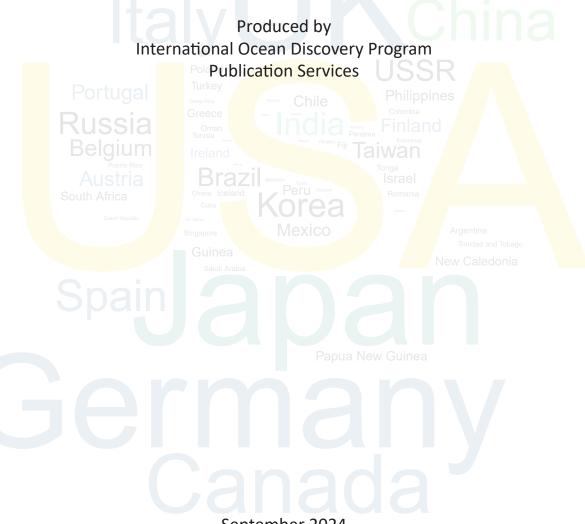
# 2024 Scientific Ocean Drilling Bibliographic Database and Publication Impact Report

Covering records related to the Deep Sea Drilling Project, Ocean Drilling Program, Integrated Ocean Drilling Program, and International Ocean Discovery Program from 1969 through June 2024



September 2024

# Introduction

This Scientific Ocean Drilling Bibliographic Database and Publication Impact Report demonstrates the impact of Program science through publications from the Deep Sea Drilling Project (DSDP), Ocean Drilling Program (ODP), and Integrated Ocean Drilling Program/International Ocean Discovery Program (IODP). The first section presents statistics from the bibliographic records indexed by the American Geosciences Institute (AGI) in the Scientific Ocean Drilling Bibliographic Database (previously named the Ocean Drilling Citation Database) as of June 2024. The second section covers alternative impact metrics. Citation statistics obtained from Google Scholar in July 2024 and links to Altmetric scores for high-impact papers demonstrate trends in societal relevance and research usage.

## **Report categories**

Data collected for the annual Scientific Ocean Drilling Bibliographic Database Report are divided into two main categories:

- Program records: publications produced and published by the ocean drilling Programs DSDP, ODP, and IODP. These records include but are not limited to
  - The Initial Reports of the Deep Sea Drilling Project,
  - The Initial Reports and Scientific Results Proceedings volumes of ODP,
  - The Proceedings volumes of IODP,
  - The technical note series of ODP and IODP, and
  - The journal *Scientific Drilling* from 2006 to 2013.
- Non-Program records: Program-related scientific research published in the open literature. Non-Program publications are further categorized into three groups:
  - Serial records: drawn from any periodically produced analytic or monographic journal or report, especially those that are peer reviewed, but may also include reports from universities, organizations, or government entities (e.g., *Open-File Reports—U.S. Geological Survey*).
  - Theses and dissertations: Bachelor's and Master's theses and Ph.D. dissertations.
  - Miscellaneous records: books, reports, maps, abstracts, posters, newsletters, videos, and CD-ROM/DVD-ROMs.

# Scientific Ocean Drilling Bibliographic Database

The Scientific Ocean Drilling Bibliographic Database is a subset of AGI's GeoRef database. To generate the GeoRef database, AGI indexes and records bibliographic data from more than 3,500 domestic and international publications. AGI also has arrangements to acquire metadata with many publishers including Springer, Elsevier, the American Association for the Advancement of Science, Copernicus, Wiley, the American Geophysical Union, MDPI, IOP, and most of the GeoScienceWorld publishers. In addition, IODP Publication Services notifies AGI when Program publications are released.

AGI produces the Scientific Ocean Drilling Bibliographic Database in collaboration with IODP. AGI uses a series of keywords to extract bibliographic records related to Program research from the GeoRef database. The database resides on the AGI server (http://iodp.americangeosciences.org/vufind) and is updated weekly. Metadata associated with each record can be saved to a personalized list, texted or emailed, or exported into common bibliographic software. The database also generates references in several formats. Depending on the source from which AGI acquires its information, there may be a significant delay after publication before a record is included in the GeoRef database and later in the Scientific Ocean Drilling Bibliographic Database. There is no guarantee that all publication venues for Program research are included in GeoRef or the Scientific Ocean Drilling Bibliographic Database, but scientific publications throughout the world are represented.

