Comet debuting in new Deep Impact movie expected to star this winter

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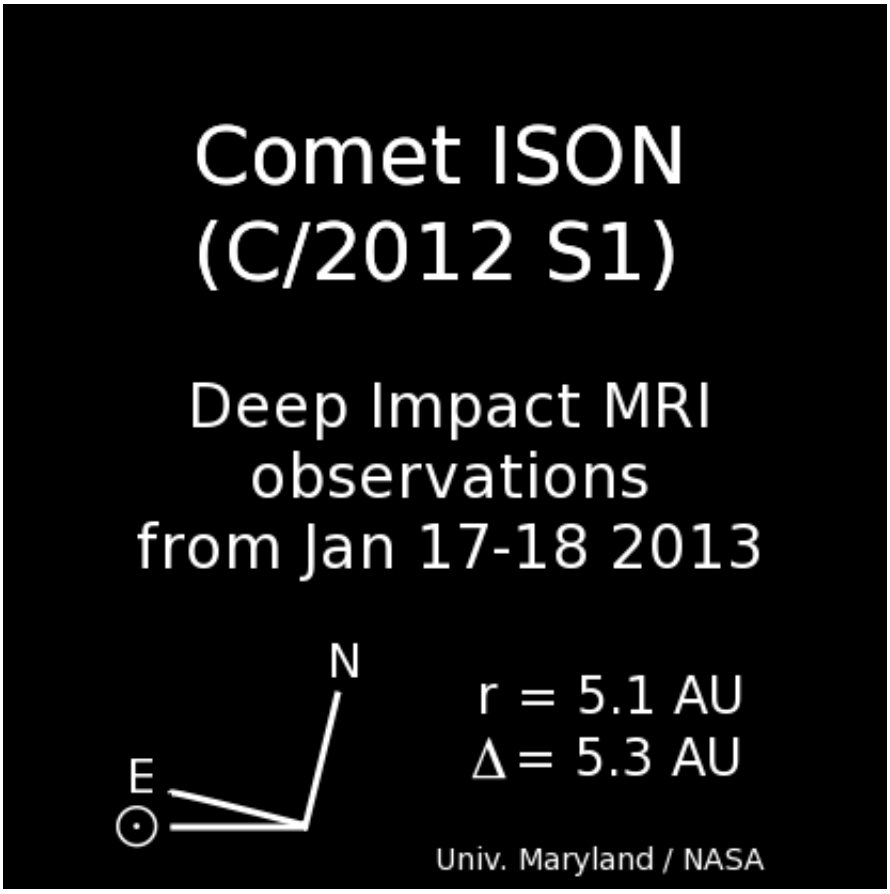
(Phys.org)—The newly discovered comet ISON, which late this year could give sky watchers one of the brightest shows ever, shines in a new movie made by a University of Maryland-led team of scientists. The team recently began tracking and studying the comet with NASA's historic Deep Impact spacecraft.

The "movie"—a brief clip of comet ISON—won't win any Oscars, but it is an early look at a comet that promises to be a major light in the night sky during its close up with the sun beginning November 2013. This close encounter also holds the potential for exciting new scientific insights into the composition of comets, the most pristine remnants of the early days of our solar systems, says Maryland astronomer Tony Farnham and other members of the Deep Impact science team.

"This appears to be this comet's first ever journey into the inner solar system and it is expected to pass much closer to the sun than most comets—within a distance of only a few solar radii," says Farnham, a research scientist at Maryland. "Thus it offers us a novel opportunity to see how the dust and gas frozen in this comet since the dawn of our Solar System will change and evolve as it is strongly heated during its first passage close to the Sun."

Farnham—whose fellow team members include Ken Klaasen of NASA's Jet Propulsion Laboratory and five Maryland colleagues, including Deep Impact Principal Investigator Michael A'Hearn—says this comet also stands out because it was discovered much earlier on its first tour of the inner solar system than most other comets. "We see sun grazers [comets that pass relatively close to the sun] all the time, but most are only seen as they flare up very close to the sun. With this comet we are able to study it from where it is currently, farther from the sun than Jupiter and about five times farther from the sun than Earth, until its closest approach to the Sun, called its perihelion, on November 28th."

Comet ISON is already developing an entourage (coma and tail) of dust and gas that will continue to grow in size and reflect brilliance as it moves nearer to the sun. Its first solar close-up will cause this luminance to peak and could result in an historic starring role in the night sky.



