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Warming Effects on Topsoil Organic Carbon and C:N:P Stoichiometry in a Subtropical Forested Landscape

编号	010022204
推送时间	20200120
研究领域	森林生态
年份	2020
类型	期刊
语种	英语
标题	Warming Effects on Topsoil Organic Carbon and C:N:P Stoichiometry in a Subtropical Forested Landscape
来源期刊	Forest
期	第222期
发表时间	20200106
关键词	climate change; forest ecosystem; stoichiometric ratio; warming index; inverse elevational gradient; warming gradient;
摘要	Warming effects on agricultural and forest ecosystems have been well documented at broad spatiotemporal scales but less so at stand and landscape scales. To detect the changes in soil organic carbon (SOC) and carbon:nitogen:phosphorus (C:N:P) stoichiometry in response to a short-range warming gradient, we defined an inverse elevation-dependent warming gradient and developed a novel index of warming based on a common environmental lapse rate. We associated the warming gradient and warming index with the changes in SOC and C:N:P stoichiometry and tested the independence of warming effects using partial correlation analysis. SOC content and C:N:P stoichiometric ratios significantly decreased with warming, and the effect of warming on C:N:P stoichiometric ratios were stronger than on SOC content. The relationships of SOC content and C:N:P stoichiometric ratios with warming did not change after controlling for two other energy-related variables, i.e., transmitted total radiation and potential direct incident radiation. However, the strength in the relationships of C:N:P stoichiometric ratios with vegetation-related variables significantly decreased after the warming index was controlled for. As indicated by the random forest regression model, the warming index was the most important variable for predicting SOC variability and the second most important for predicting total N variability, while vegetation-related variables were the most important for predicting C:N:P stoichiometric ratios. Our results showed that warming was responsible for the decrease in SOC content and C:N:P stoichiometric ratios and the warming index was the most important variable for predicting SOC variability. Although the most important variables for C:N:P stoichiometric ratios were related to vegetation, the relationships between C:N:P stoichiometric ratios and vegetation-related variables were significantly affected by warming. These findings demonstrate that warming is the major driver of SOC variability and the decrease in SOC content, as well as of C:N:P stoichiometry, even along a short-range warming gradient.
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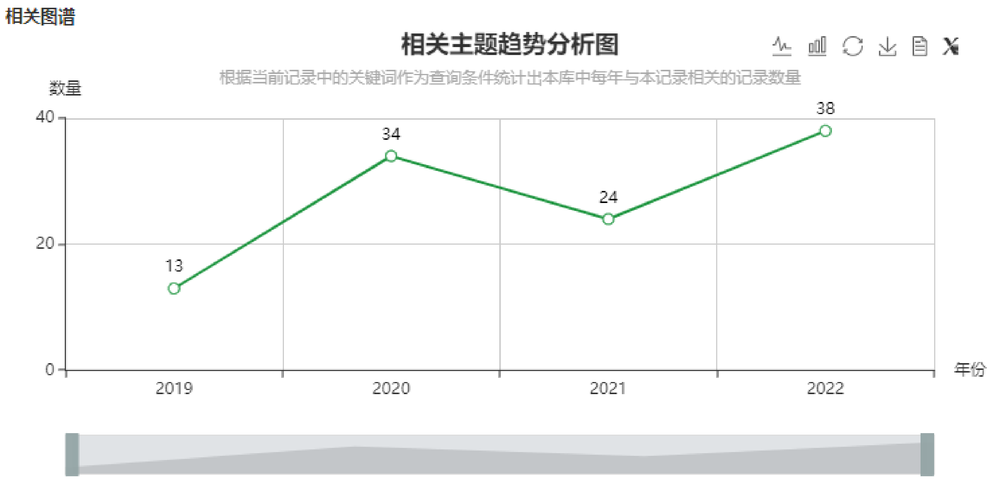

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