Interpretation of the Status Quo of Domestic Ecological Environment Quality Based on Remote Sensing Technology

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Abstract. Using CNKI’s full-text database of Chinese journals as the data source, we will discuss the inter-annual changes, main research forces, funding funds, high-frequency keywords and development context of the ecological environment quality research field in my country based on remote sensing technology. The results show that: from the perspective of the inter-annual changes in the literature, the number of papers published on the ecological environment quality in my country has shown a significant upward trend, and it has developed rapidly in recent years; from the perspective of research strength, Beijing Forestry University has the highest total citation frequency, whether it is the number of papers or the number of citations. The frequency indicates that universities have a relatively high level of scientific research in this field as a whole; from the perspective of fund funding, the research on ecological environment quality has attracted great attention from the national and local levels.

1. Introduction
The ecological environment is the basic guarantee for human survival and the material basis for social development. The quality of the ecological environment is inseparable from human life. How to quantitatively express the quality of the ecological environment and its development trend, and scientifically evaluate the quality of the ecological environment are current research hotspots. Remote sensing technology has the characteristics of rapid, real-time and large-scale monitoring, and is widely used in the field of ecological environment, becoming an effective means of evaluating the regional ecological environment [1]. With the rapid development of "3S" technology and computer technology, ecological environmental quality assessment research has also entered a period of rapid development. Dynamic monitoring, analysis and judgment of environmental quality are more conducive to formulating corresponding environmental protection strategies and understanding environmental dynamics and development trends [2].
2. Data and methods
This paper uses CNKI China Journal Full-text Database as the data source to analyze the current research status and research hotspots of ecological environment quality. On January 20, 2021, search related Chinese documents with the search terms “ecological environment quality” and “remote sensing” in the “subject” field. The search time is as of December 31, 2020. This article is to improve accuracy and reduce errors. After several searches and screenings, irrelevant documents were manually eliminated, and finally a total of 593 scientific research documents were determined. The development trend of domestic remote sensing research on ecological environment quality is analyzed based on the number of publications and citation frequency.

3. Results and analysis

3.1. Interannual changes in literature
The total amount of literature can represent the degree of attention of the scientific community to a certain field, and it can also reflect the development speed and history of the field [3]. During the 20-odd years from 1996 to 2020, the amount of research papers on ecological environment quality in my country has shown a significant upward trend. By fitting the trend line, it is found that the annual change trend of the number of research documents on ecological environment quality in my country shows a linear increase, R² is 0.82, indicating that the research on ecological environment quality has received more and more attention and attention. From the perspective of statistical grouping methods, my country's ecological environment quality research has generally experienced three stages: the initial stage, the slow development stage, and the rapid development stage. From 1996 to 2004, a total of 36 articles were issued, accounting for 6.07% of the total amount of articles issued in the past 20 years, and the development was basically stable; from 2005 to 2015, a total of 296 articles were issued, accounting for 49.92% of the total amount of articles issued in the past 20 years, and the development was relatively slow; From 2016 to 2020, a total of 261 articles were issued, accounting for 44.01% of the total amount of articles issued in the past 20 years, and the development is relatively rapid. It can be seen from Figure 1 that the total amount of research literature on ecological environment quality in my country is increasing year by year. With the continuous deepening and comprehensiveness of research, the research on ecological environment quality in my country will still be a hot spot in the future.

![Figure 1. Trends in the annual publication volume of remote sensing research on ecological environment quality in my country.](image)

3.2. Main research strength
The CNKI database retrieves the top 5 institutions in my country's remote sensing research on ecological environment quality. As shown in Table 1, the top 5 research institutions have published 78
articles in total, accounting for 13.15% of the total published articles. Beijing Forestry University ranks first in the field of ecological environmental quality research with 20 articles published, accounting for 3.37% of the total published articles. Followed by Chengdu University of Technology, Fujian Normal University, Fuzhou University and Chang'an University. In addition, my country's ecological environment quality research is mainly concentrated in agricultural and forestry colleges and universities or research institutes related to agricultural resources and environment. It can be seen from the total citation frequency that Beijing Forestry University has the highest total citation frequency. Whether it is the number of articles published or the frequency of citations, it indicates that universities have a relatively high level of scientific research in this field.

Table 1. Top 5 research institutions in terms of publication volume.

| Serial number | Research institute                     | Total literature volume/article | Percentage of total | Total citation frequency/time |
|---------------|---------------------------------------|---------------------------------|---------------------|------------------------------|
| The first     | Beijing Forestry University           | 20                              | 3.37%               | 307                          |
| Second        | Chengdu University of Technology      | 19                              | 3.20%               | 180                          |
| Third         | Fujian Normal University              | 16                              | 2.70%               | 295                          |
| Fourth        | Fuzhou University                     | 12                              | 2.02%               | 287                          |
| Fifth         | Changan University                    | 11                              | 1.85%               | 96                           |

3.3. Funding analysis

Based on the statistics of my country's funding status in the field of remote sensing research on ecological environment quality, 593 documents on ecological environment quality involve 39 fund projects, among which are the top five National Natural Science Foundation, National Science and Technology Program Support Program, National Key R&D Program, and National Key Program. There are a total of 120 articles funded by the basic research development plan and the knowledge innovation project of the Chinese Academy of Sciences, accounting for 20.24% of the total published papers. It can be seen that the research on my country's ecological environment quality has received great attention from the national and local levels.

