Scientists Probe Green Comet

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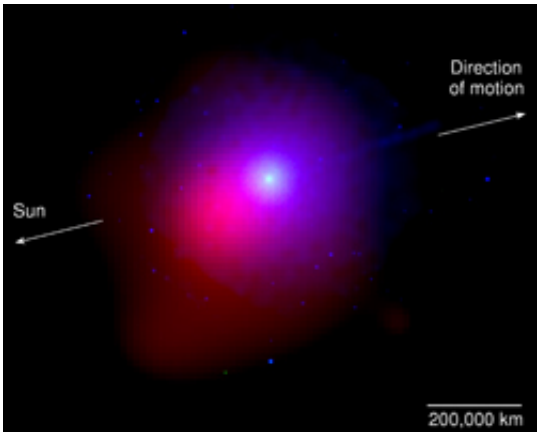

This image of Comet Lulin taken Jan. 28 merges data acquired by Swift's Ultraviolet/Optical Telescope (blue and green) and X-Ray Telescope (red). At the time of the observation, the comet was 99.5 million miles from Earth and 115.3 million miles from the sun. Credit: Univ. of Leicester/NASA/Swift/Carter et al.

(PhysOrg.com) -- Space scientists from the University of Leicester are keeping a close eye on a ‘green comet’ fast approaching the Earth - reaching its nearest point to us on February 24.

Comet Lulin will streak by the earth within 38 million miles - 160 times farther than the moon -and is expected to be visible to the naked eye. Discovered only a year ago, the comet gains its green colour from poisonous cyanogen and diatomic carbon gases in its atmosphere.

This will be the comet’s first visit to the Earth’s inner solar system- and

will enable the team from the University of Leicester to gain valuable insights into the comet.

They are using NASA's Swift satellite to monitor Comet Lulin as it closes on Earth. The spacecraft has recorded simultaneous ultraviolet and X-ray images of a comet.

“Swift is the ideal spacecraft with which to observe this comet”, said Jenny Carter, a scientist working with Dr Andrew Read at the University of Leicester, UK. “We alerted the Swift team that the comet might be visible” said Dr Read “and they quickly responded to take images using both the X-ray (XRT) and Ultraviolet/Optical Telescopes (UVOT) on-board.”

Dr Julian Osborne, leader of the Swift project at Leicester, said 'The wonderful ease of scheduling of Swift and its joint UV and X-ray capability make Swift the observatory of choice for observations like these.'

Carter added: “It is important to carry out these observations as they give us clues about the origin of comets and the solar system".

As the University of Leicester has played a major role in developing Swift's X-Ray Telescope and is an important centre for the study of high-energy emission from objects within our Solar System, it is an ideal place for this study to be carried out.

A comet is a clump of frozen gases mixed with dust. These "dirty snowballs" cast off gas and dust whenever they venture near the sun. Comet Lulin, which is formally known as C/2007 N3, was discovered last year by astronomers at Taiwan's Lulin Observatory.

On Jan. 28, Swift trained its Ultraviolet/Optical Telescope and X-Ray

Telescope on Comet Lulin. "The comet is quite active," said team member Dennis Bodewits, a NASA Postdoctoral Fellow at the Goddard Space Flight Center in Greenbelt, Maryland, USA. "The UVOT data show that Lulin was shedding nearly 800 gallons of water each second." That's enough to fill an Olympic-size swimming pool in less than 15 minutes.

Swift can't see water directly. But ultraviolet light from the sun quickly breaks apart water molecules into hydrogen atoms and hydroxyl (OH) molecules. Swift's UVOT detects the hydroxyl molecules, and its images of Lulin reveal a hydroxyl cloud spanning nearly 250,000 miles, or slightly greater than the distance between Earth and the moon.

The UVOT includes a prism-like device called a grism, which separates incoming light by wavelength. The grism's range includes wavelengths where the hydroxyl molecule is most active. "This gives us a unique view into the types and quantities of gas a comet produces" Bodewits explains.

In the Swift images, the comet's tail extends off to the right. Solar radiation pushes icy grains away from the comet. As the grains gradually evaporate, they create a thin tail of hydroxyl molecules.

Farther from the comet, even the hydroxyl molecule succumbs to solar ultraviolet radiation. It breaks into its constituent oxygen and hydrogen atoms. "The solar wind -- a fast-moving stream of particles from the sun -- interacts with the comet's broader cloud of atoms. This causes the solar wind to light up with X-rays, and that's what Swift's XRT sees," said Stefan Immler, also at Goddard.

This interaction, called charge exchange, results in X-rays from most comets when they pass within about three times Earth's distance from the sun. Because Lulin is so active and is losing a lot of gas, its X-ray emitting region extends in a large cloud far sunward of the comet.

Geronimo Villanueva completes the team working on the comet data at Goddard.

“We are looking forward to future observations of Comet Lulin, when we hope to get better X-ray data to help us determine its makeup,” notes Carter. “They will allow us to build up a more complete 3-D picture of the comet during its flight through the solar system.”

Swift, launched in November 2004, is a NASA mission in partnership with the Italian Space Agency and the Science and Technology Facilities Council of the United Kingdom; and is managed by NASA Goddard. Penn State controls science and flight operations from the Mission Operations Center in University Park, Pennsylvania. Los Alamos National Laboratory provides gamma-ray imaging analysis. The Ultra-Violet -Optical Telescope (UVOT) was constructed at UCL's MSSL. The University of Leicester played a major role in developing Swift's X-Ray Telescope and hosts the UK Swift Science Data Centre.

Provided by University of Leicester