

IRIS CITATION PROJECT

January 2015 – December 2015

Introduction

The aim of this year's project was to continue the 16-year compilation of IRIS related citations into one database. In order to maintain continuity while searching journals and procuring citations the processes and procedures used in previous years were followed as closely as possible and improved upon where applicable. These procedures and data findings are outlined below.

The searching of journals for references with IRIS citations for 2015

The eleven most prominent earth science journals were given priority while searching. These journals are - *Bulletin of Seismological Society of America (BSSA)*, *Journal of Geophysical Research (JGR)*, *Geophysical Journal International (GJI)*, *Seismological Research Letters (SRL)*, *Geophysical Research Letters (GRL)*, *Earth and Planetary Science Letters (EPSL)*, *Physics of the Earth and Planetary Interior (PEPI)*, *Tectonophysics*, *Nature*, *Science* and *Geology*.

The journals were searched for the following key words: *IRIS*, *Incorporated Research Institution for Seismology*, *PASSCAL*, *DMC*, *DMS*, *Data Management Center*, *GSN*, *Global Seismographic Network*, *GDSN*, *USArray*, *EarthScope*, *PBO*, *Plate Boundary Observatory*, *Transportable Array (TA)*, *Magnetotellurics and Flexible Array*, *OBSIP*, *Ocean Bottom Seismograph Instrument Pool*, *GLISN*, *Greenland Ice Sheet Monitoring Network* and *www.iris.edu*.

The searches were carried out electronically with different search engines for journals as follows:

- *Journal of Geophysical Research*, *Geophysical Research Letters*, and *Geophysical Journal International* were searched through Wiley search engine.

- For SSA publications (*Bulletin of Seismological Society of America*, *Seismological Research Letters*) the GSW engine was used.

- For Elsevier publications, *Earth and Planetary Science Letters*, *Physics of the Earth and Planetary Interiors*, and *Tectonophysics*, the ScienceDirect engine was used.

- The other journals, *Nature* and *Science* have their own search engines on their respective web pages and *Geology* has the search engine of Geological Society of America.

Most of these search engines are capable of an all-text search, which often brings up unrelated documents as well as the intended IRIS research results. I make an initial scan through the results, deleting entries that are obviously unrelated to IRIS research activities. For the remaining documents I manually perform a “find” function for the key word on the abstract, primary text, figures, funding sources and/or acknowledgements. If the document is relevant I mark it and export it into the database as a .ris file.

The distribution of findings are given in the following table:

Table 1: Total number of citations in the Top 11 journals

No.	Journal / Magazine	Number of references
		Jan. 2015 – Dec. 2015
1	Bulletin of the Seismological Society of America	59
2	Journal of Geophysical Research	80
3	Geophysical Journal International	80
4	Geophysical Research Letters	55
5	Earth and Planetary Science Letters	33
6	Seismological Research Letters	46
7	Physics of the Earth and Planetary Interiors	4
8	Tectonophysics	19
9	Science	3
10	Nature	12
11	Geology	4

There was an increase in the total number of citations in 2015 compared to calendar year 2014; there were 395 citations in 2015 and 372 citations in 2014.

This year there were more IRIS related publications in BSSA, JGR, GJI, SRL, Tectonophysics, and Nature and EPSL (12, 4, 37, 13, 3 and 8 more references, respectively), but there were less IRIS related publications in GRL (19 less), PEPI (5 less), EPSL (24 less) and Science (6 less). Refer to Figure 1 below to see a direct comparison of the number of citations in each journal for the last 2 calendar years and Figure 2 to see the number of citations per year.

