Can Mars' low gravity affect how it's rocks deform?

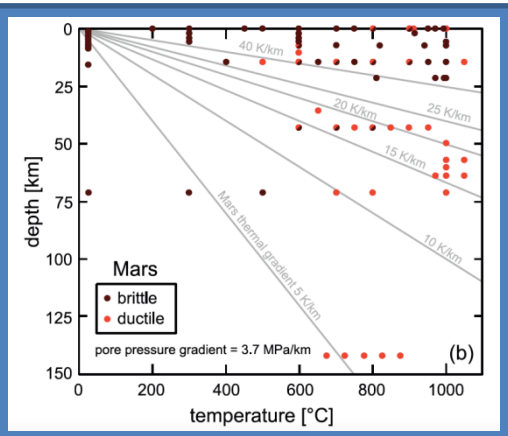

Figure 1: Depth of the brittle-ductile transition on Mars (Heap et al., 2017).

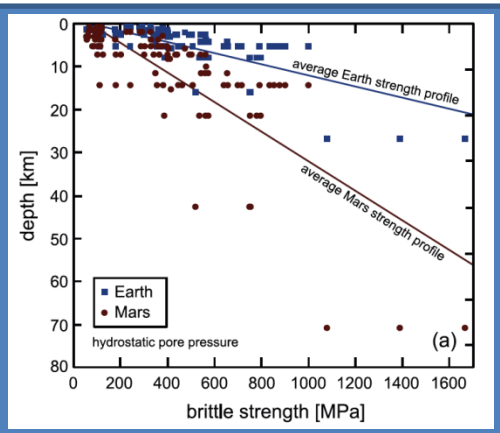

Figure 2: Brittle lithosphere strength profiles (Heap et al., 2017).

- The surface gravity of a planet plays a controlling role in the magnitude of lithostatic pressure at a given depth.
- Lithostatic pressure exerts a first-order control on the mechanical and hydraulic behaviour of rock.
- We collate published rock deformation data on basalt to explore the influence of surface gravity on the depth of the brittle-ductile transition and the strength of the Martian lithosphere.
- The brittle-ductile transition is much deeper on Mars than on Earth due to surface gravity alone, for a range of Martian thermal gradients (Figure 1).
- The Martian lithosphere is much weaker than Earth's due to surface gravity alone (Figure 2).
- We discuss these data in terms of their impact on Martian topography, volcanism, and hydrology.
- These inferences can be tested by data returned by the upcoming InSight mission to Mars, due to reach the Red Planet in 2018.

Heap, M.J., Byrne, P., and ***Mikhail, S****. (2017), Low surface gravitational acceleration of Mars results in a thick and weak lithosphere: Implications for topography, volcanism, and hydrology, Icarus, 281, 103-114.* (link to paper)

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