

# Proposed metadata standards for FAIR access to GNSS data

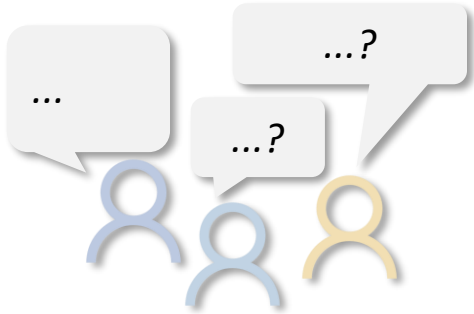


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# GNSS user community



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

# Institutions & policy makers

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



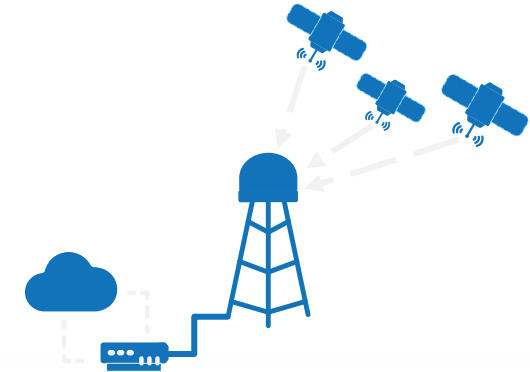
IGS INTERNATIONAL GNSS SERVICE

...