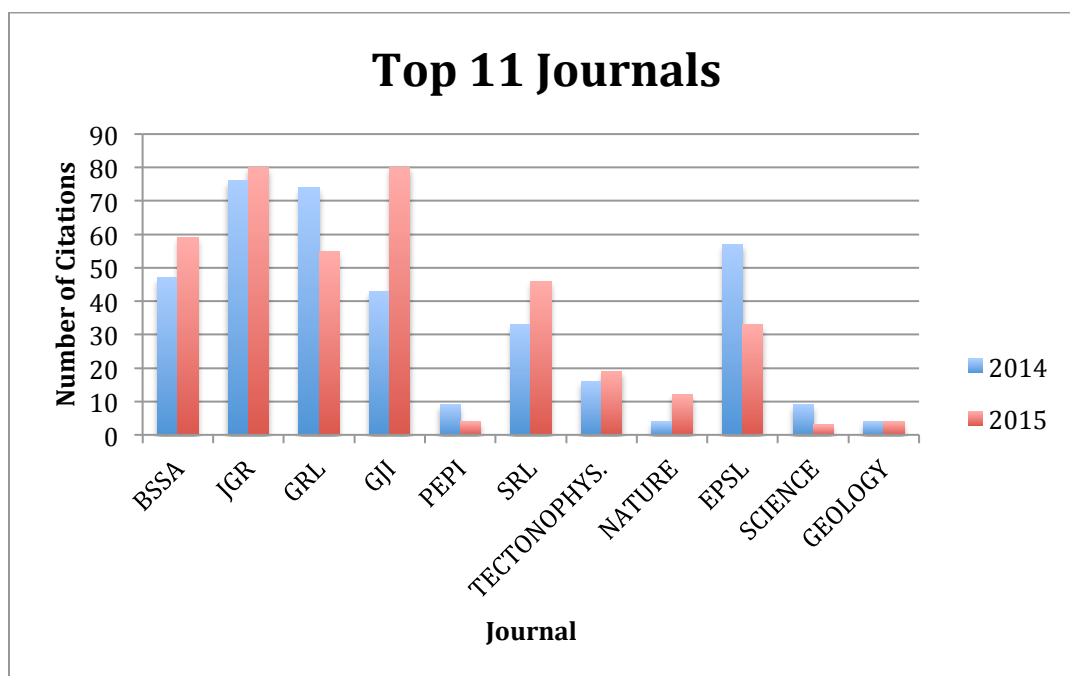


Figure 1. Number of publications in the top eleven journals in calendar years 2013 and 2014.

Since the inception of the IRIS citations database in 2000 the number of IRIS related citations has showed an upward trend (Figure 2). This increase can be expected to continue, particularly as USArray moves into Alaska and the OBSIP and GLISN projects gain momentum.

BSSA	52	8	12	17	2	2	0	1	0
JGR	71	14	5	36	6	6	5	4	0
GRL	49	6	5	30	2	2	1	1	0
GJI	58	16	15	22	12	7	2	1	0
PEPI	4	0	2	3	0	0	0	0	0
SRL	33	6	3	18	8	5	1	5	0
TECTO	14	2	2	4	3	2	0	0	0
NATURE	6	4	5	3	1	1	2	1	0
EPSL	18	8	11	13	4	3	0	3	0
SCIEN	1	1	1	0	0	0	0	0	1
GEOL	1	1	0	0	2	1	0	0	0
All 11 journals	307	66	61	146	40	29	11	16	1

Table 3: Number of search terms in top 11 journals in calendar years 2014 and 2015

	IRIS or full name	PASS-CAL	GSN /GDSN	DMC DMS or full name	USArray	EarthScope	PBO	OBSIP	GLISN
2014	324	86	78	154	154	137	54	4	1
2015	307	66	61	146	40	29	11	16	1

In order to determine the importance of the IRIS data in the study represented by any paper, it was necessary to go through the content of each paper. I did this by searching each reference from the 11 most important journals for IRIS search terms and then reading the associated content to determine how the IRIS facility or data was utilized in the study. In keeping with previous reports, I considered the IRIS contribution to the study to be of high importance when only IRIS data or equipment were used for the research work; of medium importance when the IRIS data and/or equipment are employed together with other data or equipment from other agencies or organizations; and of low importance when IRIS structures are mentioned only occasionally (for example in references of the paper) or for the reason of archiving and disseminating the produced data through that research into the IRIS facilities mentioned.

Table 4: Importance of IRIS facilities in references from Top 11 journals

Journal	Important	Total	High	Moderate	Low
BSSA	59	23	23	13	
JGR	80	45	20	15	
GRL	55	31	13	11	
JGI	80	47	20	13	
PEPI	4	0	4	0	
SRL	46	27	13	6	
TECTONOPHYS.	19	8	9	2	
NATURE	12	8	2	2	
EPSL	33	18	11	4	
SCIENCE	3	2	1	0	
GEOLOGY	4	3	1	0	
All 11 journals	395	212	117	66	

