B01: Soil carbon as a predictor of soil, plant and atmospheric variables on multiple scales

Conveners: Hida Manns[1], and Maren Oelbermann[2]

Co-chairs: Hida Manns[1], and Maren Oelbermann[2]

[1] Trent School of the Environment, Trent University, Peterborough, ON, V6T 2P6
Phone: 905 983-8149 , E-mail: hmanns@trentu.ca
[2] School of the Environment, Resources and Sustainability, University of Waterloo, 200 University Ave W., Waterloo, ON, N2L 3G1 Phone: 519-888-4567 x 37552,
E-mail: moelbermann@uwaterloo.ca

Session Description

A single stable predictor of ecosystem parameters is most significant in the age of digital data. The ability to chart variables that change little over time can be used to predict average values of more variable measurements such as hydraulic conductivity, soil moisture, stream sedimentation, plant transpiration and leaf area. Additionally, a high correlation between primary soil variables suggests we can use global satellite estimates of soil moisture to develop regional and global carbon balances. Progress in remote sensing of soil variables is now a distinct initiative with analysis of spectral wavelength. We welcome results and discussion of methods and existing data, along with models which can develop the relationship between regional and global carbon balances using the most current applications.

Primary Affiliation: CGU/ Biogeosciences

B02: That biogeochemistry has a short attention span! Insights for scaling

Conveners: Colin Whitfield[1], and Nora Casson[2]

Co-chairs: Colin Whitfield[1], and Nora Casson[2]

[1] School of Environment and Sustainability & Global Institute for Water Security, University of Saskatchewan, Saskatoon, SK, S7N 3H5
Phone: 306-652-2226, E-mail: colin.whitfield@usask.ca
[2] Department of Geography, University of Winnipeg, Winnipeg, MB, R3B 2EN
Phone: 204-258-3052, E-mail: n.casson@uwinnipeg.ca

Session Description

Many hydrochemical and biogeochemical processes are extremely variable in both space and time. Despite technological advances, there are often significant barriers to characterizing the full complexity of these processes. A fundamental challenge of this work is scaling from short-term dynamics to longer time scales and understanding the importance of transient biogeochemical processes in larger scale patterns. This is particularly important for understanding how biogeochemical cycles respond to environmental drivers, including precipitation events, temperature fluctuations and redox conditions, among others. This session will feature contributions from researchers investigating transient biogeochemical processes. We encourage submissions with a focus on short-term biogeochemical patterns and those that address the challenges of scaling local or transient dynamics to larger scales, through novel technologies or new quantitative approaches.

Primary Affiliation: Biogeosciences / Hydrology

B03: Physical and Biogeochemical Land Surface Processes in a Changing Climate

Conveners: Vivek Arora[1], Paul Bartlett[2], Chris DeBeer[3] and Andrew Ireson[4]

Co-chairs: Paul Bartlett[2] and Andrew Ireson[4]

[1] Canadian Centre for Climate Modelling and Analysis
Environment and Climate Change Canada, Victoria, BC
Phone: 250 363-8246, E-mail: vivek.arora@canada.ca
[2] Climate Processes Section
Environment and Climate Change Canada, Toronto, ON
Phone: 416-739-4359, E-mail: paul.bartlett@canada.ca
[3] Global Institute for Water Security
University of Saskatchewan, Saskatoon, SK
Phone: (306) 966-6224, E-mail: chris.debeer@usask.ca
[4] School of Environment and Sustainability and the Global Institute for Water Security
University of Saskatchewan, Saskatoon, SK
Phone: (306) 966-8020, E-mail: andrew.ireson@usask.ca

Session Description

The Earth's climate has been warming in recent decades in response to increases in atmospheric carbon dioxide (CO_2) and other greenhouse gases. The interactions between climate change and physical and biogeochemical land surface processes are varied and dynamic. Increasing temperature affects not only the length of the mid-to-high latitude growing season, but also the speed of biogeochemical reactions governing rates of growth, decomposition and nutrient cycles. Evaporation tends to increase with temperature, influencing soil moisture and precipitation patterns, as well as plant moisture stress and soil biogeochemical processes. The CO_2 fertilization effect is an important but poorly understood negative feedback mechanism that may help to mitigate changes in climate by increasing carbon sequestration. The response of nutrient cycles, such as nitrogen, is important for determining whether nutrient availability to plants will enhance or limit expected increases in photosynthetic rates. Changes in temperature and precipitation patterns also have the potential, over time, to alter the distribution of plant functional types over the globe, but the factors controlling the range and success of vegetation species are complex, and so the effect on the net carbon balance of the land surface is uncertain. The extent of seasonal snow and ice cover represents a large positive feedback mechanism, the snow-albedo feedback, which interacts strongly with temperature, precipitation phase, and vegetation distribution. There is a large spread in the simulated albedos for snow-covered surfaces in the CMIP5 climate models, much of which appears to be related to the representation of vegetation masking in the boreal forest, and which contributes to a large spread in the snow albedo feedback in these models. In this session we welcome papers that investigate or model the response of land surface physical and biogeochemical processes to climate change, or that contribute to improved understanding of processes that affect these interactions.