As of June 2024, the database contains 42,745 records, each including metadata, from publications published from 1969 to 2024 (beginning of DSDP to present), including ~76% non-Program records and ~24% Program records (Figure 1). Since the 2023 report, 1,257 records have been added to the database. Figure 1 highlights the ~3% theses and dissertations (total = ~1,172) in the database that illustrate early career scientific research relating to the Program and details serial publications related to IODP and its predecessor programs.

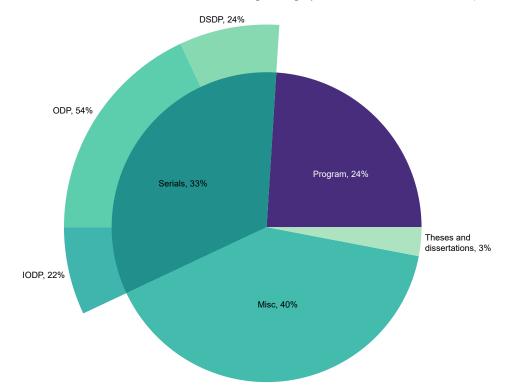


Figure 1. Overview of records in the Scientific Ocean Drilling Bibliographic Database as of June 2024 (total = 42,745).

## All Programs (1969-2024)

#### Publications from top-ranking peer-reviewed journals

Database records indicate that 14,410 Program-related papers have been published in non-Program, primarily peer-reviewed serial publications. A total of 5,852 of these research papers (~41% of the serial publications in the database) were published in 30 highly ranked peer-reviewed journals, based on the Clarivate Analytics 2023 journal impact factor (Figure 2). Starting in 1996, ODP encouraged scientists to publish postcruise research results in English language peer-reviewed journals rather than the Program *Proceedings* volumes. Figure 2 includes the highly ranked journals that have published a total of 25 or more research papers related to DSDP and ODP (1969–2002) and IODP (2003–present). Journal impact factors are shown in parentheses. Table 1 presents the data behind this graph.

Figure 2. Highly ranked peer-reviewed serials publishing Program-related expedition research results (1969–2024). \* = includes Paleoceanography papers (name changed in 2018); \*\* = includes Science in China Series D, Earth Sciences papers (name changed in 2010).

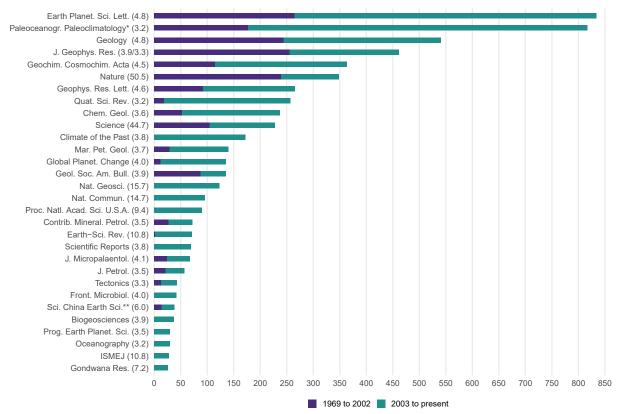


Table 1. Highly ranked peer-reviewed serials publishing Program-related expedition research results (1969–2024).
* = includes Science in China Series D, Earth Sciences papers (name changed in 2010); ** = includes Paleoceanography
papers (name changed in 2018).

	Journal Impact	Number of Program-related papers published		
Journal	Factor (2023)	1969-2002	2003–2024	Total
Nature	50.5	239	109	348
Science	44.7	105	123	228
Nature Geoscience	15.7	0	123	123
Nature Communications	14.7	0	96	96
Earth-Science Reviews	10.8	2	69	71
The ISME Journal	10.8	0	28	28
Proceedings of the National Academy of Sciences of the U.S.A.	9.4	0	90	90
Gondwana Research	7.2	0	26	26
Science China Earth Sciences*	6.0	14	24	38
Earth and Planetary Science Letters	4.8	265	569	834
Geology	4.8	244	297	541
Geophysical Research Letters	4.6	92	173	265
Geochimica et Cosmochimica Acta	4.5	115	248	363
Journal of Micropalaeontology	4.1	24	43	67
Global and Planetary Change	4.0	12	123	135
Frontiers in Microbiology	4.0	0	42	42
Journal of Geophysical Research (Solid Earth, Oceans)	3.9/3.3	255	206	461
Geological Society of America Bulletin	3.9	87	48	135
Biogeosciences	3.9	0	37	37
Climate of the Past	3.8	0	172	172
Scientific Reports	3.8	0	69	69
Marine and Petroleum Geology	3.7	29	111	140
Chemical Geology	3.6	53	184	237
Contributions to Mineralogy and Petrology	3.5	27	45	72
Journal of Petrology	3.5	22	35	57
Progress in Earth and Planetary Science	3.5	0	30	30
Tectonics	3.3	13	30	43
Paleoceanography and Paleoclimatology**	3.2	177	640	817
Quaternary Science Reviews	3.2	19	238	257
Oceanography	3.2	0	30	30