The searching of references of IRIS citations in other 29 earth science journals

IRIS promotes continuous conducting of geophysical investigations of seismic sources and earth properties through its facilities and allows free and unrestricted access to its database, one of the largest in the world. This database is used by researchers around the world to explore the lithosphere, cryosphere, atmosphere, hydrosphere and deep earth in unprecedented ways. The types of scientific findings aided by IRIS facilities are extremely varied, and this is reflected in the number and type of journals that cite IRIS data, instruments and facilities. Given the importance of some of these journals, their impact factor and effectiveness citation index, 29 other journals from earth science publications are selected for expanding our searching for IRIS-related citations. These journals are: *Canadian Journal of Earth Sciences, Geophysics, The Leading Edge, Reviews of Geophysics, Tectonics, Polar Science, Earth Surface, Journal of Glaciology, Marine Geophysical Research, Nature Geoscience, Lithosphere, Journal of Geodynamics, Geosphere, Earthquake Science, Journal of Volcanology and*

Seismology, Seismic Instruments, Natural Hazards and Earth System Sciences, Journal of Structural Geology, Natural Hazards, Geochemistry, Geophysics, Geosystems, Soil Dynamics and Earthquake Engineering, Russian Journal of Pacific Geology, Journal of Volcanology and Geothermal Research, Marine Geology, Geomorphology, Pure and Applied Geophysics, Chinese Journal of Geophysics, Journal of Seismology, EOS.

The number of citations for each of these journals for the calendar years 2014 and 2015 are presented in Table 4 below.

Table 5: Number of citations found in additional 29 journals

	2015	2014
Canadian Journal of Earth Sciences	0	1
Geophysics	5	1
The Leading Edge	4	0
Reviews of Geophysics	3	4
Tectonics	8	4
Polar Science	7	0
Earth Surface	0	0
Journal of Glaciology	2	0
Marine Geophysical Research	0	1
Nature Geoscience	0	2
Lithosphere	1	2
Journal of Geodynamics	0	4
Geosphere	5	3
Earthquake Science	2	2
Journal of Volcanology and Seismology	2	0
Seismic Instruments	1	0
Natural Hazards and Earth System Sciences	2	0
Journal of Structural Geology	0	5
Natural Hazards	3	4
Geochemistry, Geophysics, Geosystems	32	28
Soil Dynamics and Earthquake Engineering	0	0
Russian Journal of Pacific Geology	1	0
Journal of Volcanology and Geothermal Research	0	8

Marine Geology	2	2
Geomorphology	3	1
Pure and Applied Geophysics	16	12
Chinese Journal of Geophysics	3	0
Journal of Seismology	4	0
EOS	0	4
All 29 Journals	106	88

The total number of citations found in these journals in 2015 is greater than what was found the previous year (Figure 3). In particular, there were more IRIS related citations in journals *Geochemistry*, *Geophysics*, *Geosystems*, *Geophysics*, *Leading Edge*, *Pure and Applied Geophysics* and *Tectonics*.

Number of Citations in 29 Journals from 2000-2015

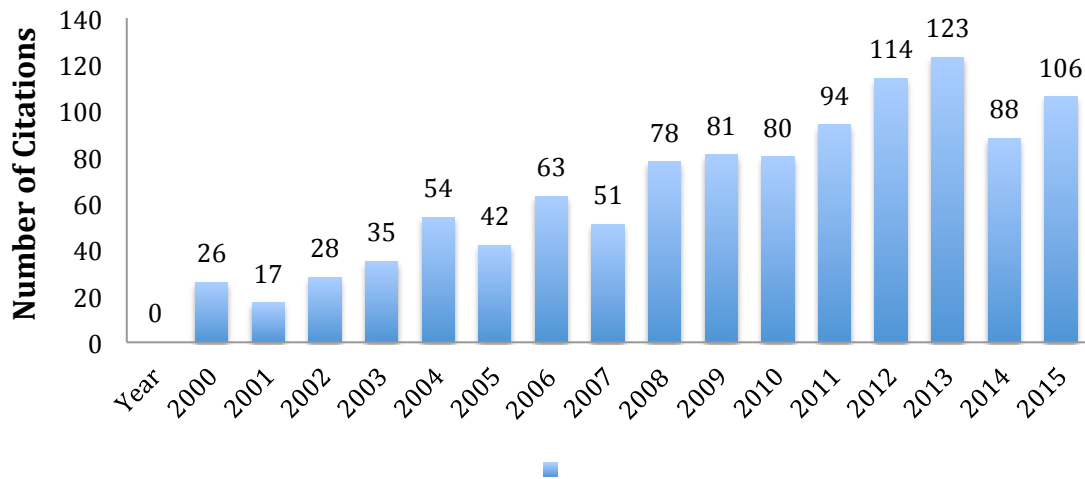


Figure 3. Graph showing the number of citations per year in the 29 additional journals.

