ABSTRACT

Contributed poster presentation, US-AILE 2018 Annual Meeting

Forest Succession and Climate Variability Interacted to Control Fire Activity Over the Last Four Centuries in an Alaskan Boreal Forest

Tyler Hoecker[1] and Philip Higuera[2]
[1]University of Wisconsin-Madison, [2]University of Montana

The boreal forest biome is globally important for its influence on Earth's energy balance and its sensitivity to ongoing climate change. Structure and function in boreal forests is strongly shaped by fire activity, so anticipating the impacts of climate change requires understanding the precedence for, and consequences of, climatically induced changes in fire regimes. Long-term records of climate, fire, and vegetation are critical tools for gaining this understanding. To understand the relative importance of variability in climate and vegetation flammability as drivers of fire activity in boreal forests, we characterized the relationship among centennial-scale records of fire, climate and vegetation. We reconstructed the timing and pattern of fire activity in a boreal forest landscape in interior Alaska, USA using seven lake-sediment charcoal records spanning CE 1550-2015. We developed composite fire activity records and used correlation and qualitative comparisons to assess relationships with existing vegetation and climate records.

Biomass burning and fire frequency were higher over the past 50 years than during any other 50-year period in the record. Mean fire return intervals ranged from 50-125 years at individual sites, with a study-wide mean (SD) of 90 (60) years. Pulses in tree establishment occurred between periods of elevated fire activity, when biomass burning and fire frequency were relatively low.

Fire activity was facilitated by warm growing season temperatures combined with landscape-scale dominance of mature black spruce. The results support evidence that fire-vegetation feedbacks can regulate fire activity in high-severity regimes, and imply widespread burning at intermediate spatial scales (100's km2) is controlled by a combination of climate and vegetation dynamics that drive landscape flammability.