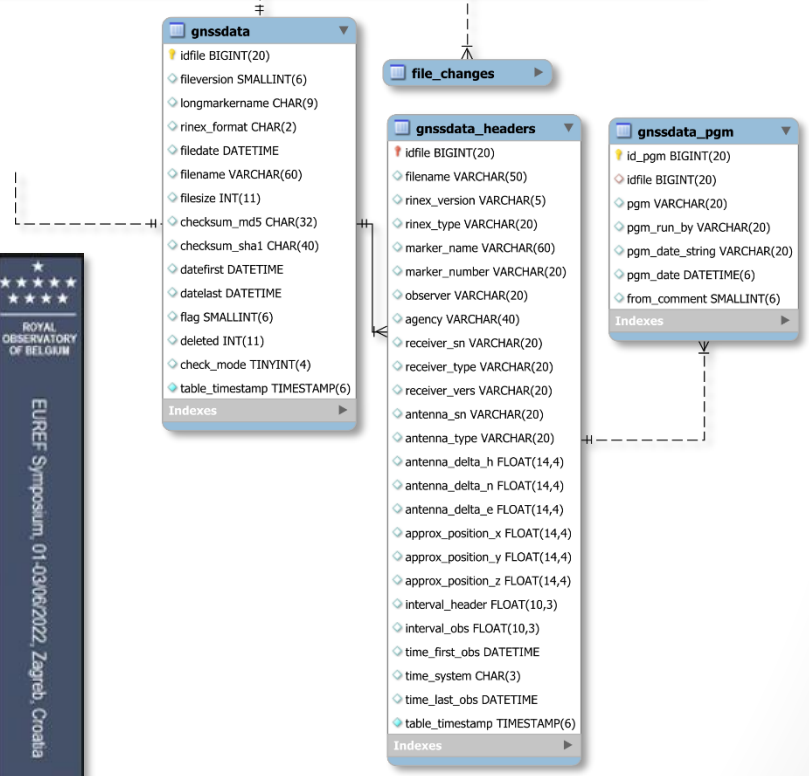
RINEX-specific metadata (i.e. created on-the-fly upon data download):

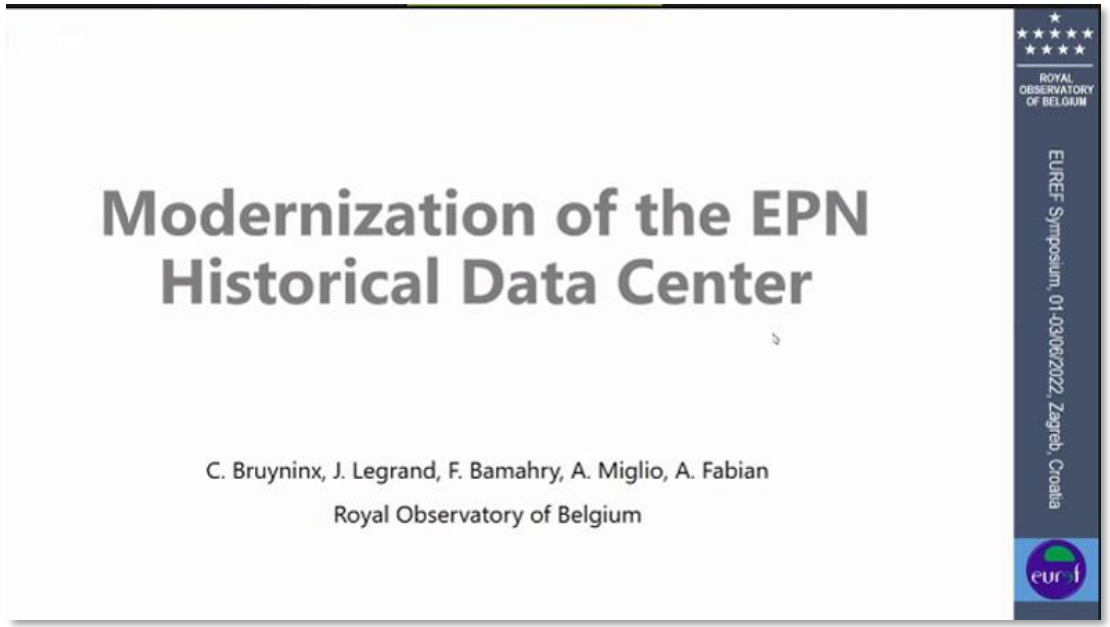
Data identifier, repository, creation & publication date, data license, summary and keywords,

Optionally: quality check results, MD5, file size, …



…extensive work on data inventory and databases restructuring (modernization of EPN HDC)…