Primary Affiliation: Biogeosciences / Hydrology

B04: Mine reclamation: Multidisciplinary studies from across mining sectors

Conveners: Matthew B. J. Lindsay[1] , Lesley A. Warren[2] , and Sean K. Carey[3]

Co-chairs: Matthew B. J. Lindsay[1] , Lesley A. Warren[2] , and Sean K. Carey[3]

[1] Dept. of Geological Sciences, University of Saskatchewan, Saskatoon, SK, S7N 5E2 Phone: 306-966-5693 Fax: 306-966-8593, E-mail: matt.lindsay@usask.ca
[2] Dept. of Civil Engineering, University of Toronto, Toronto, ON, M5S 1A4 Phone: 416-978-5978 Fax: 416-978-6813, E-mail: lesley.warren@utoronto.ca
[3] School of Geography & Earth Sciences, McMaster University, Hamilton, ON, Phone: 905-525-9140 Fax: 905-546-0463, E-mail: careysk@mcmaster.ca

Session Description

Mine reclamation presents considerable challenges for all sectors of the mining industry. Mine wastes stored in reclamation landscapes are in an initial state of chemical, biological and physical disequilibrium, and associated risks to the surrounding environment are often uncertain. Although various reclamation approaches are employed across the mining sector, common short- and long-term challenges include: (1) preventing or minimizing contaminant release; (2) predicting contaminant fate and transport; and (3) achieving measureable environmental improvements. Addressing these and other challenges requires a thorough understanding of interconnected physical, chemical and biological processes. The goal of this session is to bring together hydro(geo)logists, (bio)geochemists, and other reclamation researchers and practitioners to advance our understanding of mine reclamation. Contributions focused on oil sands, metal, and other mining sectors are thus encouraged.

Primary Affiliations: Biogeosciences / Hydrology

B05: Marine Derived Nutrient Water and Sediment Interactions Within Pacific Salmon Streams

Conveners: John Rex[1], and Sam Albers[2]

Co-chairs: John Rex[1], and Sam Albers[2]

[1] Ministry of Forests, Lands, and Natural Resource Operations & Geography Program, University of Northern British Columbia Prince George, BC V2L 1R5
Phone: 250-561-3464 E-mail: john.rex@gov.bc.ca
[2] Geography Program, University of Northern British Columbia Prince George, BC V2K 4Z9 Email: Samuel.Albers@unbc.ca

Session Description

Spawning Pacific salmon return to their spawning grounds having gained the majority of their mass at sea. As they migrate upstream through their natal watersheds they provide a valuable food source for many animals and once they arrive at their spawning grounds they excavate the streambed to create redds to house fertilized eggs. The excavation of redds causes a significant streambed disturbance suspending fine sediment, redistributing bedload clasts, and disturbing benthic alage, plants and invertebrates. Spawning salmon concurrently release gametes and waste products to the system. Once spent and salmon die, they contribute the biomass and marine derived nutrients (MDN) they gained at sea, which may represent a significant contribution of matter and nutrients to their natal watershed. The contrasting actions of disturbance and nutrient addition can result in a range of in-stream responses reflecting spawning return numbers as well as watershed geophysical and stream hydrological conditions. MDN signals have been identified in many stream and terrestrial biota, the water column, suspended and fine bed sediments, as well as the hyporheic zone yet there is still debate on the cumulative value of MDN to natal watersheds. The goal of the session is to draw together biogeoscientists, aquatic ecologists and fisheries specialists, along with geomorphologists, to share their recent findings in this research area. The objective is to advance our understanding of MDN sediment and water interactions, transfer and storage, to increase our understanding of the potential enrichment or disturbance effects of returning spawning salmon and MDN on natal stream reaches and watersheds. In particular, contributions will be welcomed that focus on sediment and water interactions with MDN, salmon and streambed interactions, and MDN transfer, storage, and transformation processes.