#### Publications by authors from current member countries

Of the 14,410 Program-related papers published in serial publications, 12,637 (~88%) are first-authored by scientists from current IODP funding entities, which include the following:

- National Science Foundation (NSF), United States;
- Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan;
- European Consortium for Ocean Research Drilling (ECORD);
- Ministry of Science and Technology (MOST), People's Republic of China;
- Australia-New Zealand IODP Consortium (ANZIC); and
- Ministry of Earth Sciences (MoES), India.

Table 2 shows publication statistics for member countries and consortia, including the following:

- First author: the correspondence author of a paper.
- Contributing authors: co-authors listed on a paper.
- Serial contributions by country: the number of papers that list contributing authors from each country. The country is counted once per paper regardless of the number of authors from that country.
- Serial contributions by author: the number of contributing authors from each country. Multiple contributors from a single country are each counted.
- Total contributions: the total number of times researchers from each country are included in the authorship of peer-reviewed serials, including first and contributing authors and multiple contributors from a single country per paper. The member country total contributions are also shown in Figure 3.

Table 2. Serial publication for peer-reviewed serials showing counts by first author, contributing country, contributing authors, and total contributions by all authors from current IODP member countries (1969–2024).

IODP member country		Serial contributions		Total contributions
or consortium	of serials	by country	by author	by all authors
Australia/New Zealand Consortium	453	791	997	1,450
Australia	273	524	633	906
New Zealand	180	267	364	544
China	944	815	1,248	2,192
ECORD	5,370	7,838	10,149	15,519
Austria	34	102	108	142
Canada	393	517	615	1,008
Denmark	85	149	164	249
Finland	12	20	24	36
France	760	1,098	1,552	2,312
Germany	1,304	1,745	2,292	3,596
Ireland	7	47	51	58
Italy	381	511	665	1,046
Netherlands	292	407	444	736
Norway	173	269	308	481
Portugal	21	87	103	124
Spain	224	405	508	732
Sweden	133	205	225	358
Switzerland	200	333	358	558
United Kingdom	1,351	1,943	2,732	4,083
India	259	191	238	497
Japan	936	1,240	2,600	3,536
United States	4,675	4,373	8,312	12,987
Total papers:	12,637			36,181

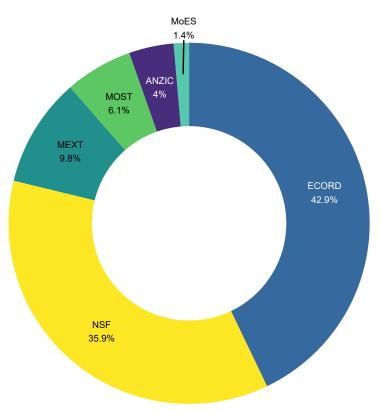


Figure 3. Total serial contributions by all authors from current IODP funding entities (1969–2024).

Table 3 shows the breakdown of first authors by country or consortium affiliation for all non-Program publication types except for theses and dissertations in the database.

Table 3. First-authored non-Program publications by type and current funding consortium (1969–2024).

IODP member country or consortium	Serials	Misc.
Australia/New Zealand Consortium	453	583
China	944	211
ECORD	5,370	5 <i>,</i> 889
India	259	107
Japan	936	966
United States	4,675	7,851
Totals:	12,637	15,607

# Integrated Ocean Drilling Program and International Ocean Discovery Program (2003–2024)

#### Publication co-author networks

Figures 4 and 5 show co-author networks based on the serial records in the database. Each time authors publish a paper together, a line connects their countries; no line is shown if authors from the same country publish together. Each connecting line shows a minimum of 5 collaborations; line thickness indicates relative number of individual collaborations between authors from the two countries. Figure 4 includes all countries in the database that have a total of 30 or more author contributions. Figure 5 shows author contributions from current member countries.

