CHARACTERIZATION OF THE SCIENTIFIC PROFILE ASSOCIATED WITH GLOBAL WARMING AND CLIMATE CHANGE: ANALYSIS FROM WELL-BEING

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Abstract

In order to develop this article, a documentary review of the elaboration and production of research works related to the study of Global Warming and Climate Change was carried out to know, through a bibliometric study, the main characteristics of 245 publications registered in Latin America, according to the Scopus database. The results obtained from this database were organized in tables and figures, categorizing the information by variables such as the Year of Publication, Country of Origin and Area of Knowledge, which allowed to identify, through qualitative analysis, the position of different authors regarding the proposed topic. The main findings of this research were that Brazil stood out for having the highest scientific production, leading the list with 108 publications. Likewise, the area of knowledge that made the greatest contribution to the construction of bibliographic material related to the study of variables was agricultural and biological sciences, with 115 published documents.

Keywords: Global Warming, Climate Change, Climatic Events, Humans.

1. Introduction

Over the years, the concern of human beings for the state of the environment and the pollution resulting from daily activities, apparently harmless but caused significant changes in climate behavior, becoming more noticeable. Hence, the terms Climate Change and Global Warming are constantly referred to by scholars and organizations that seek to take control of the situation through informative appeals that allow the population to contribute to reducing the effects of centuries of bad practices and industrialization. Although both terms are synonyms, it is worth clarifying the difference between them to ensure a better understanding of the subject to be discussed.

On the one hand, Global Warming refers "to climate change, especially in the field of politics, Environmental Education or both, a concept that in general terms refers to an increase in temperature due to actions carried out by human beings" (García Mayorga et al., 2017) that is to say, it is "the increase in planetary temperatures" (Paterson, 2017).

On the other hand, Climate Change can be defined as a "stable and durable change in the distribution of weather patterns over short or long periods"

(García Mayorga et al., 2017). Although these modifications can also result from human actions, it should be emphasized that the planet earth has also experienced climatic alterations due to "natural processes or cosmic phenomena" (García Mayorga et al., 2017). In other words, Climate Change encompasses Global Warming and all the factors that influence the "increase of greenhouse gases (GHG) such as abnormal climatic situations in time, form or place" (García Mayorga et al., 2017).

In order to characterize the scientific profile associated with these variables, the present article seeks to describe the main characteristics of the set of publications attached to the Scopus database that is directly related to the variables mentioned above, as well as the description of the position of specific authors affiliated to institutions around the world, during the period from 2017 to 2021 at the Latin American level.

2. General Objective

To analyze from a bibliometric and bibliographic perspective, the elaboration of research papers on variables in Scopus.

3. Methodology

This article is conducted through a mixed research approach combining quantitative and qualitative methods.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach to the scientific production corresponding to Global Warming and Climate Change study.

On the other hand, from a qualitative perspective, examples of some research papers published in the area of the study mentioned above are analyzed from a bibliographic approach that allows describing the position of different authors on the proposed topic.

It is important to note that the entire search was carried out through Scopus, establishing the parameters referenced in *Figure 1*.
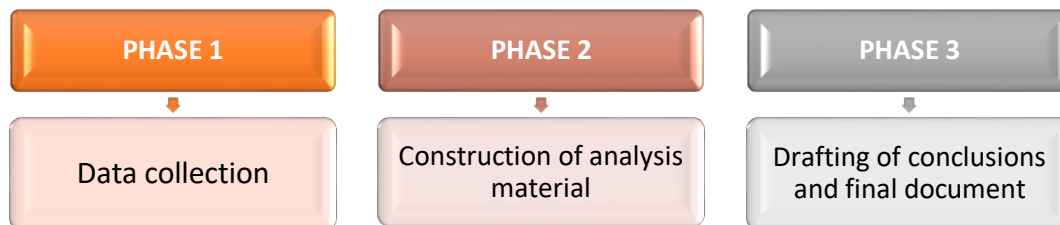
3.1 Methodological design

