Global Research Trend in Petrology Research during 2009-2018 using Scopus Database: A Scientometric Analysis

Dr Ajay Rai

Assistant Librarian

Central Library

Banaras Hindu University

Varanasi- 221005

E-mail: ajay_azamgarh@rediffmail.com

Abstract - *The present study aims to analyse the global research trend in petrology research during the period of ten years i.e. (2009-2018). The primary data was collected by the Scopus database in which a total of 6505 records were found. The study analysis and examine various scientometric parameters i.e. year wise distribution of publications; most productive authors; subject wise distribution of publications; document wise distribution; source name; significant keywords; affiliation names; and countries wise distribution of publications and found that the maximum 791 (12.16%) of research papers were published in 2018; the most productive author was Santosh, M with 117 contributions; in the Earth and Planetary Sciences subject area the maximum 6042 (74.20%) of records were published; the maximum 5810 (89.32%) of records were published in Journal article while the maximum 333 publications came in Lithos source title; Petrology keyword was used much time i.e. 4818 while the Chinese Academy of sciences was the most productive organisation with 514 publications; China was the most productive country with 2347 research papers contributions during the period of study.*

Keywords: Scientometrics, Bibliometric, Petrology, Productive Authors, Geographical Distribution.

1.   Introduction

Petrology is the branch of science concerned with the origin, structure, and composition of rocks. "Petrology has as its root the Greek word (πετροσ) meaning rock and so is literally the study of rocks. (Those of you who are biblical scholars will recognize that the name "Peter" has the same root.) We will be concerned principally with igneous and metamorphic rocks in this course". http://www.science.smith.edu/geosciences/petrology/Notes/Introduction.pdf. According to IGI Global disseminator of knowledge,"Petrology is a field of geology that focuses on the study of rocks and the conditions by which they form. There are three branches of petrology corresponding to the three types of rocks: igneous, metamorphic, and sedimentary. The word petrology itself comes from the Greek word petra, meaning rock. The word lithology once was approximately synonymous with petrography, but today lithology is essentially a subdivision of petrology focusing on macroscopic hand-sample or outcrop-scale descriptions of rocks".https://www.igi-global.com/dictionary/fuzzy-classification-shipwreck-scatter-analysis/22588.

2.   Scope Of The Study

The present study is limited to 'Petrology' research publications which are published on the Scopus database. The study further limited to time period i.e. (2009-2018).

3. Literature Review

Shukla (2019) carried out a scientometric study on genetic disorder research in India during the period (2008-2017) in which a total 3673 records were published. The study was shows that the publications were increased from the marked period of study and the maximum 504 (13.72%) of publications were published in the year 2017 while the minimum 184 (5.01%) of research papers were came in 2008. The most productive author was Ghosh, K with 66 publications; 30 h-index; and 5078 citations. The highest number of 2421 publications were related to medicine subject during the period of study.Shukla and Verma (2019) conducted a scientometric study on digital library research publications in India during the period (1989-2018) in which a total of 1068 articles were published. The highest 108 (10.11%) of publications were published in 2016 and the maximum annual growth rate was 300 recorded in the year 1997. Verma and Shukla (2019) carried out a scientometric study on information literacy of selected countries from (2008-2019) based on the Scopus database. Out of a total of 9496 records, a maximum of 1234 (12.99%) of research papers were published in 2016 while the annual growth was 25.68% recorded in 2010. Shukla et al. (2019) conducted a bibliometric analysis on the research publications pattern of faculties of library and information science department, Mizoram University during the period 2008-2017 in which a total 279 publications were found and the most productive authors was M K Verma with 96 (34.41%) publications; the maximum 366.67 growth rate was recorded in the year 2010 while the maximum 119 records was journaled articles type documents. Shukla and Gupta (2019) carried out a scientometric analysis on web mining research publications from the marked period (2009-2018) in which a total 2218 publications were published and the maximum 291 research papers were published in 2010 while the maximum 15.17 annual growth rate was recorded in 2016. The maximum 15 research papers were published by Zhu, Q. during the period of study.Gaud et al. (2018) conducted a bibliometric study on library and information science output of BBA University, Lucknow during the period (1991-2017) in which a total of 426 research papers were published. The maximum 131 (30.75%) of records were Journal articles type publications. The maximum 325 annual growth was recorded in 2007 while the average degree of collaboration was 0.78 recorded during the period of study.

4. Objectives of the Study

- To analysis the year wise growth of publications.
- To examine the most prolific author's name.
- To identify the subject wise and document wise distributions.
- To analysis source name and significant keyword in petrology research.
- T analysis of the geographical distribution of publications.

