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A MAPPING STUDY ON OCEANOGRAPHY FROM 2015 TO 2019: A SCIENTOMETRIC STUDY

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Abstract

The present study investigates a Mapping Study on Oceanography from 2015 to 2019: A Scientometric Study. The oceanography is essential in the blue revolution of the agriculture and related fields. The data have been extracted from the Scopus database by using the key term of Oceanography. The selected period for study is five years (2015 -2019). Totally 19,316 publications were found in the period, and the most of the publications were in 2019. The Relative Growth Rate in 2016 increases (0.72) and minimum in 2019, is 0.25 decreases. It shows the result of maximum 1.11 and annual growth rate was recorded in the year 2017, a minimum of 0.98 ARoG in the year 2018. In the author wise analysis, it is found that Xie, S.P. has published 46 publications. In the selected period, 74.02 per cent of publications were articles, and others were only 73.27. In the topic wise analysis, publications on Earth and Planetary Sciences were more in number, which are 13443 (69.60%).

Keywords: *Scientometric Study, Oceanography, Scopus database, Relative Growth Rate and Doubling Time*

I. Introduction

Scientometric studies broadly constitute quantitative analyses of scientific literature to reveal the latest developments in various fields and the patterns of the geographical distribution of science and scientific productivity of individual nations. Nalimov and Mulchenk (1969) stated: “Scientometrics is the investigation of science as the development of information process".

Oceanography means scientific discipline concerned with all aspects of the world’s oceans and seas in the marine environment. They have many branches such as physical oceanography, chemical oceanography, marine geology, and aquatic ecology.

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1.1. Definition of Oceanography

Oceanography is a branch of science that deals with the oceans and includes that delimitation of their extent and depth, the physics and chemistry of their waters, marine biology, and the exploitation of their resources.

II. Review of Literature

Verma and Ravi (2019) analyzed a study on "Mapping the Research Trends on Information Literacy of Selected Countries during 2008-2017: A Scientometric Analysis." The study period is 10 years from 2008 to 2017. It is based on the result which shows a total of 9496 research papers. A scientometric study is one of the most popular measurement tools to identify and find out the publications trends in the field of sciences. The study reveals the year wise distributions of publications, annual growth rate, compound annual growth rate, relative growth rate and doubling time, most productive authors and geographical distributions. The study result analyzes of maximum 1234 (12.99 %) which were published in 2016, annual growth rate (25.67), in the year 2010 and the maximum 10.21 CAGR was recorded in 2009. The maximum RGR 0.795 and Dt. 5.824 were recorded in 2009 and 2017, respectively. The most prolific authors were Wolf, M.S with 65 publications, followed by 31 publications by Pinto, M. The maximum citations were recorded in 2010, i.e. 14298, accompanied by 13594 citations in 2011.

Sab et al. (2017) analyzed on "Scientific Productivity of Oceanography Literature: A Scientometric Analysis." The study period was from 2011 to 2015. It shows on the various aspects of oceanography research such as the growth of papers (year wise), most prolific authors, document types, institutions involved, Sources wise distribution, subject-wise distribution of publications and international collaboration linkages. The study concluded that most of the researchers preferred to publish their findings in journals. 1.92% of articles were published in journals, and comparatively a higher number of materials were published in 2015. The study shows that the overall average citation per paper was 2.32, and this study will be helpful for future development. Further, this study also identified coverage growth rates, coverage growth rates, source wise. Degree of collaboration, institutions wise and Geographical wise distribution of the literature.

Ranganathan (2014) carried out a study on "Mapping of Oceanography Research Productivity in India: A Scientometric Analysis." The study has an Oceanography Research in India as revealed by the scholarly publication indexed in Aquatic Science and Fisheries Abstract (ASFA) using the data base from 2008 to 2013. It focuses on research growth, author productivity, authorship pattern and Geographical Distribution of the literature, global publications' share. It reveals that the most of the researchers preferred to publish their research results in journals. 61.78% of articles were published in journals, and comparatively more numbers of materials were published in 2013. It is observed that the author's productivity is not agreeable with Lotka's law, but distribution data of productivity fits the constitution when the value of Chi-square is 199.01.