Figure 1. Methodological design

Source: Own elaboration

3.1.1 Phase 1: Data Collection

The data collection was executed from the Search tool on the Scopus web page, where 245 publications were obtained from the choice of the following filters:

characterization AND of AND the AND scientific AND profile AND associated AND with AND global AND warming AND climate AND change AND PUBYEAR > 2016 AND PUBYEAR < 2022 AND (LIMIT-TO (AFFILCOUNTRY ,"Brazil") OR LIMIT-TO (AFFILCOUNTRY ,"Argentina") OR LIMIT-TO (AFFILCOUNTRY ,"Chile") OR LIMIT-TO (AFFILCOUNTRY ,"Mexico") OR LIMIT-TO (AFFILCOUNTRY ,"Peru") OR LIMIT-TO (AFFILCOUNTRY ,"Colombia") OR LIMIT-TO (AFFILCOUNTRY ,"Cuba") OR LIMIT-TO (AFFILCOUNTRY ,"Venezuela") OR LIMIT-TO

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(AFFILCOUNTRY ,"Panama") OR LIMIT-TO (AFFILCOUNTRY ,"Ecuador") OR LIMIT-TO (AFFILCOUNTRY ,"Costa Rica") OR LIMIT-TO (AFFILCOUNTRY ,"Paraguay") OR LIMIT-TO (AFFILCOUNTRY ,"Bolivia")))

❖ Published papers whose study variables are related to Global Warming and Climate Change.
❖ Limited to the years 2017-2021.
❖ Limited to Latin American countries.
❖ Without distinction of area of knowledge.
❖ Without distinction of type of publication.

3.1.2 Phase 2: Construction of analysis material

The information collected in Scopus during the previous phase is organized and subsequently classified through graphs, figures and tables as follows:

❖ Word Co-occurrence.
❖ Year of publication

❖ Country of origin of the publication.
❖ Knowledge area.
❖ Type of Publication

3.1.3 Phase 3: Drafting of conclusions and final document

In this phase, the study analyzes the results previously obtained, resulting in the determination of conclusions and, consequently, the final document.

4. Results

4.1 Co-occurrence of words

Figure 2 shows the co-occurrence of keywords found in the publications identified in the Scopus database.
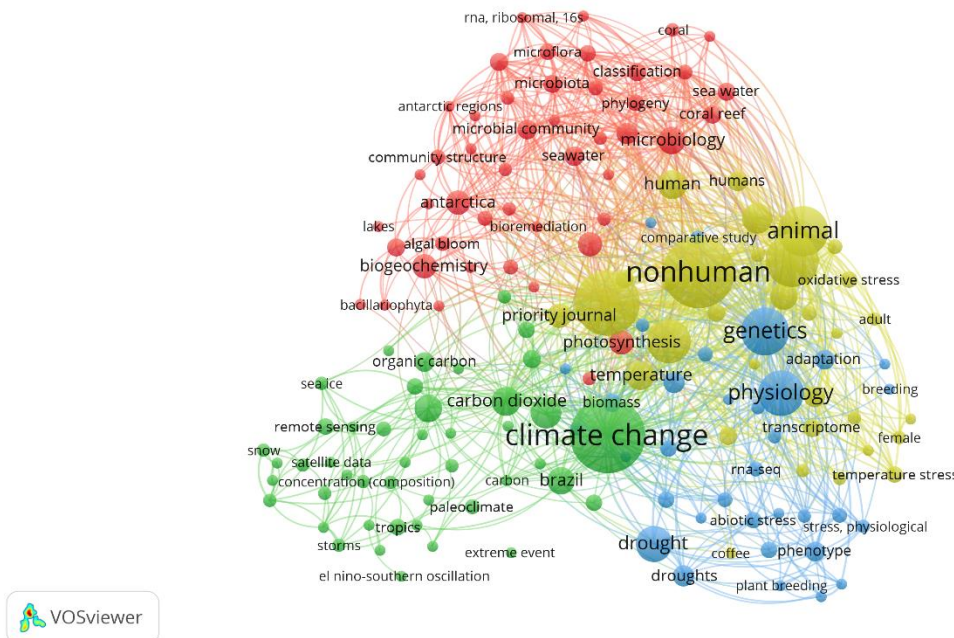

Figure 2. Co-occurrence of words

Source: Own elaboration (2022); based on data exported from Scopus.

