3 questions: Ben Weiss discusses what a wet moon might mean

The planetary scientist explores the implications of the recent discovery of water on the lunar surface.

David L. Chandler, MIT News Office

today's news

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Last week, NASA and other agencies announced results from instruments aboard three different spacecraft which all indicate that there is water present in the surface soil, or regolith, of the moon. Although the amount is very small, it is much more than had been predicted. Associate Professor of Planetary Sciences Benjamin Weiss discusses the implications of the new finding.

NASA

Q: How surprising was the detection of water on the surface of the moon, especially in daylight regions?
A: It was enormously surprising and exciting. The accepted wisdom has been that the moon is and has always been bone dry. Although water was identified in the Apollo samples, it was generally discounted as terrestrial contamination. The three studies last week, which involved spectroscopic data from three different spacecraft taken over a period of 10 years, showed that not only does the lunar soil apparently have up to 0.1 percent by weight of water in its upper layer, but that this water is forming and "exhaling" on timescales of just a lunar day. This means that much of this water was recently emplaced and is present all over the surface of the moon. Until now, it has generally been assumed that if there is any water on the moon, it would almost exclusively be in the form of ice located mainly in permanently shadowed craters at the lunar poles.

Q: Does this finding suggest that there may be amounts of water in the lunar environment that would be sufficient to be a resource for future astronauts working on the moon?
A: The spectroscopic evidence for lunar water only reflects the top few millimeters of the lunar surface. Therefore, these data do not constrain the abundance of lunar water throughout most of the lunar soil. Nevertheless, if astronauts were to harvest soil containing water with an abundance like that inferred from the spectroscopic data, then they would have to process about a ton of regolith to obtain a liter of water. Given that water was observed to leave the soil every lunar day due to solar heating up to 100

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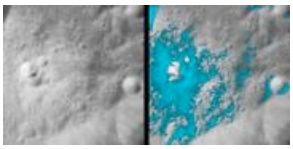

These images show a recent crater on the side of the moon that faces away from Earth, as seen by a NASA instrument aboard the Indian Chandrayaan-1 spacecraft. On the left, an ordinary image taken by infrared light. On the right, the light blue shows water-rich minerals, associated with material ejected from the crater.
Credits - Image: ISRO/NASA/JPL-Caltech/USGS/Brown Univ.

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water was observed to leave the soil every lunar day due to solar heating up to 100 degrees Celsius, this implies that simply heating the soil to these relatively mild temperatures would be enough to liberate the water for use. I think this makes it a promising resource for astronauts.

Q: Does this discovery tell us anything new about the formation or evolution of the moon, or raise new questions about it?
A: It is not yet clear what is the source of this water. If much of it is indigenous, it suggests that the moon may have been far wetter than we supposed. This may have important implications for one of the leading hypotheses for the origin of the moon — that is was formed from the debris of a giant meteoroid impact on the young Earth — which predicts that the source material which formed the moon should have been extensively heated. Alternatively, if the main source of the water is the solar wind or comets, then it says little about the original composition of the moon.

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Although it is an important discovery, I think that the real profit for a future human civilization is still hard to imagine. I would better think that the real profit of this finding is the new perception of how easy is to find water in other different places different from our planet and its relationship with the presence of life.