**GGOS**  
Global Geodetic  
Observing System

# Evolve towards FAIR GNSS data!



## FAIR DATA PRINCIPLES



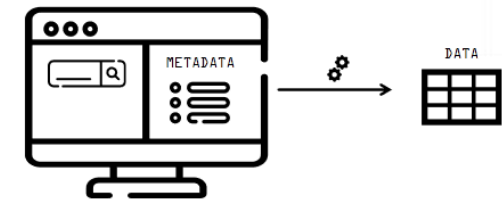
  
**FAIR-GNSS**

Belgian national project funded by Belgian Science Policy Office

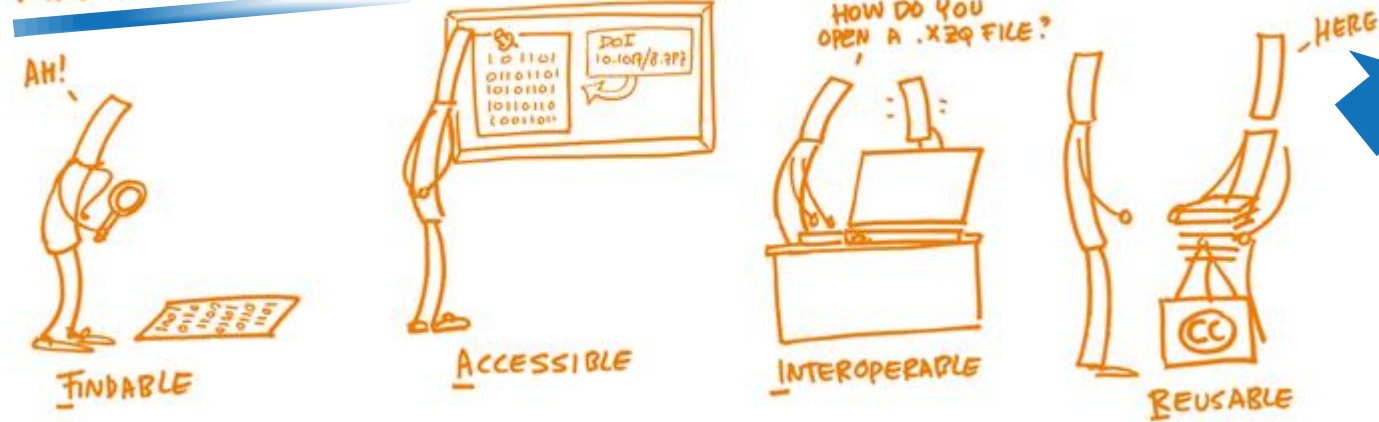


# Towards FAIR GNSS data

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



## FAIR DATA PRINCIPLES



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

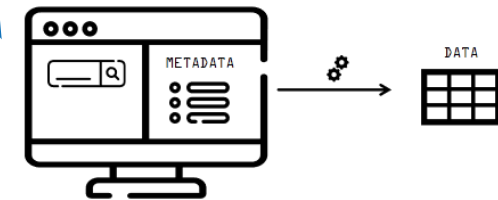
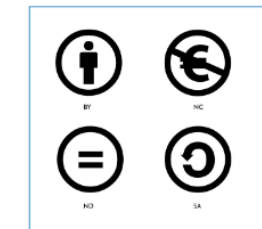
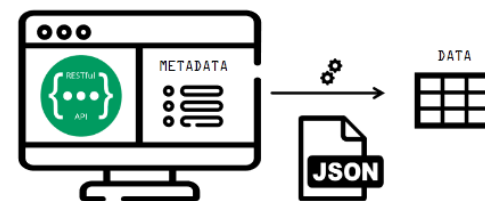


FIGURE 1: PHOTOGRAPHS OF THE CC LICENSE FEATURE

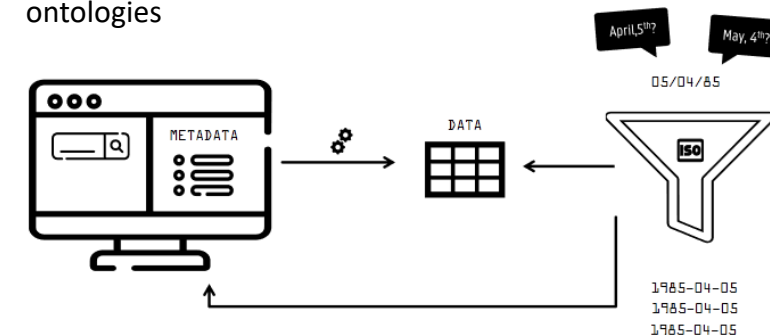


CC creative commons

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. **Controlled vocabularies**, taxonomies or ontologies



# Rich metadata for GNSS 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)

## File-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, ...

RINEX files



station  
information

## Station-specific metadata:

Site log + DOI (including data license)

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

...metadata should provide all the information a user needs to know about downloaded data

# RINEX files: identify relevant metadata

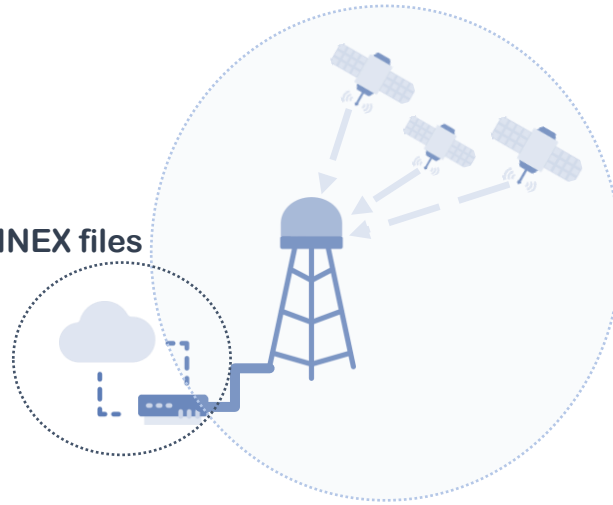
## File-specific metadata

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

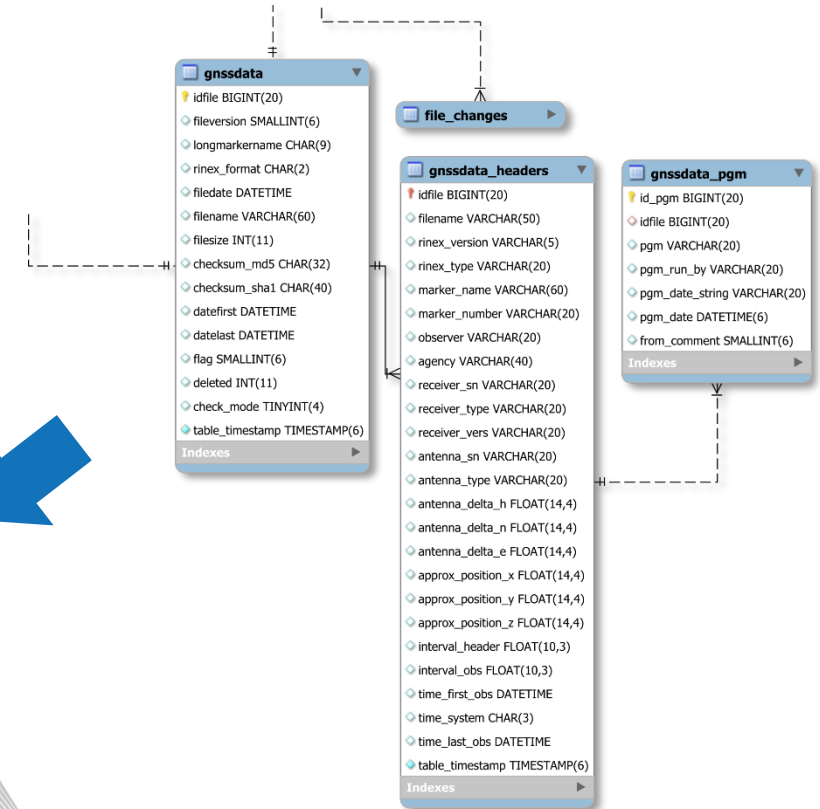
Data identifier, repository, creation & publication date, data license, summary and keywords,

