

## Research Highlights

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### Geodynamics: Breaking the lid

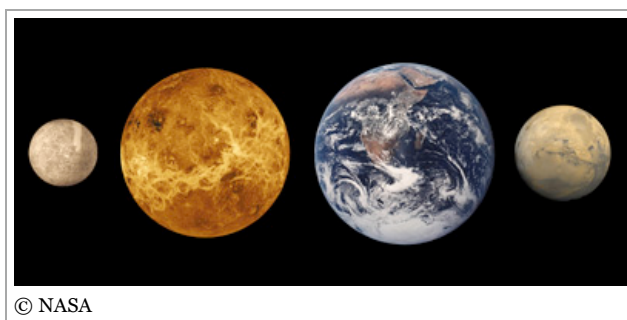
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#### The presence of liquid water on the surfaces of Mars and Venus could be a key determinant for past occurrence of Earth-style plate tectonics on these planets

Plate tectonics — the slow but steady recycling of a planet's rigid outermost layer or lid into its interior — probably operates only on Earth, of all the terrestrial planets and moons. Research now suggests that this process could have existed on Venus and possibly on Mars in the geologic past [1](#) (#Bi).

Numerical modelling by Craig O'Neill from Rice University and his colleagues, along with scaling theory, elucidates the combinations of vigour of mantle convection and strength of the outermost shell that are necessary to break the lid of planetary bodies into tectonic plates. They find that the thickness of the brittle part of the lid is the key factor in this process. Unlike on Earth, on the Moon, Mercury and present-day Venus and Mars, this thickness is such that the forces of convection — the slow churning of a planetary body's interior — are insufficient to break it. However, the new results position Venus, and Jupiter's moons Io and Europa, on the transition between a plate-tectonic and a stagnant-lid regime.

If liquid water was present on Venus and Mars in the geologic past, their lids would have been considerably weaker, making past plate tectonics on those two planets plausible.



## REFERENCE

1. O'Neill, C. O., Jellinek, A. M. & Lenardic, A. Conditions for the onset of plate tectonics on terrestrial planets. *Earth Planet Sci. Lett.* **261**, 20–32 (2007).