

亚热带红壤丘陵区典型景观单元土壤养分的空间变异

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Spatial variability of soil nutrition in the typical landscape unit of red soil hilly in subtropical region

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摘要

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摘要 基于区域化变量理论和地理信息系统的空间分析功能,应用地统计学的半变异函数定量分析了亚热带红壤丘陵区典型景观单元土壤养分的空间异质性特征。结果表明,土壤有机碳和全磷的理论模型为球状模型、全氮为高斯模型、土壤pH为指数模型。在60m步长间隔尺度下,土壤有机碳、全氮和pH有强烈的空间相关性,土壤全磷空间相关性为中等程度。4种土壤养分的空间自相关范围具有明显的差异,有机碳的有效变程最大(为261m),全氮(208m)和pH(156m)次之,全磷的有效变程最小(133m)。其空间自相关范围的差异由本身的养分、土地利用格局、地形和人为管理措施等因素所决定。在GIS支持下,采用Kriging插值方法,分析景观单元内土壤养分的空间分布格局看出,土壤有机碳和全氮含量呈现出明显的条带状和斑块状的梯度变化,并表现出极为相似的空间分布格局;土壤全磷的空间分布随机性强,斑块变得更加琐碎并呈现镶嵌的“星空”状分布;土壤pH的空间分布格局处于三者之间,没有表现出明显的条带状分布。总体上说,基于整个景观尺度的4种土壤养分的半方差拟合效果优于不同土地利用类型的拟合效果。

关键词: 土壤养分 空间变异性 GIS 景观单元 亚热带 土壤养分 空间变异性 GIS 景观单元 亚热带

Abstract: Based on regionalized variable theory and spatial analysis functions of GIS, spatial heterogeneity of soil properties in the typical landscape ecological units of subtropical region was studied using semivariogram of geostatistics in this paper. The results showed that theoretical semivariogram models of soil organic carbon, and soil total P were spherical one, the best model for semivariograms of soil total N was gaussian model and that of pH was exponential model. Soil (organic) carbon, soil total N, and pH belonged to high and soil total P belonged to medium degree spatial correlation at 60m lag intervals, respectively. However, there were significant differences in ranges of spatial autocorrelation among four soil properties, among which the effective range of soil organic carbon was the highest (261m), followed with soil total N (208m), pH (156m), and soil total P (133m). The differences in their ranges of spatial autocorrelation were dependent on their properties, land use pattern, topography and man-made factors. Kriging method, under the support of GIS, was applied to analyze the spatial distribution of these four soil properties. The results indicated that spatial distribution (patterns) of organic carbon and soil total N were similar appearing an apparent belt-shaped and spot massive gradient change, while that of soil total P was strong random distributed and its patches were more trivial showing a "star-studded" pattern. Spatial distribution pattern of soil pH did not show a distinctive strip belt-shaped distribution. In general, the fitting results using semivariograms of four soil properties at the scale of whole landscape scales were better than that at the scale of different land use types.

Keywords:

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