Geophysical Research Abstracts
Vol. 21, EGU2019-8591, 2019
EGU General Assembly 2019

The expected lifespans of Icelandic glaciers and ice caps

Leif S. Anderson (1,2,3), Áslaug Geirsdóttir (1), Gwenn E. Flowers (2), Andrew W. Wickert (4), Guðfinna Aðalgeirsdóttir (1), and Thorsteinn Thorsteinsson (5)

(1) Faculty of Earth Sciences, University of Iceland, Oskju, Sturlugötu, 7, 101, Reykjavík, Iceland, (2) Department of Earth Sciences, Simon Fraser University, 8888 University Dr., Burnaby, B.C., V5A 1S6, Canada, (3) GFZ German Research Centre for Geosciences, Telegrafenberg, 14473, Potsdam, Germany (leif@gfz-potsdam.de), (4) Department of Earth Sciences, University of Minnesota, 116 Church St. SE, Minneapolis, MN 55455-0231, USA, (5) Icelandic Meteorological Office, Bústaðavegi 7-9, 108, Reykjavík, Iceland

Rapid, near global retreat of glaciers over the last few decades is striking, and is often used to highlight the effects of anthropogenic climate change to the public. This approach is more effective when modern glacier and climate change is placed within a frame of reference. Here we present a new, efficient method to assess the timing of glacier birth and death. We model equilibrium line altitudes (ELAs) from 20 glaciers and ice caps in Iceland, and in doing so produce the first regional estimates of glacier lifespans. We force the model with three Holocene temperature reconstructions and five future climate projections, while also exploring the effects of glacial-isostatic adjustment and precipitation variability. Mass balance parameters are tuned for each ice cap using modern data. We use inception constraints to evaluate the success of individual model simulations. Icelandic glacier inception likely ranged from before the Holocene to the Little Ice Age. Anthropogenic warming is therefore expected to cut short the lifespans of glaciers that have existed for thousands of years. Glaciers that likely formed over the last 1000 years will lose their accumulation areas within 40 years in all future climate scenarios. Topography is the primary control of glacier lifespans in Iceland. The onset of Holocene (Neoglacial) cooling could be better established using new, topographic metrics to identify the glaciers most likely to form first. Our model reveals that these simple metrics, easily measured from global data sets, exert a first-order control on glacier lifespans, and can be used as a rapid means of contextualizing ongoing glacier change.