As mentioned above, the data in Figure 2 were exported from Scopus, which shows our variables and their relationship with other terms such as drought, carbon dioxide, temperature, and

seawater, among others that we will explain below.

Global warming produces major impacts that influence the Climate Change to which the world

is exposed today. One of the most worrisome is the greenhouse gases resulting from human activity and increased industrial processes that alter their concentration level in the atmosphere. Latin America, made up of developing countries, has faced serious temperature increases, periods of drought, rising sea levels, storms and diseases that threaten the health and stability of its human and animal populations. Hence, both variables are the

object of study from different areas such as microbiology, physiology and biogeochemistry.

4.2 Distribution of scientific production by year of publication

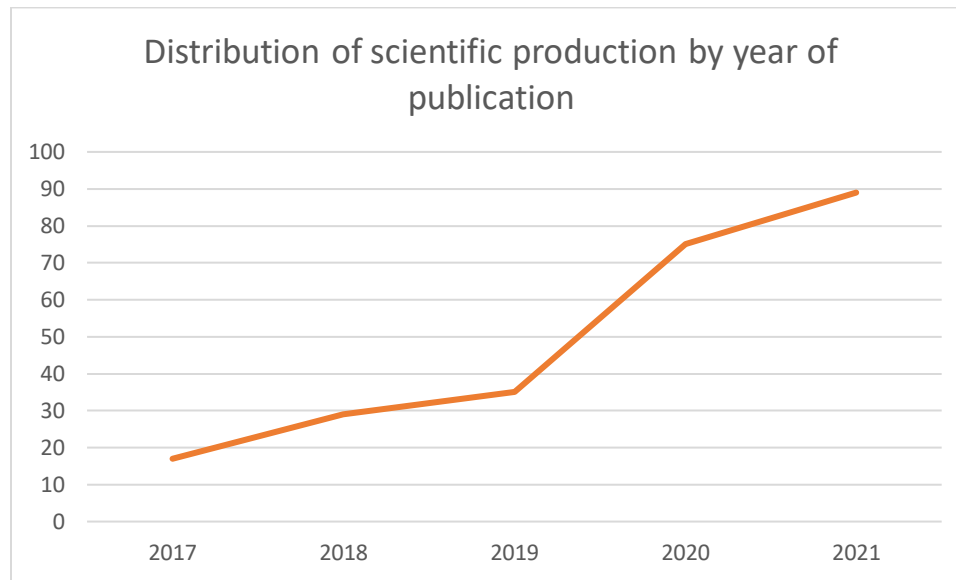*Figure 3* shows the distribution of scientific production according to the year of publication.

Figure 3. Distribution of scientific production by year of publication.

Source: Own elaboration (2022); based on data exported from Scopus.

Figure 3 shows that the scientific production concerning the variables Global Warming and Climate Change, at the Latin American level, between 2017 and 2021 resulted in the publication of 245 documents in the Scopus database containing the keywords. Likewise, throughout the period, several changes were experienced. It started in 2017, when the lowest number of documents published during the period was observed, a figure that increased considerably in the following years. Although the number of publications was higher each year, it is essential to note that those with the highest scientific contribution were in 2020 and 2021, with 75 and 89 papers, respectively.

Of the latter, the article "Evidence of climate change based on surface temperature trends of

lakes in central southern Chile" (Aranda, et al., 2021) stands out, which analyzes temperature changes at various scales in "the lakes of south-central Chile during the period 2000-2010" to analyze the trends according to the month and season of the year and thus provide important data to facilitate decision making and policy implementation in the Latin American country.