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

RINEX files



...extensive work on data inventory and databases restructuring...



...structured information: **metadata schema** to facilitate GNSS observation **data exchange**

Data Catalog Vocabulary (DCAT) - Version 2

W3C Recommendation 04 February 2020



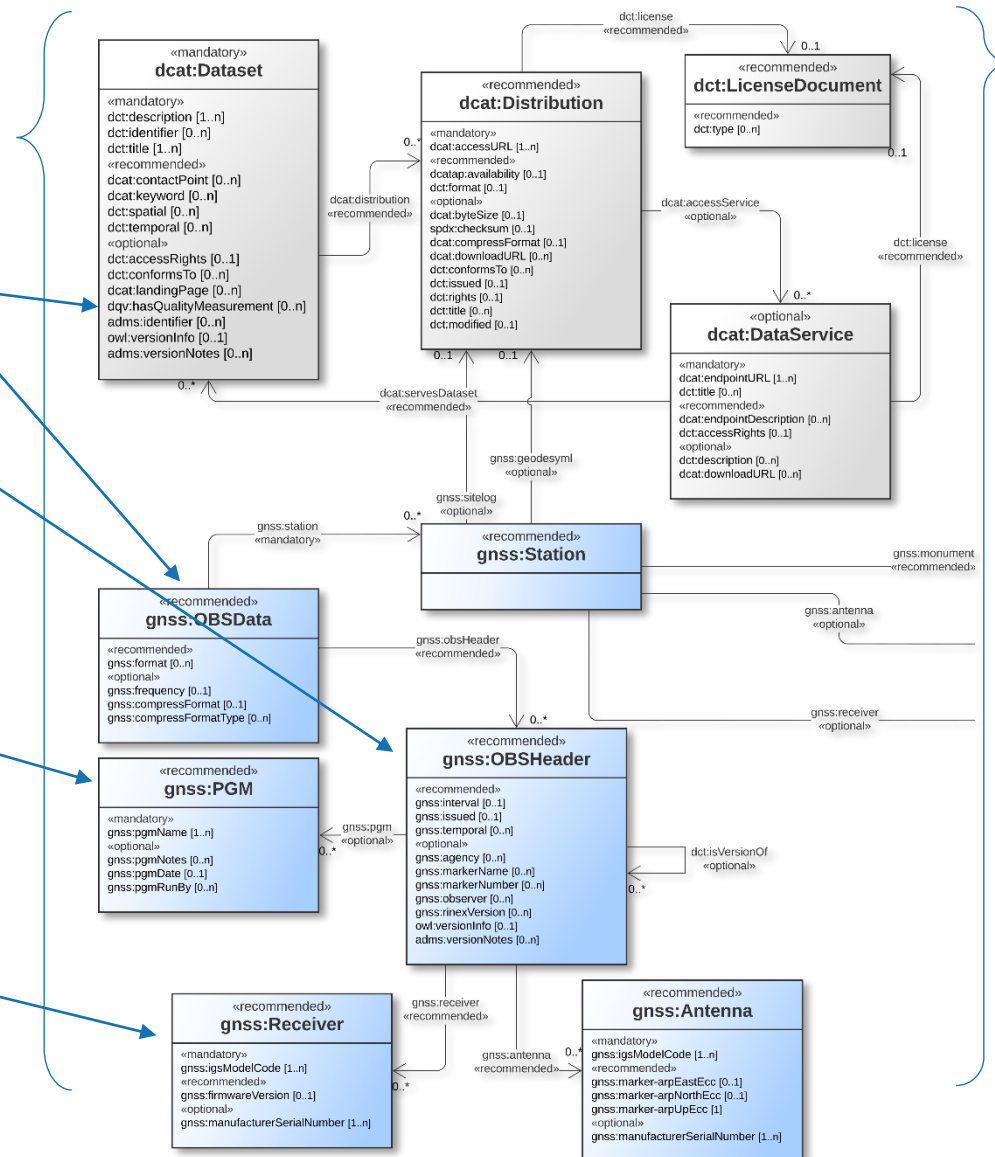
DCAT Application Profile for data portals in Europe  
Version 2.1.0