5. Methodology

The primary data was collected by the Scopus database. It is an international online bibliographic database which is containing abstracts and citations for academic journal articles owned by Elsevier.The following searching to use to collect the primary data: (TITLE-ABS-KEY("Petrology") AND (LIMIT-TO(PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014) OR LIMIT-TO (PUBYEAR,2013) OR LIMIT-TO (PUBYEAR,2012) OR LIMIT-TO(PUBYEAR,2011) OR LIMIT-TO (PUBYEAR,2010) OR LIMIT-TO (PUBYEAR,2009))). There is a total of 6505 research records were found during

the period of study. The data was downloaded on 26.06.2019 and extracted data from the database further processed and analysed by using MS Excel applications software.

6. Data Analysis

6.1 Year-wise distribution of Publications

Table 1 shows that the year wise distribution of the publication in petrology research from (2009-2018). Out of a total 6505 publications, a maximum 791, constituting 12.16% of publications were published in the year 2018, followed by 746 (11.47%) of publications in 2017 while the minimum 483 (7.43%) of publications in 2010. A similar bibliometric study on the JKCM conducted by (Shukla and Verma, 2019) found that the maximum 16 (17.39%) of publications were published in 2015 and 2017 each year. The overall details of year wise distribution of publications were shown in below table 1.

Table 1: Year-wise distribution of publications			
Year	No. of Publications	percentage	Cumulative Sum
2009	570	8.76	570
2010	483	7.43	1053
2011	582	8.95	1635
2012	629	9.67	2264
2013	663	10.19	2927
2014	659	10.13	3586
2015	665	10.22	4251
2016	717	11.02	4968
2017	746	11.47	5714
2018	791	12.16	6505
Total	**6505**	**100.00**	

6.2 Productive authors published 20 or more than 20 papers in Petrology research

Table 2 depicts the productive of authors published 20 or more than 20 papers in petrology research during the period (2009-2018). The maximum 117 research papers were published by Santosh, M, followed by Tsunogae, T. with 52 contributions and Hower, J.C. has contributed 36 publications. The whole description of productive authors published 20 or more than 20 papers in petrology research has been shown in below table 2.

Table 2: Productive authors published 20 or more than 20 papers in Petrology research	
Authors Name	No. of publications
Santosh, M.	117
Tsunogae, T.	52
Hower, J.C.	36
Li, C.	26
Wang, W.	25
Dong, X.	24
Arai, S.	23
Zhang, Z.M.	23

Yang, J.	22
Blundy, J.	21
Zheng, Y.F.	21
Littke, R.	20
Mo, X.X.	20

6.3 Subject-wise distribution of publications

Table 3 illustrates that the subject wise distribution of publications from the marked period of study. The maximum 6042 (74.20%) of records were published in the earth and planetary sciences subject area, followed by engineering subject area with 436 (5.35%) of publications, Energy and Environmental science subjects' areas with 383 (4.70%) and 348 (4.27%) of publications. The overall data of the subject wise distribution of publications were shown in below table 3.

Table 3: Subject-wise distribution of publications		
Subject Area	**No. of publications**	**Percentage**
Earth and Planetary Sciences	6042	74.20
Engineering	436	5.35
Energy	383	4.70
Environmental Science	348	4.27
Computer Science	245	3.01
Physics and Astronomy	114	1.40
Agricultural and Biological Sciences	110	1.35
Materials Science	81	0.99
Multidisciplinary	78	0.96
Social Sciences	73	0.90
Chemistry	60	0.74
Chemical Engineering	56	0.69
Arts and Humanities	52	0.64
Biochemistry, Genetics and Molecular Biology	23	0.28
Mathematics	21	0.26
Decision Sciences	4	0.05
Immunology and Microbiology	4	0.05
Medicine	4	0.05
Business, Management and Accounting	3	0.04
Pharmacology, Toxicology and Pharmaceutics	3	0.04
Economics, Econometrics and Finance	2	0.02
Neuroscience	1	0.01
Total	**8143**	**100.00**

**6.4 Document wise distribution of publications**

Table 4 depicts the document wise distribution of publication from the marked period of study. Out of a total 6505 publications, a maximum 5810 (89.32%) of publications were article type documents, followed by conference paper with 269 (4.14%) of publications and review type documents was 187 (2.87%). The whole data of document wise distribution of publications has been shown in below table 4.

