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Solar system

Mars may still have magma

Seismic studies are revealing details of the Red Planet's finer structure

Jacklin Kwan

MARS is more geologically active than we expected, and it might also have a water table not far below the surface.

The Red Planet is thought to have once been volcanically active, but not for millions of years. Now, by studying a cluster of more than 20 seismic events on Mars using data from NASA's InSight lander mission, Simon Stähler at ETH Zurich in Switzerland and his colleagues have uncovered a likely magma deposit near Cerberus Fossae, a region of fissures created by fault lines.

InSight landed on Mars in 2018 and studies seismic waves there. The speed and frequency of these waves can tell us about the planet's geological structure.

"Now, we have enough data to see certain statistical patterns and we are able to locate quakes happening on Mars," says Stähler.

His team has found that many of the marsquakes, both small and large, originate in the Cerberus Fossae region.

The team suspected magma may be present after analysing the spectral characteristics of the waves. The low frequencies detected are usually associated with volcanic settings.

"There must be some sort of hot body or magma chamber – so active volcanism – in this specific area," says team member Anna Mittelholz at Harvard University.

The team corroborated the finding with satellite images that show dark deposits of dust in the region, suggesting volcanic activity in the past 50,000 years (*Nature Astronomy*, doi.org/gq497j).

Many people think of planets as being unchanging over time, says Nick Teanby at the University of Bristol, UK. "I think the exciting thing is that there are these new features on the surface [of Mars] and they could still be active. Mars is still doing things."

More tantalising details have come from tremors that InSight detected from the impacts of two meteorites that struck Mars in December 2021. It is the first time we have measured seismic waves moving across the surface of another planet.

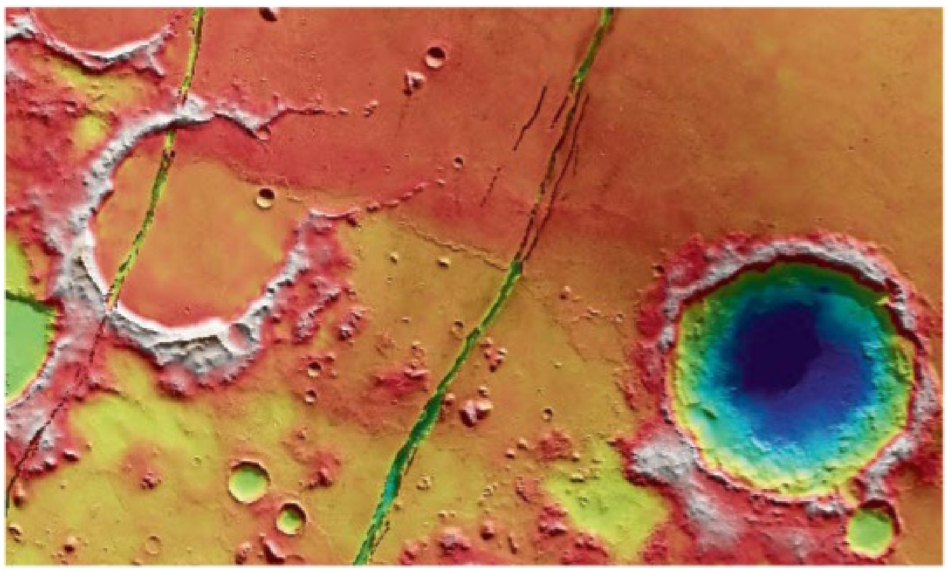
Doyeon Kim, also at ETH Zurich, and his colleagues say the surface waves coming to the lander from the impact sites were moving faster than expected, at around 3.2 kilometres per second.

Until the impacts, InSight had only been able to study seismic waves from inside Mars. These deep "body waves" showed that the crust beneath the lander was made of three distinct layers.

However, the team's analysis revealed that this structure wasn't representative of the planet as a whole, and the crust that the surface waves were moving through was denser than that under InSight (*Science,* doi.org/gq44kx). "The crustal structure looks really, really different away from the lander," says Kim.

Although the composition of the crust couldn't be established, Kim says a water table beneath Mars's ancient lava flow could have increased the wave velocities, as the presence of water would boost the ground's density. ▮

Coloured view of Cerberus Fossae on Mars. White is high ground, blue is low



Animal behaviour

Brown centipedes swim by wiggling the 'wrong way'

SOME centipedes don't swim by paddling their many legs, but by wiggling their body from tail to head – the opposite direction of motion that snakes use to cross water.

Kelimar Diaz at the Georgia Institute of Technology and her colleagues used high-speed cameras to observe how brown centipedes (*Lithobius forficatus*) move across the surface of water.

Brown centipedes are found in the UK and North America and don't live up to their name – they have just 28 legs affixed to a body comprising a head and 14 identical segments.

In 32 trials, the team placed a single brown centipede in a tank full of water. These arthropods were too light to dive under the water, but could move across its surface. As each centipede floated, the team saw its legs wiggle a bit, but Diaz says the animals really only moved forward because they were undulating their whole body.

"Snakes and eels do this too, but our centipedes did it the 'wrong' way," says Diaz. The brown centipedes undulated in a motion that began at their tail, while other elongated animals typically shimmy starting from their heads.

The team made a simplified plastic model of a large segment of a brown centipede with four legs, and analysed how it interacted with water when dragged. They also modelled all the forces acting on the centipede's body as it swims.

This revealed that the legs affected the drag forces acting on the body in such a way that it was easier for the animal to perform tail-to-head undulations instead of the reverse (arXiv, doi.org/jjdt).

In fact, says Diaz, amphibious centipedes tuck their legs in when underwater and swim more like snakes, because they don't experience the same drag effect. ▮

Karmela Padavic-Callaghan

Brown centipedes whip their body from tail to head to swim