Bay Area Geophysical Society Seminar Series

Quantifying the drivers of spatial heterogeneity in Arctic permafrost thaw and associated carbon fluxes using geophysical, sensor network and remote sensing methods

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In-person at Elevation 66 Brewery in El Cerrito (map) and on Zoom

Abstract:

In the Arctic, understanding the interactions between bedrock, permafrost, soil, terrain, vegetation, and atmospheric processes is critical for predicting the storage and flux of carbon and water in a changing climate. However, quantifying above-below ground interactions in the Arctic is challenging due to their complexity and the lack of sensing systems to jointly monitor above-below ground key processes. This presentation will discuss several strategies we developed and applied for improving the watershed-scale quantification of subsurface properties and their interactions with ground surface and vegetation properties. These strategies include (i) low-cost and low-power sensor network for monitoring soil and snow temperature, snow thickness, soil thermal parameters, and soil deformation with unprecedented spatial and temporal density, (ii) Electrical Resistivity Tomography (ERT) time-lapse monitoring to

understand the impact of spatially variable surface hydrology and subsurface characteristics on subsurface hydrological and thermal fluxes, (iii) integration of geophysical, point-scale and remote sensing data to evaluate above- and below-ground interactions and for scaling knowledge from intensive site to larger scale, and (iv) supporting data driven understanding with numerical approaches that simulate hydrological, thermal, and biogeochemical processes. Applying the above strategies in a watershed with discontinuous permafrost near Nome, Alaska provided new understanding on (1) the permafrost distribution and the control of snow and soil thermal parameters on talik development; (2) the rapid soil thermal-hydrological responses to snowmelt and intense rainfall events; (3) the role of terrain and subsurface structure in driving water and carbon fluxes; and (4) venues to scale knowledge from intensive sites to larger scales.

Presenter's Bio:

Baptiste Dafflon is a Staff Scientist in the Earth & Environmental Sciences Area at Lawrence Berkeley National Laboratory (LBNL). After an MSc degree in Geophysics at the ETH-Zurich, he completed a PhD at the University of Lausanne and a one-year postdoc at Boise State University, before joining LBNL in 2011. His current research focuses on improving the quantification and understanding of above- and below-ground processes important for managing water resources, carbon cycle, natural hazards and environmental pollutions in a variety of environments. His work includes the development of distributed sensor network, remote sensing and geophysical methods to improve the quantification of subsurface hydro-biogeochemical properties, and the multi-scale estimation of subsurface and surface properties/fluxes using statistical methods and process-based models.

Zoom meeting information:

Zoom ID: 813 5414 6598
Password: BAGS4ever