Acknowledgement of the Global Seismographic Network in Scientific Publications & Proposals

Molly Staats, Kasey Aderhold, Andy Frassetto, Bob Busby
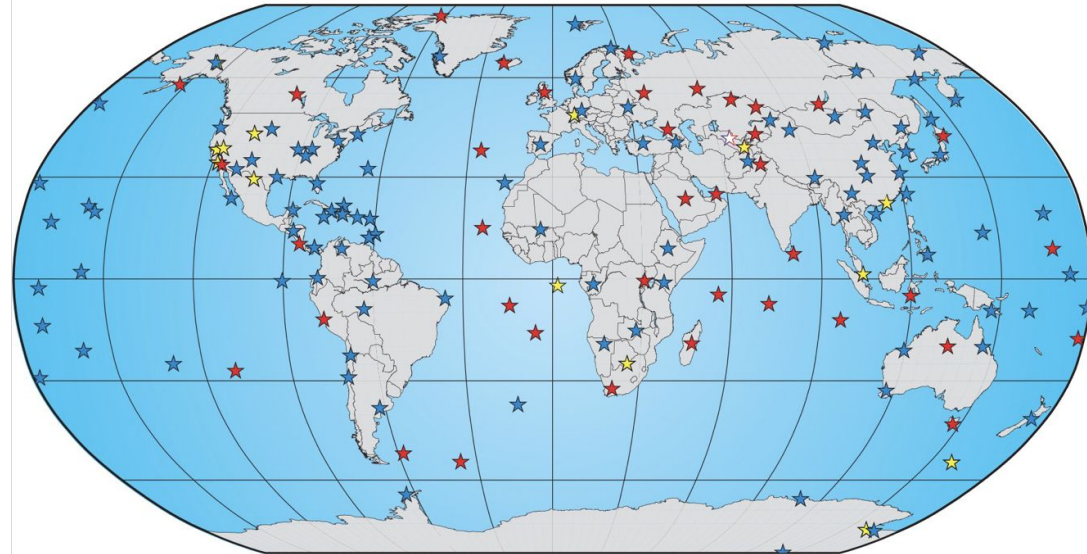(GSN Interim Management Team)

With help from Katrin Hafner, Meghan Flanagan,
and the GSN Standing Committee: Colleen Dalton, Harriet Lau, Martin Vallée, Shawn Wei, William Yeck

IRIS

Global Seismographic Network (GSN)
- Cooperative scientific facility operated jointly by the NSF and USGS
- 152 VBB seismic stations worldwide
  - very long period to mid-frequency-range seismic data
  - microbarographs, GPS, geomagnetic, and meteorological
- Data is open and available in real time
  - Global earthquake monitoring
  - Global volcano monitoring
  - Tomography and Earth structure
  - Nuclear test monitoring
  - Climate and environment
  - …and more, see Ringler et al., Reviews of Geophysics, 2022

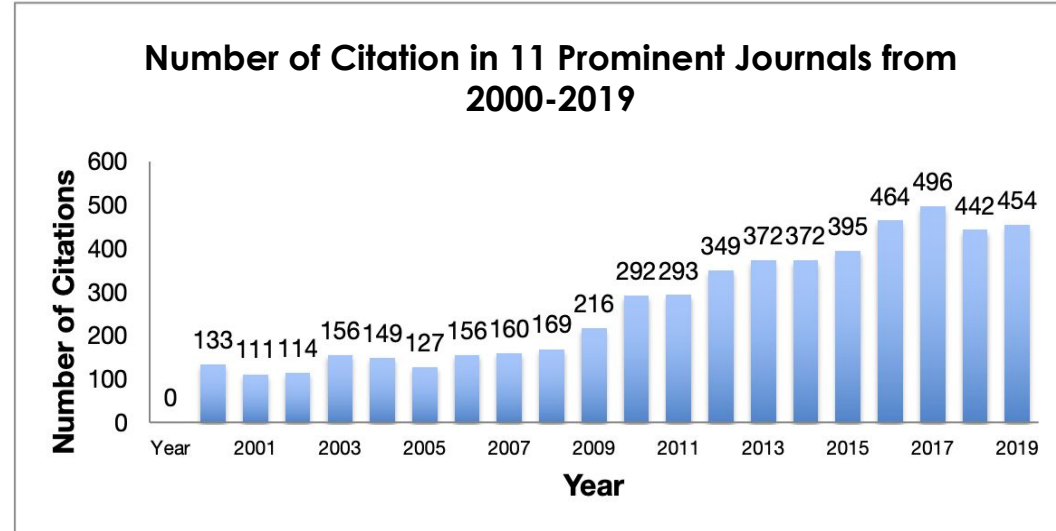Metrics necessary to justify funding of GSN by NSF (and USGS).

