

Spatial Dynamic Modeling of Tropical Forest Change and the Relevant Spatiotemporal Analysis

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The main objective of my research is to understand and analyze the spatial and temporal features of LUCC in the context of tropical forest change, and how given political, natural, and biophysical factors can drive its spatial and temporal features. By using a suite of GIS, RS, spatial analysis techniques, and spatial dynamic tools, this research will contribute to filling important knowledge gaps in contemporary research aimed to understand tropical forest dynamics. This understanding will be used to re-produce, simulate, and forecast dynamic scenarios of tropical forests change in the Guanacaste Region, Costa Rica.

The first goal of my research is to analyze the spatiotemporal disparities of tropical forest change in the Guanacaste Region in the past 36 years (1979-2015) and to explore the spatiotemporal features of forest change, which are including the spatiotemporal characteristics and spatiotemporal interactions. The second goal is to detect the geographical factors, which drove the forest change in the past 36 years, by using the method of the geographical detector. This part also considers the impacts of spatial features which are explored in the first part. The third goal is to use spatial dynamic models (a combination of Cellular Automata model and Agent-Based model, short for CA-model and AB-model) to simulate future scenarios of tropical forest in the Guanacaste region, Costa Rica. It is a multi-layer model, including three layers. The top one is CA-model layer, and it is used for simulating tropical forest change and transmitting this change over time. The middle layer is AB-model layer. The factors in this part are non-spatial data (e.g., policy, population and economy). The bottom layer is a constraint layer. It expresses how the geographical factors constrain and impact on forest change. I aim to obtain the following results: i) evolution of the tropical forest n during the past 36 years, ii) a multi-layer model used to reproduce the process of tropical forest change, and iii) future scenarios of forest change simulated by the model.

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