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Global Research output on Geo-Technology: A Scientometric Perspective

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Abstract

This paper explored the use of scientometric approach to study the Geo Technology research domain and the global research output and analysed 520 papers with 4888 Global Citation Scores obtained from Web of Science online database for the period of 1999-2012. The study examines major productive countries and their Global Citation Scores. It is identified that the 64 countries were found to be the focuses of collaborative research in Geo Technology from 1999 to 2012. The results showed that Geo Technology forms interdisciplinary studies. Furthermore, the Geology and computer science had major contribution to this field.

Keywords: Scientometrics; Geo Technology; Citation Map

Introduction

Geo technology is a specialised geotechnical and environmental practice offering technical expertise to a range of clients, including governmental organisations, consulting engineers, industrial corporations and commercial developers. Scientometrics is often using bibliometrics which is measuring of Scientometric literatures. Scientometric tools are used to measure and compare the research activities at various levels of aggregation including document wise distribution of publications, institutions, sectors, provinces and countries and also to measure research collaborations, to map scientific networks and to monitor the evolution of scientific fields.

Objectives of the Study

The objectives of the present study are:

- To study year-wise distribution of Publications;
- To study document wise and journal distribution of publications;
- To study the country wise distributions;
- To study the Authorship pattern of publications;
- To study the Institution-wise distribution of Publications; and
- To draw the Citation Map for highly cited papers of Scientist in the field of Geo Technology.

Methodology

The methodology applicable in the current study is scientometric study, which is used to analyses in detail the bibliographic attributes of the articles published on Geo Technology which indexed in Web of Science database during 1999-2012. The data were downloaded from Web of Science database and tabulated using 'histcite' software and analyzed for the study. HistCite is a software package used for bibliometric analysis and information visualization

Data Analysis and Interpretations

1. Year wise distribution of Publications

To analyse the year wise publication of research on Geo Technology, the data has been presented in the Table-1. The table depicts the research output in the comprehensive level. During the period 1999-2012 that a total of 520 publications were published with 4888 Global Citation Scores (GCS) and h-index 29. In the present study the research output on Geo Technology publication is taken as a tool to evaluate the performance at various levels. The highest publication is 73 in 2011 with 321 Global Citation Scores and followed by 72 papers in 2012 with 46 Global Citation Score, 58 papers in 2009 with 710 Global Citation Scores, 56 papers in 2010 with 188 Global citation Scores and 48 papers in 2005 with 1317 Global Citation Scores.

Table-1: Year-wise distribution of publications

Year	Publications	%	TLCS	TGCS
2011	73	14.0	0	321
2012	72	13.8	0	46
2009	58	11.2	6	710
2010	56	10.8	1	188
2005	48	9.2	11	1317
2008	42	8.1	1	261
2006	33	6.3	6	549
2007	32	6.2	1	247
2003	23	4.4	4	388
2004	22	4.2	6	262
2002	21	4.0	5	426
2001	16	3.1	0	155
2000	13	2.5	4	51
1999	11	2.1	0	56
Total	**520**	**100.0**	**45**	**4977**

2. Geographical-wise distribution of publications

The table 2 indicates that among the country wise distribution of publications on Geo Technology covered under the study the United States of America with 129(24.8%) publications tops with 2138 Global Citation Scores followed by China 64 papers with 207 Global Citation Scores, UK with 45 paper with 707 GCS, Germany 33 Publications with 550 GCS, Canada 26 papers with 209 GCS and India with 25(4.8%) in terms of publications.

Table-2: Geographical-wise distribution of publications

Country	Publications	%	TLCS	TGCS
USA	129	24.8	19	2138
Unknown	78	15.0	5	238
China	64	12.3	4	207
UK	46	8.8	11	707
Germany	33	6.3	11	550
Canada	26	5.0	2	209
India	25	4.8	3	87
Australia	24	4.6	1	628
Italy	21	4.0	1	78
Spain	18	3.5	6	264

(Total Local and Global Citation Scores)

3. Document-wise distribution of publications

It is from the analysis that the share of journal articles is the most prominent bibliographic form of publication and it occupies 78.5% (408) of total publications with 3454 Global Citation Scores, proceeding paper with 85 (16.3%) contributions with 822 Global Citation Scores, Review with 18 (3.5%) contributions, and followed by remaining bibliographic forms.