www.iris.edu/hq/programs/gsn

The Global Seismographic Network

★ IRIS/IDA Stations ★ IRIS/USGS Stations ☆ Affiliate Stations ☆ Planned Stations

- Scientific publications are key metric for facilities
  - "What data, who is using it, and for what"

- Annual IRIS-wide citation search and tracking for last 2 decades
  - iris.edu/hq/iris_citations
  - Specific GSN search terms yielded ~60/yr

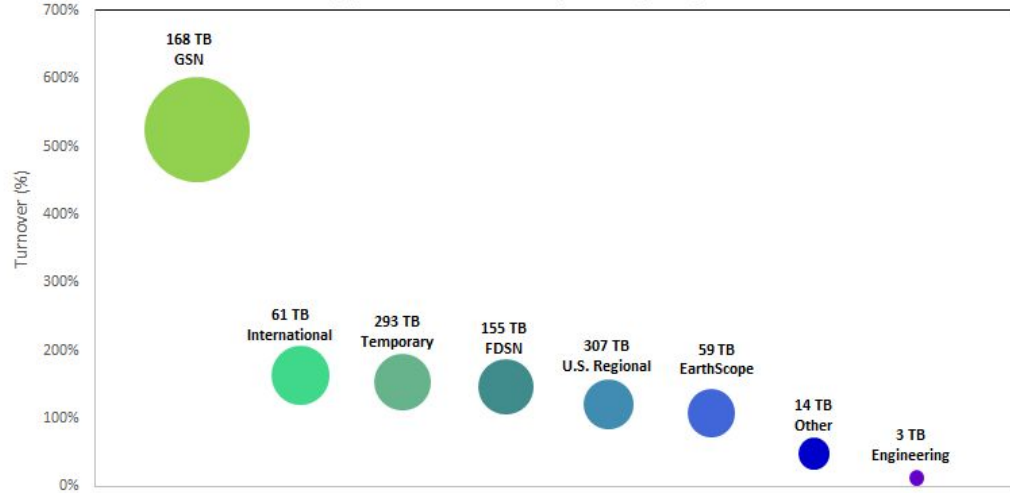**Number of Citation in 11 Prominent Journals from 2000-2019**

"GSN"
"Global Seismographic Network"
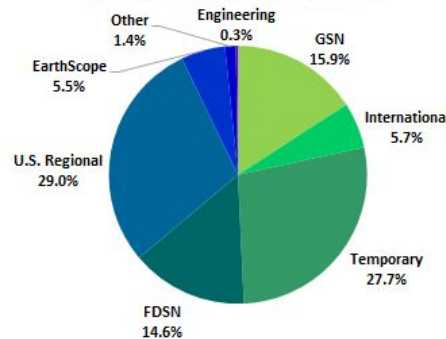"Global Seismic Network" (incorrect, but common)

- Data shipment statistics are also a key metric

- IRIS DMC has been tracking data shipments by IP
  - GSN data comprises 4% of total data holdings but 16% of shipped data

