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Wet-based glaciation in Phlegra Montes, Mars.

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Eskers are sinuous landforms composed of sediments deposited from meltwaters in ice-contact glacial conduits. This presentation describes the first definitive identification of eskers on Mars still physically linked with their parent system (1), a Late Amazonian-age glacier (∼150 Ma) in Phlegra Montes. Previously described Amazonian-age glaciers on Mars are generally considered to have been dry based, having moved by creep in the absence of subglacial water required for sliding, but our observations indicate significant sub-glacial meltwater routing. The confinement of the Phlegra Montes glacial system to a regionally extensive graben is evidence that the esker formed due to sub-glacial melting in response to an elevated, but spatially restricted, geothermal heat flux rather than climate-induced warming. Now, however, new observations reveal the presence of many assemblages of glacial abrasion forms and associated channels that could be evidence of more widespread wet-based glaciation in Phlegra Montes, including the collapse of several distinct ice domes. This landform assemblage has not been described in other glaciated, mid-latitude regions of the martian northern hemisphere. Moreover, Phlegra Montes are flanked by lowlands displaying evidence of extensive volcanism, including contact between plains lava and piedmont glacial ice. These observations provide a rationale for investigating non-climatic forcing of glacial melting and associated landscape development on Mars, and can build on insights from Earth into the importance of geothermally-induced destabilisation of glaciers as a key amplifier of climate change.

(1) Gallagher, C. and Balme, M. (2015). Eskers in a complete, wet-based glacial system in the Phlegra Montes region, Mars, Earth and Planetary Science Letters, 431, 96-109.