# RINEX files: proposed metadata schema

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

- type of RINEX file (e.g., compression format, frequency)
- data quality indicators
- RINEX file header and information regarding the GNSS station including the GNSS antenna and receiver
- software used to generate the RINEX file.
- additional optional classes e.g. information regarding the GNSS receiver, etc.



## GNSS-DCAT-AP

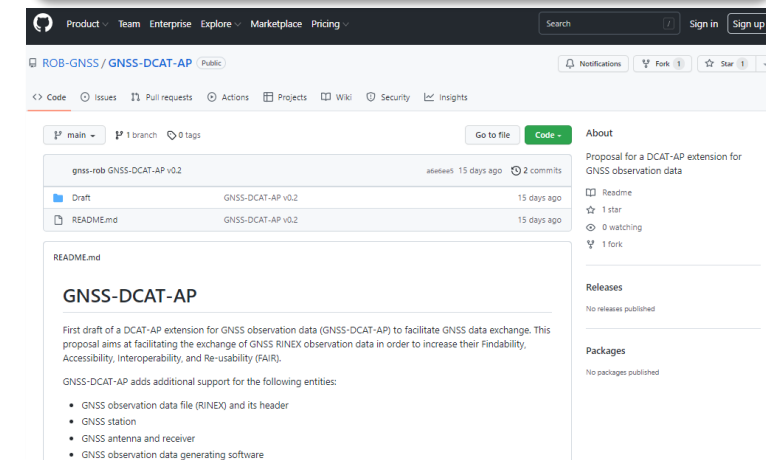
**DCAT-AP classes**

## new RINEX-specific classes

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

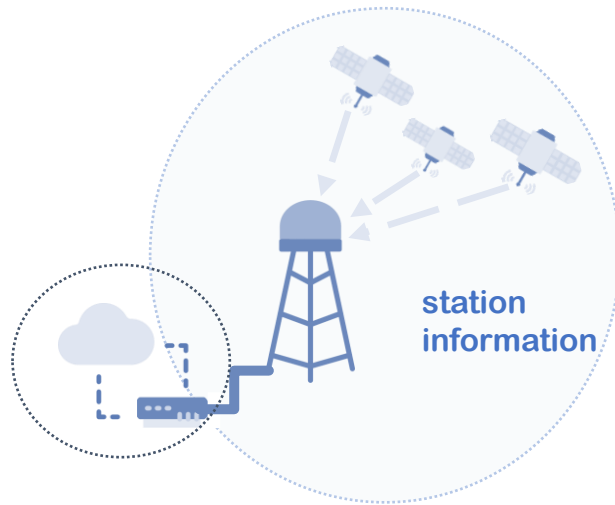


<https://github.com/ROB-GNSS/GNSS-DCAT-AP>





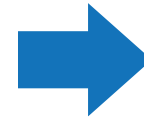
# Station information: relevant metadata