Table-3: Form-wise distribution of publications

Document Type	Publications	%	TLCS	TGCS
Article	408	78.5	28	3454
Article; Proceedings Paper	85	16.3	14	822
Review	18	3.5	2	541
Editorial Material	5	1.0	0	11
Correction	1	0.2	0	5
News Item	1	0.2	0	0
Review; Book Chapter	1	0.2	1	136
Software Review	1	0.2	0	8

4. Journal-wise distribution of publications

In this analytical period, scientists have produced 520 papers scattered over 362 journals during 1999 to 2012. Out of 362 journals, "Acta Astronautica" has published the highest number of articles as 18 (3.5 %) with 50 TGCS and followed by other journals in the field of Geo Technology.

Table-4: Journal-wise distribution of publications

Journal	Records	%	TLCS	TLCS/t	TGCS	TGCS/t	TLCR
Acta Astronautica	18	3.5	1	0.25	50	7.53	0
Classical and Quantum Gravity	8	1.5	10	1.13	444	56.12	7
Computers & Geosciences	7	1.3	1	0.13	77	9.86	1
Computers and Electronics in Agriculture	7	1.3	2	0.23	216	25.62	1
Disaster Advances	6	1.2	0	0.00	5	1.98	1
Space Communications	6	1.2	4	0.31	20	1.56	4
International Journal of Digital Earth	5	1.0	0	0.00	9	2.78	2
Photogrammetric Engineering & Remote Sensing	5	1.0	0	0.00	49	8.35	0
Precision Agriculture	5	1.0	0	0.00	25	6.83	1
Current Science	4	0.8	0	0.00	18	2.22	0

5. Language-wise distribution of publications

As far as language of publication is concerned English with 504 (96.9%) articles tops the list. During the study period Chinese language occupied second position followed by German, Slovak, Slovene, Croatian, French and other languages. From the analysis below, the English is preferred language for their sharing of knowledge and using communication channel in their products. Remaining 3.1 per cent of articles were in other language forms.

Table-5: Language-wise distribution of publications

Language	Publications	%	TLCS	TGCS
English	504	96.9	45	4959
Chinese	4	0.8	0	6
German	2	0.4	0	0
Slovak	2	0.4	0	0
Slovene	2	0.4	0	0
Croatian	1	0.2	0	0
French	1	0.2	0	12
Polish	1	0.2	0	0
Portuguese	1	0.2	0	0
Russian	1	0.2	0	0
Spanish	1	0.2	0	0

6. Institution-wise distribution of publications

The table 6 mentioned below indicates Institution-wise research productivity. It is noted that Chinese Academy of Science contributed the highest number of research publications 21 and and followed by NASA, University Birmingham, Caltech. Indian Institute of Technology ranked 20th position in global level and first rank in Indian level.

Table-6: Institution wise distribution of publications

Institution	Publications	%	TLCS	TGCS
Chinese Academy of Science	21	4.0	4	93
Unknown	12	2.3	0	26
NASA	9	1.7	1	121
University Birmingham	7	1.3	9	379
CALTECH	6	1.2	3	72
Max Planck Inst Gravitate Phys	6	1.2	10	411
Penn State University	6	1.2	0	59
University Calif Davis	6	1.2	1	47
University Queensland	6	1.2	0	41
University Zaragoza	6	1.2	1	61

7. Authorship pattern

Table-7 explicates the authorship pattern of contributions. Out of 520 articles, a single author's contribution of 18.46 per cent, 17.31 per cent of articles were published with two authors (180), 17.88 per cent of articles were published by three authors (279), 15.19 % of the contributions were published by four authors (316), 10 per cent of the contributions were published by five authors (260) and 6.73 per cent of articles were published from more than ten authors (504) group respectively.

