Geophysical Research Abstracts
Vol. 20, EGU2018-10292, 2018
EGU General Assembly 2018

The initiation and growth of glacial cirques: Insights from Britain and Ireland

Jeremy Ely (1), Iestyn Barr (2), Ian Evans (3), and Matteo Spagnolo (4)

(1) University of Sheffield, Geography, Sheffield, United Kingdom (j.ely@sheffield.ac.uk), (2) School of Science and Environment, Manchester Metropolitan University, United Kingdom, (3) Department of Geography, Durham University, United Kingdom, (4) Department of Geography and the Environment, School of Geosciences, Aberdeen University

Glacial cirques are often considered useful indicators of past glacial and climatic conditions. However, despite over 150 years of research, fundamental questions about their initiation and growth remain unanswered. Do cirques take thousands or millions of years to grow? Do cirques initiate in small hollows or cirque-scale basins? Answering these questions would increase the usefulness of cirques as palaeo-environmental proxies, and aid our understanding of the role played by glacial erosion in long-term landscape evolution. To gain insight into cirque initiation and growth, we analyse a comprehensive dataset regarding the morphology of cirques in Britain and Ireland (2208 cirques) and develop a simple statistical model which aims to explain their size frequency distributions. We show that cirque size metrics have a log-normal distribution, the mean and variance of which varies between cirque occupied regions. Similar shaped distributions are found for other features which grow over time, and we interpret the regional variation as indicating spatial patterns in cirque development across Britain and Ireland. Unfortunately, data on the erosion rate, initial size and occupancy period of cirques is limited. Our statistical model is able to replicate the observed cirque size distribution and regional variation using reasonable estimates of these unknown parameters. In our model, cirque size is most sensitive to the length of active occupancy, with cirques rapidly (within thousands of years) developing to the appropriate size. However, more sophisticated models and further work to constrain glacio-dynamic and climatological feedbacks on cirque development are required.