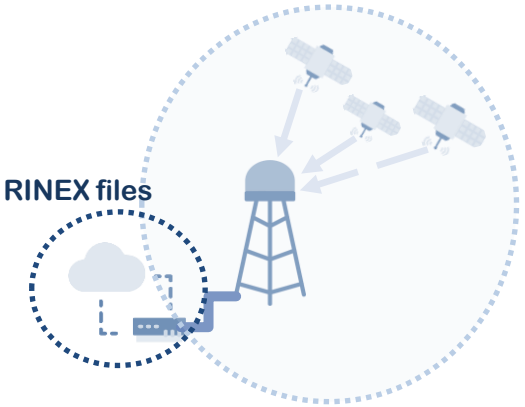


RINEX files: identify relevant metadata

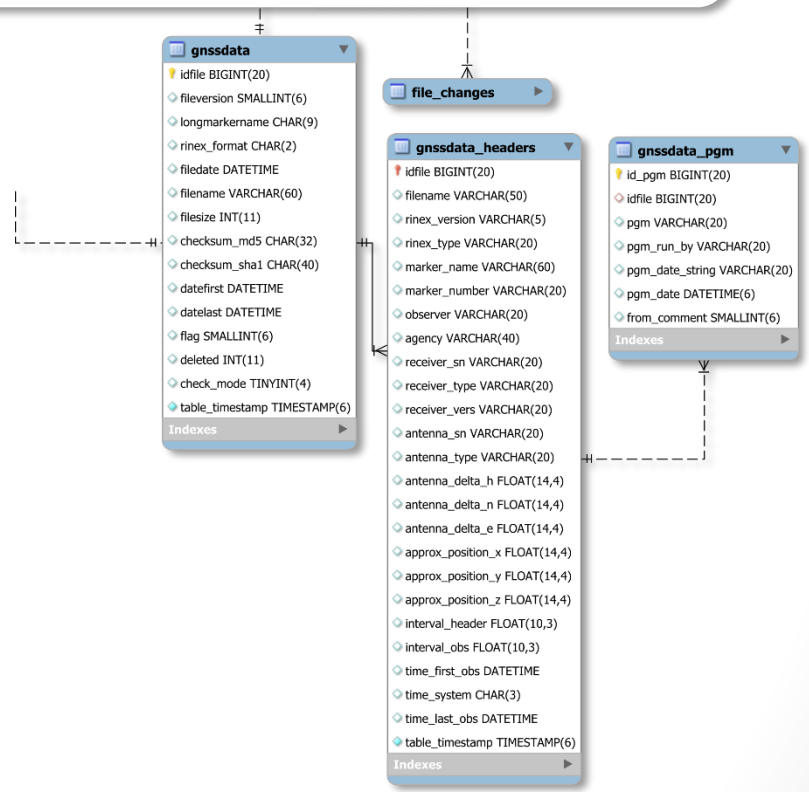
RINEX-specific metadata (i.e. created on-the-fly upon data download):

Data identifier, repository, creation & publication date, data license, summary and keywords,

Optionally: quality check results, MD5, file size, ...



...extensive work on data inventory and databases restructuring (modernization of EPN HDC)...



...structured information: **metadata schema** to facilitate GNSS observation **data exchange**...do not reinvent the wheel: **DCAT-AP**

Data Catalog Vocabulary (DCAT) - Version 2

W3C Recommendation 04 February 2020

DCAT Application Profile for data portals in Europe Version 2.1.0

European Commission

metadata mapping

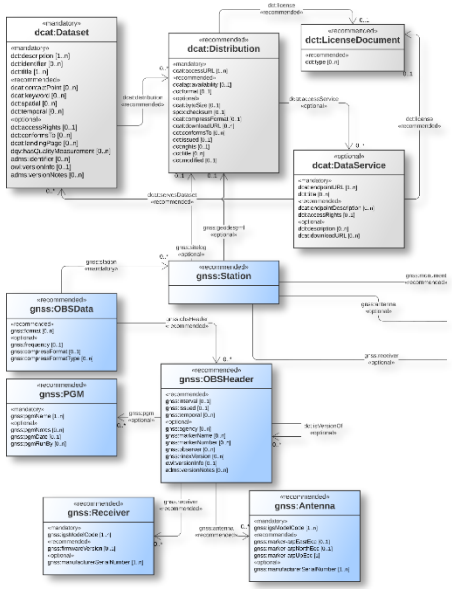
INSPIRE ➡ **DCAT** ➡ EUROPEAN DATA PORTAL

RINEX files: proposed metadata schema

- type of RINEX file (e.g., compression format, frequency)
- RINEX file header: GNSS antenna and receiver type, …
- GeodesyML: GNSS antenna and receiver type, …
- software used to generate the RINEX file.

GNSS-DCAT-AP
=
DCAT-AP classes
+
new RINEX-specific classes

…structured information in a **metadata schema: GNSS-DCAT-AP**



…will **facilitate search for and download** of daily RINEX data via **API** or GUI

RINEX files: proposed metadata schema

GNSS-DCAT-AP
=
new RINEX-specific Classes
+
DCAT-AP classes

- type of RINEX file (e.g., compression format, frequency)

...

