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PREVIEW
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Supraglacial Lake Drainage: from process puzzle to subglacial diagnostic

Laura A. Stevens[1], Alison F. Banwell[2], Mark D. Behn[3], Danielle L. Chase[4], Sarah B. Das[5], Rebecca L. Dell[6], Emily Falconer[1], Ian R. Joughin[7], Ching-Yao Lai[8], Stacy Larochelle[9], George J. Lu[9], Jeffrey J. McGuire[5], Meredith Nettles[9], Marianne Okal[10], Joshua Rines[8], and Ian C. Willis[6]

[1]Department of Earth Sciences, University of Oxford, Oxford, UK
[2]Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, CO, USA
[3]Department of Earth and Environmental Sciences, Boston College, Chestnut Hill, MA, USA
[4]Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ, USA
[5]Department of Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA, USA
[6]Scott Polar Research Institute, University of Cambridge, Cambridge, UK
[7]Polar Science Center, Applied Physics Laboratory, University of Washington, Seattle, WA, USA
[8]Department of Geophysics, Stanford University, Stanford, CA, USA
[9]Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY, USA
[10]EarthScope Consortium, Socorro, NM, USA

Supraglacial lake drainages are isolated events that deliver the largest observable fluxes of surface melt to the ice-sheet bed. This talk will present advances in the study of these lake drainages, through which we piece together an empirical understanding of glacier hydrology. We examine the ways in which lakes both respond to, and determine, the hydrologic and glaciologic conditions under which they exist. We begin with the process puzzle of what mechanisms drive the opening of fractures within the compressive regions where lakes form, allowing hydro-fracture-driven drainages to occur. Next, we follow drained lake water in time and space, using the natural experiments provided by the drainages to infer subglacial-drainage-system transmissivity and structure beneath kilometer-thick ice flowing at rates of tens to thousands of meters per year in Greenland. In widening our view to previous subglacial-flood events observed at other ice-sheet locations—as well as at alpine, valley, and tidewater glaciers—we observe surprising similarities across a wide range of ice thicknesses, flow speeds, and types of flood events. The similarities we observe are encouraging because they suggest that information on drainage-system structure and evolution gleaned from these episodic events can be used to understand the wider picture. Finally, we examine current challenges: how do we move from the observed mechanisms of individual lake drainages to an integrated understanding of the importance of hundreds of drainages for long-term ice-sheet response and ice-shelf collapse? Progress will require the combination of geodetic observations, hydrologic simulations, and geophysical models to deconvolve the differing mechanisms that result in clusters of drainages in the multiple settings in which lakes form.