The searching of references of IRIS citations in other journals

As the application of IRIS facilities expands into new realms (e.g. OBSIP, GLISN and USArray Alaska) we can expect an increase in the number of citations in journals that were previously not relevant to IRIS related research. Additionally, unexpected and

creative uses of the data and facilities are creating an exciting body of work outside of the traditional earth science journals.

In order to explore the use of IRIS data and products in journals outside of the traditional earth science sphere and to show the breadth of the data usage, I performed a generalized search on the aforementioned search terms using Google Scholar and Web of Science. This search uncovered an additional 86 citations from 37 journals. These results, taken in combination with results from 2014, show that IRIS related data or facilities have been used in articles published in 115 different journals during calendar years 2014 and 2015 (11 top journals, 29 additional journals, 38 other journals from 2014 and an additional 37 in 2015). These journals cover a diverse range of subjects, including Acoustics and Radio; Engineering; Computer Science; Law, Crime and Justice; Planetary Science and Meteorology. These journals and the number of citations from each journal in 2014 and 2015 are listed in Table 7. Particularly, the *Journal of South American Earth Sciences*, *Journal of Asian Earth Sciences*, *Izvestiya, Physics of the Solid Earth, and Earth, Planets, and Space* had a significant number of IRIS related citations.

Table 7. Additional journals and total number of IRIS related citations in each

Other Journals	2015	2014
Solid Earth Discussions	3	2
Journal of South American Earth Sciences	12	4
Computers & Geosciences	1	1
Encyclopedia of Earthquake Engineering	0	2
Surveys in Geophysics	2	2
Geotectonics	0	1
EURASIP Journal on Applied Signal Processing	0	1
The Journal of the Acoustical Society of America	1	1
Physical Review Letters	0	1
Geomagnetism and Aeronomy	1	1
Journal of Applied Physics	0	1
Journal of African Earth Sciences	0	1
Physics Today	0	1
Meteoritics and Planetary Science	0	1
Progress in Earth and Planetary Science	1	1
Scientific Reports	0	3

Journal of Asian Earth Sciences	3	5
Journal of Geodesy	1	1
International Journal of Biometeorology	0	1
Izvestiya, Physics of the Solid Earth	5	5
Ieee Journal of Selected Topics in Applied Earth Observations and Remote Sensing	0	1
Water Resources Research	0	1
Geological Society of America Special Papers	2	1
Geofísica Internacional	1	1
Earth, Planets, and Space	2	4
Journal of Applied Meteorology and Climatology	0	1
Advances in Geophysics	0	1
Annual Review of Earth and Planetary Sciences	0	1
Doklady Earth Sciences	0	2
Journal of Hydrology	0	1
Oceanography	1	1
The Cryosphere Discussions	0	1
Global and Planetary Change	0	1
Annual Review of Marine Science	0	1
Advances in Space Research	1	1
Geodesy and Geodynamics	0	1
Science China Earth Sciences	2	2
Radio Science	0	2
Geophysics	0	1
Sensors and Smart Structures Technologies for Civil, Mechanical and Aerospace Systems 2015	1	0
Advances in Geosciences	2	0
GeoResJ	2	0
Gondwana Research	3	0
Precambrian Research	2	0
Journal of Atmospheric and Solar-Terrestrial Physics	2	0
Marine and Petroleum Geology	1	0
Journal Environmental & Engineering Geophysics	1	0
International Journal of Greenhouse Gas Control	1	0
Cuadernos de Geografia	1	0
Arabian Journal of Geosciences	1	0
Earth Science Informatics	1	0
Environmental & Engineering Geoscience	1	0

Acta Geophysica	1	0
Bulletin of Earthquake Engineering	1	0
Interpretation	1	0
Earth-Science Reviews	2	0
International Journal of Law, Crime and Justice	1	0
AAPG Bulletin	1	0
International Journal of Disaster Risk Reduction	2	0
Knowledge Based Systems	1	0
Geoscience Frontiers	2	0
Monthly Weather Reviews	1	0
Engineering Structures	1	0
Science of Tsunami Hazards	1	0
Physics and Chemistry of the Earth	1	0
Italian Journal of Geosciences	1	0
Icarus	1	0
Geosciences Journal	2	0
Contributions to Geophysics and Geodesy	1	0
Bulletin of the American Meteorological Society	1	0
Nonlinear Processes in Geophysics	1	0
Journal of Applied Geophysics	1	0
Polish Polar Research	1	0
Geodesy and Geodynamics	1	0
Engineering Geology	1	0
NRIAG Journal of Astronomy and Geophysics	1	0
TOTAL	86	61