Murugan.K and Saravanan (2017) analyzed a study on "A Scientometric Study on International Journal of Remote Sensing: 2006-2015". This study examines scientometric research in the International Journal of Remote

Sensing during the year 2006-2015. This report reflects citations to source items indexed within Web of Science Core Collection of the performance of remote sensing from all over the world in term of growth for ten years.

It is reported that the distribution of the year wisely, Distribution of the document type, Top 25 Author wise contributions of the International Journal of Remote Sensing, Cited References of the International Journal of Remote sensing, Institution wise International Journal of Remote Sensing Journal of Top 25 Records and Collaborative index of continents of Remote sensing.

III. Materials and Methodology

The data were extracted from the Scopus Database with the help of the keyword "Oceanography" from the period of 2015 to 2019. The collected data have been applied in Microsoft Excel for simple calculations.

3.1. The Objective of the Study

The following objectives of the study are as below:

- To study the year wise Oceanography publications
- To find out the Relative Growth Rate and Doubling Time of Publications
- To analyze the Annual Ratio of Growth and Annual Growth Rate
- To identify the top 50 Authors profiles
- To carry out the Document type
- To investigate an access type
- To analyze the subject areas
- To find out the Publication stage
- To study on Top 10 Source Titles and
- To show the Top 20 Affiliation.

IV. Results and Discussions

4.1 Year-Wise Oceanography Publications

In table 1 and figure 1 explained the year wise Oceanography Publications from 2015 to 2019. Out of 19,316, in 2015, 3433 documents (17.77%) and followed by in 2016, 3645 (18.88%), in 2017, 4049 (20.96%), in

2018, 3982 (20.62%) and in 2019, (4207) (21.77%) and figure 1 represent the Year wise Oceanography Publications.

Table.1. Year-wise Oceanography Publications

S.No	Year	Count	Percentage
1	2015	3,433	17.77
2	2016	3,645	18.88
3	2017	4,049	20.96
4	2018	3,982	20.62
5	2019	4,207	21.77
	Total	19,316	100.00

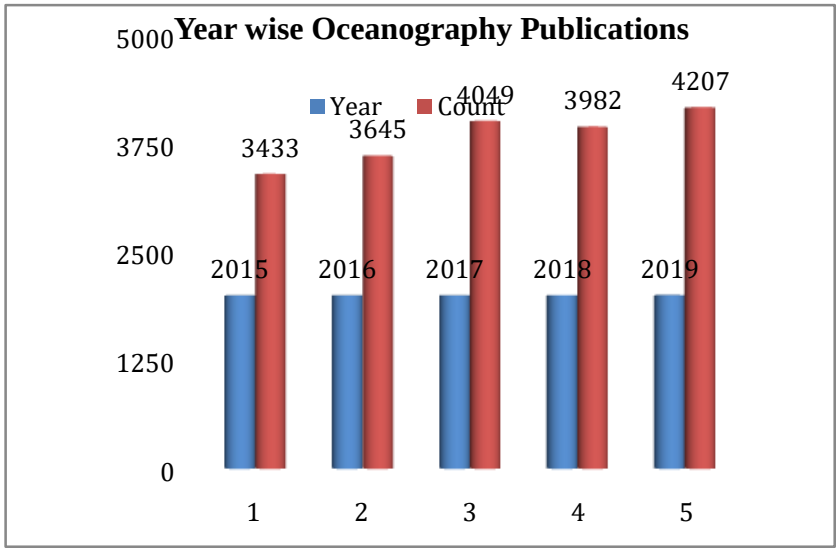

Figure.1

4.2. Relative Growth Rate (RGR)

The relative growth rate is the increase in the number of publications/pages per unit of time. Here, one year is taken as the unit of time. The mean relative growth rate R (1-2) over a specified period of the interval can be calculated from the following equation suggested by Mahapatra (1985).

$$R(1\text{-}2) = \frac{W_2 - W_1}{T_2 - T_1}$$

Where,

R = Mean relative growth rate over the specific period of the interval;

W_1 = log w_1 (Natural log of initial number of publications/ pages);

W_2 = log w_2 (Natural log of initial number of publications/pages);

T_2-T_1 = Unit difference between the initial time and final time.

