Clays on Mars: More Plentiful Than Expected

Georgia Institute of Technology

A new study co-authored by the Georgia Institute of Technology indicates that clay minerals, rocks that usually form when water is present for long periods of time, cover a larger portion of Mars than previously thought. In fact, Assistant Professor James Wray and the research team say clays were in some of the rocks studied by Opportunity when it landed at Eagle crater in 2004. The rover only detected acidic sulfates and has since driven about 22 miles to Endeavour Crater, an area of the planet Wray pinpointed for clays in 2009.

The study is published online [1] in the current edition of Geophysical Research Letters.

The project, which was led by Eldar Noe Dobrea of the Planetary Science Institute, identified the clay minerals using a spectroscopic analysis from the Mars Reconnaissance Orbiter. The research shows that clays also exist in the Meridiani plains that Opportunity rolled over as it trekked toward its current position.

“It’s not a surprise that Opportunity didn’t find clays while exploring,” said Wray, a faculty member in the School of Earth and Atmospheric Sciences. “We didn’t know they existed on Mars until after the rover arrived. Opportunity doesn’t have the same tools that have proven so effective for detecting clays from orbit.”

The clay signatures near Eagle crater are very weak, especially compared to those along the rim and inside Endeavour crater. Wray believes clays could have been more plentiful in the past, but Mars’ volcanic, acidic history has probably eliminated some of them.

"It was also surprising to find clays in geologically younger terrain than the sulfates,” said Dobrea. Current theories of Martian geological history suggest that clays, a product of aqueous alteration, actually formed early on when the planet's waters were more alkaline. As the water acidified due to volcanism, the dominant alteration mineralogy became sulfates. "This forces us to rethink our current hypotheses of the history of water on Mars," he added.

Even though Opportunity has reached an area believed to contain rich clay deposits, the odds are still stacked against it. Opportunity was supposed to survive for only three months. It’s still going strong nine years later, but the rover’s two mineralogical instruments don’t work anymore. Instead, Opportunity must take pictures of rocks with its panoramic camera and analyze targets with a spectrometer to try and determine the composition of rock layers.

“So far, we’ve only been able to identify areas of clay deposits from orbit,” said Wray. “If Opportunity can find a sample and give us a closer look, we should be able to determine how the rock was formed, such as in a deep lake, shallow pond or

volcanic system."

As for the other rover on the other side of Mars, Curiosity's instruments are better equipped to search for signs of past or current conditions for habitable life, thanks in part to Opportunity. Wray is a member of Curiosity's science team.

Related Links

- College of Sciences [2]
- James Wray Website [3]
- Published Article [1]
- School of Earth and Atmospheric Sciences [4]

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