Primary Affiliation: Biogeosciences / Hydrology

B06: Microplastics in marine, freshwater, and soil environments

Conveners: Britt Hall[1], and Peter Ross[2]

Co-chairs: Britt Hall[1], and Peter Ross[2]

[1] Biology Department, University of Regina, Regina, SK, S4S 0A2
Phone: 306-337-2355 Fax: 306-337-2410, E-mail: Britt.Hall@uregina.ca
[2] Ocean Pollution Research Program, Vancouver Aquarium Marine Science Centre
Phone: 604 659 3563Fax: 604 659 3599, E-mail: Peter.Ross@vanaqua.org

Session Description

The contamination of marine, freshwater and terrestrial environments with microplastics (any plastic with a diameter ≤ 5mm), as well as their ingestion by aquatic and soil organisms, is of increasing concern. Recent attention paid to increasing prevalence in aquatic and marine systems of microplastics beads could be considered a "red herring", in part because of the recent movement to bans these products has led to the false sense of security that society can significantly reduce these pollutants. However, secondary microplastics originating from the breakdown of macroplastics through ultraviolet, microbial, and physical degradation are much more difficult to control, and in fact, plastic micro-fibers and fragments have been shown to be more prevalent than microbeads in many environments. In aquatic and marine environments, issues of concern include pseudo-satiation, intestinal blockage, endocrine disruption through leached plasticizers, and contamination by pollutants accumulated on plastics. In agricultural environments, increased prevalence of microplastics in soils may have direct and indirect implications for long-term soil quality with the potential to alter microbial communities to more harmful assemblages, increase sorbtion of agrochemicals, and change the capacity for soil to hold water. The goal of the session is to draw together aquatic and terrestrial ecologists, agrologists, toxicologists, and biogeoscientists to share recent findings on our current knowledge of the prevalence of microplastics in both aquatic and terrestrial systems, the future research avenues that will increase our understanding of important ecological impacts, and the possible solutions or alternatives to plastics in our daily lives.

Primary Affiliation: Biogeosciences

B07: Terrestrial-aquatic interactions: measurement and modelling

Conveners: Murray Richardson[1], and Martin Brummel[2]

Co-chairs: Murray Richardson[1], and Martin Brummel[2]

[1] Department of Geography and Environmental Studies,
Carleton University, Ottawa, ON, K1S 5B6
Phone: 613-520-2600 E-mail: murray.richardson@carleton.ca
[2] Department of Geography and Environmental Management,
University of Waterloo, Waterloo, ON, CANADA N2L 3G1

Session Description

The movement of water, mass and energy through and between ecosystems is a key theme of the biogeosciences section. This session will focus on terrestrial-aquatic interactions and implications for freshwater ecosystems under changing land-use and climate regimes. Specifically, we invite contributions from researchers who focus on measurement and/or modelling of terrestrial landscape processes (e.g. hydrology, biogeochemistry, landscape disturbance), and their implications for the structural and functional characteristics of river, lake and wetland ecosystems. We also encourage contributions in the area of quantitative spatial modelling, and studies that present novel approaches for inferring ecosystem processes from spatial or temporal analysis of information-rich data sources, such as time-series data and remote sensing imagery.

Primary Affiliation: Biogeosciences

B08: General Biogeosciences

Conveners: Murray Richardson[1], and Carl Mitchell[2]

Co-chairs: Murray Richardson[1], and Carl Mitchell[2]

[1]Geography and Environmental Studies, Carleton University, Ottawa, ON, K1S 5B6
Phone: 613-520-2600 ext. 2574, E-mail: murray.richardson@carleton.ca
[2]Physical & Environmental Sciences, University of Toronto Scarborough, Toronto, ON, M1C 1A4 Phone: 416-208-2744, E-mail: carl.mitchell@utoronto.ca

Session Description

This session will highlight the diversity of research investigating the biogeoscience/biogeochemical functioning of ecosystems. Presentations discussing all aspects of biogeosciences research from recent advances in understanding the fundamental mechanisms underlying processes shaping landscapes to novel methods for modelling them and approaches for monitoring them via both field and remote techniques are encouraged. Sample topics include integrative approaches to describe biogeoscience processes in both natural and managed ecosystems; characterizing measurement and modelling uncertainty in complex and heterogeneous landscapes; scaling linked water/nutrient/element/sediment exchange processes; determining the impacts of changing climate or land use on water/nutrient/element/sediment exchange processes across ecosystems; identifying and evaluating the effects of drought and other extreme weather phenomena on ecosystem form and function; developing novel and improved sensor systems and measurement techniques; and, diagnosing the effects of biota on driving change in landscape form or hydro-biogeochemical functioning.

Primary Affiliation: Biogeosciences