

同属不同种桦树径向生长对气候变化响应的异同

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摘要:【目的】白桦(*Betula platyphylla*)和枫桦(*Betula costata*)是东北森林中重要的两种阔叶树种,但二者的生长对气候变暖和干旱的反应尚不完全清楚。探讨小兴安岭地区阔叶红松(*Pinus koraiensis*)林内白桦和伴生种枫桦生长对气候变化响应异同具有重要意义。【方法】选取伊春市五营林场中海拔高度相近且长势良好的白桦和枫桦,采用树木年轮学的方法研究了两种桦树径向生长与气候的关系。【结果】2个树种径向生长与气候关系既存在相似性,又存在差异。前一年5月-前一年11月的水分条件(月降水、相对湿度、SPEI)对白桦和枫桦当年的径向生长具有“滞后效应”。枫桦生长与前一年9-10月降水和SPEI、前一年10月相对湿度显著正相关,体现了枫桦径向生长主要受9-10月干旱的限制。白桦径向生长与前一年6月、当年5-6月及夏季最低温度显著正相关,因此白桦生长主要受前一年和当年5-6月最低温度的限制。干旱后(annualSPEI-12)白桦恢复生长的速度较枫桦快。1980年以来,随着气温升高和干旱加剧,白桦与SPEI呈显著正相关关系,且随时间的推移相关性增强。但在1980年前后,枫桦生长与SPEI的相关关系未发生明显改变。【结论】我们的发现表明若未来气候变暖持续或加剧,白桦生长可能率先发生衰退,随后枫桦的健康状况也将下降。研究结果对于理解气候变化下同属桦树种间的动态变化具有重要的参考意义。

关键词: 树轮; 白桦; 枫桦; 气候响应; 极端干旱

Differences and similarities of radial growth responses of *Betula* species in the same genus to climate change

Abstract: 【Objective】 *Betula platyphylla* and *Betula costata* are two important broadleaved tree species in temperate forests, but how their growth responds to warming and drought is not completely clear. 【Method】 We collected 122 core samples of *B. platyphylla* and *B. costata* in Yichun, China, and used dendrochronology methods to study how the two birches respond to and adapt to climate change recently. 【Result】 We discovered that there were both similarities and differences in the relationship between radial growth and climate for both tree species. The moisture conditions from May to November of the previous year had a "hysteresis effect" on the tree ring of two species. *B. costata* radial growth was significantly positively correlated with SPEI and precipitation from September to October of the previous year and relative humidity in October of the previous year, which indicated that the growth of *B. costata* was mainly restricted by the drought from September to October. However, the radial growth of *B. platyphylla* was significantly positively correlated with the minimum temperature in June of the previous year, May to June, and summer, so the growth of *B. platyphylla* was mainly limited by the minimum temperature in May-June of the previous year and the current year. After drought (annualSPEI-12), the growth of *B. platyphylla* recovered faster than that of *B. costata*. When the temperature increased and drought intensified since 1980, the correlation between *B. platyphylla* and monthly SPEI became significantly positive and strengthened over time. But around 1980, there was no obvious change in the correlation between *B. costata* growth and monthly SPEI. 【Conclusion】 Our findings suggest that if the warming continues or intensifies, the growth of *B. platyphylla* may decline first, followed by *B. costata* health. The results of this research may help us understand the dynamics of birch species within the same genus under climate change.

Keywords: tree rings; *Betula platyphylla*; *Betula costata*; climate response; extreme drought.