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近 144 年来秦岭太白山林线区 3—6 月平均气温的重建

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摘要:秦岭太白山林线植被因海拔较高且受人为扰动较轻,对气候变化的响应尤为敏感,为获取过去气候变化信息提供了可靠代用资源。然而,结合树木年代学方法及 Arcgis 空间插值功能进行秦岭林线气候变化重建的工作至今仍处于空白。利用采自太白山林线地带太白红杉(*Larix chinensis*)所建立的树轮宽度资料,与提取自太白山保护区气温栅格数据中的采样点位置气象数据进行相关分析。结果表明,太白红杉与 3—6 月平均气温相关性最显著,采用线性回归建立了两者的拟合模型,剔除重建方程中的 1997、1998 年之后,方差解释量达 57.2%(调整自由度后为 55.5%);重建气温序列显示偏冷时段平均跨度(16 年)较偏暖时段平均跨度(10.8 年)长,偏冷时段有:1870—1881 年、1903—1918 年和 1977—1996 年;偏暖的时段有:1882—1892 年、1919—1929 年和 1997—2013 年;在 1931—1978 年这一时期,气温相对稳定,1988 年之后升温强烈;周期分析显示近 144 年以来 3—6 月气温存在 22—31 a,18—22 a 以及 10—13 a 的 3 个振荡周期,可能与大尺度气候驱动及太阳活动存在联系。以上结果均得到历史记录以及周边重建结果的支持。

关键词:秦岭;林线;太白红杉;树轮宽度;气温插值;气候重建

Reconstruction of March-June mean air temperature along the timberline of Mount Taibai, Qinling mountains, northwest China, over the last 144 years

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Abstract: Since the vegetation of the timberline area at Mount Taibai in the Qinling mountains is of high elevation and rarely disturbed by anthropogenic activities, it is sensitive to climate change, thereby providing a proxy resource of past climate change information. However, to date, there have been no investigations that have integrated dendrochronological methods with Arcgis spatial analysis techniques to reconstruct the past climate change at specific elevations and locations. Herein, we presented a reconstruction based on extracted meteorological data from spatial interpolation and *Larix chinensis* tree ring widths. Climate growth response analysis revealed that the air temperature, particularly from March to June, was the principle factor that limited the radial growth of *L. chinensis* . By using dendrochronology techniques, we obtained a reconstruction of the March to June mean air temperature for the timberline of Mount Taibai over the period from 1870 to 2013. The reconstruction captured 57.2% of the temperature variance(55.5% after the degree of freedom is adjusted) after removing the tree—ring width values of 1997 and 1998 during the calibration periods. On the decadal scale, the pattern of cool-warm fluctuations exhibited frequent repetitive features., On average, the cold periods (16 years) always persist longer than the warm periods(10.8 years).The years 1870—1881, 1903—1918, and 1977—1996 were colder periods, whereas the years 1882—1892, 1919—1929, 1950—960, and 1997—2013 were relatively warmer. The temperature variations

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