Therefore,

R (a) = Relative growth rate per unit of publications per unit of time (year)

R (p) = Relative growth rate per unit of pages per unit of time (year)

Table.2. Relative Growth Rate and Doubling Time of Publication.

Years	Publication	Cumulative	w1	w2	R(a)	Mean(a) 1-2	Doubling Time	Mean Dt (a)1-2
2015	3,433	3433		8.14	-	0.35	-	1.52
2016	3,645	7078	8.14	8.86	0.72	0.35	0.96	1.52
2017	4,049	11127	8.86	9.32	0.45	0.20	1.53	1.32
2018	3,982	15109	9.32	9.62	0.31	0.11	2.27	1.02
2019	4,207	19316	9.62	9.87	0.25	0.05	2.82	0.56

It is evident from table 2 indicate the Relative Growth Rate and Doubling of Publications. In 2016, RGR was 0.72 increases and in 2019 are 0.25 decreases. It is concluded that the Oceanography growth is not in exponential ratio and has not taken place during this analysis period.

4.3. Doubling Time

A direct equivalence exists between the relative growth rate and doubling time. If the number of publications/pages of a subject double during a given period, then the difference between the logarithms of the

numbers at the beginning and the end of the period must be the logarithms of the number 2. This difference has a value of 0.693. Thus, the corresponding doubling time for publication and pages can be calculated by the following formula:

$$\text{Doubling time (Dt)} = \frac{0.693}{R}$$

Therefore,

$$\text{Doubling time for publications Dt (a)} = \frac{0.693}{R(a)}$$

Whereas, the value of doubling time is the highest (2.82) for the year 2019 and the lowest (0.96) for the year 2016. Hence, the inference can be derived from the table that RGR and DT are inversely proportional to one another.

4.4. Annual Ratio of Growth and Annual Growth Rate

It is evident from table 3, and figure 2 reveals the Annual Ratio of Growth and Annual Growth Rate of Oceanography publication from 2015 to 2019. The maximum 1.11 Annual Growth rate was recorded in the year 2017, a minimum of 0.98 ARoG in the year 2018. The maximum 0.11 Annual Growth Rate was recorded in the year 2017, a minimum of 0.02 AGR in the year 2018.

Table.3.Year-wise Annual Ratio of Growth and Annual Growth Rate

Year	No of publications	ARoG	AGR
2015	3,433	-	-
2016	3,645	1.06	0.06
2017	4,049	1.11	0.11

2018	3,982	0.98	0.02
2019	4,207	1.06	0.06

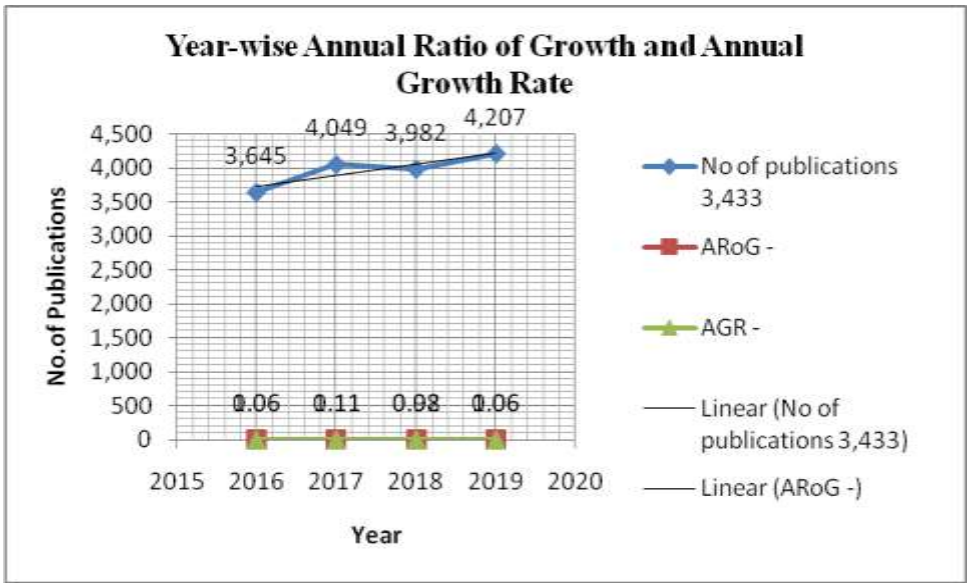

Figure.2

Table.4. Top 50 Authors Profile

S.No	Author Name	No. of Records	%19316
1	Xie, S.P.	46	0.23
2	Chapron, B.	43	0.22
3	Glenn, S.	34	0.17
4	Kohut, J.	33	0.17
5	He, X.	31	0.16
6	Wu, R.	31	0.16