The searching of references of IRIS citations in AGU, GSA and EGU abstracts

I used the NASA ADS Service Abstracts for searching into AGU proceedings. There are 172 AGU abstracts with citations of IRIS or IRIS facilities (Table 8) that are mentioned increased in 2015. This is less than the number of citations from 2014, probably due to the exclusion of non-IRIS related PBO references, as well as the overall decrease in research related to USArray and EarthScope in general. There are 28 abstracts authored or co-authored by IRIS staff.

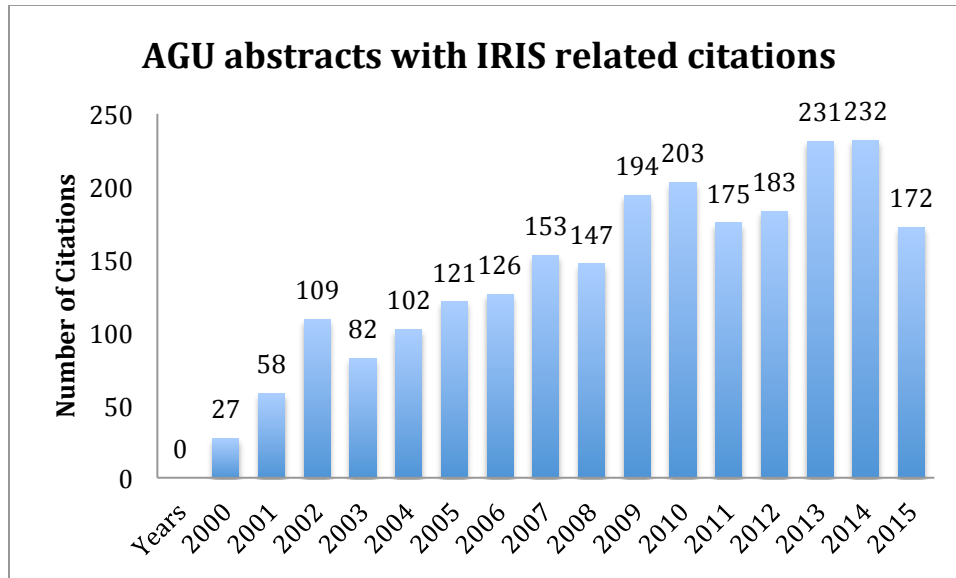


Figure 4. Number of AGU abstracts with IRIS related citations from 2000-2015.

Because the IRIS Global Seismic Network (GSN), Data Management Center (DMC) and data from USArray are widely used in studies throughout the world, I also searched for IRIS related abstracts of research presented at the Geological Society of America (GSA) meeting and the European Geophysical Union (EGU) meeting. I used Google Scholar to search for GSA and EGU abstracts that cite IRIS or IRIS facilities. 24 GSA abstracts and 27 EGU abstracts cite one or more relevant search terms.

Findings from 2015

The total number of IRIS related citations found in all journals in 2015 is 587, an increase of 85 references from the previous year. 14 of these were authored or coauthored by IRIS employees. The total number of citations in abstracts is 223; 28 were authored or coauthored by IRIS employees. Thus, the total number of IRIS related references in 2015 is 810, a slight increase from 2014.

This increase is partially the result of more IRIS-citation references in the traditional journals. The number of citation in these journals increased significantly; *Bulletin of the Seismological Society of America* (26%), *Geophysical Journal International* (86%), *Seismological Research Letters* (39%) and *Nature* (200%). In the 29 additional journals, *Geochemistry*, *Geophysics*, *Geosystems*, *Pure and Applied*

Geophysics have 2 digit entries. Finally, 86 additional citations were discovered in 52 additional journals.

The current file of the project for this year contains:

- a list of all papers and abstracts with IRIS related citations for 2015
- a list of papers with IRIS-related citations for 11 traditional journals
- a list of papers with IRIS-related citations for 29 additional journals
- a list of papers with IRIS-related citations for all other journals
- a list of papers with IRIS-related citations for AGU, GSA and EGU abstracts
- four libraries with all the entries in EndNote for 2015 citations (All citations, 11 top journals, Abstracts, all other journals)
- a report documenting the processes, procedures and findings for 2015 citation findings

Dr. Wendy Bohon, Aug 2016.