**From surface melt to raging rivers: The (changing) surface hydrology of the Greenland Ice Sheet**

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This talk will discuss certain aspects of the surface hydrology of the Greenland Ice Sheet. We examine a small moulin basin, on the western margin of ice sheet, and develop a water budget to determine the input of meltwater to the englacial system via two distinct features: a moulin (52%) and crevasses (48%). Moulin discharge exhibits large diurnal variability (0.017 to 0.54 $m^3$ $s^{-1}$) with a distinct late afternoon peak at 16:45 local time. This lags peak meltwater production by ~2.8 ± 4.2 h. We infer, from in situ observations of moulin geometry, previously published borehole water heights and estimates of the temporal lag between meltwater production and observed local ice surface uplift ('jacking'), that the transfer of surface meltwater to the englacial water table via moulins is nearly instantaneous (i.e. <30 min). We employ a simple crevasse mass balance model to demonstrate that crevasse drainage can significantly dampen the surface meltwater fluctuations reaching the englacial system in comparison to moulin discharge. Thus, unlike crevasses, moulins propagate meltwater pulses to the englacial system that are capable of overwhelming subglacial transmission capacity, resulting in enhanced basal sliding.

We'll then step back and examine the broad melt zones of the ice sheet, in particular the extent of the ablation and percolation zones. We show that both the 0° C isotherm, taken as the upper limit of the percolation zone, and the equilibrium line altitude have risen in elevation by ~40 m/a over the last 15 years. This has greatly expanded the surface area that undergoes seasonal surface melt, due to the convex parabolic profile of the ice sheet. Surface snowmelt occurred at Summit (3242 m) in July 2012 for the first time in the observational record and likely for the first time since 1889. Given the observed trends, we suggest that melting events will become increasingly frequent at Summit between 2018 and 2027, signaling the loss of the dry snow zone for the Greenland Ice Sheet.