



## Giving credit to data by citation - lessons learnt over a decade and future directions

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# Background:



Federation of Digital Seismic Networks (FDSN) : Almost four decades of cooperative open data sharing in digital seismology

Attributes seismic network codes

In 2014 the FDSN adopted assigning DOIs (persistent identifiers) to seismic networks that collect observational data. **The main objective: facilitate and encourage citations of data (networks).**

REPORT  
doi:10.26443/seismica.v4i1.1537



Quantitative assessment:

**DOI, licence and citation uptake for seismological waveform data after 10 years of implementation effort**

*Seismica*, 4(1). <https://doi.org/10.26443/seismica.v4i1.1537>



# Recommendation and implementation



Recommendation:

- Granularity: 1 network = 1 Persistent identifier
  - => **facilitate maintenance by avoiding fine granularity**
- DataCite DOIs with recommended DataCite DOI metadata
  - => **facilitate homogeneity to ease exploitation**
- Update of recommendation (metadata) in 2023
  - => **improve 'FAIR'ness**



# Recommendation and implementation



Implementation (default option):

- A DOI is created with minimum metadata when a network code is attributed.
  - => **facilitate high coverage**
- FDSN hosts the landing page
  - => **facilitate homogeneity**
  - => **decrease effort for the network providers**
- FDSN provides a citation tool <https://www.fdsn.org/networks/citation/>
  - => **facilitate citation for researchers**



# Recommendation and implementation



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# Quick view on <https://www.fdsn.org/>

<https://www.fdsn.org/networks/>

<https://www.fdsn.org/networks/detail/CZ/>

<https://www.fdsn.org/networks/detail/IV/>

[https://www.fdsn.org/networks/detail/XF\\_2024/](https://www.fdsn.org/networks/detail/XF_2024/)

<https://www.fdsn.org/pdf/DOI-Recommendations-2023.pdf>

<https://www.fdsn.org/networks/citation/>

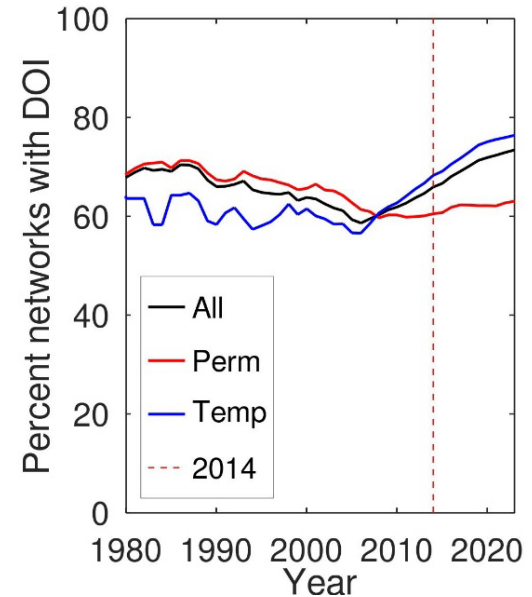
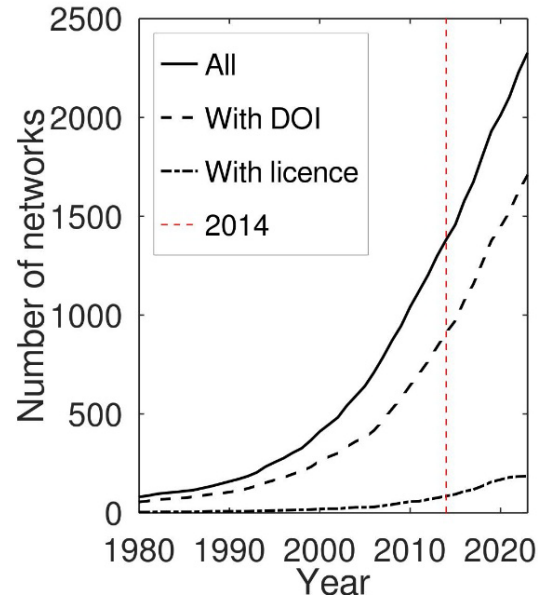