7	Griffies, S.M.	29	0.15
8	Sathyendranath, S.	29	0.15
9	Bai, Y.	28	0.14
10	Qiao, F.	27	0.13
11	Gong, F.	26	0.13
12	Vecchi, G.A.	26	0.13
13	Wu, L.	25	0.12
14	Zhang, J.	25	0.12
15	Brewin, R.J.W.	24	0.12
16	Cai, W.	24	0.12
17	Ignatov, A.	24	0.12
18	Pan, D.	24	0.12
19	Rudnick, D.L.	24	0.12
20	Schofield, O.	24	0.12
21	Wang, D.	24	0.12
22	England, M.H.	23	0.11
23	Huang, W.	23	0.11

24	Kumar, A.	23	0.11
25	Roarty, H.	23	0.11
26	Chen, X.	22	0.11
27	Danabasoglu, G.	22	0.11
28	Masina, S.	22	0.11
29	Ravichandran, M.	22	0.11
30	Wang, H.	22	0.11
31	Wang, M.	22	0.11
32	Yang, K.	22	0.11
33	Zhou, T.	22	0.11
34	Miles, T.	21	0.1
35	Cheng, H.	20	0.1
36	Li, T.	20	0.1
37	Storto, A.	20	0.1
38	Atmanand, M.A.	19	0.09
39	Biastoch, A.	19	0.09
40	Chen, W.	19	0.09

41	Chen, Y.	19	0.09
42	Deser, C.	19	0.09
43	Du, Y.	19	0.09
44	Great batch, R.J.	19	0.09
45	Jung, T.	19	0.09
46	Lin, M.	19	0.09
47	Madec, G.	19	0.09
48	Marshall, J.	19	0.09
49	Merchant, C.J.	19	0.09
50	Platt, T.	19	0.09

