Geophysical Research Abstracts
Vol. 19, EGU2017-8532, 2017
EGU General Assembly 2017

Hydrological resiliency in the Western Boreal Plains: classification of hydrological responses using wavelet analysis to assess landscape resilience

Samantha Probert (1), Nicholas Kettridge (1), Kevin Devito (2), David Hannah (1), and Geoff Parkin (3)

(1) School of Geography, Earth and Environmental Science, University of Birmingham, Birmingham, United Kingdom (sxp298@student.bham.ac.uk), (2) Department of Biological Sciences, University of Alberta, Edmonton, Canada (kdevito@ualberta.ca), (3) 3. School of Civil Engineering and Geosciences, Newcastle University, Newcastle upon Tyne, United Kingdom (geoff.parkin@newcastle.ac.uk)

The Boreal represents a system of substantial resilience to climate change, with minimal ecological change over the past 6000 years. However, unprecedented climatic warming, coupled with catchment disturbances could exceed thresholds of hydrological function in the Western Boreal Plains. Knowledge of ecohydrological and climatic feedbacks that shape the resilience of boreal forests has advanced significantly in recent years, but this knowledge is yet to be applied and understood at landscape scales. Hydrological modelling at the landscape scale is challenging in the WBP due to diverse, non-topographically driven hydrology across the mosaic of terrestrial and aquatic ecosystems. This study functionally divides the geologic and ecological components of the landscape into Hydrologic Response Areas (HRAs) and wetland, forestland, interface and pond Hydrologic Units (HUs) to accurately characterise water storage and infer transmission at multiple spatial and temporal scales. Wavelet analysis is applied to pond and groundwater levels to describe the patterns of water storage in response to climate signals; to isolate dominant controls on hydrological responses and to assess the relative importance of physical controls between wet and dry climates. This identifies which components of the landscape exhibit greater magnitude and frequency of variability to wetting and drying trends, further to testing the hierarchical framework for hydrological storage controls of: climate, bedrock geology, surficial geology, soil, vegetation, and topography. Classifying HRA and HU hydrological function is essential to understand and predict water storage and redistribution through drought cycles and wet periods. This work recognises which landscape components are most sensitive under climate change and disturbance and also creates scope for hydrological resiliency research in Boreal systems by recognising critical landscape components and their role in landscape collapse or catastrophic shift in ecosystem function under future climatic scenarios.