How does ice flow and crack in a warming climate?

One of the biggest uncertainties in sea-level rise projections results from our incomplete understanding of how surface melting of ice impacts the dynamics of ice sheets and ice shelves. As the atmosphere warms, surface meltwater impacts glaciers by changing the boundary conditions of both ice sheets (on top of solid bedrock) and ice shelves (floating over ocean).

Here, I will discuss (1) how meltwater triggers ice-shelf collapse through "hydrofracture", which caused the catastrophic disintegration of the Larsen B Ice Shelf, and (2) how meltwater lubricates the interface between ice sheets and bedrock. For part (1) of the talk I will introduce a new approach combining physics-based models and deep learning techniques to provide physical insights into the stability of ice fractures and predict the vulnerability of Antarctic ice shelves to atmosphere warming*. For part (2) I discuss a new method combining theory with observations to understand the process governing the uplift of an elastic ice sheet caused by lake drainages and reveal the seasonal changes of water lubrication between the ice sheet and bedrock.