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Editorial: Remote sensing in ecological environments: innovations and achievements

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Editorial on the Research Topic
Remote sensing in ecological environments: innovations and achievements

1 Introduction

Ecological environment monitoring plays an indispensable role in achieving sustainable development goals (Zhang et al., 2023; Kamran and Yamamoto, 2023). By monitoring ecological parameters of land, vegetation, soil, water, atmosphere, climate and so on, researchers are able to uncover the spatial patterns, temporal dynamics, and underlying causal mechanisms of environmental phenomena and processes, thus providing a scientific basis for environmental management and protection (Wang et al., 2022; Xun et al., 2024). With the rapid development of remote sensing and emerging technologies, such as artificial intelligence (AI) and cloud computing, ecological environment monitoring has entered an era of unprecedented opportunities in data acquisition, processing, and analysis (Amindin et al., 2024). To comprehensively showcase the innovations and achievements of these technologies in ecological environment monitoring, this Research Topic "Remote Sensing in Ecological Environments: Innovations and Achievements" has been launched. It aims to provide researchers and decision-makers with new perspectives, methods, and evidence on ecological environment remote sensing.

Following the peer review process, seven manuscripts were accepted for publication. These studies span multiple directions, including land use monitoring, ecological environment assessment, and ecological asset accounting, covering various geographical settings such as mountains, oceans, hills, plains, and forests. This Editorial provides an overview of the academic contributions from the seven papers.

2 Overview of the published contributions

The seven papers in this Research Topic provide a multidimensional scientific perspective for addressing global environmental challenges and promoting sustainable development. In term of land use monitoring, Liang et al. employed GaoFen-1 (GF-1) imagery in combination with object-oriented technology to conduct the first large-scale monitoring and spatial distribution analysis of abandoned farmland in Jiangxi Province. Meanwhile, Wang et al. applied AI algorithms to Landsat time-series imagery to derive the spatiotemporal distribution of land use types in the upper watershed area of the Qingshui River basin. By further integrating land use transfer matrix and redundancy analysis methods, they clarified the characteristics of land use changes. Focusing on ecological environment assessment, Yang et al. proposed an improved integrated ecological effect index (IEEI). They analyzed the ecological effects in Yunnan Province over the past 30 years, offering new perspectives for ecological management in mountainous regions. Wang and An adopted natural evolution as a baseline and employed Landsat time-series imagery on the Google Earth Engine (GEE) cloud computing platform to calculate the remote sensing ecological index (RSEI) for evaluating the ecological restoration in southern Ningxia. By integrating remote sensing imagery with geological and geomorphological data, Chen et al. investigated the spatiotemporal variations in land surface temperature (LST), enhanced vegetation index (EVI), and net primary productivity (NPP) across different geological and geomorphological regions in Hailun, Heilongjiang Province, thus providing evidence for understanding the coupling mechanisms between geological environments and ecosystems. White et al. utilized AI algorithms and remote sensing imagery on GEE platform to estimate sea surface temperature and salinity in global coastal areas. In terms of ecological asset accounting, Kang et al. developed a surface water resource asset accounting method based on multi-source remote sensing data, systematically evaluating both the tangible and intangible assets of water resources. By using the Miyun District of Beijing as a case study, they demonstrated the feasibility and practicality of their method.

3 Conclusion

The seven papers included in this Research Topic "*Remote sensing in ecological environments: innovations and achievements*", illustrate the diverse applications of remote sensing combined with emerging technologies in ecological environment research. Through covering multiple fields including dynamic land use monitoring, ecological environment assessment, and ecological asset accounting, their findings demonstrate that the integration of remote sensing with emerging technologies such as AI and cloud computing has become a significant direction for the development of ecological environment science.

In the future, as remote sensing imagery continues to improve in spatial and temporal resolution, and as AI algorithms and cloud computing platforms continue to evolve, ecological environment monitoring is expected to make even greater strides in precision and efficiency. We anticipate the development of more efficient and intelligent methods for ecological environment monitoring, thereby facilitating global environmental governance and ecological conservation.

Author contributions

CZ: Conceptualization, Formal Analysis, Investigation, Project administration, Writing–original draft. JL: Conceptualization, Formal Analysis, Project administration, Writing–review and editing. WH: Investigation, Writing–review and editing. YT: Investigation, Writing–review and editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

Publisher's note

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