
Proceedings Paper:
Hepburn, A. orcid.org/0000-0001-5738-0794, Ng, F. orcid.org/0000-0001-6352-0351, Holt, T. orcid.org/0000-0001-8361-0688 et al. (1 more author) (2020) Ice-mass survival for approximately 800 Myr in the tropical Kasei Valles region, Mars. In: EGU General Assembly 2020 Abstracts. EGU General Assembly 2020 - Sharing Geoscience Online, 04-08 May 2020, Virtual conference. Copernicus GmbH .

https://doi.org/10.5194/egusphere-egu2020-328

EGU2020-328, updated on 06 Mar 2021
https://doi.org/10.5194/egusphere-egu2020-328
EGU General Assembly 2020

Ice-mass survival for approximately 800 Myr in the tropical Kasei Valles region, Mars

Adam Hepburn[1], Felix Ng[2], Tom Holt[1], and Bryn Hubbard[1]
[1]Aberystwyth University , Geography and Earth Sciences , Aberystwyth, United Kingdom of Great Britain and Northern Ireland (adh28@aber.ac.uk)
[2]University of Sheffield, Geography Department, Sheffield, United Kingdom of Great Britain and Northern Ireland

High obliquity excursions on Mars are hypothesised to have redistributed water from the poles to nourish mid-latitude glaciers. Evidence of this process is provided by a variety of viscous flow features—ice-rich deposits buried beneath sediment mantle—located there today, including 'lobate debris aprons', or LDAs. During high obliquity extremes, ice may have persisted even nearer the equator, as indicated by numerous enigmatic moat-like depressions in the tropical Kasei Valles region. Numerous depressions surround isolated mesas and demarcate the past interaction between flowing lava and what were presumably ice-rich radial flows resembling today's LDAs, but which have long since disappeared. Little is known about 'ghost lobate debris aprons' (ghost LDAs), besides their spatial extent as recorded by these depressions. This collection of ghost LDAs implies tropical ice loss over an area ~100,000 km^2. To constrain their history in Kasei Valles we derive model ages of different terrain types from crater counts. To constrain the volume of ice loss, we use a 2D perfect-plasticity model of ice flow to reconstruct the ghost LDA surfaces. Parametrised by the present surface topography and the range of yield stresses derived from radar interrogation of mid-latitude ice masses, the model reconstructs former ice surfaces along multiple flowlines orientated normal to ghost LDA boundaries. This reconstruction indicates between 1,300–3,300 km^3 of ice—similar to that present in Iceland on Earth—was lost since lava emplacement ~1.4 Ga. Dating of these depressions shows that the ghost LDAs survived for ~800 million years following lava emplacement in the Kasei Valles region before their final demise.