Bibliometric analysis of natural lakes and paleolakes origin of natural events

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Abstract

This study explores studies on lakes and paleolakes originating from natural effects. The main objective is to perform a bibliometric analysis of research on naturally occurring lake environments worldwide, covering the period from 2014 to 2024. Data extracted from 1687 documents in the Scopus database were analyzed using VOSviewer software. The results reveal a strict trend towards a focus on geosciences and the environment, underlined by research. This study particularly highlights the relationships between authors, co-authors, keywords, and publishers of specialized journals in this research field, thus providing essential information to guide future research and to value the role of these geological environments, which are rare in the world, based on essentially multidisciplinary geoscience approaches.

Keywords: Tectonics, lakes, tectonics setting, landslide; tectonic evolution; sedimentology

1. INTRODUCTION

This study presents bibliometric analysis, which is a suitable method for quantitatively and qualitatively analyzing scientific activities in a specific field *(Donthu et al., 2021; Lawani, 1981)*, This approach uses a variety of statistical and mathematical techniques to analyze data from books, articles, and other publications. We applied this approach to conduct a comprehensive analysis of research on natural lakes of origin of natural events. We analyzed articles published between 2014 and 2024, to complement the existing literature and present the results of an accurate analysis of the data. The main objectives of this study are to carry out an in-depth bibliometric analysis to identify research tendencies, identify the main countries, regions, and research collaborators contributing to this field, and improve our valorization of these typical training courses.

2. BIBLIOMETRIC METHODS

In this study, bibliometrics has the potential to introduce a systematic, transparent, and reproducible review process based on the statistical measurement of science, scientists, or scientific activity *(Broadus, 1987; Diodato, 1994; Pritchard, 1969; Tugce Guler et al., 2016)*. We explored bibliographic data from Scopus between 2014 and 2014 to analyze and interpret them using the software's toolbox. The retrieved data analyzed via **Vosviewer** reveals the significantly contributing authors, countries, author keywords, cited references, total link strength, and co-occurrence of author keywords using bibliographic coupling and co-citation analysis *(Dulla et al., 2021)*.

3. RESULTS AND DISCUSSION

3.1. Distribution of documents over the selected period

Table 1 and **Figure 1** summarizes the annual contributions to research of natural lakes and paleolakes, the origin of natural events. Over the study period from 2004 to 2024, a total of 1687 documents were identified. 2020, 2021, and 2022 stand out with the highest publications, collectively exceeding 205 articles. While the apparent decline in 2023 is notable. The Scopus database reveals a remarkable increase in research in this field, with the number of publications rising steadily to reach a peak in 2021 and declining from 2022 to 2024. This trend underlines the importance of this lacustrine typology in the world, and their value in scientific research should be developed and generalized worldwide, noting that this field of research is very advanced just in China which is ranked at the top of the countries that are rich by these formations.
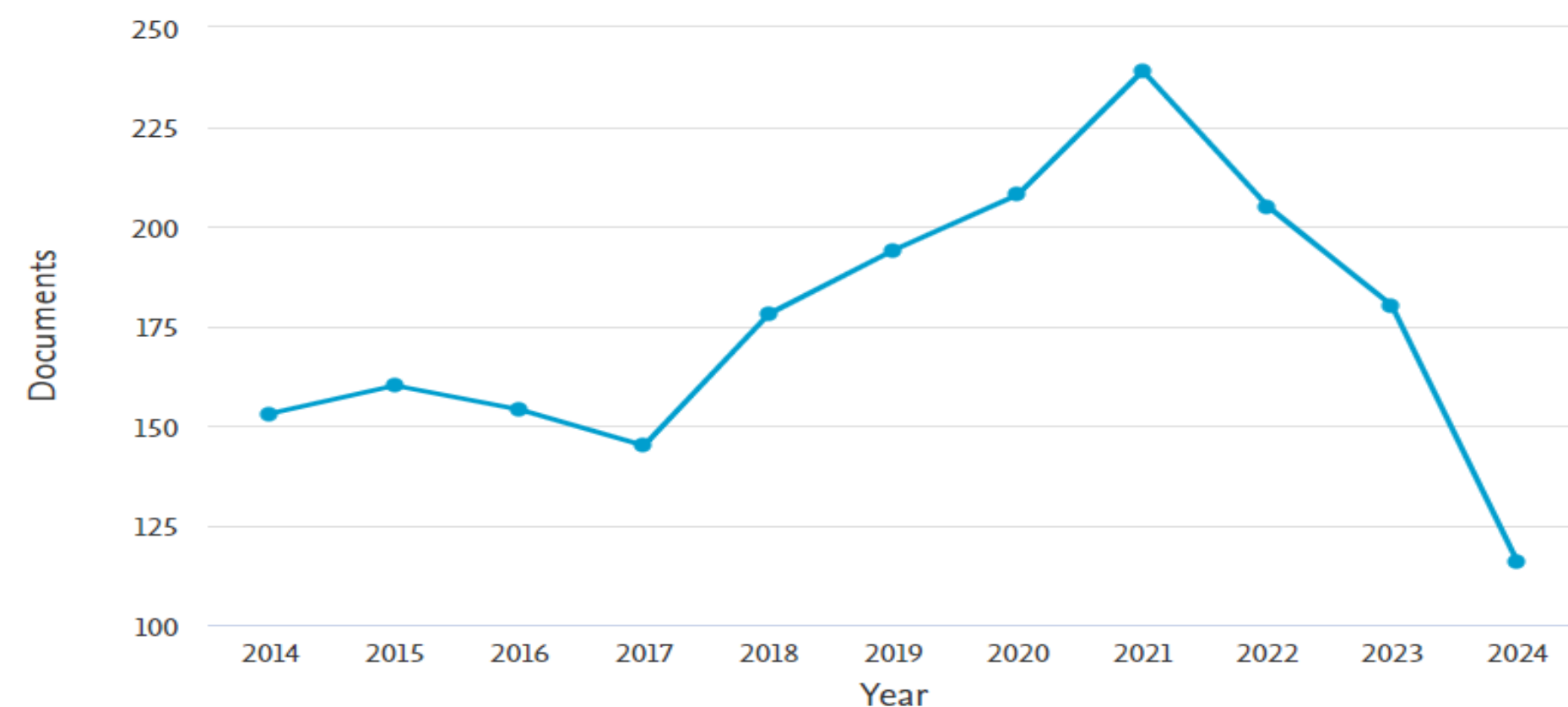