# DOI implementation: successful

## April 2024:

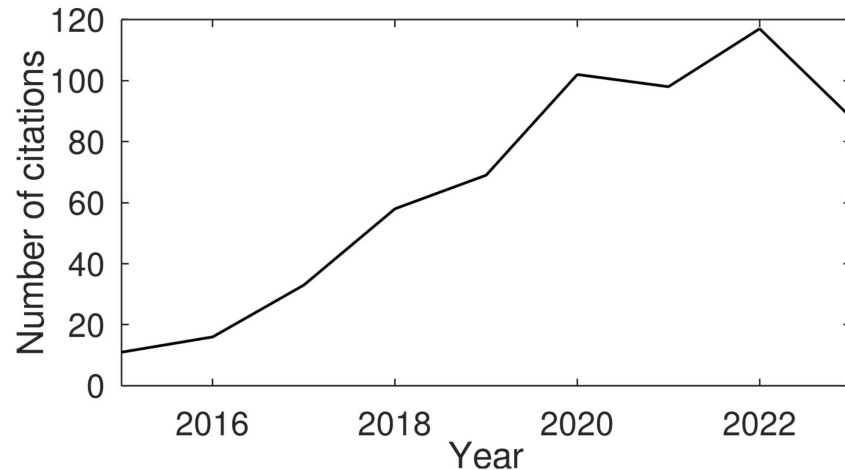
- 2368 registered FDSN networks
- 1732 Networks (73%) have a DOI
- 188 Networks (8%) have a licence
- CC:BY 4.0 recommended since 2025

Additional: 'FAIR' before FAIR!  
(but improvements possible)



# Citation : increasing but slow uptake

**Lack of tools to count, so example checks:** AGU journals and GJI



**Citations much lower than reality**

- **Many articles do not cite** the networks
- **Many articles cite incorrectly** (list networks, list DOIS, list datacenters, ... ) but network references are not in reference list.

**Causes:**

- **Lack of awareness**
- **Lack of science checks in journals** (reviewers, associate editors, editors)
- **Lack of technical checks** (if DOI in datasection : check that citation included in references)

# A potential to do list

| Recommendation   | Network operators | Data Centers | FDSN Federation | Journals | DataCite | Citation Search Scientists |
|--|-------------------|--------------|-----------------|----------|----------|----------------------------|
| Request/Mint DOI and provide complete information for datacite metadata      | x                 | x            | x               |          |          |                            |
| Community outreach to promote recommended citation practices                 | x                 | x            | x               |          |          |                            |
| Interact with publishers on strategies to increase and improve citation      |                   | x            | x               |          |          |                            |
| Include data citation practices in the review process                        |                   |              |                 | x        |          |                            |
| Improve author guidelines  |                   |              | x               |          |          |                            |
| Improve technical editorial checks   |                   |              | x               |          |          |                            |
| Ensure that network citations are included in the reference section          |                   |              | x               |          |          | x                          |
| Ensure that networks are cited in Data Availability Statements or equivalent |                   |              | x               |          |          |                            |
| Develop tools for citation of a large number of networks                     |                   |              | x               | x        |          |                            |
| Avoid limitations on number of citations of datasets                         |                   |              | x               |          |          |                            |
| Cite network data as recommended by the FDSN (see explanation Section 5)     |                   |              |                 |          |          | x                          |
| Avoid depositing copies of network data in generalist repositories           |                   |              | x               |          |          | x                          |
| Train and inform scientists about correct citations                          |                   | x            | x               |          |          | x                          |



# Your own check list

## If you are a **student or postdoc**:

- Do you cite correctly? (reports, thesis, articles, data products, ...)
- Did you learn about data citations (from supervisor? In class? Other students? Internet? Conferences?)
- Can you take any action locally or more broadly to improve citation knowledge among students ?

## If you are a **researcher**: do you

- Cite data correctly?
- Teach your Master's students, Ph D students and postdocs how to cite data?
- Check the articles you reviewed for correct data citation?
- Did you check the articles in your role as editor or associate editor?



# Thank you for your attention!

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