## 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

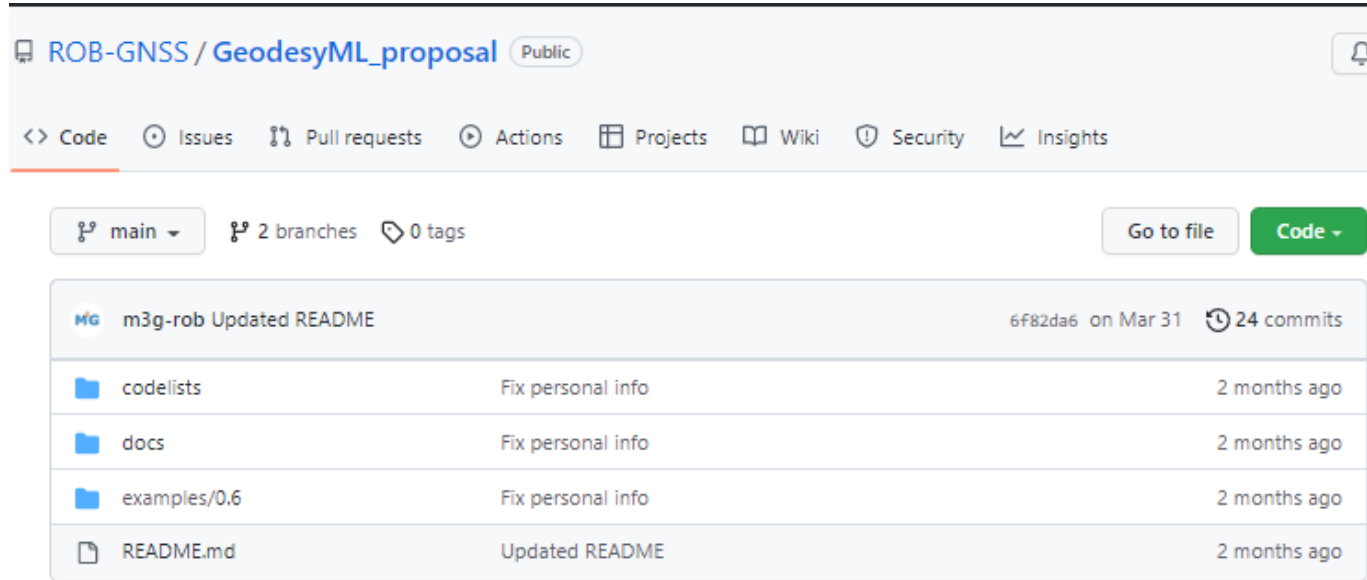


Two screenshots are shown. The left one is the IGS (International GNSS Service) website, which is a voluntary organization to ensure open access and high quality GNSS products since 1994. The right one is the EPOS website, which is a management and dissemination of GNSS site log metadata using the new GeodesyML. The EPOS logo is also visible in the background.

## 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



ROB-GNSS / GeodesyML\_proposal Public

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main 2 branches 0 tags Go to file Code

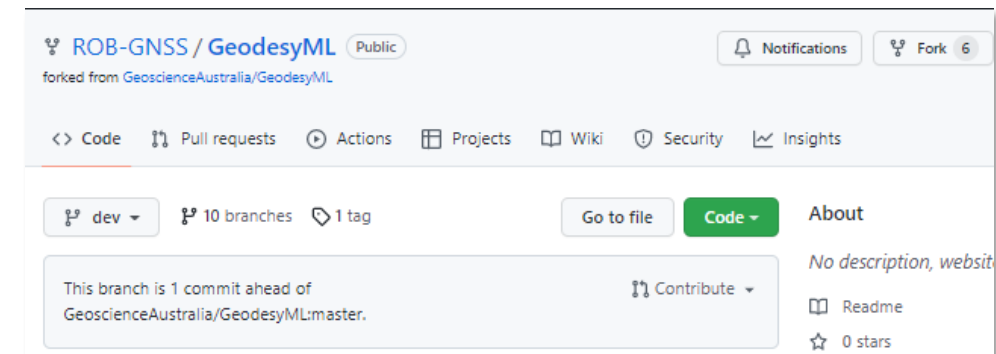
m3g-rob Updated README	6f82da6 on Mar 31	24 commits
codelists	Fix personal info	2 months ago
docs	Fix personal info	2 months ago
examples/0.6	Fix personal info	2 months ago
README.md	Updated README	2 months ago

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

...controlled terminology for:  
GNSS data centers, networks,  
types of changes in the site log,  
...



Discussed with the GeodesyML Task Team  
[https://github.com/ROB-GNSS/GeodesyML\\_proposal](https://github.com/ROB-GNSS/GeodesyML_proposal)



ROB-GNSS / GeodesyML Public

forked from GeoscienceAustralia/GeodesyML

<> Code Pull requests Actions Projects Wiki Security Insights

dev 10 branches 1 tag Go to file Code About

This branch is 1 commit ahead of GeoscienceAustralia/GeodesyML:master.

No description, website  
Readme  
0 stars



## Suggestions & comments



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

[https://github.com/ROB-GNSS/GeodesyML\\_proposal](https://github.com/ROB-GNSS/GeodesyML_proposal)

## Contact



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@be\_GNSS