In Figure 4, the numbers next to the country names indicate the total number of times affiliations from each country are listed for authors and include first and contributing authors and multiple contributors from a single country per paper. For both Figures 4 and 5, the size of the circle indicates the relative number of authors. The circle colors indicate current member country funding entities (black = nonmember countries). Line colors are a mixture of the colors between collaborating countries.

Co-author networks were generated in Gephi (https://gephi.org) with the help of the Convert Excel and CSV files to Networks and Give Colors to Nodes plug-ins (http://www.clementlevallois.net).

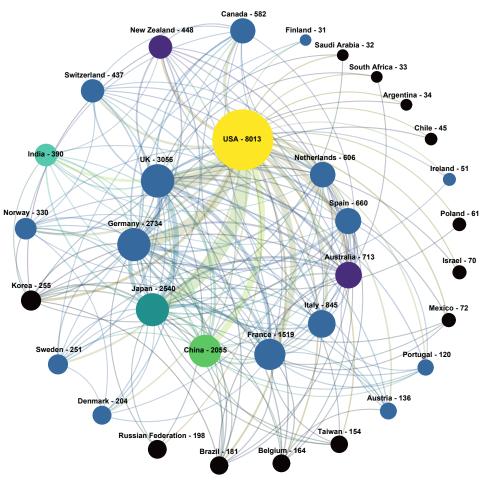
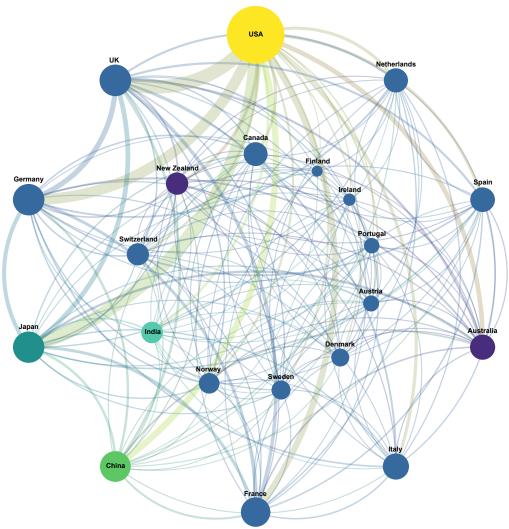


Figure 4. Co-author networks for all authors of Program-related peer-reviewed journal articles (2003–2024).

Figure 5. Co-author networks for authors of Program-related peer-reviewed journal articles from current member countries (2003–2024).



#### Publications by expedition

Figures 6, 7, and 8 show the number of Program and non-Program serial publication records for all completed IODP expeditions whose Expedition Reports volumes published before the end of August 2024 (Expeditions 301–372, 374–376, 378–383, 385, 386, 390–393, and 396–398). Note that the publication tail for postcruise expedition research in both Program and serial publications extends for several years after the end of the expedition; hence, more recent expeditions have fewer publications credited to them, as illustrated in the figure.

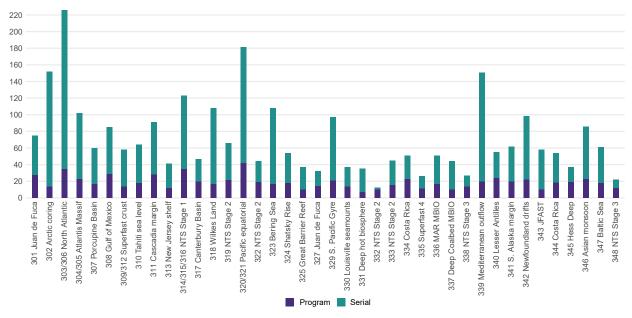
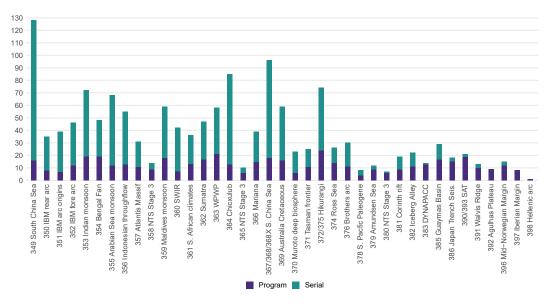


Figure 6. Number of Program and serial publication records for Integrated Ocean Drilling Program Expeditions 301–348 (2003–2024).

