Scientists discover one of the mechanisms of water formation on the moon

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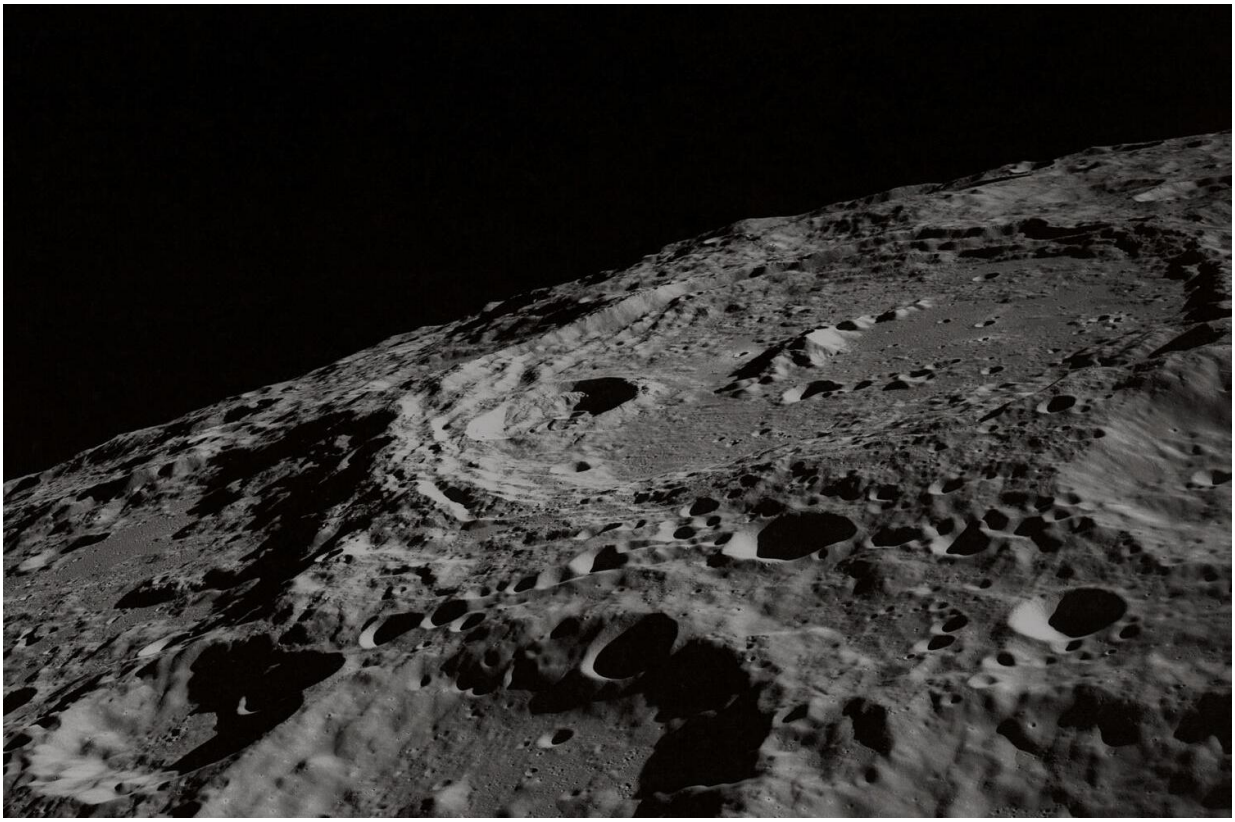

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The results of a recent study conducted by the NASA Lunar Reconnaissance Orbiter, the agency's automatic interplanetary station, show the existence of 'permafrost' near the poles of the moon with a

relatively high content of water ice (up to 5% by weight). It is believed that water ice could supply a life support system for the future Russian Lunar Station, and that it could also produce hydrogen-oxygen fuel for flights into deep space.

Researchers from the Higher School of Economics and the Space Research Institute of the Russian Academy of Sciences have discovered one of the mechanisms for how water forms on the moon. Scientists have shown that silver hydroxide molecules are released from silicon dioxide in the lunar regolith (soil). These molecules react easily with hydrogen, leading to the formation of water and silver. This means that water molecules can be formed on the moon. These molecules will become part of the near-surface lunar soil. In some areas, the proportion of water formed by this mechanism in the lunar regolith may exceed 10-6 %.

It is usually assumed that water came to the moon from outside. For example, the comet hypothesis on the origins of lunar ice argues that the impact of a comet on the surface of the moon lead to the formation of a temporary lunar atmosphere. The volatile component of this atmosphere could then accumulate in cold traps—constantly shaded areas of the moon that exist in particular in the polar regions at the bottom of craters. Condensation of volatile compounds leads to the formation of ice.

"The study demonstrates that water may form due to internal, continuously functioning mechanisms (comets hitting the lunar surface is a rather rare phenomenon). It turns out that the water on the moon can be present not only in cold traps, but also in the near-surface lunar soil. Analysis of the processes occurring near the surface of the moon should take this fact into account. For example, the presence of water can affect the photoelectric properties of the lunar regolith and the parameters of the plasma-dust system over the moon," explains Sergey Popel, one of the study's authors who serves as Professor of Physics at the Higher

School of Economics and Head of the Laboratory at the Space Research Institute of the Russian Academy of Sciences.

More information: A. Yu. Dubinskii et al, Water Formation in the Lunar Regolith, *Cosmic Research* (2019). DOI: 10.1134/S0010952519020047