

Changing Glaciers: Enhancing International Research Capacity and Learning Collaboration in Reconstructing the Impacts of Glacier Responses to Climate Change

Summary Report

Jonathan M. Harbor, MCIIF 330530

Overview: Testing and calibrating global climate models requires both high-resolution present-day climate data and well-constrained information on past climates of key regions around the world, including data provided by changes in glacier extent and mass balance. Particularly important are paleoclimatic data for regions that are at the confluence of major climate systems, such as central Asia, because these regions are especially responsive to changes in spatial patterns of large-scale climate. The MCIIF provided an opportunity for Professor Jon Harbor (USA) to spend a year based at Stockholm University (SU) to bring his focused expertise on cosmogenic nuclide (CN) dating and glacial studies to a major international research project on glacier changes in central Asia, led by the host researcher, Professor Arjen Stroeven at SU. In addition to this collaborative research, and development of a new research project, the MCIIF provided an opportunity for SU and other European universities to engage with Prof. Harbor around education, outreach and university administration.

Research

Prof. Harbor's research activities included leading and co-leading one month of research fieldwork in Mongolia and China focused on collecting geologic samples for CN dating of past glacier extents and checking remote-sensing based mapping of glacial landforms. Also co-supervision of graduate student fieldwork in Kyrgyzstan and Russia and lab work and data analysis, as well as collaboration on publications arising from the work in central Asia. The collaborative work provided new knowledge on the pattern and extent of past glaciation in Central Asia, and exciting new evidence for the timing of past glaciation that is changing our understanding of long-term glacier change in parts of central Asia. The collaboration also led to involvement of Prof. Harbor in a new research project led by SU that will focus on understanding past ice sheet change in Antarctica.

Publications, proposals and presentations during the fellowship year arising from the research and collaborations with international partners include:

- Author or co-author on presentations at the following conferences: International Association of Geomorphologists (Paris, France); European Geophysical Union (Vienna, Austria); International Greening Education Conference (Karlsruhe, Germany); Nordic Workshop on Cosmogenic Nuclides (Aarhus, Denmark).
- Presentations and research collaboration discussions at: Durham University (UK); Aachen University (Germany); University of Cambridge (UK), and; National University of Mongolia.
- 8 international peer-reviewed publications in *Journal of Maps*, *Nature Communications*, *Quaternary Science Reviews*, *Geografiska Annaler*, *Earth and Planetary Science Letters*, *Quaternary Research*, and *Quaternary International*.
- Principal researcher on proposals to the Swedish Science Foundation and the US National Science Foundation for future collaborative research in Antarctica involving scientists from Sweden, Norway, UK, Germany and USA.

Education and Outreach

Prof. Harbor played an active role in a “Future Learn” project at SU aimed at developing innovative collaborative courses developed by SU and Purdue University for students at both institutions. This included a video-conference short course in cosmogenic nuclide methods involving students at both universities, and developing a flipped course version of a master’s course at SU (moving the lectures to an online format, and using classroom time for student-centered activities). These collaborations and shared course materials will continue in 2015

As part of transferring and adapting novel pedagogical techniques, Prof. Harbor developed a pilot program called “Doktorander I Skolan” (PhD students in schools) modeled on a program he runs at Purdue University. In this program PhD students receive some training in outreach and pedagogy, and then spend one day a week for 10 weeks working with a local school teacher. The PhD student observes, co-teaches, and then develops new educational materials for a lesson or activity that brings the PhD student’s research theme into the classroom in a way that meets authentic learning goals for children. The pilot project involved teachers and students at a gymnasium level school and an international school in Stockholm. This approach brings considerable benefits to the PhD students in terms of enhanced pedagogical abilities, communication skills for diverse audiences, time management, and understanding of learning styles. SU intends to continue this innovative program that connects PhD research and researchers with innovative learning opportunities for school teachers and children.

In addition to lectures on research themes, Prof. Harbor also provided a lecture and discussion session focused on “applying for graduate programs in the USA” at SU and Cambridge University. Prof. Harbor also played an active role in formal and informal mentoring of SU graduate students and post docs, with a particular emphasis on international collaborative research and leadership.

Administration

The MCIF year provided unanticipated opportunities for Prof. Harbor to be engaged in bringing outside perspectives and program ideas to administrative areas at SU.

- **Strategic Planning:** Prof. Harbor’s host department at SU was undertaking a strategic planning process to consider a major reorganization of departmental structure. Prof. Harbor has facilitated several previous academic strategic planning processes in the US, and provided support and ideas for the SU process.
- **Alumni Relations:** Prof. Harbor’s previous experiences with alumni relations and fund raising in the US were helpful for efforts in both his host department and SU’s central alumni relations office. Prof. Harbor provided ideas that were implemented successfully (e.g. a mock job interview program that brought together alumni and students), gave a presentation to department heads about the value of alumni relations and strategies for “friend-raising”, and provided input to discussions around appropriate administrative structures to support the growth of alumni relations as a key component of better connections between the university and society.