Figure 1: document by year from Scopus database

Table 1: Publications of natural lakes and paleolakes, origin of natural events During the Study Period

	Year	Document
01	2014	153
02	2015	160
03	2016	154
04	2017	145
05	2018	178
06	2019	194
07	2020	208
08	2021	239
09	2022	205
10	2023	51
	Total	**1687**

3.2. Document type

Table 2 shows the distribution of search results for natural event lakes, sorted by document type. The analysis includes the following document types: article, Conference paper, Review, Book chapter, Letter, Erratum, and Editorial.

Articles comprise the majority, accounting for 85.95% (1450 documents). Conference paper with 7.71% (130 documents). Review for 3.44% (58 documents), Book chapter for 2.55% (43 documents). This distribution underlines the predominance of articles on research in this lacustrine field, highlighting the importance of the subject in academic publications. The high proportion of scientific journals further underlines this emphasis, indicating a trend towards rapid dissemination of research.

Table 2: Document type contribution

	Document Type	Records	%
1	Article	1450	85,95%
2	Conference paper	130	7,71%
3	Review	58	3,44%
4	Book chapter	43	2,55%
5	Letter	3	0,18%
6	Erratum	2	0,12%
7	Editorial	1	0,06%
		1687	**100%**

3.3. Contribution of countries in the publication of natural lakes and paleolakes, origin of natural events

