Geophysical Research Abstracts
Vol. 20, EGU2018-8399, 2018
EGU General Assembly 2018

Extreme wildfire exposes remnant peat carbon stocks to increased post-fire drying

Nicholas Kettridge (1), Max Lukenbach (2), Kelly Hokanson (2), Chris Hopkinson (3), Kevin Devito (2), Rich Petrone (4), Carl Mendoza (2), and James Michael Waddington (5)

(1) University of Birmingham, Birmingham, United Kingdom (n.kettridge@bham.ac.uk), (2) University of Alberta, Alberta, Canada, (3) University of Lethbridge, Alberta, Canada, , (4) University of Waterloo, Ontario, Canada, (5) McMaster University, Ontario, Canada

Boreal peatlands may be vulnerable to projected changes in the wildfire regime under future climates. Extreme drying during the sensitive post-fire period may exceed peatland ecohydrological resilience, triggering long-term degradation of these globally significant carbon stocks. Despite these concerns, we show low peatland evapotranspiration at both the plot and landscape scale post-fire, in water-limited peatlands dominated by feather moss that are ubiquitous across continental western Canada. Low post-fire evapotranspiration enhances the resilience of carbon stocks in such peatlands to wildfire disturbance and reinforces their function as a regional source of water. Near-surface water repellency may provide an important, previously unexplored, regulator of peatland evapotranspiration that can induce low evapotranspiration in the initial post-fire years by restricting the supply of water to the peat surface. However, extreme future wildfires may exceed this feedback response and instead enhanced drying under future climates and induce instability in peatland carbon stocks. We show that extreme burn severities increased post-fire evapotranspiration by 410% within a feather moss peatland. The fire burned through the protective capping layer that restricts evaporative drying in response to traditional burns. Extreme wildfires projected under future climates will therefore leave peatlands that dominate dry sub-humid regions across the boreal, on the edge of their climatic envelopes, unprotected and more vulnerable to intense post-fire drying, inducing high rates of carbon loss to the atmosphere that amplify direct combustion emissions.