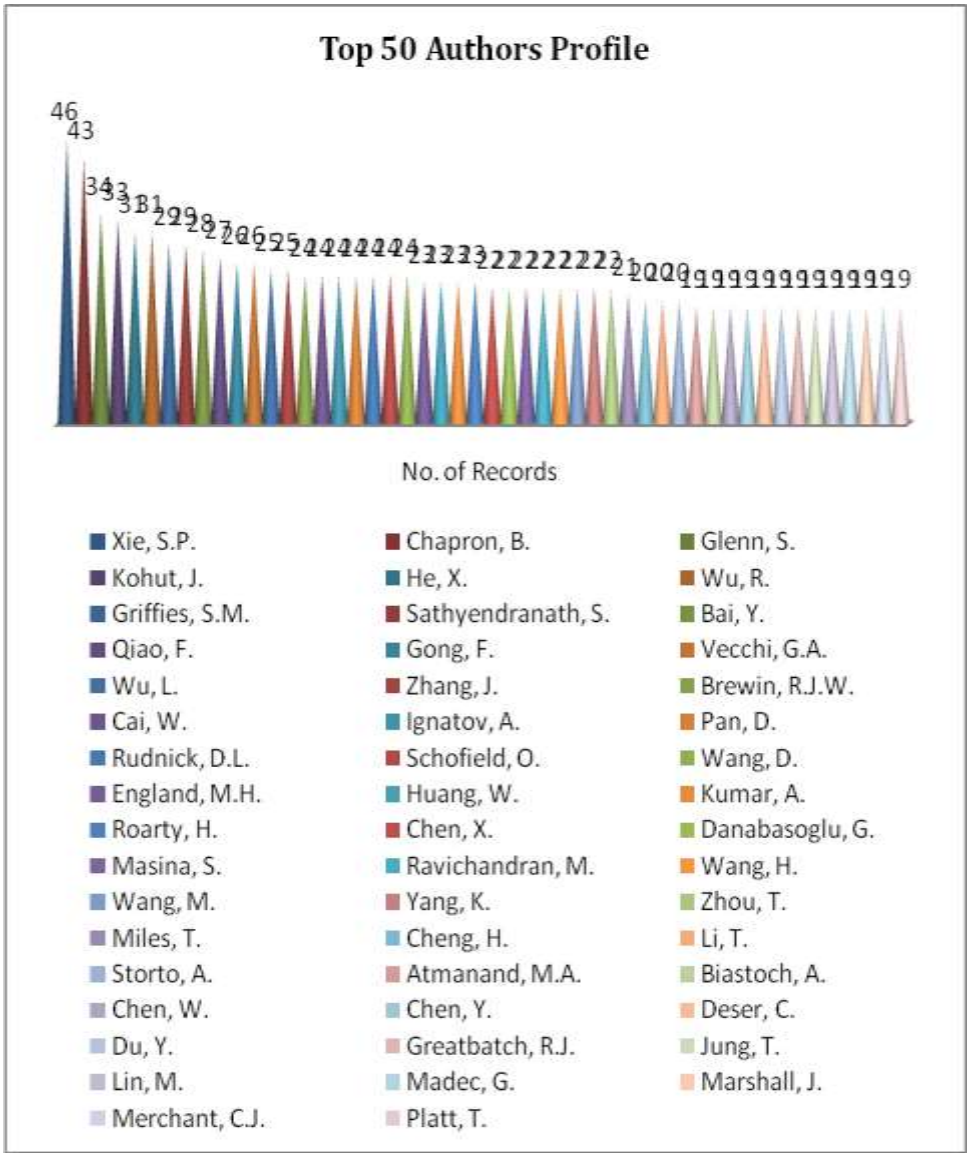

Figure.3

4.5. Document Type Of Publications

It is evident from the table 4 and figure 4 indicates the Document Type. Out of 19316, an article 14298 (74.02%), Conference Paper, 4,040 (21%), Review, 451(2.33%), Book Chapter, 217(1.10%), Note, 77(0.39%), Erratum, 54 (0.27%), Book,48 (0.24%), Editorial, 48 (0.24%), Short Survey, 28 (0.14%), Letter, 26 (0.13%), Conference Review, 5(0.02%), Data paper, Conference Review with 2 documents (0.01%) and Undefined, 19 (0.09%).

Table.5. Document Type of Publications

S.No	Document Type	No. of Records	Percentage
1	Article	14,298	74.02
2	Conference Paper	4,040	21.00
3	Review	451	2.33
4	Book Chapter	217	1.10
5	Note	77	0.39
6	Erratum	54	0.27
7	Book	49	0.25
8	Editorial	48	0.24
9	Short Survey	28	0.14
10	Letter	26	0.13
11	Conference Review	5	0.02
12	Data Paper	2	0.01
13	Conference Review	2	0.01
14	Undefined	19	0.09
	Total	**19,316**	**100.00**

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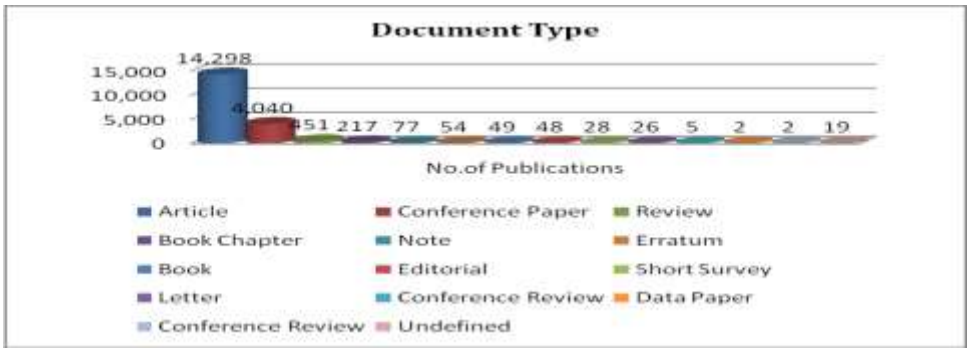

Figure.4

4.6. Access Type Of Publications

Table 6 displays an Access Type. Out of 19316, An Open access with 5164 documents (26.73%) and others are 14152 (73.27%).