GNSS-DCAT-AP recommended classes

Class name	URI	Mandatory/ Recommended/ Optional	Description
GNSS observation data	gnss:OBSData	Recommended	Domain specific vocabulary for RINEX observation files

properties

gnss:OBSData

Property	URI	Range & Cardinality	Mandatory/ Recommended/ Optional	Description
file format	gnss:format	rdfs:Literal [0..n]	Recommended	RINEX 2 / RINEX 3/ RINEX 4
frequency	gnss:frequency	dct:Frequency[0..1]	Optional	Daily/hourly RINEX files
CRX compression	gnss:compressFormat	xsd:boolean[0..1]	Optional	CRX compressed RINEX file (CRX RINEX)
CRX version	gnss:compressFormatType	rdfs:Literal [0..n]	Optional	Crinex Version (e.g. 3.0)

RINEX files: proposed metadata schema

GNSS-DCAT-AP
=
new RINEX-specific Classes
+
DCAT-AP classes

- type of RINEX file (e.g., compression format, frequency)
- RINEX file: GNSS antenna and receiver type, …
- software used to generate the RINEX file
- GeodesyML: GNSS antenna and receiver type, …

GNSS-DCAT-AP recommended classes

Class name	URI	Mandatory/ Recommended/ Optional	Description
GNSS station antenna	gnss:Antenna	Recommended	Domain specific vocabulary for the antenna associated with gnss:Station
GNSS observation data	gnss:OBSData	Recommended	Domain specific vocabulary for RINEX observation files
GNSS observation data header	gnss:OBSHeader	Recommended	Domain specific vocabulary for the information in the RINEX observation file header associated with gnss:OBSData
GNSS observation data generating software	gnss:PGM	Recommended	Domain specific vocabulary for software used to generate the RINEX file associated with gnss:OBSData
GNSS station receiver	gnss:Receiver	Recommended	Domain specific vocabulary for the receiver associated with gnss:Station
GNSS station	gnss:Station	Recommended	Domain specific vocabulary for station information

RINEX files: proposed metadata schema

GNSS-DCAT-AP
=
new RINEX-specific Classes
+
DCAT-AP classes

- type of RINEX file (e.g., compression format, frequency)
- RINEX file: GNSS antenna and receiver type, …
- software used to generate the RINEX file
- GeodesyML: GNSS antenna and receiver type, …

GNSS-DCAT-AP recommended classes

Class name	URI	Mandatory/ Recommended/ Optional	Description
GNSS station antenna	gnss:Antenna	Recommended	Domain specific vocabulary for the antenna associated with gnss:Station
GNSS observation data	gnss:OBSData	Recommended	Domain specific vocabulary for RINEX observation files
GNSS observation data header	gnss:OBSHeader	Recommended	Domain specific vocabulary for the information in the RINEX observation file header associated with gnss:OBSData
GNSS observation data generating software	gnss:PGM	Recommended	Domain specific vocabulary for software used to generate the RINEX file associated with gnss:OBSData
GNSS station receiver	gnss:Receiver	Recommended	Domain specific vocabulary for the receiver associated with gnss:Station
GNSS station	gnss:Station	Recommended	Domain specific vocabulary for station information

RINEX files: proposed metadata schema

GNSS-DCAT-AP
=
new RINEX-specific Classes
+
DCAT-AP classes

- type of RINEX file (e.g., compression format, frequency)
- RINEX file: GNSS antenna and receiver type, …
- software used to generate the RINEX file
- GeodesyML: GNSS antenna and receiver type, …

GNSS-DCAT-AP recommended classes

Class name	URI	Mandatory/ Recommended/ Optional	Description
GNSS station antenna	gnss:Antenna	Recommended	Domain specific vocabulary for the antenna associated with gnss:Station

GNSS-DCAT-AP optional classes

Class name	URI	Mandatory/ Recommended/ Optional	Description
GNSS station antenna from GeodesyML	geo:GNSSAntenna	Optional	Antenna info from GeodesyML installed on gnss:temporal (associated with gnss:Station)
GNSS station monument from GeodesyML	geo:Monument	Optional	Monument info from GeodesyML (associated with gnss:Station)
GNSS station receiver from GeodesyML	geo:GNSSReceiver	Optional	Receiver info from GeodesyML installed on gnss:temporal (associated with gnss:Station)

