National Institute of Environmental Health Sciences

Constraints on global fire activity vary across a resource gradient

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Abstract:

We provide an empirical, global test of the varying constraints hypothesis, which predicts systematic heterogeneity in the relative importance of biomass resources to burn and atmospheric conditions suitable to burning (weather/climate) across a spatial gradient of long-term resource availability. Analyses were based on relationships between monthly global wildfire activity, soil moisture, and mid-tropospheric circulation data from 2001 to 2007, synthesized across a gradient of long-term averages in resources (net primary productivity), annual temperature, and terrestrial biome. We demonstrate support for the varying constraints hypothesis, showing that, while key biophysical factors must coincide for wildfires to occur, the relative influence of resources to burn and moisture/weather conditions on fire activity shows predictable spatial patterns. In areas where resources are always available for burning during the fire season, such as subtropical/tropical biomes with mid-high annual long-term net primary productivity, fuel moisture conditions exert their strongest constraint on fire activity. In areas where resources are more limiting or variable, such as deserts, xeric shrublands, or grasslands/savannas, fuel moisture has a diminished constraint on wildfire, and metrics indicating availability of burnable fuels produced during the antecedent wet growing seasons reflect a more pronounced constraint on wildfire. This macro-scaled evidence for spatially varying constraints provides a synthesis with studies performed at local and regional scales, enhances our understanding of fire as a global process, and indicates how sensitivity to future changes in temperature and precipitation may differ across the world.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event

Extreme Weather Event: Wildfires

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content