Data from Mars probe suggests possibility of proto-ring development

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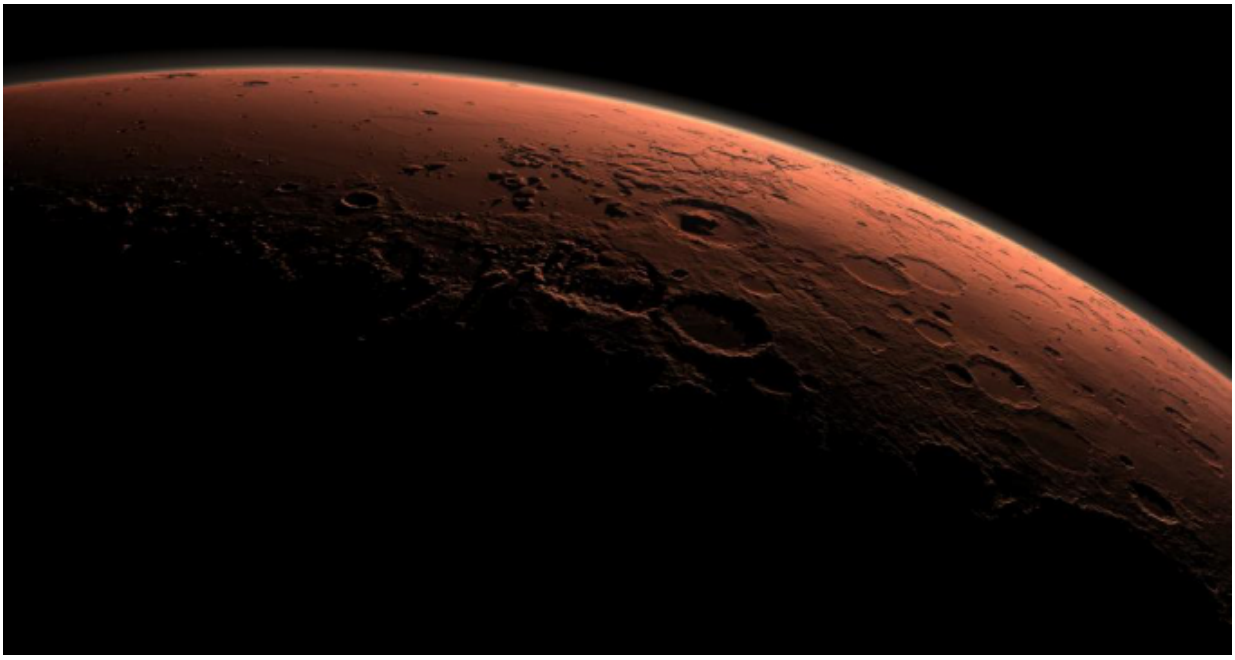

Credit: NASA

(Phys.org)—A pair of researchers with the Physical Research Laboratory in India studying data sent back from NASA's Mars Atmosphere and Volatile Evolution (MAVEN) probe has found possible evidence of the development of rings around the planet. In their paper published in the journal *Icarus*, Jayesh Pabari and P. J. Bhalodi describe the data, what the probe has measured, and the likelihood that some of

the dust that surrounds Mars may one day accumulate into a set of rings encircling the planet.

Scientists have speculated for many years that one day (20 to 70 million years from now), Mars will have rings around its equator similar to those seen around Saturn today—this is because the material that makes up its two biggest moons is unstable and likely to result in the moons tearing apart as they are drawn closer to the planet by its gravity. But now, it appears that the process might already have begun. In this new effort, the researchers found evidence in data from MAVEN that suggests at least some of the dust encircling the planet came from one or both of its biggest moons, Phobos and Deimos.

Data from MAVEN had already shown that there was a cloud of dust surrounding Mars, but it is still not clear how big the particles are. Space scientists believe that most of the dust that is thrown into the atmosphere when the planet and its moons are struck by asteroids is composed of particles so tiny that they are carried away by the solar wind. The new analysis by Pabari and Bhalodi, which compared dust and rock particles found in the Martian upper atmosphere with those predicted by models, showed that most of the dust in the cloud was interplanetary. But there was also a small component (approximately 0.6 percent) that appeared likely to have come from one of the two moons.

The researchers are quick to point out that spotting moon particles in an outer atmospheric cloud is not evidence of proto-ring development, but suggest it is possible. They note it will not be possible to determine if such activity is truly occurring until a probe is sent to Mars that is capable of fully analyzing material in the dust cloud.

More information: J.P. Pabari et al, Estimation of micrometeorites and satellite dust flux surrounding Mars in the light of MAVEN results, *Icarus* (2017). DOI: 10.1016/j.icarus.2017.01.023

Abstract

Recently, MAVEN observed dust around Mars from ~150 km to ~1000 km and it is a puzzling question to the space scientists about the presence of dust at orbital altitudes and about its source.
A continuous supply of dust from various sources could cause existence of dust around Mars and it is expected that the dust could mainly be from either the interplanetary source or the Phobos/Deimos. We have studied incident projectiles or micrometeorites at Mars using the existing model, in this article. Comparison of results with the MAVEN results gives a new value of the population index S, which is reported here. The index S has been referred in a power law model used to describe the number of impacting particles on Mars.
In addition, the secondary ejecta from natural satellites of Mars can cause a dust ring or torus around Mars and remain present for its lifetime. The dust particles whose paths are altered by the solar wind over its lifetime, could present a second plausible source of dust around Mars. We have investigated escaping particles from natural satellites of Mars and compared with the interplanetary dust flux estimation. It has been found that flux rate at Mars is dominated (~2 orders of magnitude higher) by interplanetary particles in comparison with the satellite originated dust. It is inferred that the dust at high altitudes of Mars could be interplanetary in nature and our expectation is in agreement with the MAVEN observation. As a corollary, the mass loss from Martian natural satellites is computed based on the surface erosion by incident projectiles.