RINEX files: proposed metadata schema

GNSS-DCAT-AP
=
new RINEX-specific Classes
+
DCAT-AP classes

- Data license
- Quality metrics

DCAT-AP recommended classes

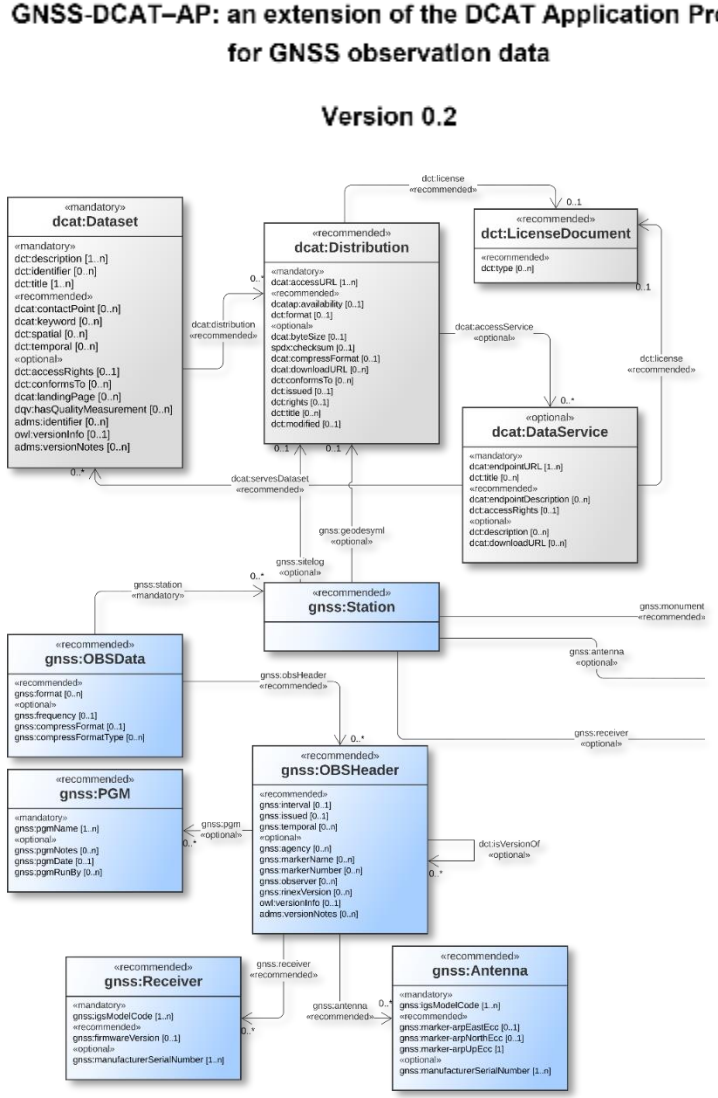
Class name	URI	Mandatory/ Recommended/ Optional	Description
License document	dct:LicenseDocument	Recommended	A legal document giving official permission to use the dataset.