Table 4: Document wise distribution of publications		
Type of document	**No. of publications**	**Percentage**
Article	5810	89.32
Conference Paper	269	4.14
Review	187	2.87
Book Chapter	86	1.32
Erratum	40	0.61
Book	28	0.43
Note	24	0.37
Editorial	22	0.34
Conference Review	10	0.15
Short Survey	6	0.09
Letter	5	0.08
Undefined	18	0.28
Total	**6505**	**100.00**

6.5 Top 10 source name

Table 5 and figure 1 shows that the top 10 source name in petrology research from (2009-2018). The maximum 333 publications were published in Lithos source, followed by Acta petrologicasinica source with 227 publications. The overall data of the top 10 source name in petrology research has been shown in below table 5 and figure 1.

Table 5: Top 10 source name	
Source Name	**No. of publications**
Lithos	333
Acta PetrologicaSinica	227
Journal of Petrology	200
DiqiuKexueZhongguoDizhiDaxueXuebao Earth Science Journal of China University of Geosciences	198
Contributions to Mineralogy and Petrology	165
YanshiXuebao Acta PetrologicaSinica	155
International Journal of Coal Geology	140
Precambrian Research	136
Journal of Asian Earth Sciences	126
Earth and Planetary Science Letters	120
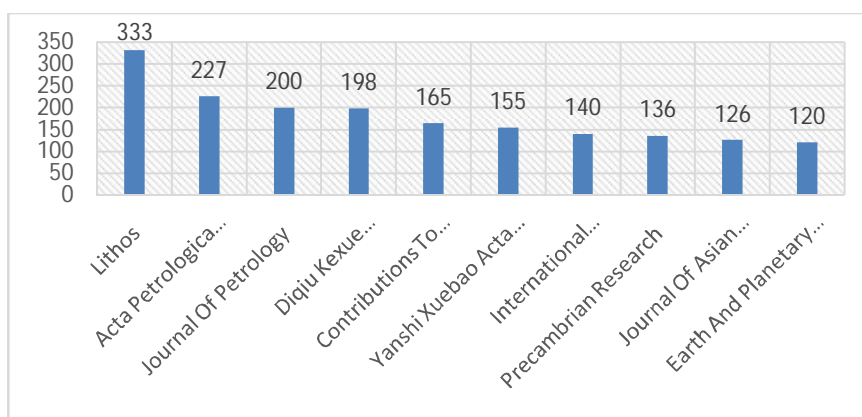
**Figure 1: Top 10 source name**

6.6 Top 10 significant keywords

Table 6 and figure 2 illustrates that the top 10 significant keywords in petrology research during the period (2009-2018). The maximum 4818 times use the keywords Petrology, followed by Geochemistry keyword with 1637 publications and China keyword use in 1339 records. The whole data of the top 10 significant keywords has been shown in below table 6 and figure 2.

Table 6: Top 10 significant keywords	
Keywords	**Use no. of times**
Petrology	4818
Geochemistry	1637
China	1339
Geochronology	1172
Petrography	966
Silicate Minerals	867
Zircon	797
Mineralogy	773
Igneous Geochemistry	742
Rocks	712
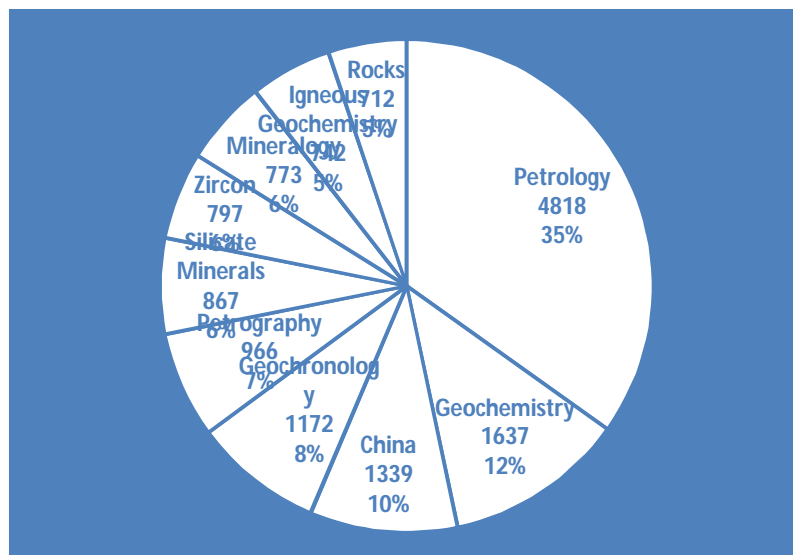
Figure 2: Top 10 significant keywords

