

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

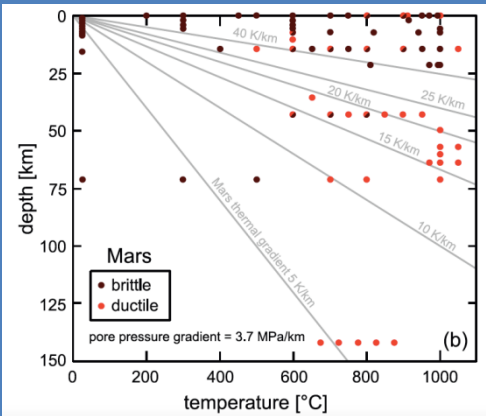


Figure 1: Depth of the brittle-ductile transition on Mars (Heap et al., 2017).

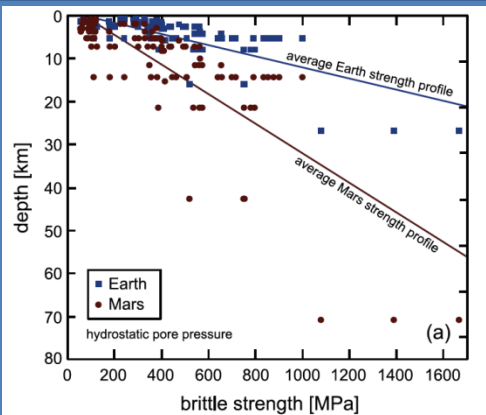


Figure 2: Brittle lithosphere strength profiles (Heap et al., 2017).

- 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](#))