49th Lunar and Planetary Science Conference – The Woodlands, Texas 19th-23rd March 2018

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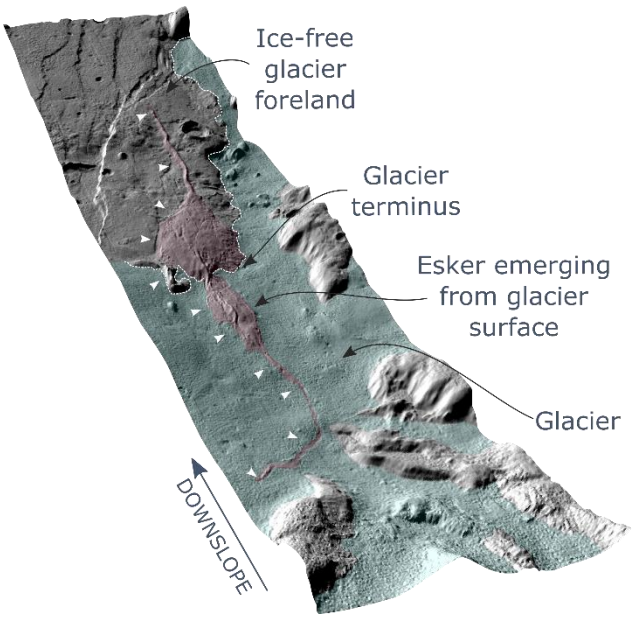
Lunar and Planetary Science Conference (LPSC)

A generous BSG grant of £300 allowed me to attend the 49th Lunar and Planetary Science Conference in The Woodlands, Houston, Texas between 19th and 23rd March 2018. LPSC is the largest annual conference in the planetary science calendar. It has a particular focus on the geology, geomorphology and evolution of lunar, planetary and cometary bodies in the Solar System. This year, both the 45th anniversary of the Apollo 17 Moon landing and the successful end of the Cassini mission to Saturn, were celebrated at LPSC.

Work presented

I presented both a talk (abstract #1490) and a poster (abstract #1498; e-poster available here) at LPSC. A paper of which I am the second author (abstract #1875) was also presented as a talk.

My talk summarised the results of our recent paper (Butcher et al. 2017, Recent basal melting of a mid-latitude glacier on Mars, *Journal of Geophysical Research: Planets 122,* 2445-2468) in which we identified a landform called an esker emerging from an existing debris-covered glacier in Mars' mid-latitudes. Eskers are ridges of sediment deposited by meltwater flowing through tunnels carved through glacial ice, and indicate past melting. The extreme rarity of evidence for past melting of existing mid-latitude glaciers on Mars means that it is commonly thought that they have always been completely frozen to their beds since they formed 100 million to 1 billion years ago, and have never produced meltwater. However, the newly-discovered glacier-linked esker (the second of its kind discovered) indicates that rare, localised melting of existing mid-latitude glaciers on Mars has occurred in the geologically recent past. My talk focussed on our use of a 1D thermal model to calculate the environmental requirements for melting at the glacier bed. The conclusion of my talk was that, under extremely cold climates of Mars' recent geological history, locally elevated geothermal heat flux and heating due to internal deformation within the ice, were prerequisites for meltwater generation at glacier beds.



Esker (pink, 14 km long) emerging from a debris covered glacier (blue) in Mars' mid-latitudes (Butcher et al., 2017, JGR: Planets 122). Oblique shaded-relief map of digital elevation model generated from High Resolution Imaging Science Experiment images. Reproduced from Butcher et al., 2018, 49th LPSC, e-poster (Abstract #1498).

My poster detailed my recent mapping campaign of Chukhung Crater, Mars. This impact crater contains a newly-identified population of candidate eskers emerging from existing mid-latitude debris-covered glaciers which occupy the southern wall of the crater. I presented the hypothesis that the ridges are eskers, and an initial model for the formation of other landforms in the crater. I discussed the alternative hypothesis that the ridges are more ancient, topographically-inverted fluvial channels formed by sub-aerial (non-glacial) water flows and subsequent differential erosion of the surrounding landscape. Since presenting my poster, I have received an invitation for collaboration on techniques to distinguish between the two hypotheses.

Summary of findings

Despite cold Martian climates, an existing mid-latitude debris-covered glacier on Mars produced meltwater 110 million years ago, driven by locally-elevated geothermal heat and heating by ice deformation.