Swift observatory catches asteroid flyby (w/ video)

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(PhysOrg.com) -- As asteroid 2005 YU55 swept past Earth in the early morning hours of Wednesday, Nov. 9, telescopes aboard NASA's Swift satellite joined professional and amateur astronomers around the globe in monitoring the fast-moving space rock. The unique ultraviolet data will aid scientists in understanding the asteroid's surface composition.

"Swift's ultraviolet and X-ray capability gives scientists a unique perspective on comets and asteroids, expanding the spectral window beyond the radio, infrared and optical observations so well handled by big ground-based facilities," said Sergio Campana, a Swift team member at Brera Observatory in Merate, Italy. Campana requested that the spacecraft train its telescopes on the asteroid as a target of opportunity.

Although Swift is better known for its study of high-energy outbursts and cosmic explosions, the versatile satellite has made valuable observations of passing comets and asteroids as well. All told, the spacecraft has observed ten asteroids, including Vesta -- now being studied close-up by NASA's Dawn spacecraft -- and Scheila, which brightened unexpectedly in late 2010 after colliding with a much smaller asteroid.

Classified as a potentially hazardous object, 2005 YU55 poses no threat of a collision with Earth for at least the next century. But understanding the details of how its surface reflects light and heat will allow improved assessments of future hazards. A body in space absorbs sunlight and

reradiates the energy as heat, and both of these processes produce a miniscule force that, over time, can alter the object's motion.

"We observed the asteroid with Swift's Ultraviolet/Optical and X-ray telescopes but, as expected, we saw it only in the UV," said Dennis Bodewits, a Swift team member at the University of Maryland in College Park.

The challenge with 2005 YU55 was its rapid motion across the sky, which was much too fast for Swift to track. Instead, the team trained the spacecraft's optics at two locations along the asteroid's predicted path and let it streak through the field. The first exposure began a few hours after the asteroid's closest approach and fastest sky motion -- before 9 p.m. EST on Nov. 8 -- but detected only a weak signal.

Six hours later, around 3 a.m. EST on Nov. 9, Swift began an exposure that captured the asteroid sweeping through the Great Square of the constellation Pegasus. The 11th-magnitude rock was then 333,000 miles away and moving at 24,300 mph, about an hour after its closest approach to the moon.

That exposure gave the Swift team more than a streak through the stars. "A novel feature of Swift is the ability to go into a mode tracking the arrival of every photon captured by the instrument. With that information, we can reconstruct the asteroid as a point source moving through the Ultraviolet/Optical Telescope's field of view," said Neil Gehrels, lead scientist for Swift at NASA's Goddard Space Flight Center in Greenbelt, Md.

The 27-minute-long image was effectively sliced into short 10-second-long exposures, which then were combined into a movie. This allows scientists to study short-term brightness variations caused by the object's rotation.

The result is a movie of 2005 YU55 at ultraviolet wavelengths unobtainable from ground-based telescopes. For planetary scientists, this movie is a treasure trove of data that will help them better understand how this asteroid is put together, information that may help make predictions of its motion more secure for centuries to come.

Provided by NASA's Goddard Space Flight Center