Caleb Walcott-George - Project Profile

2023 AGeS-Grad awardee
Project Title: Dating the Grenville Loop using U-Pb apatite thermochronology
Lab: University of Texas at Arlington Luminescence Laboratory
Lab Mentors: Dr. Nathan Brown

What scientific question(s) does your research address and what motivates this work?
Do rock cores collected from the margins of the Greenland Ice Sheet record distinct periods of ice cover and ice-free conditions? The Greenland Ice Sheet is the single largest contributor to current global sea level rise and is predicted to remain so through at least the next century. By developing chronologies of past ice sheet reactions to climate change, we can investigate the complicated relationships between ice sheets, climate, ocean and atmospheric forcing, and orbital conditions. With this, we can better forecast future ice sheet change with ice sheet models.

What chronometric tool did you employ and why?
I used luminescence surface exposure dating. Historically, investigating ice sheet fluctuations in areas of frozen-bedded ice sheets – including northern Greenland – has been hampered by cosmogenic nuclide inheritance due to a lack of glacial erosion of the bedrock. However, luminescence surface exposure dating hinges on the lack of erosion and should be ideal in these environments. Additionally, luminescence surface exposure dating should serve as a complement to cosmogenic nuclide dating as we hypothesized that the method could distinguish discrete ice burial vs. ice free events.

What were some of the key takeaways of your research?
We found that luminescence surface dating can resolve distinct periods of ice burial and ice-free conditions. We measured resolvable differences in the luminescence signal in two rock cores from areas known to have different Holocene ice sheet histories. We are still awaiting the last measurements to quantify these periods, but the signals are there! This indicates that luminescence rock surface dating has the ability to refine ice sheet chronologies in areas of cold-based ice worldwide.

What new experiences, opportunities, and collaborations did you gain as an AGeS-Grad awardee?
I had the opportunity to work in a luminescence lab, prepping rock core samples for the first time. I was also lucky to spend more time with my wonderful collaborator and host, Dr. Nathan Brown and engage with his awesome graduate students. This opportunity allowed me to incorporate cutting-edge geochronology research into my dissertation.

What is one piece of advice you have for future AGeS-Grad award applicants or awardees?

Budget more time at a lab than you think you need! There are always unforeseen circumstances and it's nice to not stress about your time at a lab. This also allows you to spend more time with your collaborators and develop those connections outside of the lab environment.

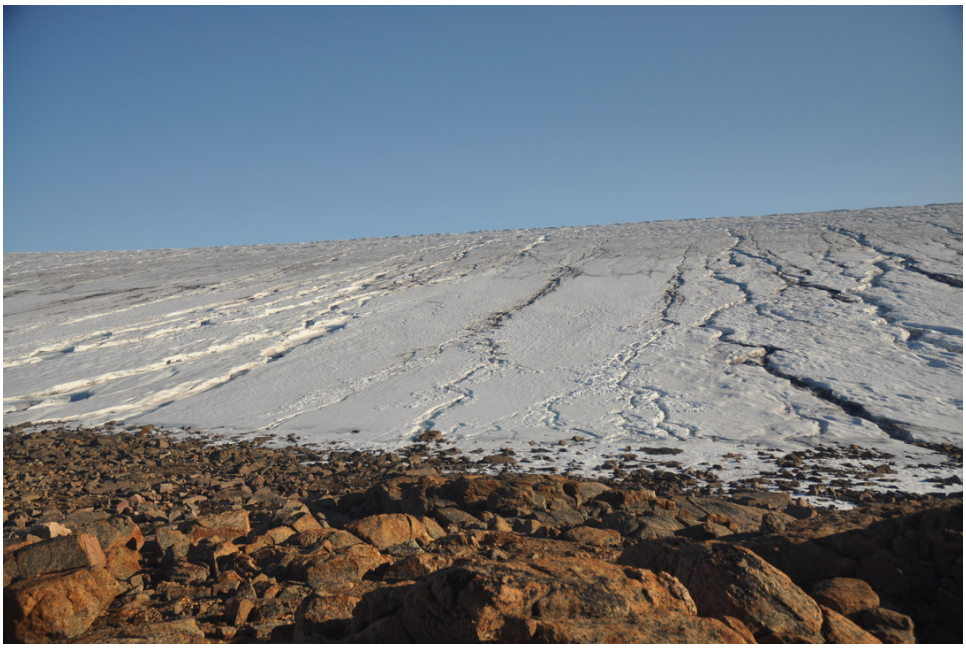

Figure 1: Our field site at the modern margin of the Greenland Ice Sheet in Inglefield Land, NW Greenland.

