BIBLIOMETRIC ANALYSIS OF COSMOGENIC RADIONUCLIDE USE IN ENVIRONMENTAL RESEARCH

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ABSTRACT

Cosmogenic radionuclides have long been studied since 1940. This knowledge has been used in the field of solar physic, atmospheric, geological system, biosphere as well as material dating. Each of these radionuclides has proven to give so many benefits in our daily lives. This study aims to explore global research trends in the usage of cosmogenic radionuclides in environmental research. The Scopus database has been analysed for several important pieces of information such as publications, sources, languages, countries, affiliations, etc. The analysis revealed that cosmogenic radionuclides are indeed widely used in environmental fields such as soil erosion, sedimentation, weather, and many more. The top three Cosmogenic Radionuclides used in the environmental study are 10Be (53.3%) followed by 26Al (12.99%) and 14C (9.63%). This analysis looks from the year 2010 to 2022 and after the exclusion of any language except English, as many as 1101 written materials whether in the form of book chapters, research articles, reviews, etc. have been identified. Publications are mainly in the form of research articles and 93.5% of the literature is in the English language. Of the total publications, the top three country contributions come from the United States (43.1%), the United Kingdom (21%), and France (18.8%).

INTRODUCTION

A nuclide that has an excess of nuclear energy that makes it unstable is called a radionuclide. This feature or property of a radionuclide has been explored by many researchers around the world and they come out with an option to be applied in many different types of applications in medical, agriculture, manufacturing as well as environment. The prospect of utilizing radioactivity measurements to identify the general characteristics of large-scale atmospheric circulation has been made possible by the discovery in rainwater of a variety of short-lived isotopes created by cosmic radiation. (Lal et al., 1958).

Be7 is one of the cosmogenic radionuclides and several studies focusing on the usage of Be7 has been found such as (Khodadadi et al., 2020) that investigate the possibility of using Be7 as a soil erosion tracer under a range of climatic condition, (Badreddine et al., 2021) study the importance of soil degradation and thus revealed the need for diagnostic of the erosion process. Additionally, they concluded that the utilization of nuclear methods that employ fallout radionuclides (FRN), which also include Be7, is a crucial alternative and useful tool to supplement traditional methods for studying soil erosion. Other cosmogenic radionuclides have also attracted a significant number of researchers in their study that relates to the environment. Given the importance of groundwater management, knowledge of the residence period is considered critical. (Schubert et al., 2020) studied the usage of ^{35}S and showed it is a suitable time tracer for investigating sub-yearly groundwater ages.

Cosmogenic radionuclides with longer half-lives are the most suitable tool to study the important processes in the environmental system as they occur on decadal to millennial or even geological time scales such as climate change. Natural archives such as ice cores, sediments, and tree rings serve as a repository for information about previous environmental situations (J.Beer et al, 2012). The time scales and the dating of significant historical events are fundamentally established by cosmogenic radionuclides. We can better comprehend the past owing to the knowledge in the archives, and understanding the past is essential for forecasting the future.

METHODOLOGY

Data Collection and Processing

The Scopus database is a significant library of peer-reviewed papers and offers coverage of a wide range of subjects and was accessed on 30th August 2022 from the access provided by the University for this study. The period under study was set to take only records from 2010 until 2022. Specific keywords have been identified to be used in the search process to get only articles related to the topic under study. Combining the specific keywords and using the advanced search tool provided by the database, make the process much easier.

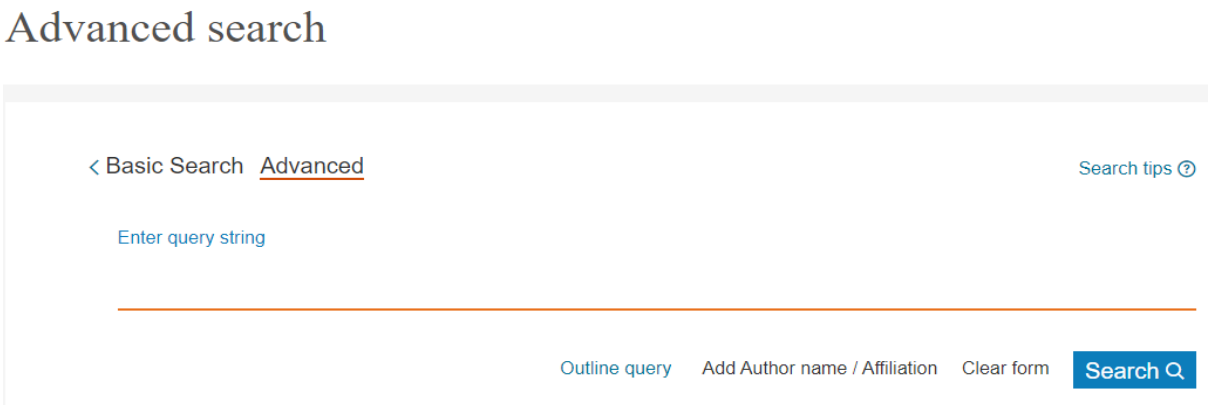

Figure 1. Scopus's Advance Search page

RESULT AND DISCUSSIONS

The United States, the United Kingdom, and France have become the top 3 contributors in terms of the number of documents in this search. Additionally, even though the number is not very significant, several nations have added their names to the list, including Vietnam, Thailand, Bangladesh, Sri Lanka, Nepal, Indonesia, and Singapore. When compared to review articles, book chapters, and other items on the list, research papers accounted for 93.6% of the search results. 52% of the documents were categorized in Earth and Planetary Science subject area and another 11.7% goes to environmental science while other areas such as Physic and Astronomy, Chemistry, Energy, Material Science, and others. As for the extra note, in this search, an article could be categorized in different subject areas by the database.

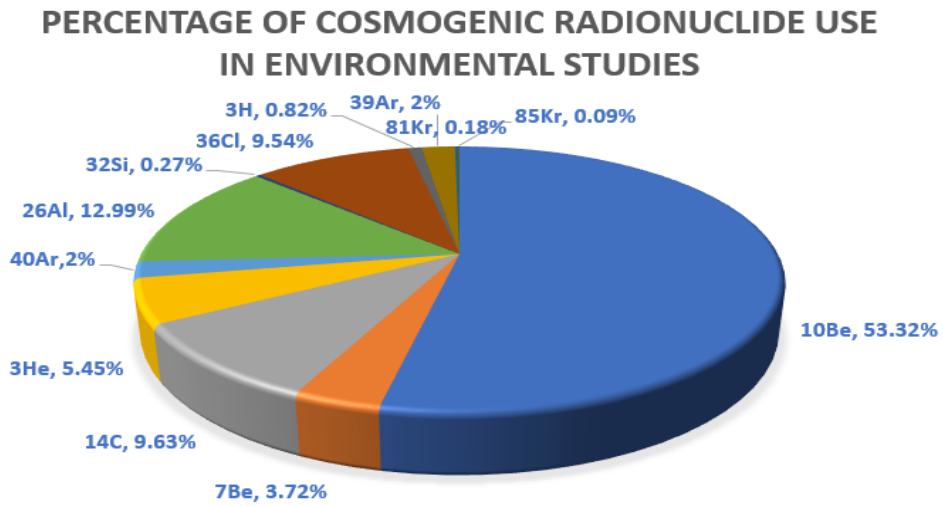

Figure 2. Percentage of Cosmogenic Radionuclide use in Environmental Studies

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