First detailed pictures of asteroid reveal bizarre system

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The first detailed images of a binary asteroid system reveal a bizarre world where the highest points on the surface are actually the lowest, and the two asteroids dance in each other's gravitational pull.

A binary asteroid is a system where two asteroids orbit around one another, like a mini Earth-moon system, said Daniel Scheeres, University of Michigan associate professor of aerospace engineering. The new results are scheduled to appear Oct. 12 in the journal *Science* in a pair of papers by Scheeres and Dr. Steven Ostro of the NASA/Caltech Jet Propulsion Laboratory.

The radar images of asteroid KW4 (the official full designation is 66391 1999 KW4) were obtained in May 2001, when the asteroid passed 4.8 million kilometers from Earth. Previously, KW4 was classified as a potentially hazardous asteroid (PHA) because of the proximity of the asteroid's orbit to Earth's orbit. The new observations show that there is no chance of KW4 hitting Earth within at least the next 1,000 years, Scheeres said.

"The KW4 results have profound consequences for ideas about mitigation of the asteroid collision hazard," Scheeres said.

The observations show that the larger object is spinning in its orbit so fast that it has been flattened into a kind of flying saucer shape, said Scheeres. Because of this, the mountainous region along the center of the asteroid actually forms the lowest part on the asteroid. In fact the

asteroid is spinning so fast that the equatorial ridge is very close to lifting off the surface and spinning into space, he said.

Another interesting finding is that the two bodies in the asteroid system are orbiting so closely that they are caught in each other's gravitational pull.

"They are so close together that when one rotates it affects the other's movements," Scheeres said.

Based on the observations, the KW4 binary asteroid appears to have formed either from tidal disruption during a close pass by the Earth or from sunlight shining on it, so that it spins so fast that it eventually broke into two pieces. The odd shapes of asteroids cause them to sometimes spin faster and faster when illuminated by the sun, acting a bit like a solar sail, Scheeres said. This is called the YORP effect.

The recent findings also confirm that the asteroids are only floating piles of rubble held together by gravity and not a solid mass.

Source: University of Michigan