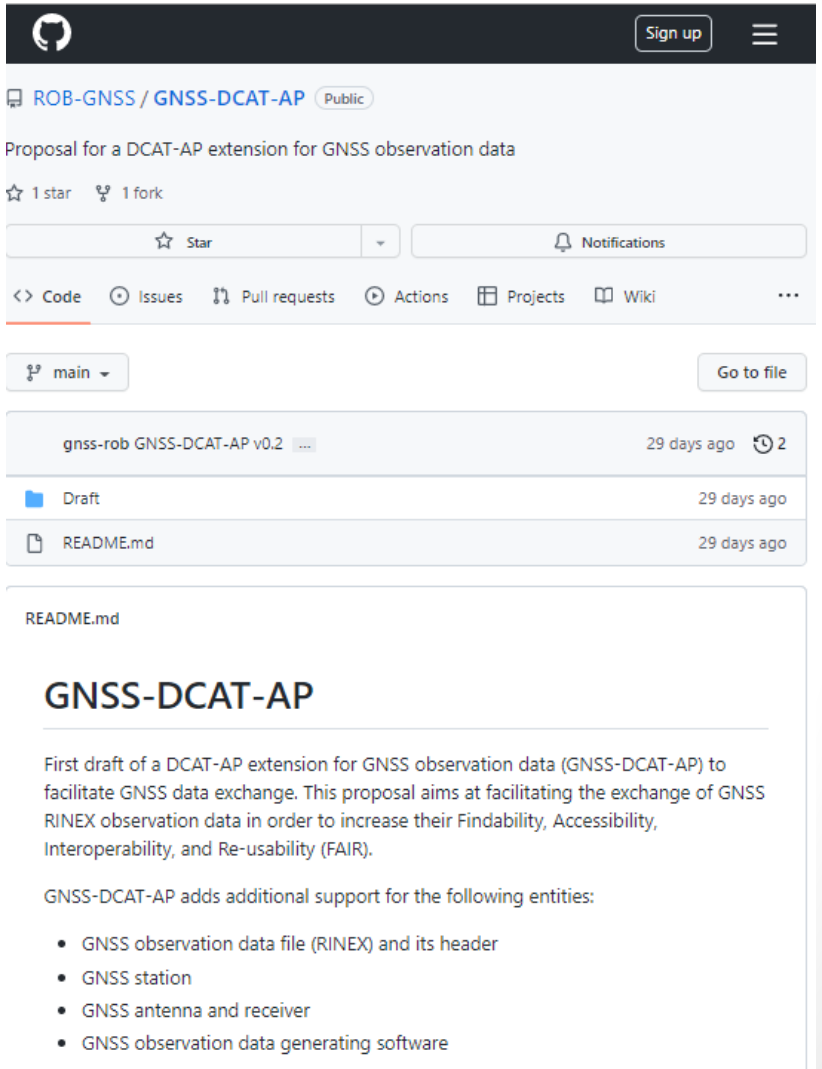
dcat:Dataset

Property	URI	Range & Cardinality	Mandatory/ Recommended/ Optional	Description
has quality measurement	dqv:hasQualityMeasurement	dqv:QualityMeasurement [0..n]	Optional	A quality measurement performed on the Dataset (e.g. ratio of the number of GPS observations, on at least two frequencies, in the daily RINEX file with respect to the number of expected observations)

RINEX files: proposed metadata schema

GNSS-DCAT-AP
=
DCAT-AP classes
+
new RINEX-specific classes



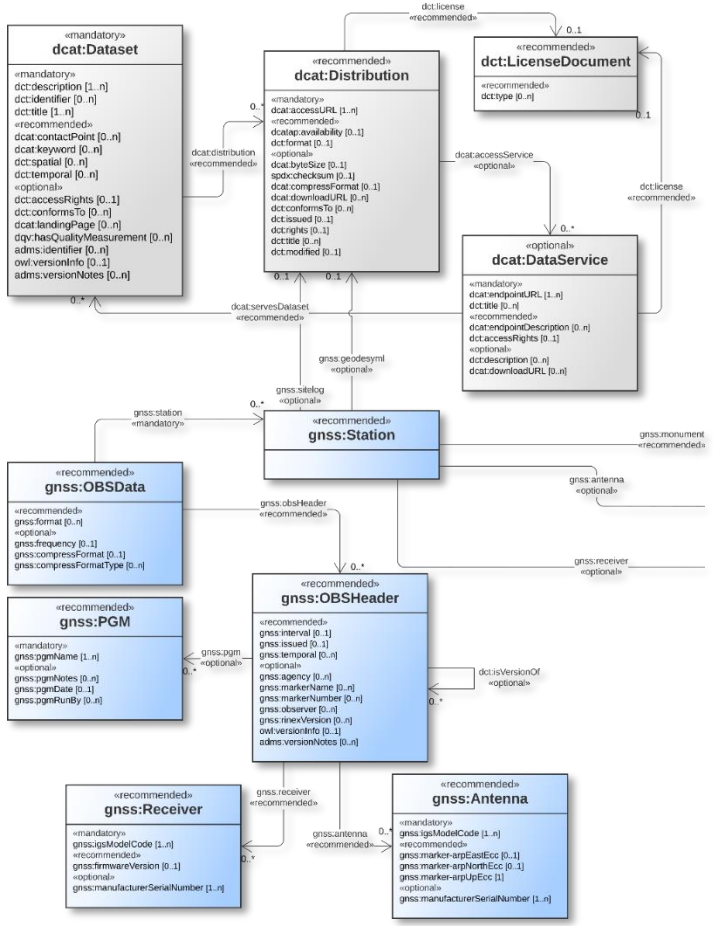


RINEX files: proposed metadata schema

GNSS-DCAT-AP
=
DCAT-AP classes
+
new RINEX-specific classes

GNSS-DCAT–AP: an extension of the DCAT Application Profile for GNSS observation data

Version 0.2



Your feedback is very welcome!
https://github.com/ROB-GNSS/GNSS-DCAT-AP

ROB-GNSS / GNSS-DCAT-AP Public

Proposal for a DCAT-AP extension for GNSS observation data

1 star 1 fork

Star Notifications

Code Issues Pull requests Actions Projects Wiki

main Go to file

gnss-rob GNSS-DCAT-AP v0.2 29 days ago 2

Draft 29 days ago

README.md 29 days ago

README.md

GNSS-DCAT-AP

First draft of a DCAT-AP extension for GNSS observation data (GNSS-DCAT-AP) to facilitate GNSS data exchange. This proposal aims at facilitating the exchange of GNSS RINEX obse
Interoper

GNSS-DC

- GNSS
- GNSS
- GNSS
- GNSS observation data generating software

Ongoing:
discussion and feedback from FAIR-GNSS FuC, GFZ and ESA GNSS Science Support Centre