Figure 7. Number of Program and serial publication records for IODP Expeditions 349–372, 374–376, 378–383, 385, 386, 390–393, and 396–398 (2014–2024).



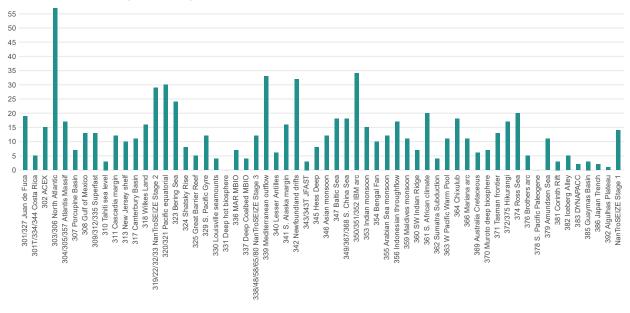


Figure 8. Number of expedition-related theses and dissertations for IODP Expeditions 301–372, 374–376, 378–383, 385, 386, 392, and 396 (2003–2024).

#### Publications by Science Plan theme

Figure 9 shows Program and non-Program (all types) records related to the Integrated Ocean Drilling Program (Expeditions 301–348) and sorted by *Integrated Ocean Drilling Program Initial Science Plan* (2003–2013) themes. Initial science plan themes are tied to the primary objectives of each expedition.

- Deep Biosphere: Expeditions 301, 307, 308, 311, 327, 329–331, 334, 336, 337, and 344.
- Environmental Change, Processes and Effects: Expeditions 302, 303/306, 310, 313, 317, 318, 320/321, 323, 325, 339, 341, 342, 346, and 347.
- Solid Earth Cycles and Geodynamics: Expeditions 304/305, 309/312, 314/315/316, 319, 322, 324, 326, 332, 333, 335, 338, 340, 343, 345, and 348.

Figure 9. Integrated Ocean Drilling Program publication records (all types) by Initial Science Plan theme (2003–2024).

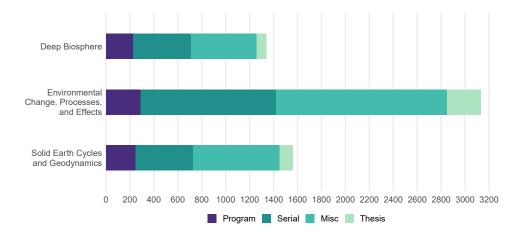
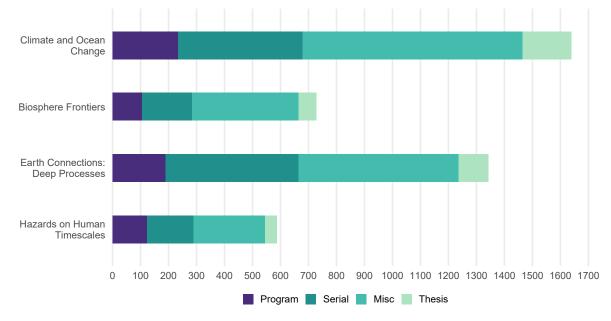


Figure 10 shows Program and non-Program serial, miscellaneous, and thesis/dissertation publication records related to IODP (Expeditions 349–372, 374–376, 378–383, 385, 386, 390–393, and 396–398) and sorted by the four major themes of the IODP science plan (*Illuminating Earth's Past, Present, and Future: The Science Plan for the International Ocean Discovery Program 2013–2023*). Science plan themes are tied to the primary objectives of each expedition.

- Climate and Ocean Change: Reading the Past, Informing the Future (Expeditions 353–356, 359, 361, 363, 364, 369, 371, 373, 374, 377–379, 382, 383, 392, 396, and 397)
- Biosphere Frontiers: Deep Life and Environmental Forcing of Evolution (Expeditions 357, 364, 366, 370, 374, 376, 385, and 390/393)
- Earth Connections: Deep Processes and Their Impact on Earth's Surface Environment (Expeditions 349–352, 356, 357, 360, 367–369, 371, 376, 381, 384, 390–393, 396, and 398)
- Earth in Motion: Processes and Hazards on Human Time Scales (Expeditions 357, 358, 362, 365, 366, 372/375, 376, 380, 381, 386, and 398)

Figure 10. International Ocean Discovery Program publication records (all types) by IODP Science Plan theme (2013–2024).