Table-7: Authorship pattern

Authorship Pattern	Publications	%	No. of authors
Single Author	96	18.46	96
Double Authors	90	17.31	180
Three Authors	93	17.88	279
Four Authors	79	15.19	316
Five Authors	52	10.00	260
Six Authors	34	6.54	204
Seven Authors	19	3.65	133
Eight Authors	16	3.08	128
Nine Authors	6	1.15	54
Ten & Above Authors	35	6.73	504
Total	**520**	**100.00**	**2154**

8. Single *vs.* Multiple Authors

It is found from the study that multiple authorship research is seen dominant in Geo Technology research as 81.54% of publications made by multiple authors and 18.46% of publications made by single authors. It is also found that the papers published by more than 10 authors.

Table-8: Single *vs.* Multiple authors

Authorship Patterns	Publications	%	Cum %
Single Author	96	18.46	18.46
Multiple Authors	424	81.54	100.00
Total		100.00	

4.9 Ranking of Authors

The table 9 depicts the productivity of authors during the period of study. Top 10 authors are most productive authors who published 5 papers with 300 to 400 Global Citation Scores with first rank and followed by remaining authors, out of 2154 authors the below table shows only top 10 authors.

Table-9: Ranking of Authors

Author	Publications	TLCS	TGCS
Danzmann K	5	9	350
Freise A	5	9	376
Grote H	5	9	350
Hewitson M	5	9	350
Hild S	5	6	258
Hough J	5	9	350
Luck H	5	9	350
Malec M	5	9	350
Rudiger A	5	9	341
Vecchio A	5	9	376

Citation Map of Highly Cited Authors

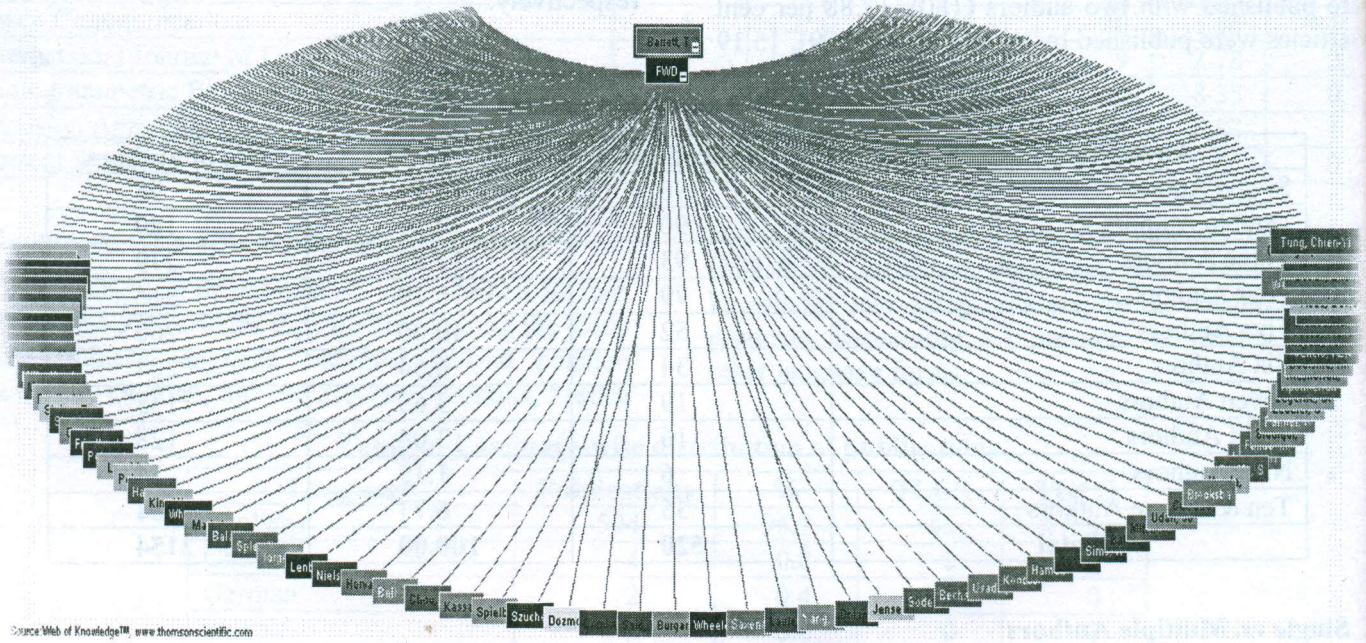
A Citation Map is a graphical representation that sho the citation relationships (cited references and citi articles) between a paper and other papers using vario visualization tools and techniques.