Table 2. Top 5 projects funded by funding.

| Serial number | Fund project                                         | Total literature volume/article |
|---------------|------------------------------------------------------|---------------------------------|
| The first     | National Natural Science Foundation of China         | 76                              |
| Second        | National Science and Technology Support Plan         | 14                              |
| Third         | National Key R&D Program                            | 12                              |
| Fourth        | National key basic research development plan         | 9                               |
| Fifth         | Knowledge Innovation Project of Chinese Academy of   | 9                               |
|               | Sciences                                             |                                 |

3.4. Highly cited literature analysis

The citation of literature can be used as an important indicator to evaluate the quality of the literature, and it can also reflect the hotspots and key points of the research in this field from the side, which can reflect the academic development context of this field to a certain extent [4, 5]. This paper selects the top 10 documents in the CNKI database that are cited in the field of ecological environment quality for statistical analysis. It can be seen from Table 4 that domestic research on ecological environmental quality mainly focuses on ecological environmental quality evaluation, determination of evaluation indexes, and dynamic monitoring. Domestic experts and scholars are committed to the theoretical and
practical research on ecological environmental quality and have achieved fruitful results. The dynamic monitoring, analysis and judgment of environmental quality is more conducive to formulating corresponding environmental protection strategies and understanding environmental dynamic changes and development trends.

**Table 3.** The top 10 most cited documents in the field of remote sensing research on ecological environment quality in my country.

| Serial number | Article title                                                                 | Author            | Cited frequency | Source journal                  | Issuing time |
|---------------|------------------------------------------------------------------------------|-------------------|-----------------|--------------------------------|--------------|
| The first     | Analysis on the Spatio-temporal Changes of Cultivated Land Resources in China in the Past 10 | Guoping Zhang     | 307             | Acta Geographica Sinica          | 2003.05      |
| Second        | Research on the Relationship between China's Land Resource Ecological Environment Quality and Population Distribution Based on Remote Sensing and GIS Remote sensing evaluation index of regional ecological environment changes | Zhiqiang Gao     | 216             | Journal of Remote Sensing       | 1999.03      |
| Third         | Comprehensive Analysis of Hubei Province Ecological Environment Supported by Remote Sensing and GIS Technology Decision Analysis of China's Returning Farmland to Forest and Grassland Supported by Remote Sensing and GIS Research on Comprehensive Evaluation of Regional Eco-environmental System Safety Based on RS, GIS and Models Ecological environment monitoring and its development in my country | Hanquiu Xu        | 202             | China Environmental Science     | 2013.05      |
| Fourth        |                                                             | Siyuan Wang       | 129             | Advances in Earth Science       | 2002.06      |
| Fifth         | Research on Land Ecological Environment Security in West Jilin | Cunjian Yang      | 107             | Journal of Remote Sensing       | 2002.06      |
| Sixth         | Research on the Relationship between China's Land Resource Ecological Environment Quality and Population Distribution Based on Remote Sensing and GIS | Wei Zuo           | 97              | Nanjing Normal University       | 2002.04      |
| Seventh       | Research on Land Ecological Environment Security in West Jilin | Tian Ma           | 89              | Sichuan Environment             | 2003.04      |
| Eighth        | GIS-based Ecological Environment Quality Evaluation and Dynamic Analysis of Yili River Basin | Fengqin Zhao      | 85              | Jilin University                | 2005.05      |
| Ninth         | Remote Sensing Evaluation of Ecological Environment Quality Based on Artificial Neural Network | Hongwei Wang      | 82              | Arid Land Geography             | 2008.03      |
| Tenth         |                                                                 | Hongyi Li         | 80              | Chinese Journal of Applied Ecology | 2006.08     |
4. Main keyword analysis

Keywords can accurately and concisely express an article. As the core and essence of a document, statistical analysis of keywords can help researchers understand research hotspots and trends in this field, and quickly grasp research trends. This paper uses CNKI to search for keywords in 593 ecological environment quality research documents in my country, and obtains the most frequently occurring keywords in the field of ecological environment quality research, mainly including ecological environment quality, ecological environment quality evaluation, ecological environment, GIS, remote sensing ecological index, research Area, principal component analysis, biological abundance index, vegetation coverage index, geographic information system, etc. These keywords reflect to a certain extent that related researches are the hot spots of ecological environment quality related research.

![Keywords for domestic eco-environmental quality research.](image)

5. Conclusion and discussion

In the past 20 years, the amount of research papers on ecological environment quality in my country with the help of remote sensing technology has shown a significant upward trend, and research in this field is in a stage of rapid development. The institution with the most published articles and the most cited institution in China’s ecological environment quality research is Beijing Forestry University; my country’s ecological environment quality research is mainly funded by national funds; domestic research on ecological environment quality mainly focuses on ecological environment quality Evaluation, determination of evaluation index and dynamic monitoring. With the advancement of science and technology, dynamic monitoring, analysis and judgment of environmental quality are more conducive to formulating corresponding environmental protection strategies and understanding the dynamic changes and development trends of the environment.

References

[1] Song Huimin, Xue Liang. Dynamic monitoring and analysis of ecological environment quality in Weinan City based on remote sensing ecological index model [J]. The Journal of Applied Ecology, 2016, 27 (12): 3913-3919.
[2] Wang Xiaolei. Research on Ecological Environment Quality of Fuxin City Based on Remote Sensing Ecological Index [D]. Liaoning Technical University, 2019.
[3] Li Yanan. Research status of domestic soil humus based on bibliometrics [J]. Anhui Agricultural Science Bulletin, 2020, 26 (08): 107-109.
[4] Li Yanan. Analysis of the status quo of the research on my country's underforest economic model based on CNKI [J]. Agricultural Technology Services, 2020, 37 (06): 108-109.
[5] An Xianjin, Li Wei. Bibliometric analysis of my country's biochar research trends based on CNKI [J]. Journal of Agricultural Resources and Environment, 2018, 35 (06): 483-491.