Brigham Young U. scientist leads discovery of mountains on Titan (Forwarded)

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BYU scientist leads discovery of mountains on Saturn's largest moon
By Jessica Witt

By analyzing images from NASA's Cassini Radar instrument, a Brigham Young University professor helped discover and analyze mountains on Saturn's largest moon, additional evidence that it has some of the most earthlike processes of any celestial body in the solar system.

Planetary scientist Jani Radebaugh is lead author of the discovery paper in the December issue of the astronomy journal Icarus. The images retrieved by the Cassini Radar are the first images showing the details of Titan's surface −− previous spacecraft and telescopes could not pierce the haze and clouds surrounding the moon to the surface.

The discovery of mountains on Titan grew out of Radebaugh's collaboration with a research team that recently found sand dunes and methane lakes on Titan. Radebaugh was a coauthor on the Science magazine study that introduced Titan's sand dunes in May 2006 as well as the Nature study that introduced Titan's methane lakes in January 2007.

"Since this is the first time humans have been able to see through the haze to Titan's surface, it was shocking to find these mountains, channels, dunes, and cryo−lava flows," Radebaugh said. "We had to wait until we got all the way to Titan to see these landforms that are so similar to Earth."

Upon receiving the images from NASA, Radebaugh, in collaboration with the Cassini Radar Team, discovered the mountains and began analyzing their characteristics. With no instrument to precisely measure the mountains' height, Radebaugh looked at the light and shadows in the radar images to

calculate the mountains' slope and then derive their height.

According to the study, Titan's mountains are most likely made of water ice and are relatively small in height, at most 2 km (1.25 mi) from base to peak. That's about half as tall as Mount Timpanogos near BYU's campus. The consistently short height of Titan's mountains provides evidence that they have been subject to similar amounts of erosion, that they are roughly the same age or that the materials are behaving in a way that prevents them from growing taller.

"Dr. Radebaugh's work represents an important advance in our understanding of that icy moon and the Earth," said Dr. Jason Barnes, a research scientist at the NASA Ames Research Center. "Her discovery tells us about the mountain−building process in general and about Titan's crust in particular."

Prior to Cassini, scientists assumed that most of the topography on Titan would be impact structures, yet these new findings reveal that similar to Earth, the mountains were formed through geological processes on the moon.

Radebaugh proposes four possible explanations for the formation of the mountains on Titan. The first possibility is that the mountains were thrust up from crustal compression, horizontal forces smashing the crust together and upward. Alternatively, Titan's mountains may have formed through spreading or separation of the crust, in the same way that Utah's Wasatch Mountains separated from the Oquirrh Mountains to the west.

It's also possible some of the mountains have been created by impact craters that threw out blocks of material, or that erosion stripped away a preexisting layer of material and left high−standing features like the mountains.

"The hard work of collecting simple facts is the key to understanding strange new worlds, and from these facts, Jani has discovered a whole new type of feature," said Richard Ghail, a planetary scientist for JMP Consulting, UK.

Since the processes on Titan are so similar to Earth's, Radebaugh also concluded in the study that Titan may be an interesting laboratory for studying Earth. Like Earth, Titan possesses the primary ingredients for life, namely energy, water and organics. Information from Titan will help scientists better understand the Earth's origin, formative processes and development of life.

"We still don't understand exactly how life began on Earth, so if we can understand how the fundamentals of these processes may be starting in some laboratory like Titan, it will help us understand the Earth a lot better," Radebaugh said.

In addition to analyzing images from space, Radebaugh also looks on planet earth for clues about the geology of other planets, moons and objects in

the solar system. Two years ago Radebaugh scoured Antarctica for meteorites with the Antarctic Search for Meteorites (ANSMET) program. Through field work at Hawaiian volcanoes, she has also worked with students to utilize a technique for using a camcorder to measure eruption temperatures in the hope of learning more about volcanoes on Io, a moon of Jupiter.

Radebaugh, an assistant professor of geological sciences, received her undergraduate in physics and astronomy and a master's degree in geology at BYU. In 2005, she received her Ph.D. in planetary science from the University of Arizona.

[NOTE: Images supporting this release are available at http://byunews.byu.edu/archive07−Dec−titan.aspx]

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