6.7 Top 10 productive affiliation name

Table 7 shows that the top 10 productive affiliation names in petrology research from the marked period of study. Chinese Academy of sciences was the most productive organisation with 514 publications, followed by the China University of Geosciences, Beijing with 484 contributions and Institute of Geology, ChineseAcademy of geological sciences with 289 contributions. The overall data of top 10 productive affiliation name has been shown in below table 7.

| Table 7: Top 10 productive affiliation name	
Affiliation Name	**No. of publications**
Chinese Academy of Sciences	514
China University of Geosciences, Beijing	484
Institute of Geology, Chinese Academy of Geological Sciences	289
China University of Geosciences, Wuhan	278
Chinese Academy of Geological Sciences	273
Institute of Geology and Geophysics Chinese Academy of Sciences	269
CNRS Centre National de la Recherche Scientifique	205
Russian Academy of Sciences	195
University of Chinese Academy of Sciences	157
China Geological Survey	152

6.8 Top 10 famous sponsor body name

Table 8 depicts the top 10 famous sponsor body names in petrology research during the period of study. The National natural science foundation of China with 530 publications, followed by the National science foundation with 204 contributions and the China geological survey published 129 research papers during the period of study. The whole data of the top 10 famous sponsor body name has been shown in below table 8.

Table 8: Top 10 famous sponsor body name	
Sponsor Body	**No. of publications**
National Natural Science Foundation of China	530
National Science Foundation	204
China Geological Survey	129
Japan Society for the Promotion of Science	121
National Basic Research Program of China (973 Program)	97
РоссийскийФондФундаментальныхИсследований (РФФИ)	95
Deutsche Forschungsgemeinschaft	92
Natural Sciences and Engineering Research Council of Canada	86
Chinese Academy of Sciences	76
Australian Research Council	67

6.9 Top 10 most productive countries name

Table 9 and figure 3 shows that the top 10 most productive countries name in petrology research during the period of study. The maximum 2347 research papers were published by China, followed by the United States with 1209 contributions and Germany was contributed 559 contributions. The similar bibliometric study on Library Herald conducted by (Shukla and Verma, 2018) and found that the maximum 161 (80.50%) of research papers were contributed by India. The whole data of the top 10 most productive countries name has been shown in below table 9 and figure 3.

Table 9: Top 10 most productive countries name	
Country Name	**No. of publications**
China	2347
United States	1209
Germany	559
United Kingdom	482
Australia	454
France	428
Russian Federation	397
Italy	354
Japan	351
Canada	340
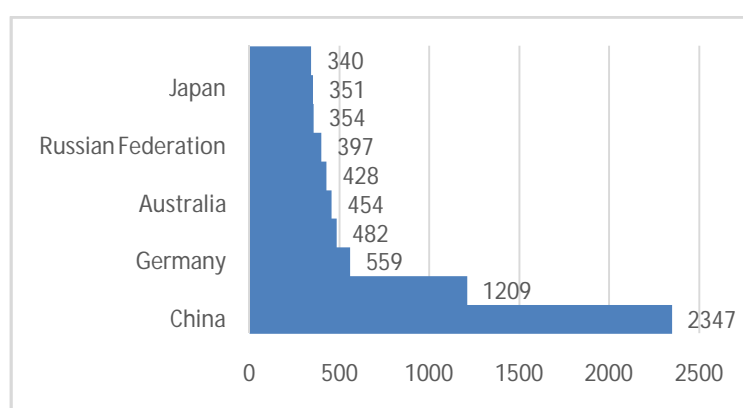
Figure 3:Top 10 most productive countries name

7. Conclusion

A total of 6505 publication on Petrology research during the period of last ten years i.e. (2009-2018). The highest 791 (12.16%) of research papers were published in 2018 while the minimum 483 (7.43%) of publications were published in 2010. The most productive author was Santosh, M with 117 contribution. The earth and Planetary sciences subject area with 6042 (74.20%) publications.A large number of 5810 (89.32%) publications were article type documents while the minimum Letter (0.08%) of documents were Letter type documents and 18 (0.28%) of documents were Undefined from the marked period of study. A large number of 333 research papers were seen in Lithos source, while the maximum 4818 times use the keywords Petrology. The most prolific institution name was Chinese Academy of sciences with 514 publications while the National natural science foundation of China was the most sponserd body with 530 publications. China was the most productive country with 2347 publications, followed by the United States with 1209 during the period of study.

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