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Stop, little pot! Are there too many scientometric studies?

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Introduction

Scientific research is growing rapidly, with an exponential rise in published studies (Bornmann & Mutz, 2015). Many scientometric studies aim to help scientists cope with a vast amount of publications. Scientometric methods assist in identifying the structure of the scientific field and trends in its development, thereby help scientists in structuring their attention. Are they good at it? Or does scientometrics mainly serve its own purposes? This study examines scientometric research on climate science. Gerald Stanhill (2001) was among the first to show the exponential growth of climate studies, echoing de Solla Price's (1963) broader observations. As climate research has surged, scientometric studies on the topic have also grown, especially in recent years. This raises a question: do these studies genuinely support climate scientists?

We address the following research questions:
(A) whether scientometric studies of climate research field are useful for the climate researchers;
(B) whether the growth of scientometric studies of climate research is accompanied by an increase in the diversity of research questions, methods, and objects studied;
(C) is there a difference in the level of attention climate scientists give to scientometric studies that use simple questions and methods compared to those employing more complex approaches?

Methodology

To answer question (A) we applied bibliometric analysis looking at how scientometric studies on climate research are cited in the climate studies. For question (B) we used the qualitative text analysis based on extracting the elements of content of the papers. To answer question (C) we used the data obtained on the previous steps and introduced the category 'the paper with basic analysis' for scientometric studies.

To obtain the set of papers with scientometric studies of climate research we used Scopus database and searched for the combination or terms in title, abstract and keywords of the documents. We limited the search to document types "article" and "review". The exact query was the following:

TITLE-ABS-KEY (climate AND (bibliometr* OR scientometri*)) AND (DOCTYPE (ar) OR DOCTYPE (re)).

The search query returned 1441 results published between 1996 and 2023. We manually checked all the articles to screen out false positives. For these papers we obtained the citation indicators provided by SciVal, as well as the indicators of the journals. We also stored metadata of all papers citing the articles from our original dataset according Scopus database.

To investigate the evolution of scientometric studies of climate research we conducted content analysis of the full texts of the papers. We coded the following characteristics of each scientometric study: software used in analysis, methods of analysis, database(s) used, units of analysis (countries, journals, authors, fields, topics, organizations, etc.), and others. We introduced a "basic analysis" category assigned to papers from the dataset based on the above data. We defined 'the paper with basic analysis' as descriptive study which could be performed almost entirely with functionality of academic databases and/or VOSviewer software. More specifically, we consider the following as the elements of basic scientometric analysis: (a) yearly dynamics of the number of publications, (b) top authors, most publishing countries or organizations, top journals, keywords, subject categories, (c) share of publications with international co-authorship, top partnering countries and institutions, (d) VOSviewer maps (terms, authors, organizations, articles). According to

our definition, the study with basic scientometric analysis contains some combination of those elements, and it does not contain other types of scientometric analysis.

Results

The first scientometric study of climate research – at least the first one we obtained from Scopus – was published in 2001. Until 2014 such studies were sporadic with no more than five articles each year. In the most recent years the number of such studies became surprisingly high – more than hundred articles annually. The geography of scientometric studies of climate research is quite diverse with 97 countries present in the affiliations of the authors. China is the undisputed leader, 38% of papers have at least one co-author from this country. The USA and Spain are the next most active with 8% of papers.

The set of journals where the scientometric studies were published is also diverse. It includes 310 journals, but only fraction of them publish such studies regularly (13 journals published 10+ papers). The two journals with the biggest number of papers – *Sustainability (61 papers*) and *Environmental Science and Pollution Research* (49 papers) – both have a controversial reputation. *Sustainability* is published by MDPI, the publisher with questionable quality standards (Oviedo-García, 2021). *Environmental Science and Pollution Research* published by Springer was recently put into warning list in Clarivate databases due to suspicious citation patterns. The fact that these two journals published scientometric studies on climate most actively in the recent years suggests that some scientometric research is done for the sake of publication itself. The share of articles in high impact journals (journals with high SJR indicatior) decreases as well as the share of papers cited above the global average (paper with FWCI > 1). This shows that on average the impact of scientometric studies of climate research declines.

To look at this explosive growth of scientometric studies from another perspective we analyzed the content of the articles and investigated whether they were becoming more diverse, extensive and sophisticated. We omit the part of the results here because of the space limitation and include only the Figure 1 which shows how prevalent were papers with basic scientometric analysis throughout the period covered. We see such studies do not constitute the majority of all scientometric studies, with the share around 30-40% in the recent years. Apart from the share, the number of such studies has been growing, and recently there were several dozen published each year. We also aimed to explore the origins of studies with basic analysis. We wanted to know whether there is a significant imbalance in which part of the world these studies come from, and whether there is any discernible trend. Preliminary results show that both parts the Global North and the Global South actively produce studies with basic scientometric analysis, but most of the "simple" studies have authors from the Global North.

In our interest to "papers with basic analysis" there is no premise that such studies are not valuable. Some of the papers with basic analysis were done by the most reputable scientometric experts (for example, Haunschild, Bornmann & Marx, 2016), and judging by the number of citations these studies are highly valued. According the data from SciVal the average Field-Weighted Citation Impact for scientometric studies of climate research is 1.52. For papers with basic analysis the average is even higher than for the rest of the studies (1.76 vs. 1.41).

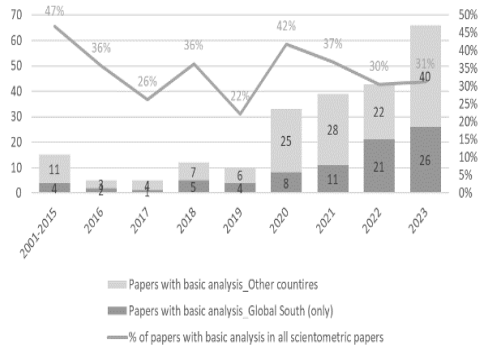

Figure 1. Prevalence of studies with basic scientometric analysis among scientometric studies of climate research.

Respected experts on scientometrics discussed the crisis in the field even before it began to grow explosively – it seems their warnings proved prophetic (Glänzel & Schoepflin, 1994). Today, many scientists are motivated to produce articles not solely by epistemic motives or the desire to attract attention, but also by the pragmatic motives.

Bibliometrics enables a large number of scientists to produce articles with a relatively low threshold of entry into the topic. We found that the rapid growth of such studies is partly due to the production of studies with basic analysis, on the one hand, and, on the other hand, to publications in low-tier journals. At the same time, we see that the citation rates of scientometric studies are on average at a decent level, including studies with basic analysis. The analysis of who cites scientometric studies (not described in detail above) showed that mostly citations are made in non-scientometric papers. Thus, scientometric analysis is clearly useful for scientists in other fields to understand the structure of the literature field.

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