GSN data are heavily shipped compared to other classes of seismic networks... but perhaps not consistently cited?
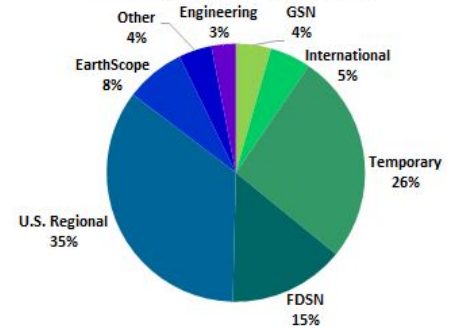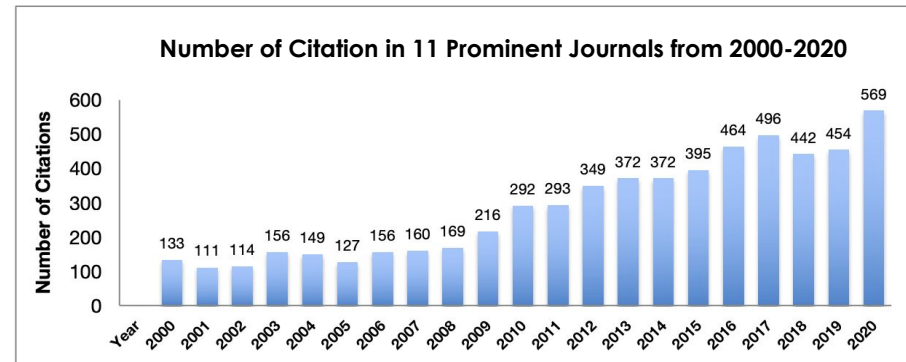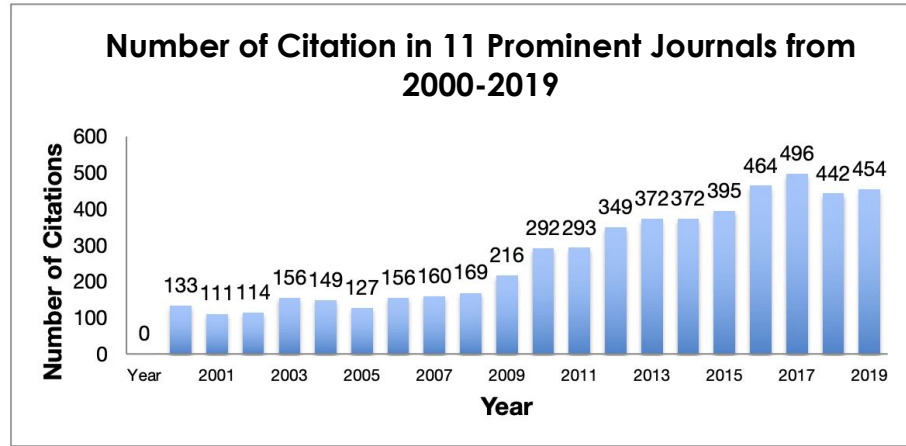

(a) 2021 IRIS DMC Shipments per Byte

168 TB GSN
61 TB International
293 TB Temporary
155 TB FDSN
307 TB U.S. Regional
59 TB EarthScope
14 TB Other
3 TB Engineering

(b) 2021 IRIS DMC Shipments

Other 1.4%
Engineering 0.3%
GSN 15.9%
International 5.7%
Temporary 27.7%
FDSN 14.6%
U.S. Regional 29.0%
EarthScope 5.5%

(c) 2021 IRIS DMC Holdings

Other 4%
Engineering 3%
GSN 4%
International 5%
Temporary 26%
FDSN 15%
U.S. Regional 35%
EarthScope 8%

- Scientific publications are key metric for facilities
  - "What data, who is using it, and for what"

- Annual IRIS-wide citation tracking for last 2 decades
  - iris.edu/hq/iris_citations
  - Program specific search terms yielded GSN = 60/yr

