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Editorial: Women in environmental informatics and remote sensing

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Editorial on the Research Topic
Women in environmental informatics and remote sensing

The Research Topic entitled "*Women in Environmental Informatics and Remote Sensing*" was created with women researchers in mind. It is estimated that fewer than 30% of researchers in the world are women. It aimed to encourage women researchers to submit the results of their research and present them in Frontiers in Environmental Sciences. The Research Topic of the journal had three editors: Monica Rivas Casado from Cranfield University in the United Kingdom, Maria João Costa from the University of Evora in Portugal, and Dominika Dąbrowska from the University of Silesia in Poland.

The aim of this issue was to highlight the diversity of research in the following topics: remote sensing, artificial intelligence, geographic information systems, spatial information technologies, environmental monitoring (water, air, and soil), computer graphics, and decision support systems. The presented Research Topic of articles includes advances in theory, experiments, and methodology with applications to solving important problems.

The Research Topic includes seven published articles prepared by a total of 46 authors from around the world, including the United States, Brazil, Korea, Australia, Morocco, Saudi Arabia, Iran, Norway, Belgium, and Poland. All articles were Original Research and published between July 2023 and February 2024. Even though only a short period of time has passed since their publication, some of them have already been cited in other studies, and the number of people who have read individual texts is up to 3,000.

The first of the published articles, titled "*Evaluating the effectiveness and robustness of machine learning models with varied geo-environmental factors for determining vulnerability to water flow-induced gully erosion*" concerns the mapping of soil erosion and identifying of the most important influencing factors that primarily cause soil deterioration in mountainous and semi-arid regions (Aboutaib et al.). Soil degradation, which negatively affects soil quality, is one of the most common natural hazards worldwide and occurs mainly in semi-arid regions. Gully erosion is described as the erosion and washing away of soil through a deep channel by flowing surface water. As a result, gullies are formed, which change the terrain and topography, and ultimately lead to abundant river branching, siltation of dams, and soil degradation. In this paper, Random Forest, Support Vector Machine, and Logistic Regression methods are used to assess the impact of geo-environmental factors on gully erosion and identify vulnerable sites. Twenty

environmental factors are used. The results of the study suggest that Random Forest and Support Vector Machine give better results, suggesting that about 12% of the studied land area requires action.

The second published article is titled "*Relationship between tropical leaf phenology and ecosystem productivity using phenocameras*" and concerns the temporal patterns of leaf phenology and their relationship to gross primary productivity in a comparative study across three contrasting tropical biomes: dry forest, woodland savanna, and rainforest (Alberton et al.). Tropical plant communities account for about 50% of all terrestrial photosynthesis and dominate the rate of rainfall recycling, contributing significantly to the regulation of regional and global climate. Leaf phenology is related to, among other things, plant physiology and is a factor in photosynthetic metabolism and carbon exchange in the ecosystem. This paper shows how the temporal dynamics of leaf phenology changes with the intensity of environmental aridity. The interactions between water and light to trigger plant community responses are determined. The relationship between leafiness and productivity in tropical ecosystems under different water constraints is confirmed.

The third article, "*Protected but unmanaged: insights into the ecological status of priority stony reefs in Belgian waters based on the integrated use of remote sensing technologies*," aims to reconcile the scientific evidence on the detrimental impacts of bottom-contact fisheries on priority biotopes with arguments against the coexistence of such activities with MPAs (Gavazzi et al.). Subtidal natural hard substrates represent important ecological habitats and provide essential ecosystem functions. In sedimentary continental shelves they can act as oases, promoting high biomass and species richness with diverse functional traits (Papenmeier et al., 2020; Hiddink et al., 2019; Hinz et al., 2021). Bottom-contact fishing is an important source of anthropogenic disturbance of the physical and ecological integrity of the seabed. The exposed study locations had a higher abundance of opportunistic species, with moderate to high results. The presence of several trawling traces on the seabed was observed in the exposed locations, which negatively changed the functional composition of bentonite. The research results presented in the text should be of interest to environmental managers in order to properly implement environmental regulations in the face of rapid and widespread anthropogenic changes.

The fourth article, entitled "*Multiscale phenology of seasonally dry tropical forests in an aridity gradient*," is thematically related to the second article (Ramos et al.). Leaf phenology in seasonally dry tropical forests is characterized by a synchronized shedding of new leaves triggered by the first rains of the rainy season. The aim of this paper was to compare the so-called transition dates from PhenoCams and satellite remote sensing and to use the transition dates calculated from PhenoCams to select the best thresholds for time series. The authors found a positive relationship between cumulative precipitation and length of the growing season and between cumulative precipitation and maximum and minimum temperatures and vegetation productivity. It should be noted that the good temporal resolution of the phenocamera phenology time series improved the definitions of transition times and thresholds for landscape phenology.

The fifth article concerned the analysis of satellite images. The title of the publication is "*Spatial prediction of physical and chemical properties of soil using optical satellite imagery: a state-of-the-art hybridization of deep learning algorithm*" (Hosseini et al.). The aim of this paper was to predict the physical and chemical properties of soil using a hybrid model based on deep learning algorithms and optical satellite images. As dependent data, 317 soil samples were collected and examined for physical and chemical properties. In the analysis of photographic data, 23 remote sensing parameters, 17 topographic parameters, and four climate parameters were taken. Spatial prediction of physical and chemical properties was implemented using convolutional neural network, recurrent neural network, and hybrid CNN-RNN models. The evaluation results indicated that the hybrid model had better accuracy in all soil properties, which highlights the potential of deep learning techniques in using satellite data for precise mapping of soil properties.

The sixth article, entitled "*End-to-end system for monitoring the state of rivers using a drone*" was intended to present the results of the activities of an end-to-end system, wherein the user performs measurements with a drone and the result is a segmentation mask from the U-Net network improved by image processing algorithms (Prokop et al.). The system is based on mobile technology, where the entire analysis process is performed by a single application. Analysis of measurement data is based on determining image coordinates and segmenting the river on a simplified image using a dedicated network with transfer learning, which results in an image indicating the river and its boundaries. The end result for the user is the ability to visualize the analyzed area and compare current data with archived data.

The last article published in this issue is titled "*Remote detection and monitoring of post-mining heat island*" (Worsa-Kozak et al.). The aim of the article was to improve and develop a methodology for remote detection and monitoring of heat islands resulting from coal mining operations to track the thermal activity of heaps and tailings ponds in the study area. Mining residues cause environmental hazards with spontaneous combustion tendencies, emitting huge amounts of greenhouse gases into the atmosphere and increasing the temperature of surrounding the air, soil, and water. However, the heat island phenomenon after mining has been rarely studied. The authors of the text focused on improving and developing a methodology for remote detection and monitoring of heat islands. The study used open satellite data from the Landsat program, which allowed for geospatial analysis on a time scale to identify post-mining hot spots. Such studies are particularly important in heavily industrialized regions. Their results can help identify places particularly at risk.

As you can see, the topics covered in the articles in this Research Topic are very diverse, but each of these texts discusses environmental threats to the modern world. These threats are being studied by women researchers in many research centers. Let's hope that the research results obtained will allow for the development of methods to counteract threats to the environment.

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Conflict of interest

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