



## Report from the Third International Summer School in Glaciology

McCarthy, Alaska, USA, 6–16 August 2014

Hosted by the University of Alaska Fairbanks (UAF), the third International Summer School in Glaciology brought together a dynamic group of students and instructors to discuss glaciology theory and techniques in the heart of the Wrangle Mountains in southwestern Alaska. The majority of participants set off from Fairbanks on 6 August and after a 10 hour journey of pipeline views, gas station brews, salmon jumping and rear-wheel bumping, we all arrived in the small town of McCarthy, Alaska.

We were an international group of students, with approximately half studying in the USA and the remainder travelling from the UK, Canada, Norway, Germany, Switzerland and as far as New Zealand, Australia and India! Equally diverse were the research interests of the students, with thesis projects spanning geographically from pole to pole and academically from computer modelling to fieldwork-intensive case studies. Joining us as glaciology instructors were Regine Hock (UAF and summer school coordinator), Jon Ove Hagen (University of Oslo), Martin Truffer (UAF), Ed Bueler (UAF), Andy Aschwanden (UAF), Nick Barrand (University of Birmingham) and Mike Loso (Alaska Pacific University Anchorage). The instructors did a great job satisfying our broad spectrum of interests and over the 10-day course we studied glacier mass balance and surface energy balance, continuum mechanics, ice dynamics, tidewater glaciers, ice sheet modeling, inverse methods, glacier geomorphology, subglacial hydrology, thermodynamics and remote sensing methods. With a lineup like that, we were grateful for the endless supply of caffeine from our gracious hosts at the Wrangle Mountain Centre! Our morning lectures were hosted in Porphyry Place, a beautiful log cabin and former home of the late Edward LaChapelle, the highly regarded avalanche researcher, glaciologist, ski mountaineer and author.

In the afternoons we would spend 2 hours gaining hands-on experience through exercises developed around the morning lecture content. After refuelling once more on caffeine, we would shift to our group assignments in which teams of two or three students would work on a project developed by one of the course instructors. The projects were wonderfully diverse and ranged from modelling experiments to working with remote sensing or field measurements. As an example,



Kennicott Glacier. Photo: Noel Fitzpatrick

one team was able to work with data collected by a drone (i.e. not an undergraduate student) over the nearby Kennicott Glacier. The drone, most unfortunately, met a sad demise as it attempted a renegade survey of its own over the moraines of the Kennicott, and we graduate students vicariously learned the dangers of disobedience in the field. The efforts of our group projects culminated in a mini-conference on the last day of the field school at whichh students presented their findings. The group projects were a great opportunity to benefit from the specific expertise of our assigned mentors and it was amazing to see how much we had accomplished in such a short time. Who knew the secrets to Matlab and Python programming lay in the remote reaches of Alaska?



Regine Hock and Shaun Eaves working on group projects. Photo: Florian Ziemer



Admiring a moulin on Root Glacier.  
Photo: Laura Thomson

A new addition to the summer school was a session on science communication facilitated by Lindsay Bartholomew, science curator at the Frost Museum of Science in Miami, Florida, USA. Lindsay did a great job helping us rekindle our scientific sense of wonder and curiosity, and taught us how to encourage this in others through sharing our own research in an accessible, exploratory and engaging way. It was unquestionably a valuable addition to our training as future scientists and will hopefully become a regular component of glaciology programmes in the future. Lindsay maintained a compelling blog about the summer

school throughout our time in McCarthy and it can be viewed at:

<http://www.miamisci.org/lindsayintheartic/>

The highly anticipated field excursions were led by part-time resident of McCarthy Mike Loso. On our first excursion, Mike led us from the trailhead in the town of Kennicott to the lateral moraines of the Kennicott Glacier and then onto the Root glacier, which coalesces with the debris-covered Kennicott approximately 5 km upstream from the terminus. We crossed the Root Glacier, admiring great examples of thrust faults, moulins and medial moraines. We even witnessed a large colony of glacier mice, which became a noted highlight throughout the course. From the western margin of the Root glacier we admired the impressive Donahoe Falls, then slid down the debris-ridden margin to explore an ice cave that forms where the waters from Donahoe Falls cut under the ice. As we scrambled back onto the glacier, the mantra of graduate students everywhere, 'two steps forward, one step back', rang all too true, but we all found our way back up onto the Root Glacier (albeit with varying levels of gracefulness). At the end of the day we devoured a delicious pasta dinner and enjoyed an entertaining public lecture on Tidewater Glaciers from Martin Truffer in the Kennicott recreation hall. On our second excursion we explored the proglacial area of the Kennicott glacier where a large lake has formed in recent years. From here we had excellent views of the regional geomorphology and were able to take in lateral moraines and trim lines dating back to the Little Ice Age, as well as several rock glaciers that flow into the Kennicott valley.

Two of our evenings were spent enjoying talks from guest lecturers. On the first evening of the field school Mark Vail, a 30-year resident of McCarthy, shared with us the fascinating history of



Instructors and participants of the third International Summer School in Glaciology on Root Glacier.  
Photo: Andy Aschwanden



Students investigating an ice cave beneath Root Glacier near Donahoe Falls. Photo: Laura Thomson



Glaciologists refueling in the old McCarthy Hardware Store, now used by the Wrangle Mountain Centre. Photo: Noel Fitzpatrick

the community and the nearby ghost town of Kennicott. Kennicott was developed upon the prosperous copper ore deposits of the region during the early 1900s. Any lingering misgivings about our own drive from Fairbanks were quelled as we heard stories of the men who built (and rebuilt) the Copper River and Northwestern Railway across river gorges and mountain ranges, and often within mere metres of unpredictable glaciers. We also enjoyed a lecture from Vladimir Alexeev (UAF), who shared with us his work on global climate modelling, with a specific emphasis on changes occurring in the Arctic. This lecture provided a helpful context for many of us working in the Arctic and brought to our attention the broader impacts of these changing conditions, beyond the response of glaciers.

For fun (which is not to say that continuum mechanics isn't fun), we spent our evenings enjoying

the wilderness of Alaska in its many forms. Given our international crowd, we decided to initiate a football match on a pock-marked pitch, with the New World taking on the Old World... and then immediately regretting the decision (it appears that you can't teach a New World old tricks). We also participated in Friday-night softball with the McCarthy locals (many with beards to rival the most field hardened glaciologists), open mic night in the McCarthy Saloon, and undertook our own attempts at music making in the old McCarthy Hardware Store, which serves as the main gathering space for the Wrangle Mountain Centre. On our final night together we were treated to a decadent meal in the dining room of the McCarthy saloon, and here the wine and conversation flowed like Jakobs-havn Isbræ in the summer of 2012. The winners of the photo and video contest were selected by the crowd applause-ometer and the winners were awarded the coveted paraphernalia generously donated by the IGS (thank you!). Students and instructors alike spent the remainder of the evening around the campfire where Glacier Jeopardy ensued and the student poster contest culminated (in a rather fiery display). We left as a new generation of glaciologists, indoctrinated in the lexicon of the Glossary of Mass Balance and Related Terms, and very thankful for the camaraderie and efforts of our peers and mentors alike!

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(Disclaimer: No drones were harmed in the writing of this article).

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Winners of the photo and video contest, modelling their IGS prizes (Top, left to right: Noel Fitzpatrick, David Lilien, Caitlyn Florentine, Laura Thomson, Jenna Zechmann. Bottom: Aurora Roth). Photo: Regine Hock