

新疆阿尔泰山森林火灾发生率与拉尼娜事件的联系

洪瑞成^{1,2}, 梁瀛¹, 王秋华², 马诚², 朱熙隆², 石春明³

(1. 新疆林业科学院森林生态研究所, 乌鲁木齐 830006; 2. 西南林业大学土木工程学院, 云南省森林灾害预警与控制重点实验室, 昆明 650224; 3. 北京师范大学全球变化与地球系统科学研究院, 北京 100875)

摘要: 【目的】气候变暖引起的干旱胁迫和厄尔尼诺造成的夏季降水不足是北方温带森林火灾频率和火灾面积增加的主要原因。本文将针对拉尼娜事件对阿尔泰山森林(西伯利亚北方森林向中国最南端的延伸)火灾的影响机制进行探讨。【方法】本文分析了阿尔泰山森林的火灾频率、火灾面积和气候数据, 探讨阿尔泰山森林火灾与厄尔尼诺—南方涛动(ENSO)的联系。通过计算火灾频率与湿度指标之间的 Pearson 相关系数, 并计算相关系数的显著性水平, 将厄尔尼诺和太平洋十年涛动(PDO)数据与夏季火灾频率相关联, 以确定遥相关的基本机制。【结果】夏季干旱程度和火灾发生率都与前一年的拉尼娜现象有显著相关性($p < 0.05$)。尽管气候变暖趋势明显, 但阿尔泰山林区湿度的增加在很大程度上抵消了气候变暖引起的干旱胁迫的影响, 导致过去几十年火灾频率增加的趋势不明显。自 20 世纪 80 年代以来, 阿尔泰山被火灾烧毁的林区面积大幅减少, 这也归因于自 1987 年以来大幅增加的防火投资和林火扑救能力的提升。【结论】干旱胁迫与阿尔泰山森林火灾发生之间存在显著联系, 阿尔泰山森林火灾的发生与拉尼娜现象存在遥相关, 而非厄尔尼诺现象。研究结果为阿尔泰山林区的森林火灾预测和预防提供了重要参考。

Linkage between forest fire incidence and La Niña events in the Altai Mountains, Xinjiang, China

Rui-Cheng Hong^{1,2}, Ying Liang¹, Qiu-Hua Wang², Cheng Ma², Xi-Long Zhu², Chun-Ming Shi³

(1. Institute of forestry ecology, Academic of forestry of Xinjiang Uygur Autonomous Region, Urumqi 830000 2. Yunnan Key Laboratory of Forest Disaster Warning and Control, College of Civil Engineering, Southwest Forestry University, Kunming 650224, China; 3. College of Global Change and Earth System Science, Beijing Normal University, Beijing 100875, China)

Abstract: 【Objective】 Drought stress due to climate warming and summer precipitation deficit due to El Niño are the main reasons for the increase in the frequency and area of forest fires in the northern temperate zone. This paper will address the mechanism of the impact of La Niña events on forest fires in the Altai Mountains (the extension of Siberian boreal forests to the southernmost part of China). 【Method】 In this paper, we analyzed the fire frequency, fire area and climatic data of Altai Mountain forests to explore the connection between Altai Mountain forest fires and the El Niño-Southern Oscillation (ENSO). El Niño and Pacific Decadal Oscillation (PDO) data were correlated with summer fire frequency by calculating the Pearson correlation coefficients between fire frequency and humidity indicators and the significance level of the correlation coefficients to determine the underlying mechanisms of the remote correlation. 【Result】 Both summer drought severity and fire frequency were significantly correlated with La Niña in the previous year ($p < 0.05$). Despite the clear warming trend, the increase

in humidity in the forested Altai Mountains largely counteracted the effects of warming-induced drought stress, resulting in an insignificant trend of increasing fire frequency in the past decades. Since the 1980s, the area of forest area burned by fire in the Altai Mountains has decreased significantly, which is also attributed to the significantly increased investment in fire prevention since 1987 and the improvement of forest fire fighting capacity.

【Conclusion】 There is a significant association between drought stress and the occurrence of forest fires in the Altai Mountains, and the occurrence of forest fires in the Altai Mountains is remotely related to La Niña rather than El Niño. The results of this study provide an important reference for the prediction and prevention of forest fires in the Altai Mountains.