Meeting agenda

- FAIR GNSS data: why?
- FAIR-GNSS workflow & progress
- DOI & K. Elger invited talk
- Metadata
- API
- Questions & discussion

Towards FAIR GNSS data

STEP 1

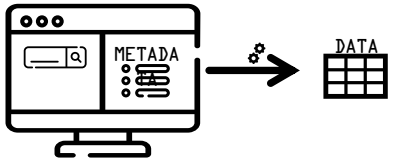
Assign a persistent identifier (PID)

DataCite

Globally unique and **persistent identifiers**

STEP 2

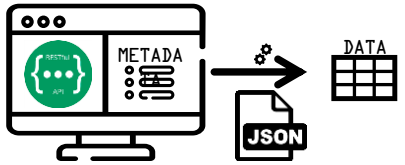
Data are described with rich metadata



Metadata, machine-readable and structured documentation

STEP 3

Standard communications protocol to retrieve (meta)data



APIs (Application Programming Interface)

ROYAL OBSERVATORY OF BELGIUM

Towards FAIR GNSS data EUREF Symposium June 2, 2022

GHENT UNIVERSITY

Examples

RESTful API @BEV

https://gnss.bev.gv.at/at.gv.bev.dc/api/gnss-station/?four_letter_code=&nine_letter_code=&country=BE

Api Root / Station List

Station List

Filters | OPTIONS | GET

```
GET /at.gv.bev.dc/api/gnss-station/?four_letter_code=&nine_letter_code=&country=BE
```

```
HTTP 200 OK
Allow: GET, POST, HEAD, OPTIONS
Content-Type: application/json
Vary: Accept
```


```
{
    "count": 6,
    "next": null,
    "previous": null,
    "results": [
        {
            "id": 42,
            "url": "https://gnss.bev.gv.at/at.gv.bev.dc/api/gnss-station/42/",
            "four_letter_code": "BRUS",
            "nine_letter_code": "BRUS00BEL",
            "country": "BE"
        },
        {
            "id": 43,
            "url": "https://gnss.bev.gv.at/at.gv.bev.dc/api/gnss-station/43/",
            "four_letter_code": "BRUX",
            "nine_letter_code": "BRUX00BEL",
            "country": "BE"
        },
        {
            "id": 81,
            "url": "https://gnss.bev.gv.at/at.gv.bev.dc/api/gnss-station/81/",
            "four_letter_code": "DENT",
            "nine_letter_code": "DENT00BEL",
            "country": "BE"
        },
        {
            "id": 88,
            "url": "https://gnss.bev.gv.at/at.gv.bev.dc/api/gnss-station/88/",
```


RESTful API @M³G

https://gnss-metadata.eu/v1/sitelog/view?id=BRUX00BEL

https://gnss-metadata.eu/v1/sitelog/view?id=BRUX00BEL

This XML file does not appear to have any style information associated with it. The document tree is shown below.


```
<response>
  <id>BRUX00BEL</id>
  <uri>https://gnss-metadata.eu/v1/sitelog/view?id=BRUX00BEL</uri>
  <status>A</status>
  <md5Sitelog>c1aa0d43b241c922e7c1ee23cf844a4f</md5Sitelog>
  <md5Geodesyml>9fd8a23e798ac232602465af31d4caae</md5Geodesyml>
  <sitelogName>brux00bel_20220405.log</sitelogName>
  <geodesymlName>BRUX00BEL.xml</geodesymlName>
  <preparedDate>2022-04-05T00:00Z</preparedDate>
  <dateUpdate>2022-04-05T08:30Z</dateUpdate>
  <sitelog>
    <id>brux00bel_20220405</id>
    <uri>https://gnss-metadata.eu/v1/sitelog/view?id=BRUX00BEL#brux00bel_20220405</uri>
    <stationId>BRUX00BEL</stationId>
```


https://igs.bkg.bund.de/api/collections/stations/items/ABMF00GLP

BKG | Home | Data & Products | Tools | Links | Filter | Help | Sign in

ABMF00GLP

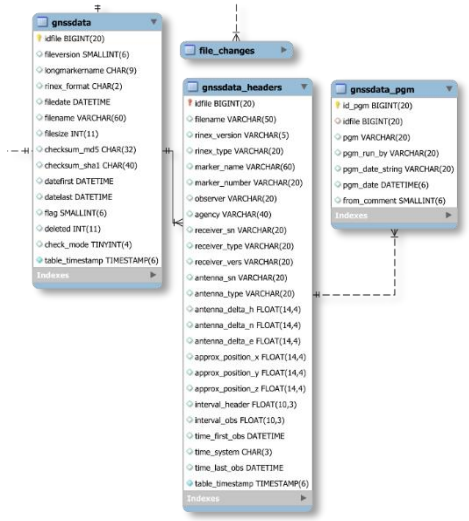
General | Receiver | Antenna | Performance | Coordinates