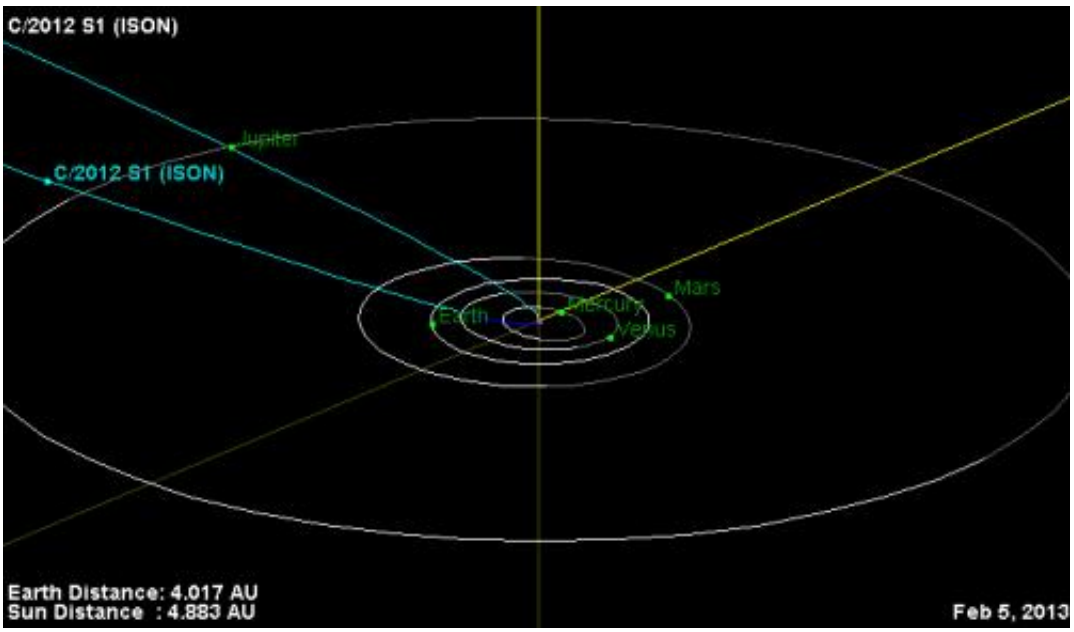
Comet ISON. Credit: University of Maryland

However, this hot encounter also could result in a spectacular breakup. If ISON survives, it is expected to shine even brighter as it moves away from the sun—bright enough to be seen with the naked eye and possibly even brighter than a full moon, astronomers say. In total, Comet ISON could be visible to sky watchers in both the Northern and Southern

Hemispheres for at least a couple of months, from about November 2013 through January 2014.

"This is the fourth comet on which we have performed science observations and the farthest point from Earth from which we've tried to transmit data on a comet," said Tim Larson, project manager for the Deep Impact spacecraft at NASA's Jet Propulsion Laboratory in Pasadena, Calif.

Deep Impact has executed close flybys of two comets – Tempel 1 and Hartley 2 – and performed scientific observations on two more – comet Garradd and now ISON. Its first comet flyby was an historic encounter on July 4, 2005, that saw it smash a probe craft into Tempel 1 generating world-wide headlines and unprecedented comet science.



This is the orbital trajectory of comet C/2012 S1 (ISON). The comet is currently located just inside the orbit of Jupiter. In November 2013, ISON will pass less than 1.1 million miles (1.8 million kilometers) from the sun's surface. The fierce heating it experiences during this close approach to the sun could turn the comet into a bright naked-eye object. Credit: NASA/JPL-Caltech

The ISON imaging campaign is expected to yield infrared data, light curves (which are used in defining the comet's rotation rate) in addition to visible-light images. The current movie of comet ISON was generated from initial data acquired during this campaign. Preliminary results indicate that although the comet is still in the outer solar system, more than 474 million miles (763 million kilometers) from the sun, it is already active. As of Jan. 18, 2013, the tail extending from ISON's nucleus was already more than 40,000 miles (64,400 kilometers) long.

ISON poses no threat to Earth – getting no closer to our planet than about 40 million miles on Dec. 26, 2013. The comet was discovered on Sept. 21, 2012, by two Russian astronomers using the International Scientific Optical Network's 16-inch (40-centimeter) telescope near Kislovodsk.

Frequently referred to as "dirty snowballs," comets consist of varying amounts of dust and ice particles. The ices in a comet are both frozen gases and frozen water. Comets warm up and give off gas and dust whenever they venture near the sun. According to current scientific understanding, what generally powers this activity is frozen water transforming from solid ice to gas, a process called sublimation. Jets powered by ice sublimation release dust, which reflects sunlight and brightens the comet. Typically, a comet's water content remains frozen until it comes within about three times Earth's distance to the sun, or 3 astronomical units (3AU), so astronomers regard this as the solar system's "snow line." At distances beyond 3 AU, other ices, such as carbon monoxide and carbon dioxide, sublimate to drive the comet's activity.

Provided by University of Maryland