

研究论文

快速城市化地区生态质量退降的自组织临界性——以深圳市南山区为例

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摘要 弄清快速城市化地区生态退降过程的机制, 可以为相关景观动态模型建设和调控策略选择创造有利条件。借助于自组织临界性理论和方法, 在基于多时段遥感影像数据的景观分类和生态质量制图结果支持下, 以深圳市南山区为例进行了快速城市化地区生态质量退降的自组织临界性研究, 以期揭示城市化过程与生态质量退降过程的响应关系和生态质量退降的过程特点。结果表明, 工作区内建设用地扩张过程和生态质量退降过程均具有典型的自组织临界性特点; 区域生态质量退降主要是由建设用地扩张导致3种不同生态质量区域之间发生的3种主要生态质量退降过程造成的; 建设用地扩张和3种主要生态退降过程的动态分形指数都呈现出不断增加的趋势; 具有自组织临界特征的建设用地扩张过程是同样具有自组织临界性特点的各种生态质量退降过程发生和发展的主要驱动力来源。

关键词 城市化; 生态退降; 自组织临界性(SOC); 分形; 深圳市

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Self-organizing criticality of ecological degradation in quickly urbanizing area: A case study in Nan Shan district, Shenzhen

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Abstract Ecological degeneration induced by urban sprawl is one of the most significant components of environmental change in rapidly urbanizing area, and its spatial-temporal complexity makes it analytically challenging to conduct empirical studies. This paper presents a case study in Nan Shan district, Shenzhen, from 1988 to 2003. Motivated by the theoretical insights of self-organizing criticality (SOC) this paper has three objectives: (1) To study the relationship between the process of urban sprawl and ecological degeneration; (2) the assessment of SOC in the processes of ecological degradation process; (3) The dynamic characteristics of ecological degradation. To relate urban sprawl and ecological degradation process, the study area is subdivided into three main categories based on land use types: Forest dominant area (F), Agricultural dominant area (A) and Build-up dominant area (B). We discovered that ecological degradation is composed of three main processes: Forest dominant area converted to Agricultural dominant area (FTA), Agricultural dominant area converted to Build-up dominant area (ATB) and Forest dominant area converted to Build-up dominant area (FTB). According to the size-frequency and "Power Law" distribution, their spatial and temporal fractal characteristics were verified. The following are the main conclusions of this paper: (1) Urban sprawl and three main ecological degradation spatial and dynamic size-frequency distribution follow "Power Law", these processes are all in SOC state. (2) Urban sprawl is the driving force for ecological degeneration aiming three major types of land use; their dynamic fractal indices have the same trend. (3) The increase of the dynamic fractal indices of urban sprawl and ecological degradation indicate the process of transformation from large to small patches.

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