Table.6. Access Type of Publications

S.No	Access Type	Count	%19,316
1	Open Access	5,164	26.73
2	Other	14,152	73.27

4.7. Subject Area Wise Coverage

Table 5 reveals that the Subject Area wise coverage. Out of 19316, 13443 documents are Earth and Planetary Sciences (69.60%) followed by Engineering , 5032 (26.05%), Agricultural and Biological Sciences, 4,245 (21.97%), 2934 with Environmental Science (15.18%), Physics and Astronomy, 2,567 (13.28%), Energy, 2210 (11.44%), Computer Science, 1949 (10.09%), Mathematics, 720 (3.72%), Materials Science, 632(3.27%), Chemical Engineering, 502(2.60%), Social Sciences, 426 (2.20%), Biochemistry, Genetics and Molecular Biology and Multidisciplinary, 306 (1.58%), Chemistry, 255 (1.26%), Arts and Humanities, 244 (1.26%), medicine, 158 (0.81%), Decision Sciences, 71 (0.36%), Immunology and Microbiology, 55 (0.28%), Pharmacology, Toxicology and Pharmaceutics, 39 (0.20%), Neuroscience, 26 (0.13%), Economics, Econometrics and Finance, 21 and Business, Management and Accounting (0.10%), Health Professions and Psychology (0.02%).

Table.7. Subject Area wise coverage

S.No	Subject Area	Count	%19316
1	Earth and Planetary Sciences	13,443	69.60
2	Engineering	5,032	26.05
3	Agricultural and Biological Sciences	4,245	21.97
4	Environmental Science	2,934	15.18
5	Physics and Astronomy	2,567	13.28
6	Energy	2,210	11.44
7	Computer Science	1,949	10.09
8	Mathematics	720	3.72
9	Materials Science	632	3.27
10	Chemical Engineering	502	2.60
11	Social Sciences	426	2.20
12	Biochemistry, Genetics and Molecular Biology	306	1.58
13	Multidisciplinary	306	1.58
14	Chemistry	255	1.26
15	Arts and Humanities	244	1.26

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16	Medicine	158	0.81
17	Decision Sciences	71	0.36
18	Immunology and Microbiology	55	0.28
19	Pharmacology, Toxicology and Pharmaceutics	39	0.20
20	Neuroscience	26	0.13
21	Economics, Econometrics and Finance	21	0.10
22	Business, Management and Accounting	20	0.10
23	Health Professions	5	0.02
24	Psychology	4	0.02

4.8. Source Title

The topmost ten source title of Oceanography occupied in the first position of Limnology and Oceanography, 1033 (5.34%) followed by the second position of Journal of Climate, 965 (5%), Acta Oceanologica Sinica in third place, 898(4.64%), Geophysical Research Letters, 870 (4.50%) in the fourth position, 2018 Oceans Mts IEEE Kobe Techno Oceans Oceans Kobe 2018, 471 (2.43%) in fifth, Oceans 2018 Mts IEEE Charleston Ocean 2018, 403(2.08%) occupied in the sixth, Journal of Physical Oceanography, 353 (1.82%) in seventh, International Journal Of Climatology, 344 (1.78%) eight position, the ninth position of Limnology And Oceanography Methods, 336 (1.73%) and Proceedings Of The International Conference On Offshore Mechanics And Arctic Engineering OMAE, 307 (1.58%) as tenth place.

Table.8. Top 10 Source Title

Source Title	No. of Records	%19316	Rank
Limnology and Oceanography	1,033	5.34	1

Journal of Climate	965	5.00	2
Acta Oceanologica Sinica	898	4.64	3
Geophysical Research Letters	870	4.50	4
2018 Oceans Mts IEEE Kobe Techno Oceans Oceans Kobe 2018	471	2.43	5
Oceans 2018 Mts IEEE Charleston Ocean 2018	403	2.08	6
Journal of Physical Oceanography	353	1.82	7
International Journal Of Climatology	344	1.78	8
Limnology And Oceanography Methods	336	1.73	9
Proceedings Of The International Conference On Offshore Mechanics And Arctic Engineering OMAE	307	1.58	10

4.9. Country Wise Publications

In table 9 and figure 5 depicts the Top 10 Country wise Publication of Oceanography. Out of 19316, United States, 6530 publications is the topmost level of first place and followed by China (4,405), United Kingdom (1789), Germany (1359), France (1240), Japan (1128), Australia (1013), Canada (987), South Korea (696) and Spain (695).

