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Prespective

Geostatistical Approach to Construct Spatial Coastal-Flooding Models

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DESCRIPTION

This article aims to propose new strategies for building spatial coastal flood models based on records of flood sites and the ecological and anthropogenic characteristics of the area. Intensifying flood events and the management of highly vulnerable ecosystems in urban coastal areas have become global issues and have been the subject of several studies over the last few decades. The combination of statistical modeling techniques and spatial analysis is becoming increasingly important in the integrated management of natural disasters. The combined approach represents a promising strategy for reducing complexity and providing a complete analysis of the system. However, to apply planning and risk management alternatives in coastal cities, the causal relationship between the distribution of environmental and anthropogenic factors and floodplains needs to be fully clarified. Therefore, this new strategy was named MEIC (Modelo Espacial de Inundacao Costeira Spatial Coastal Flooding Models) and developed a flood model based on the relationship between the spatial distribution of flood points and environmental and anthropogenic characteristics.

This strategy was designed to combine simple yet robust statistical methods to combine geospatial data sourced from free and easily accessible online databases. Geostatistical strategies have been applied in coastal cities where high environmental vulnerabilities and constant flooding are observed. This strategy shows that the relationship between ecological and anthropogenic variables and flood events is not uniform throughout space. The results show that by including other influential factors, the strategy is easily reproducible and sophisticated, achieving excellent accuracy in representing and describing coastal flood events. In general, this strategy provides information that can support government decisions related to integrated urban planning and coastal flood risk mitigation. Possibility of proposed strategies for spatially modeling coastal flood outbreaks using information available in free and easily accessible online databases. In addition, the combination of statistical methods and spatial analysis is very useful in explaining the relationship between the spatial distribution of flood points and the hydrological, topographical, geological, and anthropic features present at each site. It has been shown to be suitable for. As expected, the limitations in modeling any of the three areas are likely due to the influence of external factors, and it is not possible to identify a consistent and direct relationship, only some trends. Hereby, in addition to the main function of the MEIC strategy, you can also obtain valuable information by analyzing the distribution of each influential class within a subregion. If higher quality input data is not available (for example, improved accuracy and spatial resolution), you can improve the impactor data, including on-site validation of the information. Another relevant feature to consider improving the performance and accuracy of the strategy is to consider soil moisture conditions, including cumulative rainfall few days ago. The general consequences of applying the strategy are to improve the understanding of the factors that influence the spatial distribution of flood points and provide direct information that allows easy comparison between different sub-regions. The latest and most interesting result of this study is that the relationship between environment variables, anthropogenic variables and flood events is not spatially uniform.

This strategy has achieved the proposed objectives, demonstrated the robustness and effectiveness of the application, and has emerged as a potential approach for planning, development, and integrated management of urban coastal environments. This strategy is to aid in the search for socially and economically viable solutions that consider the limited resources associated with decision making and safeguard selection, and the adaptation of previously built infrastructure, can be adopted by both public managers and academics. This paper emphasizes a strategy based on socio-hydrological principles that considers the population as an important part of the system that contributes to the observation, understanding, and dissemination of phenomena in the real world of the landscape in which the real people live. Hydrology improves by reconstructing and studying the past, supplementing temporal and spatial analysis in human databases (social realms), and making significant contributions primarily in the event of conventional systems failure.

For future research, and to further leverage the diversity of MEIC strategies, research efforts can focus on including other influential factors such as local subsidence and the process of coastal erosion. In addition, the geostatistical approach presented in this study can be reproduced in other developing countries, where accurate information is lacking and financial resources for urban planning and management are limited.

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