Scientists finds evidence of water ice on asteroid's surface

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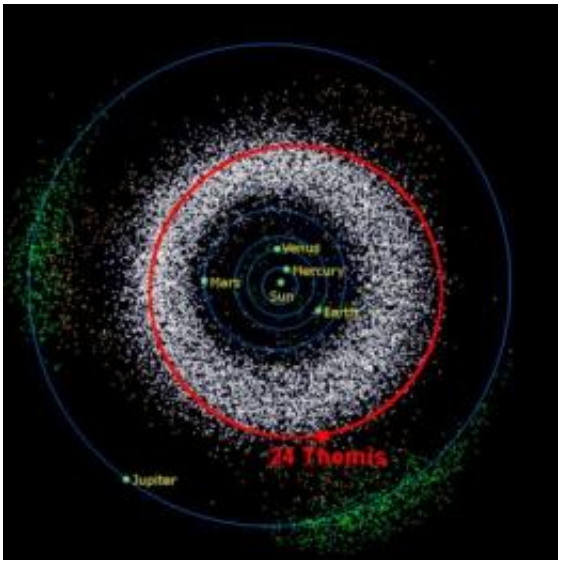

This image shows the Themis Main Belt which sits between Mars and Jupiter. Asteroid 24 Themis, one of the largest Main Belt asteroids, was examined by University of Tennessee scientist, Josh Emery, who found water ice and organic material on the asteroid's surface. His findings were published in the April 2010 issue of *Nature*. Credit: Josh Emery/University of Tennessee, Knoxville

Asteroids may not be the dark, dry, lifeless chunks of rock scientists have long thought.

Josh Emery, research assistant professor with the earth and planetary sciences department at the University of Tennessee, Knoxville, has found evidence of water ice and organic material on the asteroid 24

Themis. This evidence supports the idea that asteroids could be responsible for bringing water and organic material to Earth.

The findings are detailed in the April 29 issue of the journal *Nature*.

Using NASA's Infrared Telescope Facility on Hawaii's Mauna Kea, Emery and Andrew Rivkin of Johns Hopkins University in Laurel, Md., examined the surface of 24 Themis, a 200-kilometer wide asteroid that sits halfway between Mars and Jupiter. By measuring the spectrum of infrared sunlight reflected by the object, the researchers found the spectrum consistent with frozen water and determined that 24 Themis is coated with a thin film of ice. They also detected organic material.

"The organics we detected appear to be complex, long-chained molecules. Raining down on a barren Earth in meteorites, these could have given a big kick-start to the development of life," Emery said.

Emery noted that finding ice on the surface of 24 Themis was a surprise because the surface is too warm for ice to stick around for a long time.

"This implies that ice is quite abundant in the interior of 24 Themis and perhaps many other asteroids. This ice on asteroids may be the answer to the puzzle of where Earth's water came from," he said.

Still, how the water ice got there is unclear.

24 Themis' proximity to the sun causes ice to vaporize. However, the researchers' findings suggest the asteroid's lifetime of ice ranges from thousands to millions of years depending on the latitude. Therefore, the ice is regularly being replenished. The scientists theorize this is done by a process of "outgassing" in which ice buried within the asteroid escapes slowly as vapor migrates through cracks to the surface or as vapor escapes quickly and sporadically when 24 Themis is hit by space debris.

Since Themis is part of an asteroid "family" that was formed from a large impact and the subsequent fragmentation of a larger body long ago, this scenario means the parent body also had ice and has deep implications for how our solar system formed.

The discovery of abundant ice on 24 Themis demonstrates that water is much more common in the Main Belt of asteroids than previously thought.

"Asteroids have generally been viewed as being very dry. It now appears that when the asteroids and planets were first forming in the very early Solar System, ice extended far into the Main Belt region," Emery said. "Extending this refined view to planetary systems around other stars, the building blocks of life -- water and organics -- may be more common near each star's habitable zone. The coming years will be truly exciting as astronomers search to discover whether these building blocks of life have worked their magic there as well."

The scientists' discovery also further blurs the line between comets and asteroids. Asteroids have long been considered to be rocky and comets icy. Furthermore, it was once believed that comets could have brought water to Earth. This theory was nixed when it was discovered comets' water has different isotopic signatures than water on Earth.

Now, due to Emery and Rivkin's findings, many wonder if asteroids could be responsible for seeding Earth with the ingredients for life.

More information: The Nature article is entitled "Detection of Ice and Organics on an Asteroidal Surface."

Provided by University of Tennessee at Knoxville