4.3 Distribution of scientific production by country of origin.

Figure 4 shows the distribution of scientific production according to the nationality of the authors.
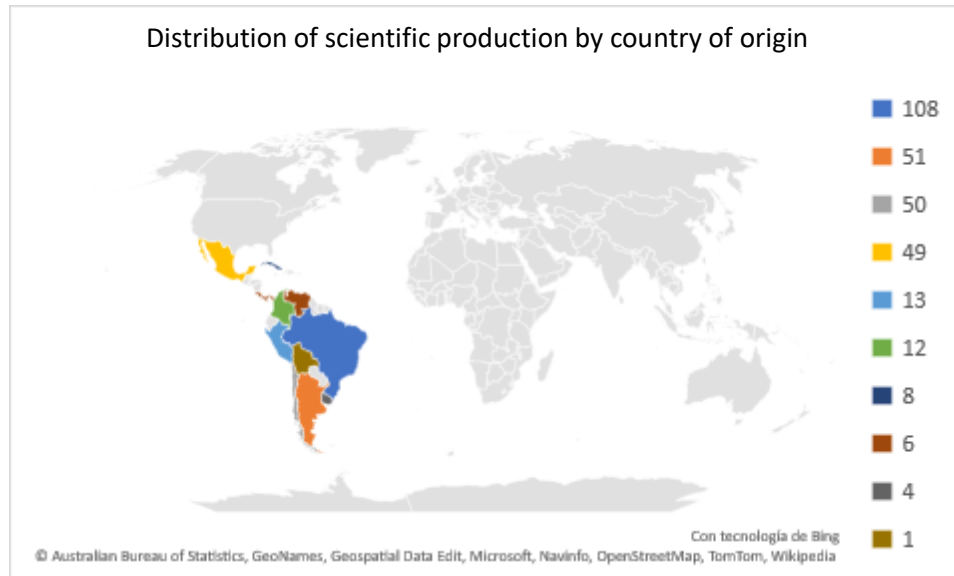
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Figure 4. Distribution of scientific production by country of origin.

Source: Own elaboration (2022); based on data provided by Scopus.

In the Global Warming and Climate Change study, Brazil leads the list of published papers with 108 records in the Scopus database from 2017-2021, followed by Argentina and Chile, with 51 and 50 texts, respectively.

The paper entitled "Spatiotemporal climate analysis in the state of Pernambuco, northeastern Brazil" (Araújo Júnior et al., 2021), states that "the main factors responsible for major natural disasters are related to extreme climatic events for which no country is well prepared, particularly in Latin America and specifically in Brazil." For this reason, research was carried out to establish the similarities of some municipalities in the state of Pernambuco during the periods 1993-2018, analyzing with statistics their meteorological changes, taking into account several variables that would allow the improvement of "the productivity of economic activities, especially agriculture and livestock" (Araújo Júnior, et al., 2021).

At this point, it is essential to note that the elaboration of scientific publications, in many cases, is based on collaborations that may involve private and public institutions from one or several countries. Therefore, the same publication may be linked to one or more authors with different nationalities and thus to more than one country simultaneously, making part of each of the total number of articles or publications in the final sum. *Figure 5* shows the flow of collaborative work carried out by several countries in greater detail.
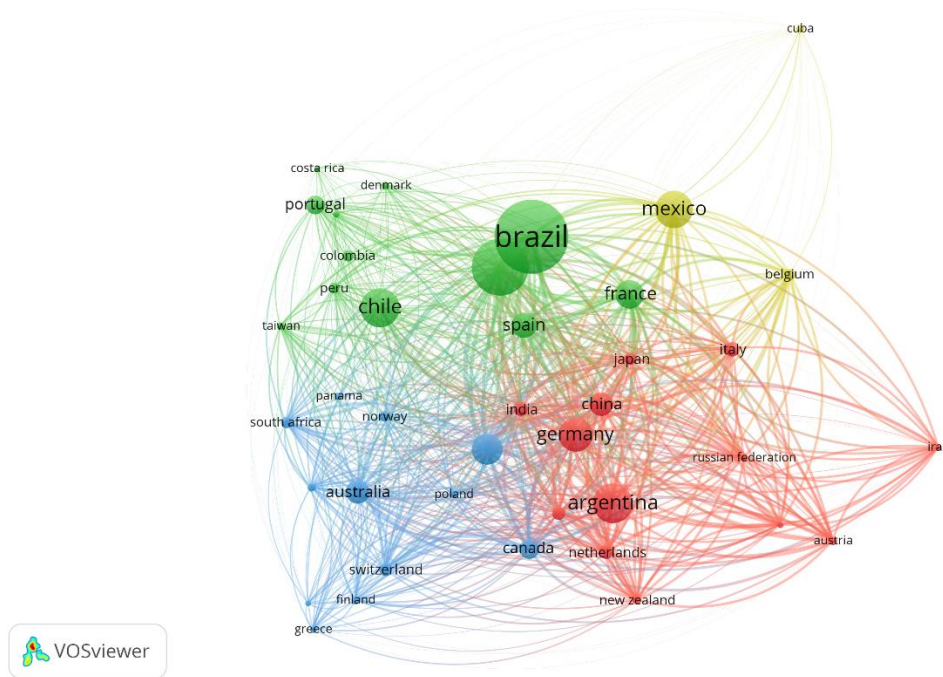
Figure 5. Co-citations between countries.