# Alternative impact metrics

## **Citation statistics**

As indexing and interconnectivity of scientific research results increase, we are better able to illustrate through citation data how often scientific publications are cited in other research articles. Citation data, in the form of number of times an article has been cited, can be accrued through several venues: Science Direct, Scopus, CrossRef, Web of Science, Plum Analytics, and others. Comprehensive citation data are unavailable at this time because not all publishers utilize citation data compilers. For this report, we collected citation data through Google Scholar in July 2024. Program publications and non-Program serial

publications containing research results from IODP expeditions have been cited in other research articles more than 132,838 times between 2003 and 2024. Expedition-related science continues to be cited in other research for many years after publication. Figures 11 and 12 include available citation counts for Expeditions 301–372, 374–376, 378–383, 385, 386, 390–393, and 396.

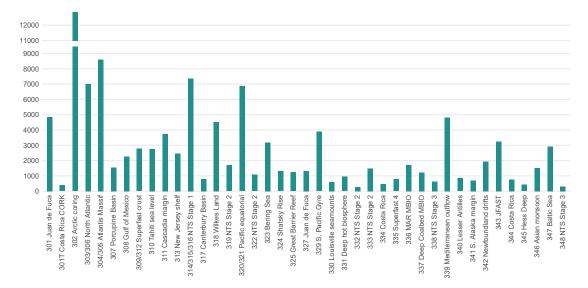


Figure 11. Number of times Program or non-Program serial publications from Integrated Ocean Drilling Program expeditions were cited by other research articles (2003–2024). Note the *y*-axis scale break.

Figure 12. Number of times Program or non-Program serial publications from International Ocean Discovery Program expeditions were cited by other research articles (2014–2024). Note the *y*-axis scale break.

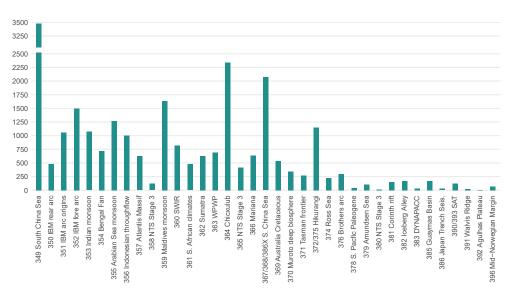


Table 4 lists the ODP and IODP expedition-related papers that have been most cited as of July 2024. It takes several years for papers to be published, and even more time for them to build up a high cited-by number; all of the most-cited papers are related to volumes published in 2015 or before. All of them are published in the top journals by impact factor, as shown in Figure 2. The Altmetric score for each paper is listed. See the next section for a discussion of Altmetric scores.

Table 4. Top cited Program-related serials as of July 2024 with corresponding Altmetric scores from 30 August 2024. Click on the graphic to view the live Altmetric data.