According to Scopus data, China leads among the top thirty-three countries chosen with 638 articles: accounting for 25,12% of the total publications. The USA follows closely with 282 articles with 11,1%; Third place is awarded to Italy, with 116 and 4,57%. It should be noted that most of these documents were published between 2018 and 2020. and Morocco ranked 32nd with just 13 articles published during the period of this analysis. These results show the global importance of research into this very rare type of environmental patrimony, given that the number of natural lakes of origin of natural events is very limited in the world and their educational and scientific role in understanding their origins and the circumstances of their genesis. **(Figure2)**
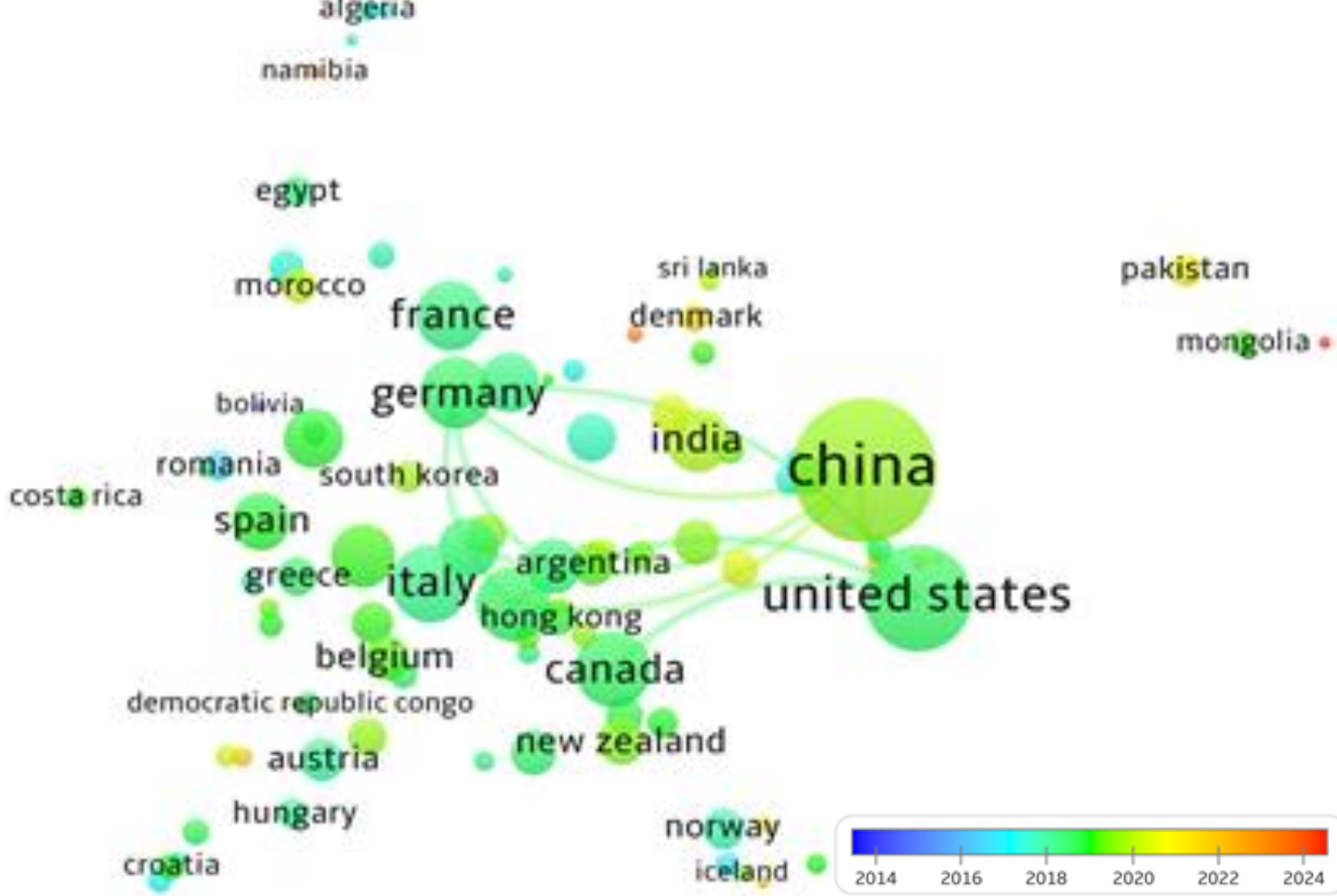

Figure 2: Distribution of documents by countries.

3.4. Top 10 Author's Contribution

The results for the top 10 authors from Scopus, as illustrated in **Table 3** and **Figure 3**, reveal that Liu Bo and Huang Runqiu stand out for their prolific output in the field of natural lakes and paleolakes, the origin of natural events. Liu Bo has published 11 documents, with 377 citations and 20 Total link strength. Huang Runqiu and the four authors following him published 9 articles, with their annual average falling between 2020 and 2021 **(Figure 2)**. Their contributions are particularly notable in this domain. **Figure 3** shows a network where the nodes represent the authors, and the links illustrate their collaboration patterns; driven by international collaborations between elite research groups. This will challenge the ability of nations to conserve their scientific wealth either as intellectual property or as research talent *(Adams, 2013; Liu & Zhang, 2024; Pei et al., 2024)*.