Source: Own elaboration (2022); based on data provided by Scopus.

Figure 5 shows the research grouping according to the collaboration between authors from different international institutions. There is outstanding participation between authors affiliated with institutions in Latin American countries such as Brazil, Chile, Mexico, Argentina, Colombia, and Peru and countries in other regions such as Germany, France and China, to mention a few.

4.4 Distribution of scientific production by area of knowledge

Figure 6 shows the distribution of the production of scientific publications according to the area of knowledge through which the different research methodologies are implemented.
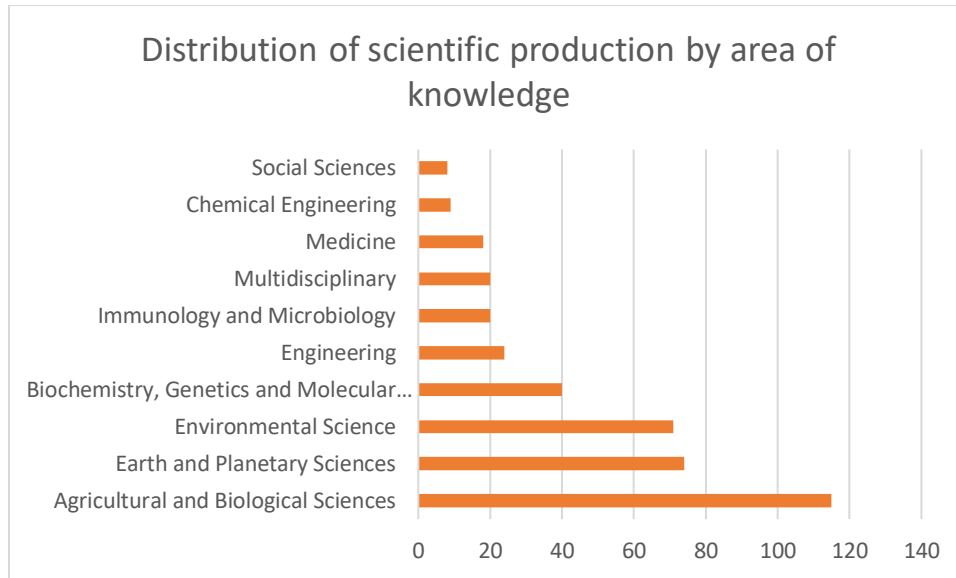
Figure 6. Distribution of scientific production by area of knowledge.

Source: Own elaboration (2022); based on data provided by Scopus.

Given the contribution of agriculture to the production of greenhouse gases and consequently to global warming and climate change, it is not surprising that most of the publications found in the Scopus database on our variables are from the area of agricultural and biological sciences, occupying the leading position in the publication of documents. However, other areas, such as earth and planetary sciences, and environmental science, have contributed to the study of these variables, publishing 74 and 71 documents, respectively.

As we can see in *Figure 6,* the variables that are the object of this study are relevant in various areas of knowledge since they directly influence the conservation of the human species, flora, fauna, and all the resources that guarantee an appropriate quality of life on the planet.