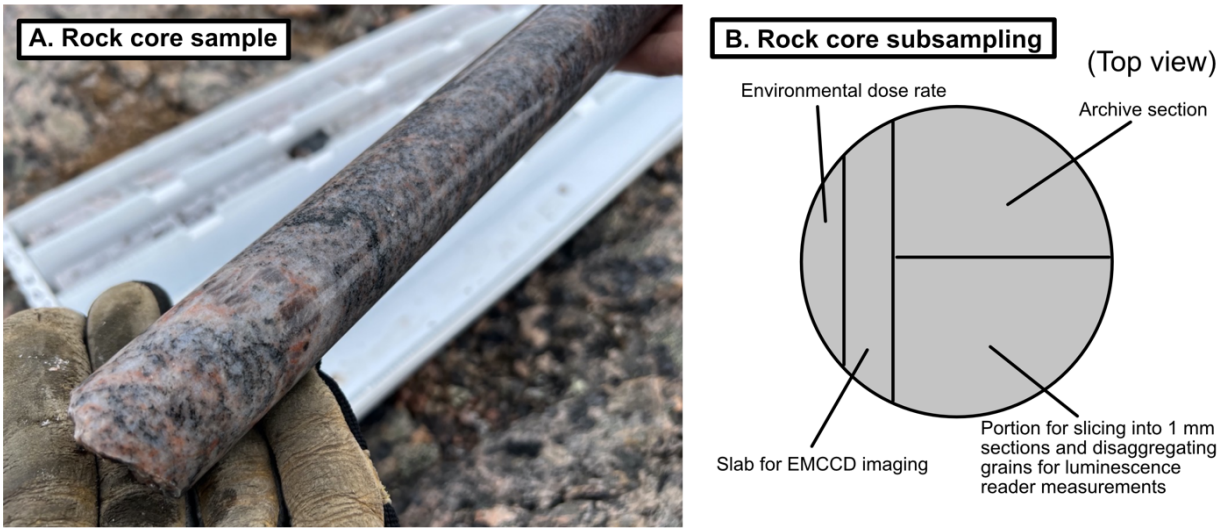

Figure 2. It's difficult to take photos in a dark luminescence lab, but A) is an example of the core and rock type I worked with, while B) shows how I cut the rock for various analyses.

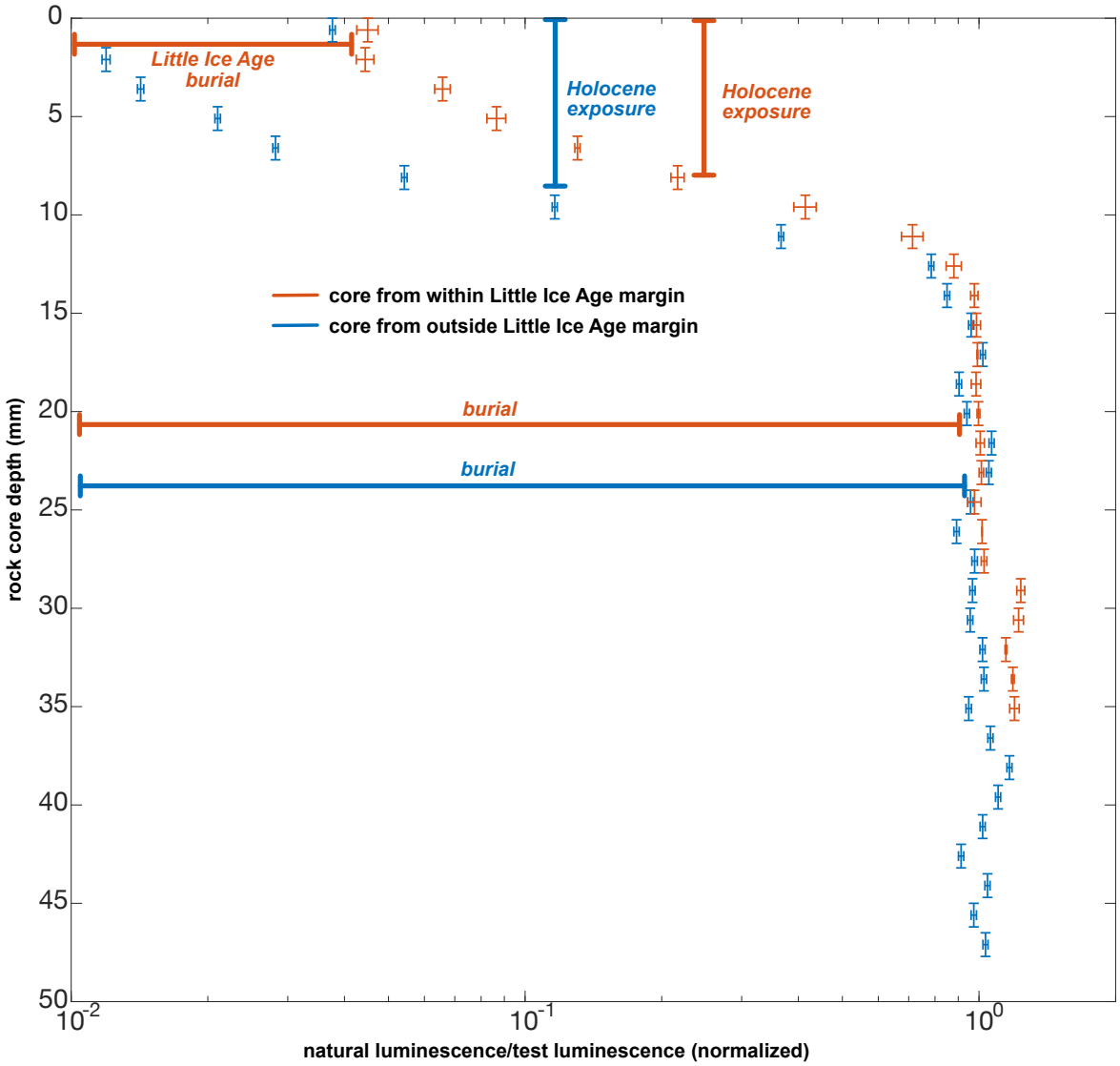

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Figure 3: Data! The points with different colors show our luminescence measurements from two different cores with known difference ice cover histories. The orange core was covered by ice during the Little Ice Age, while the blue core was not. You can see the difference in luminescence measurements. We are still awaiting data to determine the exact duration. Of this burial and the Holocene exposure.