Table 3: Distribution of articles by author's contribution

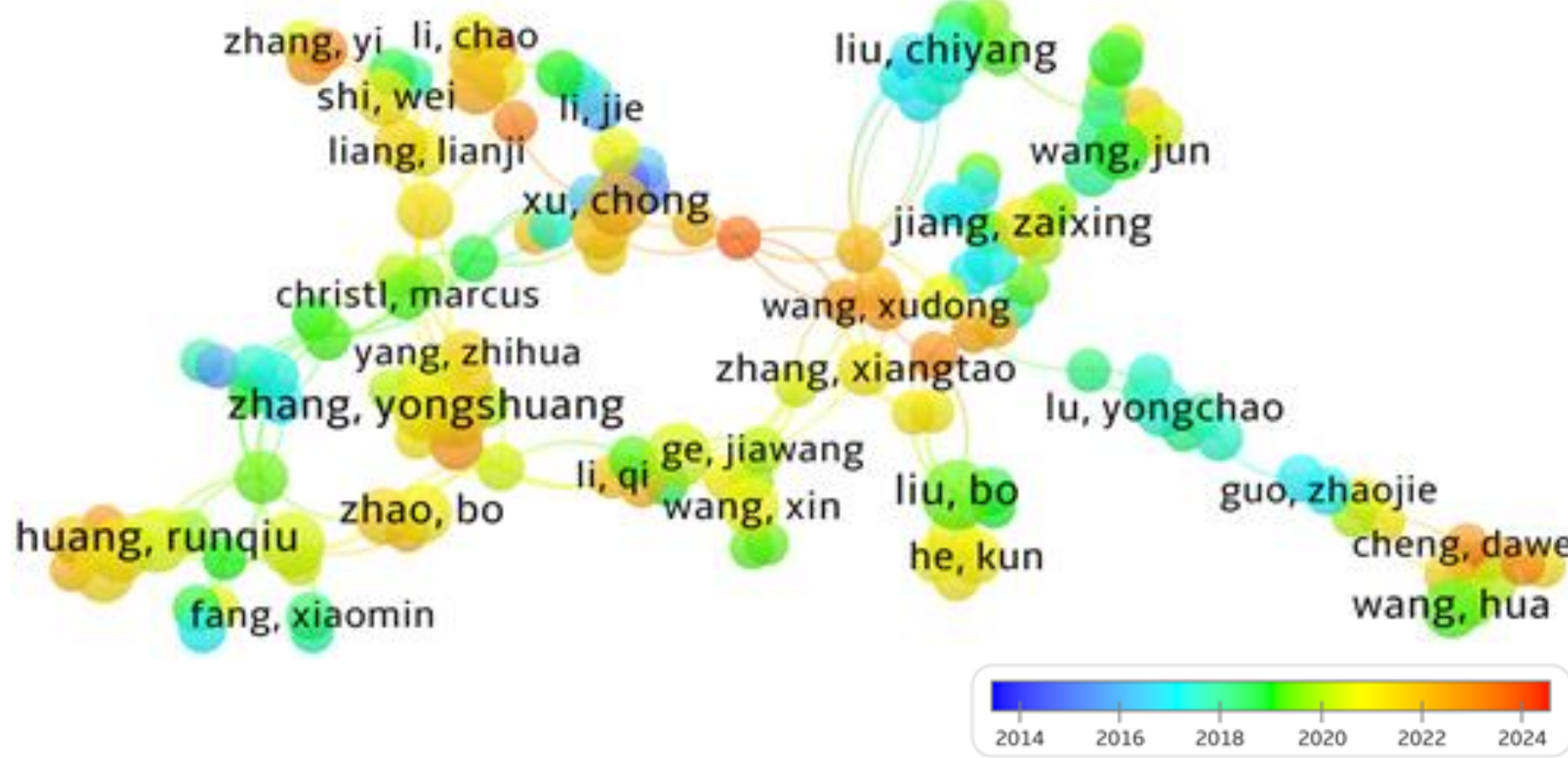|	Author	Documents	Citations	Total link strength
1	Liu, bo	11	377	20
2	huang, runqiu	9	260	25
3	pei, xiangjun	9	132	26
4	xu, qiang	9	353	12
5	zhang, yongshuang	9	153	29
6	zhu, xiaomin	9	118	16
7	cui, shenghua	8	123	24
8	liu, chiyang	8	210	24
9	ren, sanshao	8	108	27
10	xu, chong	8	84	14

Figure 3: Distribution of documents by authors.

