MARS

Venerable volcanism

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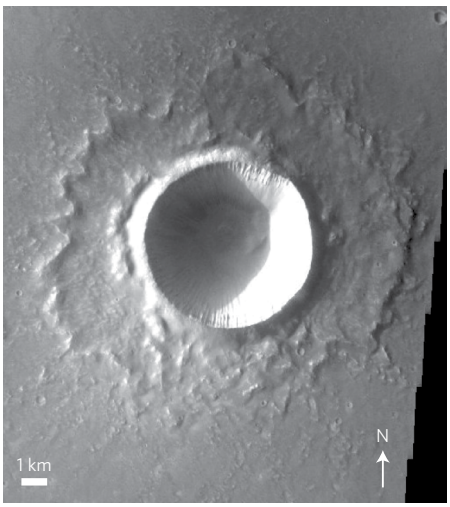

Credit: Nasa/jpl-caltech/arizona state university

Contrary to Earth, where volcanic activity is mostly driven by plate tectonics, Mars's shield volcanoes were created by hot plumes channelling material from the deep mantle. Estimates of the formation timescales of these volcanoes, which can reach diameters of several hundred kilometres, vary widely. Benjamin Cohen and co-workers examine nakhlite meteorites to quantify the rate of growth of a Martian shield volcano. These meteorites — most likely from a crater (pictured) lying northwest of Elysium Mons — are mostly basaltic with minor components including phyllosilicates (clays) and carbonates, connected with aqueous processes.

The age of Martian volcanoes is usually determined by counting and characterizing impact craters, providing only relative timescales. Instead, Cohen et al. apply radioisotope dating techniques — similar to those used by Earth's volcanologists — to those nakhlites from Mars. They combine ^{38}Ar cosmogenic exposure dating, which is a proxy for the time spent in space between Mars and Earth, with $^{40}Ar/^{39}Ar$ dating of six nakhlite samples. The authors conclude that the nakhlite samples were formed over four volcanic episodes, thus enabling them to extract a growth rate 1,000 times slower than on Earth. Moreover, the nakhlites were erupted 1,416 (±7) to 1,322 (±10) million years ago (2σ). These results suggest protracted volcanic activity with a higher eruption rate, at least up to those dates.

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