Article	Expedition	Citations (N)	Altmetric score
Westerhold , T., Marwan, N., Drury, A.J., Liebrand, D., Agnini, C., Anagnostou, E., Barnet, J.S.K., et al., 2020. An astronomically dated record of Earth's climate and its predictability over the last 66 million years. Science, 369:1383–1387. https://doi.org/10.1126/science.aba6853	IODP 321; ODP 208, 199, 184, 154	1191	1301
Kallmeyer, J., Pockalny, R., Adhikari, R.R., Smith, D.C., and D'Hondt, S., 2012. Global distribution of microbial abundance and biomass in subseafloor sediment. Proceedings of the National Academy of Sciences of the United States of America, 109(40):16213–16216. https://doi.org/10.1073/pnas.1203849109	IODP 323; ODP 146, 164, 168, 177, 190, 201	1000	137
Grimes, C.B., John, B.E., Kelemen, P.B., Mazdab, F.K., Wooden, J.L., Cheadle, M.J., Hanghøj, K., and Schwartz, J.J., 2007. Trace element chemistry of zircons from oceanic crust: a method for distinguishing detrital zircon provenance. Geology, 35(7):643–646. https://doi.org/10.1130/G23603A.1	IODP 304/305; ODP 209, 735B	910	2
Sluijs, A., Schouten, S., Pagani, M., Woltering, M., Brinkhuis, H., Sinninghe Damsté, J.S., Dickens, G.R., et al., 2006. Subtropical Arctic Ocean temperatures during the Palaeocene/ Eocene Thermal Maximum. Nature, 441(7093):610– 613. https://doi.org/10.1038/nature04668	IODP 302	817	99
Rebesco, M., Hernández-Molina, F.J., Van Rooij, D., and Wåhlin, A., 2014. Contourites and associated sediments controlled by deep-water circulation processes: State-of-the-art and future considerations. Marine Geology, 352:111–154. https://doi.org/10.1016/j.margeo.2014.03.011	IODP 339, 342, 303, 307, 317, 318	791	30
Hoehler, T., Jørgensen, B., 2013. Microbial life under extreme energy limitation. Nature Reviews Microbiology, 11:83–94. https://doi.org/10.1038/nrmicro2939	IODP 347, 336; ODP 201	708	79
Moran, K., Backman, J., Brinkhuis, H., Clemens, S.C., Cronin, T., Dickens, G.R., Eynaud, F., et al., 2006. The Cenozoic palaeoenvironment of the Arctic Ocean. Nature, 441(7093):601–605. https://doi.org/10.1038/nature04800	IODP 302	670	37
Lipp, J.S., Morono, Y., Inagaki, F., and Hinrichs, KU., 2008. Significant contribution of Archaea to extant biomass in marine subsurface sediments. Nature, 454(7207):991–994. https://doi.org/10.1038/nature07174	IODP 311, 301; ODP 201, 204, 207	667	8

Article	Expedition	Citations (N)	Altmetric score
Li, CF., Xu, X., Lin, J., Sun, Z., Zhu, J., Yao, Y., Zhao, X., et al., 2014. Ages and magnetic structures of the South China Sea constrained by deep tow magnetic surveys and IODP Expedition 349. Geochemistry, Geophysics, Geosystems, 15(12):4958-4983. https://doi.org/10.1002/2014GC005567	IODP 349	640	?
Grimes, C.B., Wooden, J.L., Cheadle, M.J., and John, B.E., 2015. "Fingerprinting" tectono-magmatic provenance using trace elements in igneous zircon. Contributions to Mineralogy and Petrology, 170(5–6). https://doi.org/10.1007/s00410-015-1199-3	IODP 304/305; ODP 209, 735B	616	

### Altmetric scores

Altmetric scores demonstrate the more immediate impact of papers by tracking mentions of them by news outlets, blogs, Wikipedia pages, and other social media. Table 5 lists the DSDP, ODP, and IODP expedition-related serials with the highest Altmetric scores as of August 2024. All of them are published in the top-ranked journals by impact factor, as shown in Figure 2. Altmetric score colors represent the following sources: red = news outlets, orange = blogs, teal = Twitter, dark blue = Facebook, gray = Wikipedia, purple = policy source, plum = Google+, light blue = Reddit, light green = video uploader, and pink = research highlight platform. Visit the Altmetric website for more information about Altmetric scores (https://www.altmetric.com).

Table 5. Expedition-related papers with the highest Altmetric scores as of 30 August 2024. Click on the graphic to view the live Altmetric data and links to news articles and social media stories about each article.

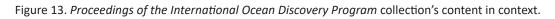
Article	Expedition	Citations (N)	Altmetric score
Morono, Y., Ito, M., Hoshino, T., Terada, T., Hori, T., Ikehara, M., D'Hondt, S., and Inagaki, F., 2020. Aerobic microbial life persists in oxic marine sediment as old as 101.5 million years. Nature Communications, 11:3626. https://doi.org/10.1038/s41467-020-17330-1	IODP 329	95	2245
Margari, V., Hodell, D.A., Parfitt, S.A., Ashton, N.M., Grimalt, J.O., Kim, H., Yun, KS., et al., 2023. Extreme glacial cooling likely led to hominin depopulation of Europe in the Early Pleistocene. Science, 381(6658):693–699. https://doi.org/10.1126/science.adf4445	IODP 339	21	2172
Lissenberg, C.J., McCaig, A.M, Lang, S.Q., Blum, P., Abe, N., Brazelton, W.J., Coltat, R., et al., 2024. A long section of serpentinized depleted mantle peridotite. Science, 385(6709):623-629. https://doi.org/10.1126/science.adp1058	IODP 399	1	1853
Collins, G.S., Patel, N., Davison, T.M., Rea, A.S.P., Morgan, J.V., Gulick, S.P.S., the IODP-ICDP Expedition 364 Science Party, and Third-Party Scientists, 2020. A steeply-inclined trajectory for the Chicxulub impact. Nature Communications, 11:1480. https://doi.org/10.1038/s41467-020-15269-x	IODP 364	78	1608
Sibert, E.C., and Rubin, L.D., 2021. An early Miocene extinction in pelagic sharks. Science, 372(6546):1105–1107. https://doi.org/10.1126/science.aaz3549	ODP 145 with DSDP 91	42	1398