- Using additional GSN search terms, 89 citations contributed to 2020 results

Number of Citation in 11 Prominent Journals from 2000-2019

Number of Citation in 11 Prominent Journals from 2000-2020

89 GSN citations added in 2020

IRIS

Identifying Publications Using GSN Data
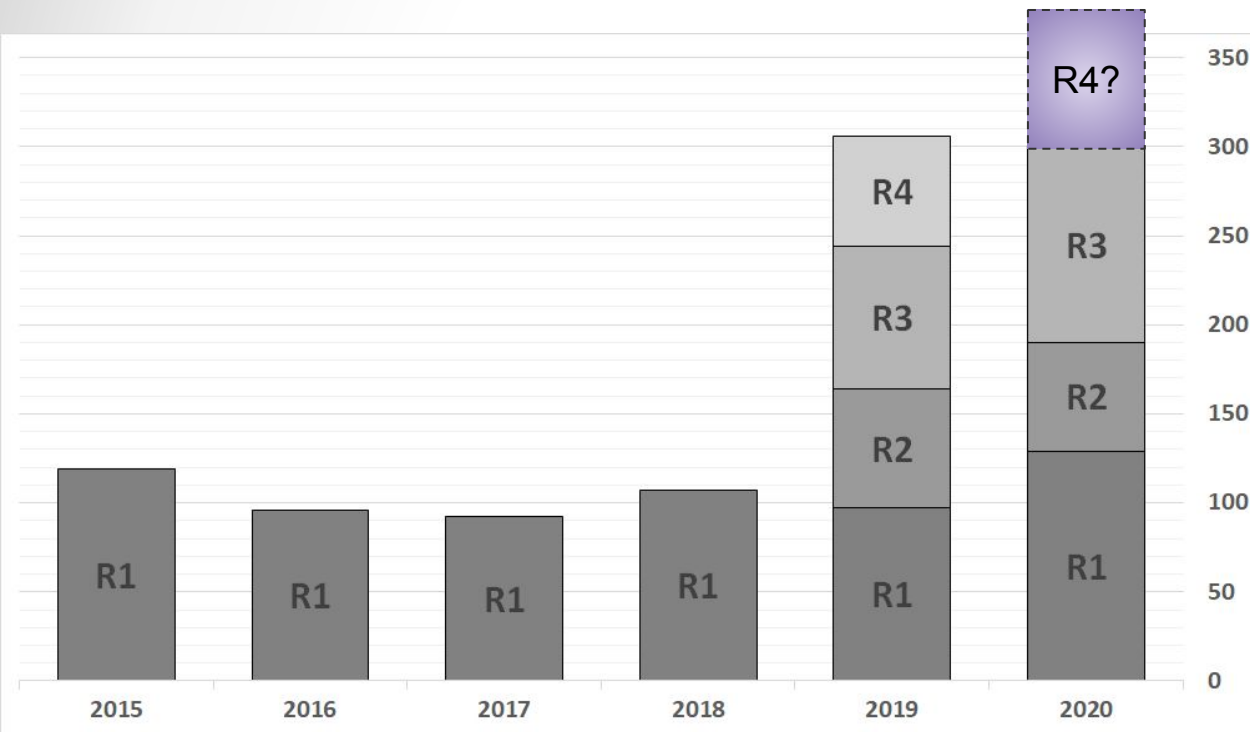
Google Scholar

- **Round 1**
  - Additional search terms (spellings of GSN/IDA, II, IU, and 20 station codes)
  - ~8 -12 hrs/yr

- **Round 2**
  - Additional search terms (affiliate networks) and data products (Global CMT)
  - ~16 to 28 hrs/yr

- **Round 3**
  - Additional search terms (DOIs) and data products
  - ~40 hrs/yr

Still not finding all known papers…

- **Round 4**
  - Expert level deep dive with GSN standing committee (GSNSC) members reviewing every individual paper in 11 prominent journals from January 1-April 30, 2019
  - ~200+ hrs/yr