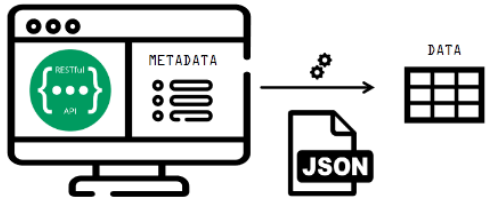
Name	Aeroport du Raizet -LES ABYMES - MÃ©tÃ©o France
Site log	ABMF00GLP_20211124.log
Date prepared	2021-11-24T00:00:00
FourCharID	ABMF
Country	Guadeloupe (GLP)
Tectonic Plate	CARIBBEAN
X Coordinate	2919786.00
Y Coordinate	-5383745.00
Z Coordinate	1774604.00

Preparatory work

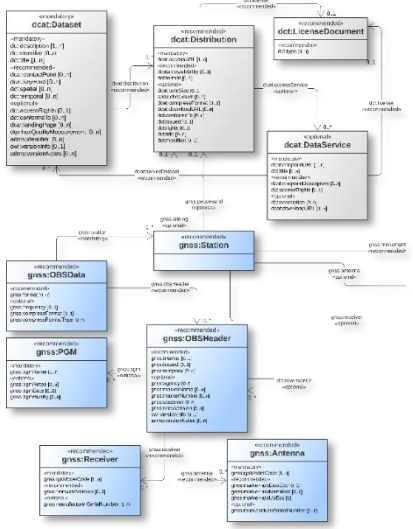
API

...extensive work on data inventory and databases restructuring to identify **relevant information**...





...structured information **metadata schema: GNSS-DCAT-AP**...



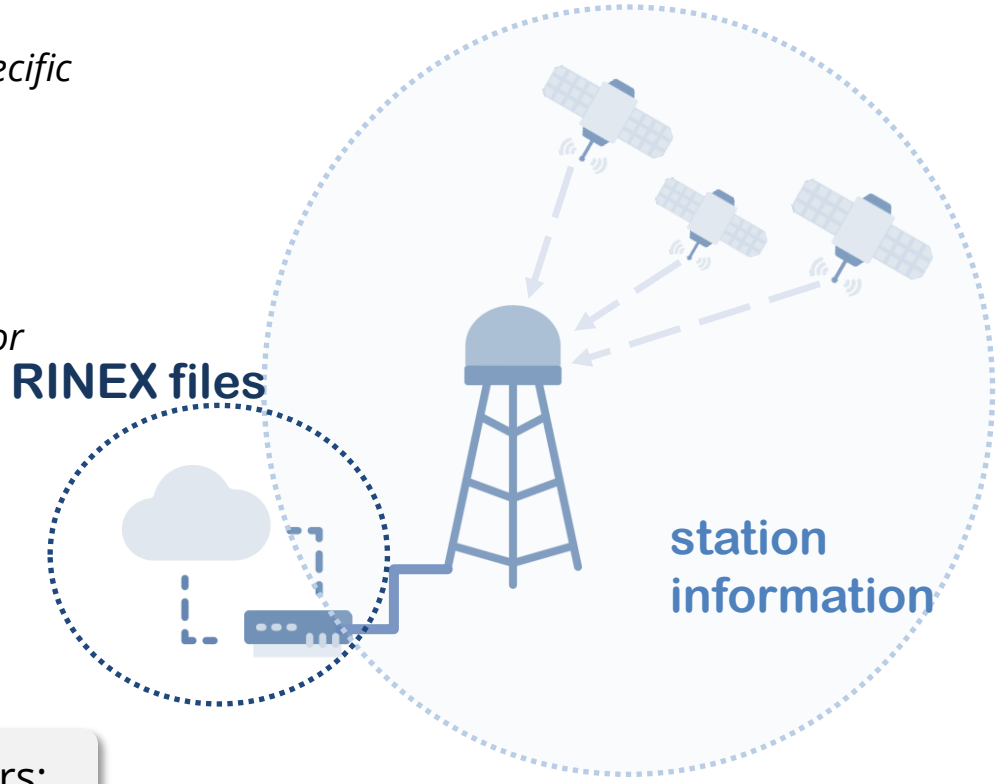
...easy data access (for both humans & machines):
queries and data download via API

- allow to use search criteria
- provide all necessary metadata about the data/station
- use of standards to ensure machine-readability and interoperability with other data

Preparatory work: use cases

Retrieve RINEX data

B.1 *– that have been changed since a specific date*
B.2 *–based on time range*
B.3 *– based on a specific RINEX version*
B.4 *– based on type of antenna/receiver*
B.5 *– including specific signals*
B.6 *– including specific satellite systems or numbers*



Retrieve station information

A.2 *– based on time range*
A.3 *– based on type of receiver/antenna/firmware version and date range*
A.4 *– for stations with an external clock*
A.5 *– for stations with meteorological instruments*

First feedback from GNSS users:

…retrieve data based on

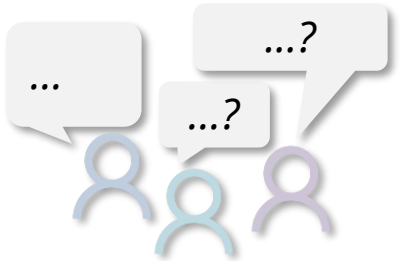
- *monument type*
- *co-located geodetic instrumentation ("Local Survey Tie" and "Collocation Information")*
- *responsible agency and/or operator*

…your feedback will be appreciated!