Citation mapping analysis can be applied as subje similarity indicators. It is defined as "the frequenci with two documents are cited together". (Source: Web of Science Database)

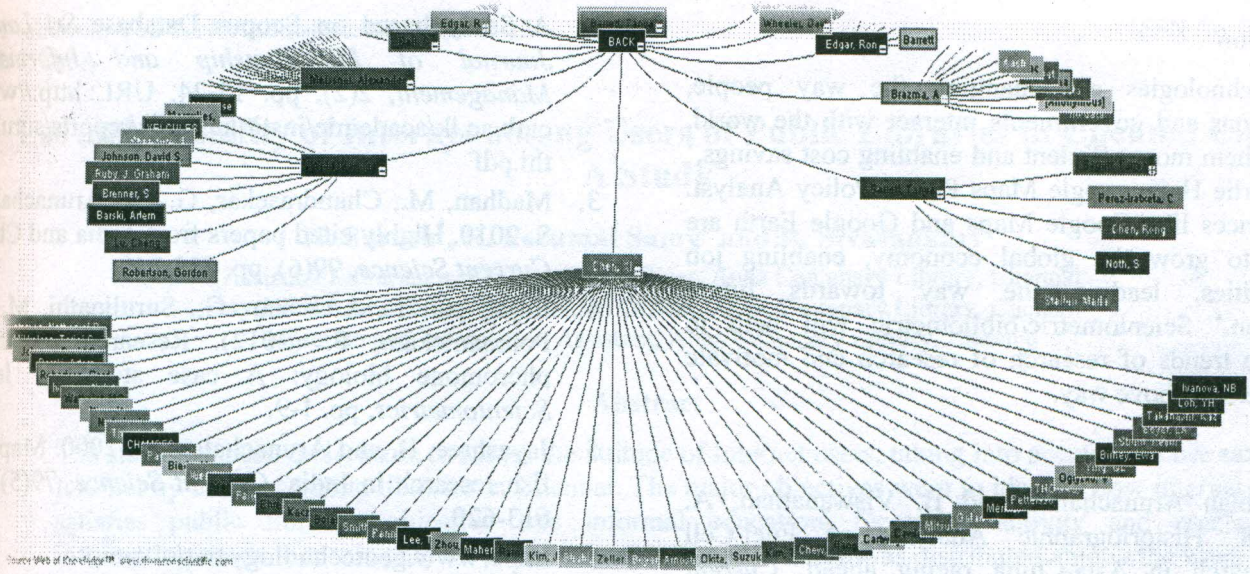
Citation Map of Barrett

Out of the total 520 number of publications, auth Barrett has less number of 4 publications with highe Global Citation Scores 1067 and single paper receiv 380 citations.

The average citation per article of Barrett is 267 in t field of Geo Technology and below figure shows t citation map.