3.5. Hottest keywords

Analysis of the keywords in an article or a scientific paper provides an effective way of determining the orientation and focus of research in a specific field by identifying the basic concepts and key terminology selected by the authors. The keyword network is analyzed with VOSviewer software, with a *"Total link strength"* (TLS), which refers to a measure of the interconnectedness of research topics or keywords within a specific body of literature *(van Eck & Waltman, 2013)*. **(Table 4)**

Table 4: Distribution of documents by Keywords

	Keyword	Occurrences	Total link strength
1	Tectonics	574	851
2	Lakes	530	804
3	Tectonic setting	456	667
4	Landslides	437	565
5	China	352	761
6	Sedimentology	321	568
7	Landslide	308	574
8	Faulting	236	534
9	Stratigraphy	234	545
10	Tectonic evolution	215	475

3.6. Top journals manuscript publication

Figure 4 present the top thirty journals publishing scientific research on natural lakes and paleolakes, the origin of natural events. The journals with the highest number of publications are "Marine and Petroleum Geology" and "Geomorphology", and "Landslides", which published 64, 48, and 45 articles respectively, with an overall citation score of over 913. the top ten journals are ranked in the first quartile and have a very high H index; These reviews are generally classified under or affect all the headings of the geosciences, because the study of a natural lake of tectonic or karstic origin, or a landslide or glacial slide, requires a general view of the circumstances of its structural genesis, its development, and its hydrological and hydrogeological regime. In this way, all fields are affected to better understand and valorize these natural heritages, which are less abundant throughout the world.
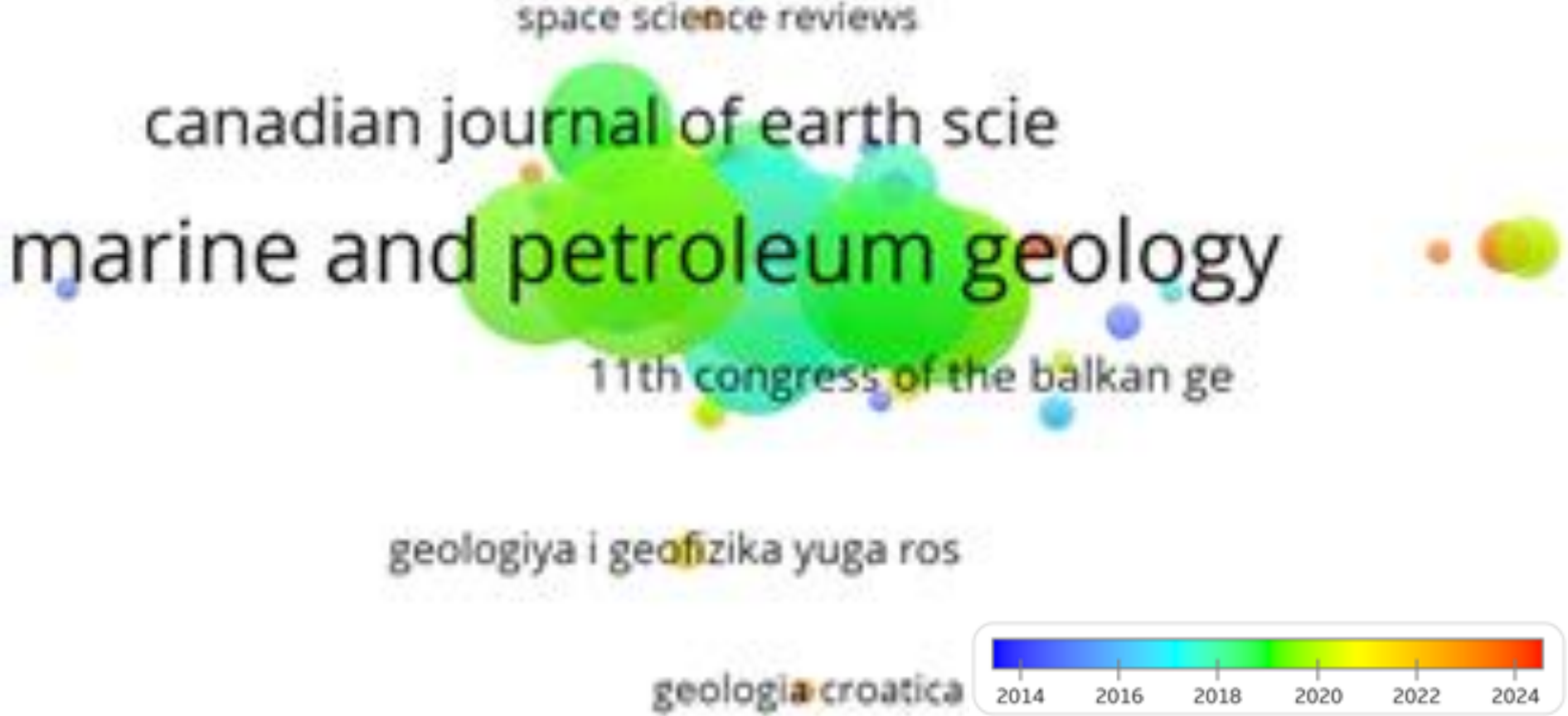

