

基于小波变换的土壤有机碳与其影响因子多尺度相关分析

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Multi-scale correlation analysis of soil organic carbon with its influence factors using wavelet transform.

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摘要

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摘要

基于GIS,采用小波变换和相关分析方法,以广东山区表层(0~20 cm)土壤有机碳密度及其影响因子(包括归一化植被指数NDVI、海拔、坡度和坡向)作为分析对象,选取4条样带,使用一维离散小波变换对分析对象进行多尺度分解,在栅格尺度上定量分析土壤有机碳密度与其影响因子相关关系的多尺度响应特征.结果表明:研究区土壤有机碳密度与其影响因子具有不同程度的尺度相关性.NDVI在2、8和16 km尺度、海拔在8和16 km尺度下的控制作用最强;坡度的控制作用极弱,尺度相关性不显著;坡向在大于2 km尺度表现为随尺度增加而增大的负相关作用.不同样带的土壤有机碳密度受不同影响因子的制约,NDVI和海拔是影响广东山区土壤有机碳密度分布的主要因子,坡度和坡向仅在个别样带、较大尺度上起作用.

关键词: 土壤有机碳 小波变换 尺度相关 偏相关系数 广东山区

Abstract:

Based on GIS, this paper chose the soil organic carbon (SOC) density in soil surface layer (0-20 cm) and its influence factors (NDVI, elevation, slope and aspect) as research objects, one-dimensional discrete wavelet transform (DWT) was used as the multi-scale decomposition tool to quantitatively revealed the multi-scale correlation relationships among SOC density and its influence factors on the grid scale along 4 transects of the mountainous area of Guangdong Pro-vice. The results showed that the correlation among SOC density and its influence factors was scale-dependent with varying degree. The influence of NDVI was strongest at the scales of 2, 8 and 16 km, while elevation showed its greatest influence at the scales of 8 and 16 km. The control action of slope was rather weak, with a less significant correlation depending on scale. The negative effect of aspect became stronger with increasing scale at >2 km scale. The SOC density of the different transects was affected by various factors, of which NDVI and elevation were the main factors, and slope and aspect only reacted with individual transects at larger scales.

Key words: soil organic carbon wavelet transform multi-scale correlation partial correlation coefficient mountainous area of Guangdong Province.

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