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研究报告

天目山柳杉树轮$\delta^{13}C$年序列差异

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摘要

对天目山3株柳杉树轮$\delta^{13}C$年序列分别进行了测定,分析了柳杉树轮$\delta^{13}C$年序列变化的异同及其原因.结果表明,在1837～1982年的共同时段，3个树轮$\delta^{13}C$年序列彼此间相关系数为：r_{12}=0.47，r_{13}=0.65，r_{23}=0.52 (n=146)，都通过了显著性水平α=0.001的信度检验.用多项式拟合法去除原$\delta^{13}C$年序列中的高频变化后，所得3个低频序列间高度正相关；原$\delta^{13}C$年序列与拟合序列的差值序列即高频序列间也显著正相关，相关系数均达到0.79～0.99,说明气候因素引起树轮$\delta^{13}C$年序列的高频变化及大气CO_2浓度引起的低频变化对不同的柳杉个体是共同的.3株树轮$\delta^{13}C$年序列间的差异主要是树木立地处局部环境条件的不同所造成的,但是局部环境条件所引起的树轮$\delta^{13}C$年序列间的个性差异对其共性变化影响较小.所以，3个树轮$\delta^{13}C$年序列间的个性差异,并不影响树轮$\delta^{13}C$年作为气候变化研究代用资料的适宜性及重建历史气候结果的可靠性与一致性.

关键词 天目山 树轮 $\delta^{13}C$

分类号

扩展功能

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Differences of $\delta^{13}C$ annual series among报*Cryptomeria fortunei* tree rings at Tianmu Mountain

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Abstract

This paper determined the $\delta^{13}C$ annual series of three *Cryptomeria fortunei* tree rings at West Tianmu Mountain,and analyzed their similarities and differences.In the period of 1837～1982,the correlations among the three $\delta^{13}C$ series were significant,with r_{12}=0.47,r_{13}=0.65 and r_{23}=0.52 (P<0.001,n=146),respectively.After removing the high-frequencies from the original $\delta^{13}C$ series by using polynomial function model,a significant correlation was observed among three low-frequencies,with the correlation coefficient varied from 0.95 to 0.998.A significant correlation was also observed between original low-frequencies and simulated high-frequencies,with the correlation coefficient being 0.79～0.84.The three $\delta^{13}C$ annual series had similar high-frequency and low-frequency variations.High-frequency variation recorded similar climate variation information,while low-frequency reflected the information of atmospheric CO_2 changes.It was the common case for different individuals of trees that in the

three $\delta^{13}C$ annual series,climatic factors caused high frequency change,while atmospheric CO_2 concentration caused low-frequency variation.The differences among the three $\delta^{13}C$ annual series were mainly caused by the local environmental conditions at the growth sites of trees,while the individual difference among the three $\delta^{13}C$ series caused by local environmental conditions had very small effects on the changes of the three $\delta^{13}C$ series.It could be concluded that the differences among the three $\delta^{13}C$ series did not affect the suitability of using tree ring's $\delta^{13}C$ annual series as the indirect evidence in climatic variation study,and the reliability and coherence of reconstructing historical climate changes.

Key words Tianmu Mountain Tree ring $\delta^{13}C$

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