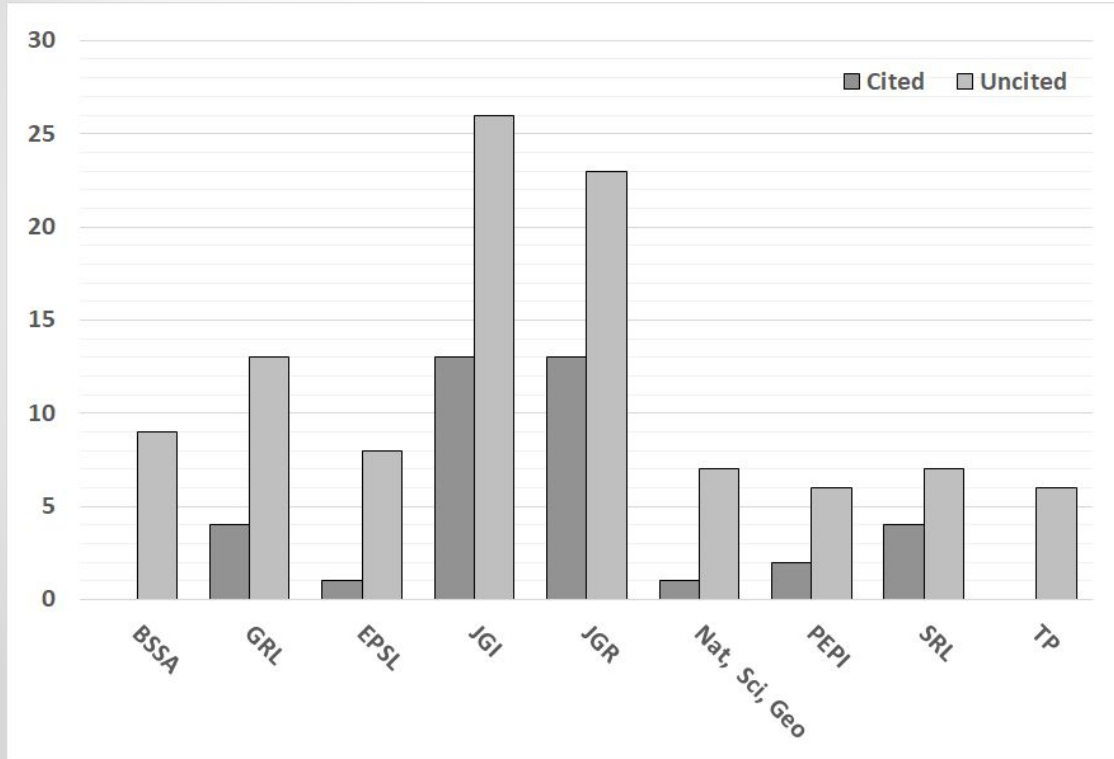(Cross-comparison of all rounds to ensure not double counting)