ROYAL OBSERVATORY OF BELGIUM
Towards FAIR GNSS data
EUREF Symposium
June 2, 2022
GHENT UNIVERSITY

Towards FAIR GNSS data

GNSS user community



- **search for and download data** (and site logs) from multiple stations
- get **data usage conditions**
- **acknowledge data providers**

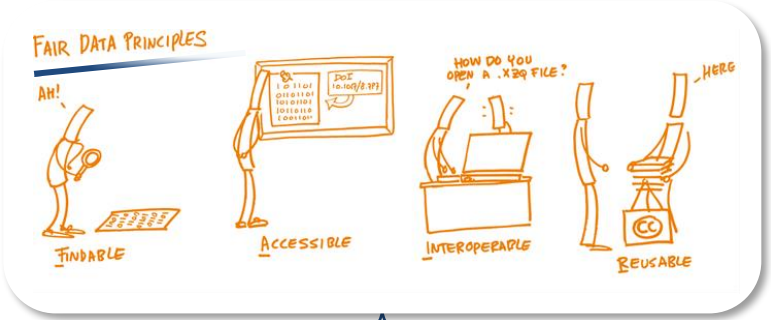
GNSS organizations

IGS INTERNATIONAL GNSS SERVICE

EUREF

IAG GGOS GGOS Global Geodetic Observing System

- **interoperability & discoverability**
- **standards and controlled vocabularies**
- **metadata**
- **data license**
- **DOI**



...**DOI for GNSS dataset** proposal
insert DOI for GNSS dataset in a future release of M^{3}G

...**metadata & controlled vocabularies:**
GNSS-DCAT-AP for RINEX data
extended GeodesyML for station information

Overview & next steps

STEP 1

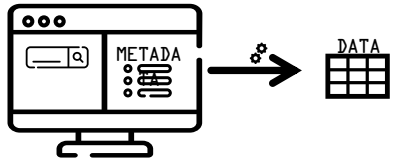
Assign a persistent identifier (PID)

Globally unique and **persistent identifiers**

…**DOI for GNSS data** proposal
insert DOI for GNSS dataset in a future release of M³G

STEP 2

Data are described with rich metadata

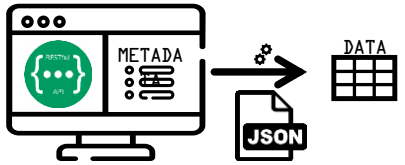


Metadata, machine-readable and structured documentation

…**GNSS-DCAT-AP** for RINEX data
extended GeodesyML for station information

STEP 3

Standard communications protocol to retrieve (meta)data

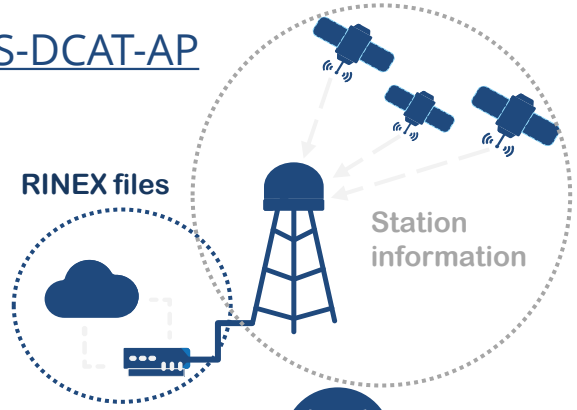


APIs (Application Programming Interface)

…implement **APIs**

Suggestions & comments

https://github.com/ROB-GNSS/GNSS-DCAT-AP



https://github.com/ROB-GNSS/GeodesyML_proposal

Contact us

fair-gnss @observatory.be

@be_GNSS

FAIR-GNSS

ROYAL OBSERVATORY OF BELGIUM

C. Bruyninx
A. Fabian
J. Legrand
A. Miglio
A. Moyaert

GHENT UNIVERSITY

S. De Bodt
P. Oset Garcia
I. Van Nieuwerburgh

Meeting agenda

- FAIR GNSS data: why?
- FAIR-GNSS workflow & progress
- DOI & K. Elger invited talk
- Metadata
- API
- Questions & discussion