4.5 Type of publication

Figure 7 shows the distribution of the bibliographic findings according to the type of publication made by each of the authors found in Scopus.
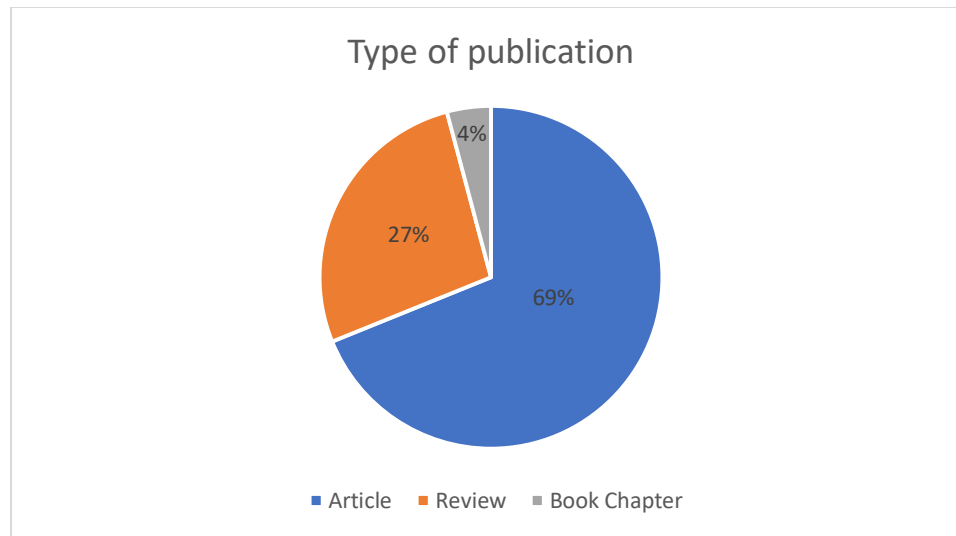
Figure 7. Type of publication.

Source: Own elaboration (2022); based on data provided by Scopus.

Figure 7 clearly shows that the predominant type of publication in the study of the Scientific Profile associated with Global Warming and Climate Change was the journal article, with a total of 166 documents. In second place, reviews with 65, followed by book chapters with only 10 publications.

One of the reviews that stands out the most is entitled "Physiological and agronomic performance of coffee cultivation in the context of climate change and global warming: a review" (Avila et al., 2018). This paper asserts that coffee is one of the most important global crops and provides a livelihood for millions living in developing countries. Likewise, it is known that coffee plantations are sensitive to any event that modifies the climate, so it was sought to determine alternatives that would allow for maximizing the yield of coffee crops taking into account the environmental changes to which the planet is exposed.

5. Conclusions

Finally, thanks to the bibliometric analysis conducted in this research work, it was possible to establish that Brazil was the country with the highest number of published records facing the variables Climate Change and Global Warming, with a total of 10 publications in the Scopus database during the period 2017-2021 in Latin America.

Although the concern derived from the study of our variables could arise from different approaches, it was determined that the predominant area of knowledge for this purpose is the agricultural and biological sciences. This is because Latin American countries are considered developing countries, in which the inhabitants of rural areas derive their livelihood directly from agriculture, so the scientific profile associated with these variables is characterized by studies in journal articles that allow an understanding of the effects of Global Warming and Climate Change, as well as finding ways to guarantee the population access to good quality food and therefore the food security of a nation. Since this is a vital issue, it is normal for researchers to work with personnel from other countries who can provide knowledge and tools that can be adapted to any Latin American country. Although the most important thing is preserving the right to life, it is up to each reader to implement the recommendations in each document.

In order to continue generating awareness of the damage caused by human activities, it is hoped

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that this research article will encourage the increased participation of scientific communities in the study of Global Warming and Climate Change from any scientific profile and area of knowledge, which will allow Latin American society and the whole world to know accurately the strategies that can be carried out to remedy what has been caused in the past.

