

Simulating soil carbon dynamics in Alaskan terrestrial ecosystems

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A large amount of soil organic carbon (SOC) is stored in high-latitude boreal permafrost regions, accounting for twice as much as is in the atmosphere at present. In those regions, climate warming has often caused disturbances that may accelerate the rate of permafrost thaw and change SOC dynamics in both organic and mineral soils. In this study, we used a soil carbon dynamics model named Physical and Biogeochemical Soil Dynamics Model to examine how climate-induced disturbances could change SOC pools in the boreal forest and tundra terrestrial ecosystems in Alaska, especially focusing on the effect of fire disturbances on the permafrost soil layers. The results showed that the fire disturbance would reduce SOC stores substantially associated with the fire-induced thawing of permafrost. It is suggested that the vulnerability of the SOC stocks in the boreal region as affected by future warming is closely linked to the sensitivity of permafrost to wildfire disturbance.