soil systems

Editorial

Contemporary Applications of Geostatistics to Soil Studies

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This Special Issue presents carefully selected examples of Contemporary Applications of Geostatistics to Soil Studies. Therefore, it is worth briefly considering what factors determine the current state of these applications. Although it would be impossible, due to the diversity of the topics, to discuss them fully and systematically, I would like to share the experiences and subjective observations that I acquired while editing this Special Issue. Geostatistics emerged in the twentieth century from statistical methods, geological research, mining practice, and atmospheric research [1–4]. Its applications gradually began to cover other fields, such as environmental research [5–14], including soil applications [15–19], various economic and technical applications, and even social and medical ones. Modern applications of geostatistics in soil research largely depend on the degree of development of geostatistical methods, which has continued to be very rapid over the last few decades. From the early works of Krige and Matheron [1,2] to modern times, enormous theoretical progress has been made in geostatistics. Non-stationary methods have been developed, including non-linear, multi-dimensional, multi-point, space–time geostatistics, advanced methods based on kriging, which celebrated its fiftieth anniversary not so long ago, etc. Even at the end of the twentieth century, it was difficult to imagine the current state of development of geostatistics, including space–time geostatistics, methods based on random fields, and stochastic partial differential equations, as a fusion of geostatistics and methods related to artificial intelligence [8,11–13,19–23]. However, theoretical progress in geostatistical methods is not the main factor determining the applications of this field in soil research. The level of statistical and geostatistical knowledge of pedologists, including practitioners performing soil measurements, is also an important factor. It can be quite diverse, and the proper planning and quality of measurements ultimately affect the quality of geostatistical analyses. It is worth emphasizing that rich countries have strong scientific or government statistical centers with the ability to perform advanced geostatistical calculations. In poorer countries, such possibilities are limited, and geostatistical analyses are carried out by much smaller research teams. It is also worth mentioning the issue of geostatistical software availability, which is an important factor in enabling soil research using geostatistical methods. Access to good commercial geostatistical software is not a universal privilege, but this is supported by creators and suppliers of free or open-source programs for soil research, including specialized packages, e.g., in R software [24]. Although geostatistics is not always taught in university departments dealing with soil or environmental research, it has found a permanent place in soil research. The above considerations are fully confirmed by the content of this Special Issue, which, as you can see, presents various advanced applications of geostatistical methods in soil research. These studies were conducted on four continents, namely Africa (two articles), South America, North America, and Asia, in five countries: Algeria, Canada (two articles), Chile, Morocco, and Russia. The topics covered are diverse and interesting, namely Assessing Soil Prediction Distributions for Forest Management Using Digital Soil Mapping, Surface Formations Salinity Survey in an Estuarine Area of Northern Morocco, by Crossing Satellite Imagery, Discriminant Analysis, and Machine Learning, Spatial Variability of Soil Erodibility at the Rhirane Catchment Using Geostatistical Analysis, Proximal, and Remote Sensing Data Integration to Assess Spatial Soil

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Citation: Zawadzki, J. Contemporary Applications of Geostatistics to Soil Studies. *Soil Syst.* **2024**, *8*, 70. https://doi.org/10.3390/soilsystems8030070

Received: 28 May 2024
Accepted: 20 June 2024
Published: 24 June 2024

Heterogeneity in Wild Blueberry Fields, Evaluation and Spatial Variability of Cryogenic Soil Properties (Yamal-Nenets Autonomous District, Russia), Tillage Management Impacts on Soil Phosphorus Variability under Maize–Soybean Rotation in Eastern Canada. It would be difficult and insignificant to discuss each article separately. Those interested in the articles above are referred to the List of Contributions below. However, it is worth noting that the articles published in this Special Issue are dominated by modern issues related to the integration of soil data with other types of measurements, and geostatistical methods are used together with other advanced research methods. The presented research uses various measurement equipment and geostatistical programs. It can be concluded that this relatively small Special Issue contains a surprisingly large spectrum of information on contemporary applications of geostatistics in soil research. In my opinion, the role of geostatistical methods in soil research, due to their advantages and further development, will continue in the foreseeable future, and this Special Issue contributes to that.

Acknowledgments: As Guest Editor of the Special Issue "Contemporary Applications of Geostatistics to Soil Studies", I would like to express my deep appreciation to all the authors whose valuable work was published in this issue.

Conflicts of Interest: The author declares no conflicts of interest.

List of Contributions:

1. Gavilán-Acuna, G.; Coops, N.C.; Olmedo, G.F.; Tompalski, P.; Roeser, D.; Varhola, A. Assessing Soil Prediction Distributions for Forest Management Using Digital Soil Mapping. *Soil Syst.* **2024**, *8*, 55. https://doi.org/10.3390/soilsystems8020055.
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