

## MARS

## Recently melting glaciers

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Water ice melting occurs at the interface between glaciers and the terrain and it is one of the mechanisms of glaciers' slow flowing on Earth. Despite the presence of recently formed (less than 1 Gyr old) glacier-like

features covered by debris at Martian mid-latitudes, there is little indication that these glaciers actually moved. The standard interpretation is that the present-day Martian climate is too cold to produce the layer of liquid water necessary to make a glacier slide.

Using imaging data from the Mars Reconnaissance Orbiter and Mars Odyssey, Frances Butcher and colleagues have identified a sedimentary surface feature called an esker in the Tempe Terra (46° N) region of Mars. Eskers are formed by meltwater running through tunnels in glaciers, and take the form of a ridge when the parent glacier has melted (pictured; the white arrow shows an indication of surface viscous flow). The particular esker under study is on the opposite side of Mars to the only other mid-latitude esker discovered, but both lie in tectonic trenches in volcanic regions, a possible factor involved in their formation. As on Earth, tectonic rifts can be a source of geothermal heat, melting the base of the glacier despite the generally cold climate.

Butcher et al. have calculated the effect of enhanced geothermal heating on a model Martian mid-latitude glacier, working out basal temperatures for various thicknesses of glacier, surface temperatures and geothermal energy inputs. They find that when combined with an additional heat source due to the internal deformation of flowing ice (strain heating), the energy input could have produced localized cases of glacial melting. Cratering chronology indicates that the melting episode creating the Tempe Terra esker happened ~110 Myr ago.

Frances Butcher was the recipient of a *Nature Astronomy* 'Best Student Presentation' award at the recent British Planetary Science Congress, held in Glasgow, UK over 3–5 December 2017.

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