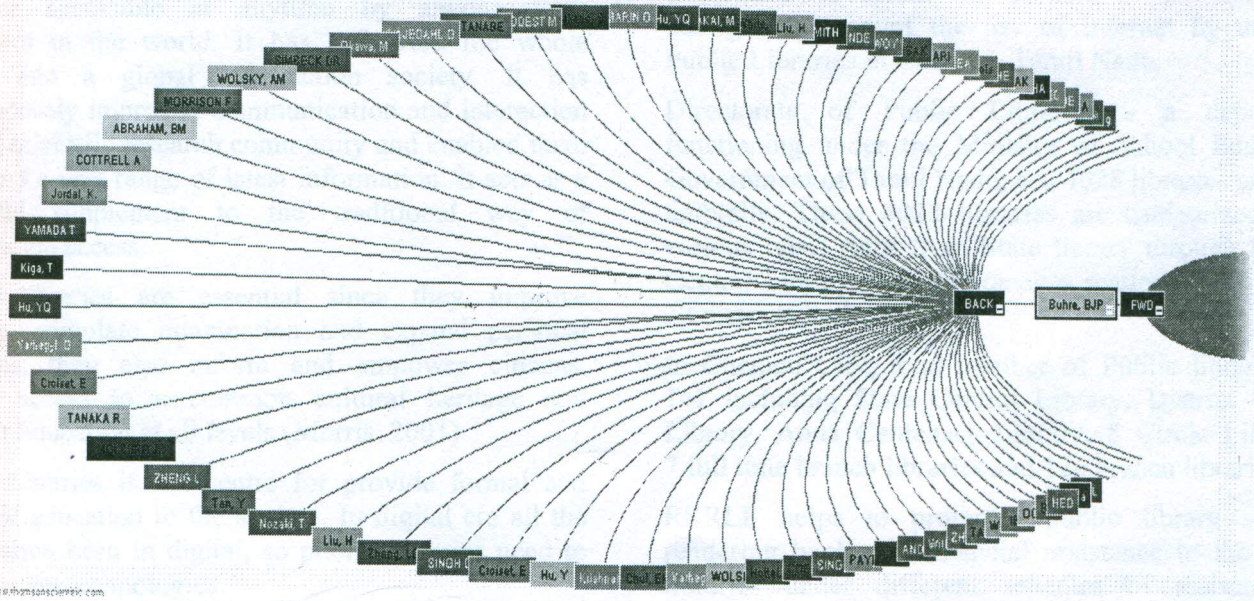
Title: NCBI GEO: Mining millions of expression profiles - database and tools, Authors: Barrett, T., Suzek, T.O Troup, D. B. *et al.*, Source: Nucleic Acids Research, Vol. 33, Special Issue: SI, pp.: D562-D566. Published: Jan 2005, Times Cited: 380 (from Web of Science)



Title: NCBI GEO: archive for high-throughput functional genomic data, Authors: Barrett Tanya, Troup Dennis, B., Wilhite Stephen E. *et al.*, Source: Nucleic Acids Research, Vol. 37, pp. D885-D890, DOI: 10.1093/nar/gkn764. Published: Jan 2009, Times Cited: 362 (from Web of Science)

Citation Map of Buhre

Out of the total 520 number of publications, author Buhre is much less in number 1 but Global citation Scores 351 and single paper received 351 Citations. The average citation per article of Buhre is 351 in the field of Geo Technology and below figure shows the citation map.



Title: Oxy-fuel combustion technology for coal-fired power generation, Authors: Buhre, B. J. P., Elliott, L. K., Sheng, C. D. *et al.*, Source: Progress in Energy and Combustion Science. Vol. 31, Issue 4, pp. 283-307, DOI: 10.1016/j.pecs. 2005.07.001, Published 2005.

Conclusion

'Geo technologies are changing the way people, corporations and governments interact with the world, making them more efficient and enabling cost savings,' said Charlie Hale, google Maps Public Policy Analyst. Geo services like Google Maps and Google Earth are helping to grow the global economy, enabling job opportunities, leading the way towards future innovation.' Scientometric/bibliometric will help to know the trends of research of research and motivate researchers in above way.

References

1. Subbiah Arunachalam and B. Viswanathan, A. 2008. Historiographic Analysis of Fuel-Cell Research in Asia-China racing ahead. *Current Science*., 95(1), pp. 1-14.
2. Surulinathi, M. 2006. Scientometric Dimensions of Knowledge Management Research in India: A Study based on Scopus Database. *Sri Lanka Journal of Librarianship and Information Management*, 2(2), pp. 13-24. URL: http://www.cmb.ac.lk/academic/institutes/nilis/reports/surulinathi.pdf
3. Madhan, M., Chandrasekar, G. and Arunachalam S. 2010. Highly cited papers from India and China. *Current Science*, 99(6), pp. 738-749.
4. Rajagopal, T., Archunan, G., Surulinathi, M. and Ponmanickam, P. (2012). Research output in pheromone biology: A case study of India. *Scientometrics*, pp. 1-9.
5. Jayashree, B. and Arunachalam, S. 2000. Mapping fish research in India. *Current Science*, 79(5), pp. 613-620.
6. http://www.geotechnology.net/
7. http://isiknowledge.com/
8. http://www.scopus.com/home.url.