References

[1] Aberson, S. D., Archambault, H. M., Bosart, L. F., Corbosiero, K. L., Davis, C. A., Doyle, J., . . . Wood, K. M. (2017). The extratropical transition of tropical cyclones. Part I: Cyclone evolution and direct impacts. *Monthly Weather Review*, 4317-4344.

[2] Altieri, M. A., & Nicholls, C. (2018). Agroecology and Climate Change: Adaptation or Transformation? *Revista de Ciencias Ambientales* , 235-243.

[3] Aranda, A. C., Arumí-Ribera, J. L., Fuentes-Jaque, G., Morales-Salinas, L., Pedreros, P., Rivera-Ruiz, D., . . . Urrutia, R. (2021). Evidence of climate change based on surface temperature trends of lakes in south-central Chile. *Remote Sensing*.

[4] Araújo Júnior, G. d., de Lima, J. L., Lopes, P. M., Moura, G. B., Oliveira-Júnior, J. F., Pandorfi, H., . . . Silva, M. V. (2021). Spatiotemporal climate analysis in the state of Pernambuco, northeastern Brazil. *Journal of Atmospheric and Solar-Terrestrial Physics*.

[5] Avila, R. T., Cardoso, A. A., Damatta, F. M., Martins, S. C., & Ramalho, J. C. (2018). Physiological and Agronomic Performance of the Coffee Crop in the Context of Climate Change and Global Warming: A Review. *Journal of Agricultural and Food Chemistry*, 5264-5274.

[6] Batista, D., Damatta, F. M., Fernandes, I., Lidon, F. C., Marques, I., Partelli, F. L., . . . Ribeiro-Barros, A. I. (2021). Understanding the impact of drought in coffea genotypes: Transcriptomic analysis supports a common high resilience to moderate water deficit but a genotype dependent sensitivity to severe water deficit. *Agronomy*.

[7] Bícego, M. C., de Castro Martins, C., Figueira, R. C., Marcovecchio, J. E., Montone, R. C., Tonelli, M. H., . . . Wainer, I. E. (2017). Globalization of the antarctic seas: Pollution and climate change perspectives. *Marine Pollution and Climate Change*, 237-278.

[8] Bourne, D. G., Leite, D. C., Peixoto, R. S., Rosado, A. S., & Rosado, P. M. (2017). Beneficial microorganisms for corals (BMC): Proposed mechanisms for coral health and resilience. *Frontiers in Microbiology*.

[9] Bravo-Montero, L., Herrera-Franco, G., Montalván-Burbano, N., & Mora-Frank, C. (2021). Scientific research in ecuador: A bibliometric analysis. *Publications*.

[10] Bremer, U. F., Florêncio de Souza, S., Simões, J. C., Veettil, B. K., & Wang, S. (2017). Glacier monitoring and glacier-climate interactions in the tropical Andes: A review. *Journal of South American Earth Sciences*, 218-246.

[11] Carrera, F. P., Cevallos-Cevallos, J. M., Maridueña-Zavala, M. G., & Noceda, C. (2021). Metabolomics, a powerful tool for understanding plant abiotic stress. *Agronomy*.

[12] Choque, P., & Marleny. (2021). CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT. *REVISTA LATINOAMERICANA OGMIOS*, 82-90.

[13] Fan, K., Gao, Y., Lam, H.-M., Li, K.-P., Li, M.-W., Muñoz, N. B., . . . Yung, W.-S. (2017). Using genomic information to improve soybean adaptability to climate change. *Journal of Experimental Botany*, 1823-1834.

[14] García Mayorga, E., Maldonado Tapia, C., Moreno García, M., Muñoz Escobedo, J., & Rivas Gutiérrez, J. (2017). El Cambio Climático y la salud humana. . *Biocenosis*, 72-79.

[15] Miranda Delgado, R. G. (2018). Desarrollo y cambio climático. Una mirada desde América Latina. . *Revista del CESLA*, 193-210.

[16] Paterson, P. (2017). Calentamiento Global y cambio climático en Sudamérica. *Revista Política y Estrategia*, 153-188.