Table.9. Top 10 Country wise Publication

S.No	Country	Publications	%19316
1	United States	6,530	33
2	China	4,405	22
3	United Kingdom	1,789	9

4	Germany	1,359	7
5	France	1,240	6
6	Japan	1,128	6
7	Australia	1,013	5
8	Canada	987	5
9	South Korea	696	4
10	Spain	695	3

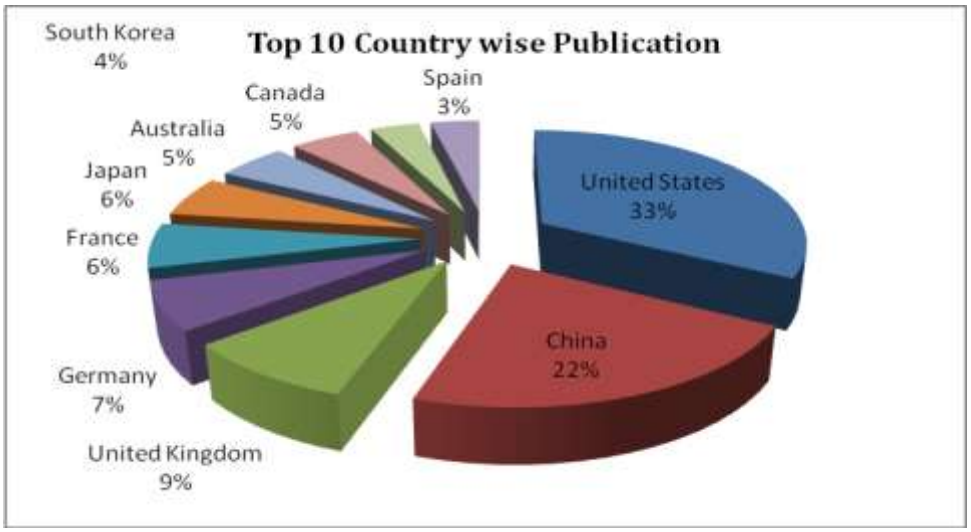

Figure.5

4.10. Affiliation Of The Oceanography Research

Table 10 indicates the Top 10 Affiliation Oceanography Research Output. The topmost level in the first place in Chinese Academy of Sciences, 1136(5.88%), with 683publication of the National Oceanic and Atmospheric Administration (3.53%), State Oceanic Administration China, 579(3%), CNRS Centre National de la Recherché Scientifique, 571 (2.95%), Ocean University of China, 558(3.04%), Woods Hole Oceanographic

Institution, 459 (2.37%), Scripps Institution of Oceanography, 431(2.23%), University of Chinese Academy of Sciences, 420(2.17%), University of Washington, Seattle, 418 (2.16%) and Ministry of Education China, 407 (2.10%).

Table.10. Top 10 Affiliation of the Oceanography Research Output

S.No	Affiliation	No. of Publications	%19316
1	Chinese Academy of Sciences	1,136	5.88
2	National Oceanic and Atmospheric Administration	683	3.53
3	State Oceanic Administration China	579	3.00
4	CNRS Centre National de la Recherché Scientifique	571	2.95
5	Ocean University of China	558	3.04
6	Woods Hole Oceanographic Institution	459	2.37
7	Scripps Institution of Oceanography	431	2.23
8	University of Chinese Academy of Sciences	420	2.17
9	University of Washington, Seattle	418	2.16
10	Ministry of Education China	407	2.10

V. Conclusion

The present research concludes the Oceanography, based mapping of the scientometric study. In recent years are climate change and environmental factors affect various reasons are carried out the research and find out the situation for the current trend. They have changed in Earth and Planetary Sciences in the seasonal, Agriculture and environmental systems. It is finding out the solution after recycling and living factors of human life and others.

In the selected five years, the research output has been increased year by year, and most of the articles were published in the field of Oceanography.

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