Geophysical Research Abstracts
Vol. 21, EGU2019-12591, 2019
EGU General Assembly 2019

Peatland heterogeneity and its control on spatiotemporal complexities in peat surface temperature

Rhoswen Leonard (1), Paul Moore (2), Stefan Krause (1), Kevin Devito (3), Richard Petrone (4), Carl Mendoza (5), James Waddington (2), and Nick Kettridge (1)

(1) School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK, (2) School of Geography and Earth Sciences, McMaster University, Hamilton, ON, Canada, L8S 4K1, (3) Department of Biological Sciences, University of Alberta, Edmonton, AB, Canada, T6G 2E9, (4) Department of Geography and Environmental Management, University of Waterloo, Waterloo, ON, Canada, N2L 3G1., (5) Department of Earth and Atmospheric Science, University of Alberta, Edmonton, AB, Canada, T6G 2E3

Surface temperatures drive non-linear terrestrial biogeochemical, ecohydrological, and micrometeorological processes within carbon rich peatland landscapes.
Such surface temperatures show small scale spatiotemporal complexities that underpin larger scale ecosystem function, with thermal hot spots and hot moments being observed across peatland ecosystems that shift in space and time in responds to perturbation.
However, the role of that individual layers of peatland heterogeneity (tree canopy and sub-canopy, subsurface ice-layers, ground cover vegetation and micro topography), and the interaction of layers, play in driving such peat thermal complexity is unknown.
We utilise a recently produced surface temperature dataset of unprecedented spatio-temporal resolution (1.9 million temperature measurements over 10 m2), to critically and rigorously assess the spatio-temporal thermal regime simulated by a newly advanced Boreal Ecohydrology Tree Algorithm (BETA+) model.
This model simulates the peatland thermal behaviour in three dimensions within the forested boreal peatland. We apply the evaluated model to assess not only the influence of individual ecosystem structural layers on surface temperature distributions but how all possible combinations of these heterogeneous layers influence peat-surface thermal regimes.
The simulations of peat temperature using different combinations of heterogenous layers allows us to determine how ecosystem layers may simplify or complicate surface thermal patterns and promote or dampen temperature extremes.
We found that system layers of heterogeneity have varying influences over the promotion or dampening of temperature extremes with likely co-dependence in the observed system layers of heterogeneity. Critically, the results show that changes in the spatio-temporal dynamics may occur without significant changes in median temperatures. Our study provides important insight into spatial and temporal variability in temperature driven peatland processes and highlights key considerations for future research.