Citation Search Results

- No surprise, more search terms yield more citations

- Round 4 (deep dive) yielded studies that did not cite/acknowledge GSN data

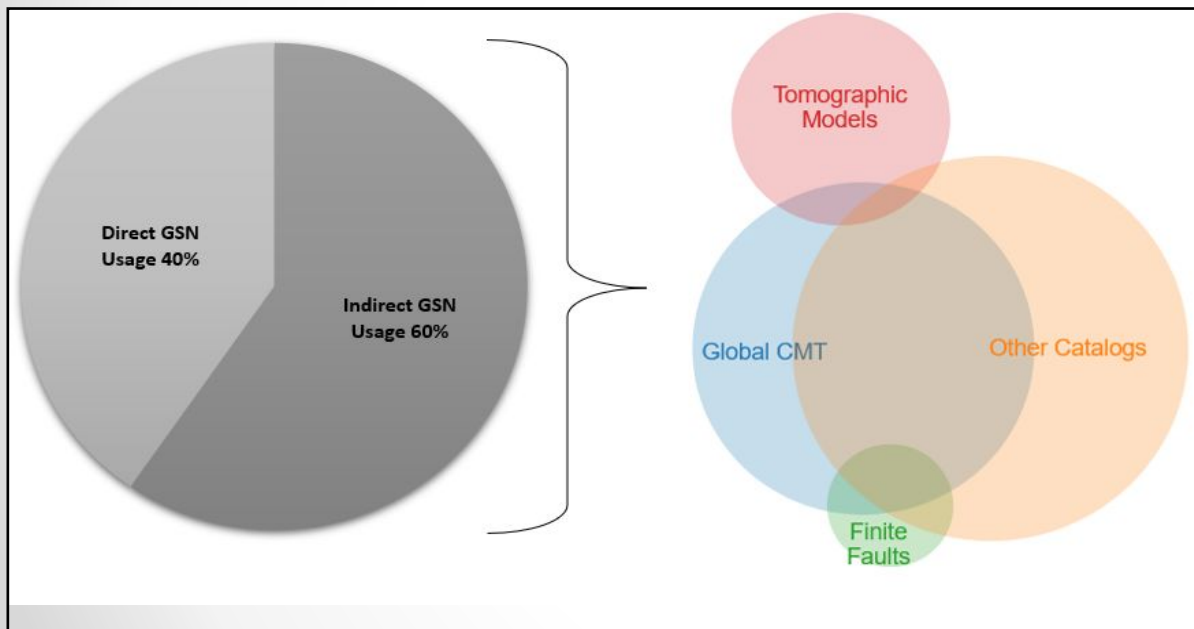R4 (deep dive) - January 1- April 30, 2019, extrapolated for a full year

Round 4 (deep dive): Cited vs Un-Cited

- ~100 journal articles from Jan-April 2019

- Only ~25% directly cite GSN (network codes, DOI, by name)
  - No uncommon to be embedded in figures or supplemental materials

- Human error vs scholarly search engines
  - ~18% citation missed by R4 (deep dive)

Round 4 (deep dive): Data Products and Catalogs

- GSN data feeds numerous data products and earthquake catalogs

- 60% of the total R4 citations come from these indirect uses

- Indirect uses almost never reference/acknowledge the GSN
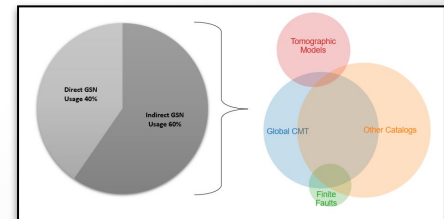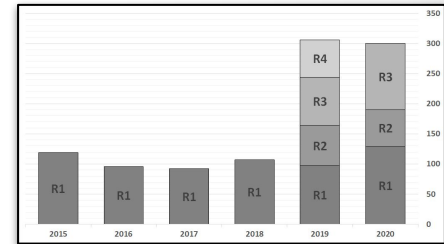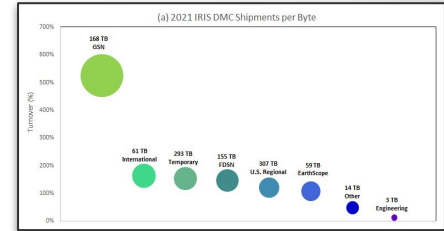
Take Aways

GSN data is being heavily requested and used
- evidenced by DMC deliveries
- evidenced by citations
- evidenced by science results

More search terms (and time) yields more citations…
- acronyms and commonly used terms
- network DOIs
- data products

…but there are always more studies!

Manuscript for submission to SRL (Staats et al., in prep.)

Recommendations

Work with journal editors to ensure proper citation and acknowledgement at review stage
- Key place where even the best of intentions fails
- Benefits from expertise of reviewers and authors
- Address issues of "complex citations", e.g. 100s of DOIs

Better understanding and appreciation needed from all on how data is used, how science and monitoring products rely on that data
- Metrics like citations are useful (if optimizing time spent on tracking them)
- Public outreach materials, science highlights, and other media are also part of the equation for acknowledgement
- Ongoing discussions like this workshop for agreement on best practices