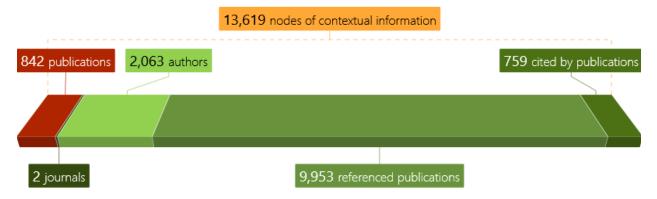
Article	Expedition	Citations (N)	Altmetric score
Schulte, P., Alegret, L., Arenillas, I., Arz, J.A., Barton, P.J., Bown, P.R., Bralower, T.J., et al., 2010. The Chicxulub Asteroid Impact and Mass Extinction at the Cretaceous-Paleogene Boundary. Science, 327(5970):1214–1218. https://doi.org/10.1126/science.1177265	IODP 364	1522	1355
Westerhold, T., Marwan, N., Drury, A.J., Liebrand, D., Agnini, C., Anagnostou, E., Barnet, J.S.K., et al., 2020. An astronomically dated record of Earth's climate and its predictability over the last 66 million years. Science, 369(6509):1383–1387. https://doi.org/10.1126/science.aba6853	IODP 320/321	1191	1301
Junium, C.K., Zerkle, A.L., Witts, J.D., Ivany, L.C., Yancey, T.E., Liu, C., and Claire, M.W., 2022. Massive perturbations to atmospheric sulfur in the aftermath of the Chicxulub impact. Proceedings of the National Academy of Sciences of the United States of America, 119(14). https://doi.org/10.1073/pnas.2119194119	IODP 364	15	1265
Trubovitz, S., Lazarus, D., Renaudie, J., and Noble, P.J., 2020. Marine plankton show threshold extinction response to Neogene climate change. Nature Communications, 11:5069. https://doi.org/10.1038/s41467-020-18879-7	IODP 320/321	33	1146
Gulick, S.P.S., Bralower, T.J., Ormo, J., Hall, B., Grice, K., Schaefer, B., Lyons, S., et al., 2019. The first day of the Cenozoic. Proceedings of the National Academy of Sciences of the United States of America, 116(39):19342–19351. https://doi.org/10.1073/pnas.1909479116	IODP 364	134	1056

## ScienceOpen indexing

ScienceOpen is a discovery platform with interactive features for scholars. IODP maintains two publication collections at ScienceOpen, and statistics from these collections can be used to demonstrate the wide-reaching impact of Program publications.

Program publications starting with Expedition 301 are indexed in the *Proceedings of the International Ocean Discovery Program* collection (https://www.scienceopen.com/collection/IODP\_Publications). The 842 Program publications included in the collection represent 2,063 authors, cite 9,953 references, and have been viewed 29,540 times through ScienceOpen (Figure 13).





The Scientific Ocean Drilling Expedition Research Results collection contains 11,059 non-Program serials representing DSDP, ODP, and IODP (https://www.scienceopen.com/collection/8b0582f6-47bf-4988-b90a-8533135e6fcc). The publications in the collection represent 23,168 authors, cite 113,620 references, and have been viewed 87,914 times through ScienceOpen (Figure 14).

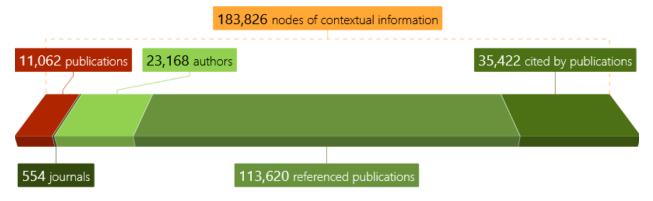


Figure 14. Scientific Ocean Drilling Expedition Research Results collection's content in context.

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