Figure 4: Distribution of articles published by journals.

3.7. Top 30 Institutions Contribution of Research Output

Figure 5 shows the thirty most prolific institutions regarding research results. noting that these top thirty organizations feature China, also noting that this country leads the way in terms of scientific publications devoted to lakes, with a steady increase in the number of articles published in international journals. This tendency is reflected in this Scopus bibliometric database, where Chinese researchers top the list of the most prolific authors on lakes. At the top of the list, "The University of Chinese Academy of Sciences" stands out as the leading contributor with 26 articles published on this theme with 796 citations.
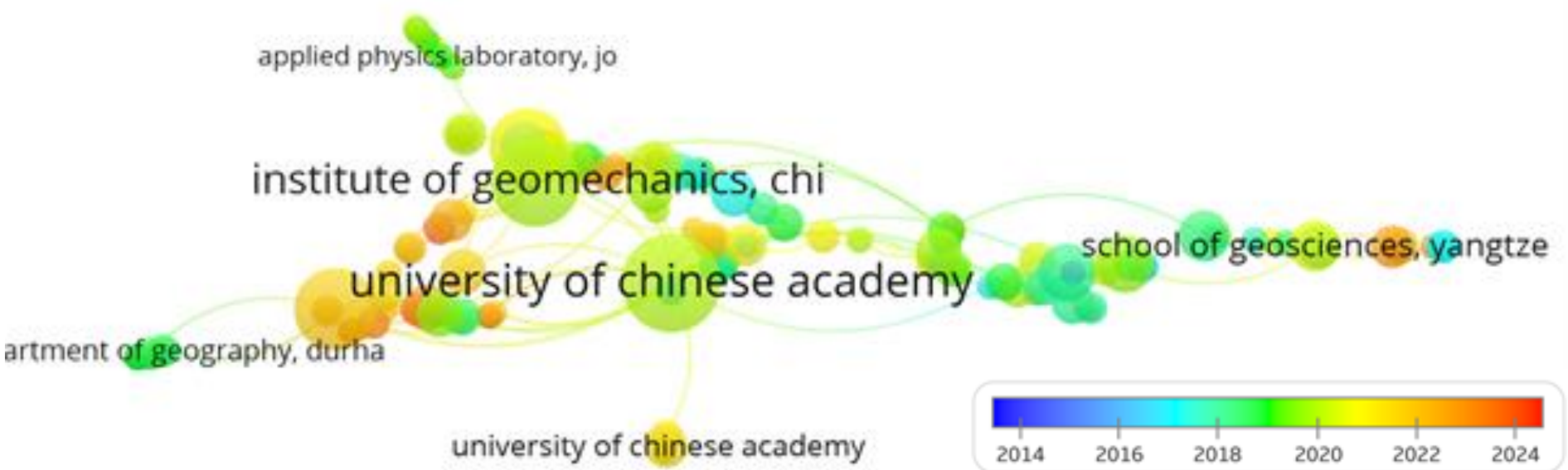

Figure 5: Distribution of documents by different institutes.

4. CONCLUSION

This study explores the literature on natural lakes and paleolakes origin of natural events published between 2014 and 2024. 1687 documents were exported.

Every year, the trend shows a steady increase in publications in this field, peaking in 2021 with 239 articles. China (25.12%), followed by the USA (11.1%) and Italy (4.57%), are the top three contributors to the literature on this research theme. Although ranked 32nd, Morocco stands out for its efforts in managing natural heritage, particularly lake formations. The results of this study can be effectively utilized by the academic community and policymakers seeking to develop this research area, which plays significant roles in civil society and science on various levels: scientific, socio-economic, and environmental.

5.REFERENCES

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