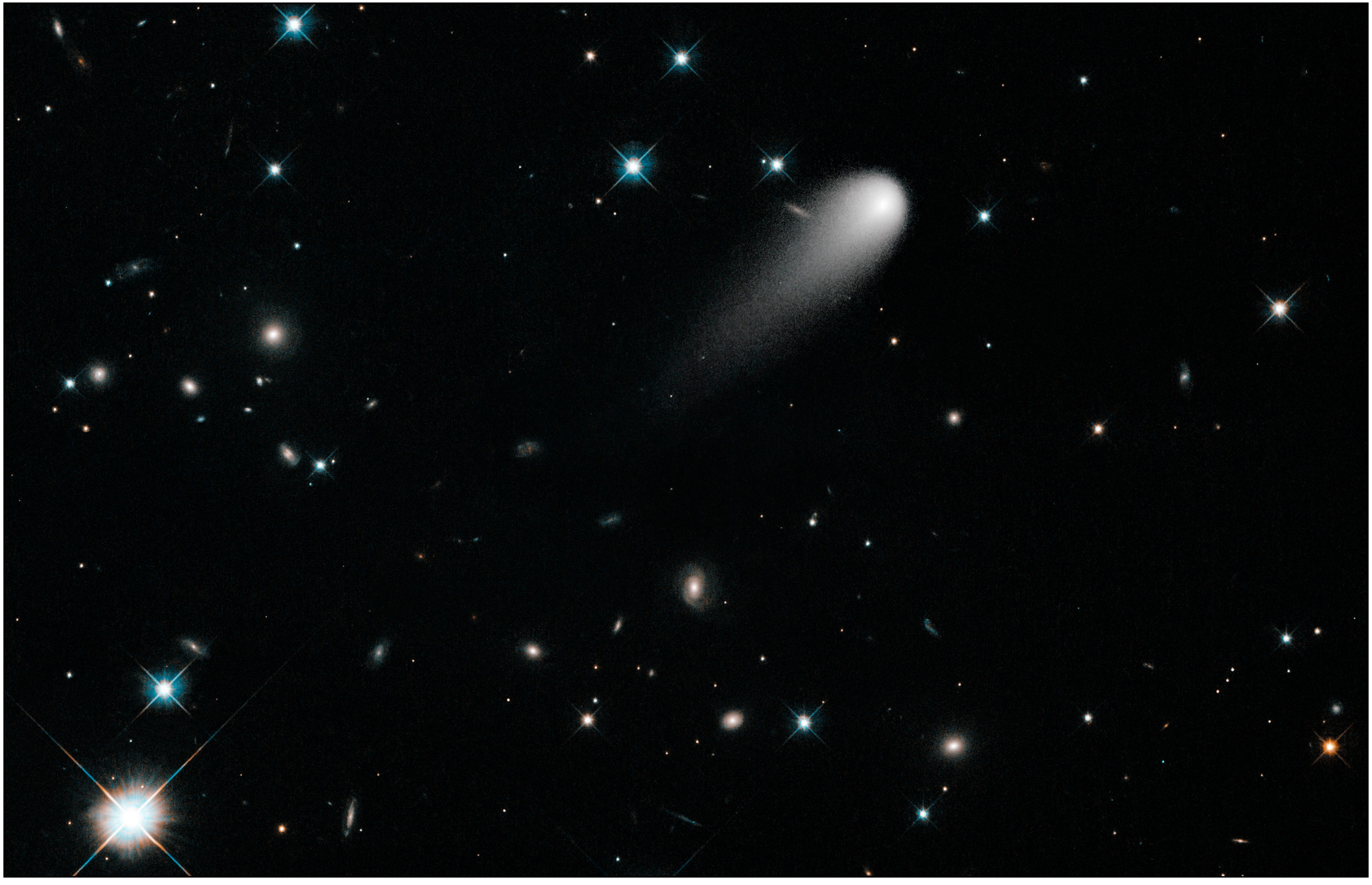
National Aeronautics and Space Administration



Comet ISON

The fate of a sungrazing comet

On September 21, 2012, astronomers discovered an inbound visitor near the orbit of Jupiter, a traveler carrying clues about our solar system's past. The icy guest, a sungrazing comet, was making its way toward the Sun for the first time—giving astronomers a pristine sample from our solar system's earliest beginnings to study.

Traveling nearly 3 million years from the Oort cloud, a far-distant region of icy objects thought to date back to the birth of the solar system, Comet ISON would make its closest pass by the Sun on November 28, 2013, with the possibility of putting on a stunning cosmic spectacle for viewers.

Comets are essentially tightly packed chunks of dirty ice tumbling through space. But as they approach the Sun, their ices warm and transform directly from a solid to a gas, creating their distinctive fuzzy comas and tails. ISON was on the edge of what is known as the Roche Limit, the distance at which a solid body can pass an object with massive gravity—like the Sun—before that gravitational field rips the object apart. This gave it two possible outcomes: either complete its journey around the Sun and emerge as a comet bright enough to be visible to naked-eye viewers on Earth, or disintegrate under gravitational stress.

As ISON reached perihelion, the point closest to the Sun, the comet's nucleus was quickly torn to pieces, leaving nothing behind for observers. Most sungrazing comets meet this fate, since few can withstand the combination of intense gravity and the heat of the Sun's outer layer, or corona. Kicked out of its frigid Oort cloud home, likely by an interaction with a passing star, the comet had traveled millions of miles only to meet its demise.

Despite ISON's eventual fate, its journey toward the Sun did not disappoint. In one of the most coordinated comet-viewing events in history, more than a dozen NASA spacecraft, the International Space Station, and numerous ground-based astronomers monitored and analyzed ISON's journey. Over the course of a year, ISON provided these observers with one of the largest datasets ever collected on a single comet, offering key information for future studies.

The Hubble Space Telescope observed Comet ISON on April 30, 2013, when it was 363 million miles (584 million km) from the Sun (front image), as well as in May and October of 2013. This image is a composite of various exposures captured by Hubble at different wavelengths. It incorporates galaxies far off in our universe with those nearby, creating a striking visualization of the comet's journey through space.

Image Credit: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

Comet ISON as captured by the Hubble Space Telescope on April 10, 2013, when the comet was 386 million miles (621 million km) from the Sun, traveling at 47,000 mph. Despite being relatively far from the Sun (just inside the orbit of Jupiter), the Sun's warmth is already releasing gas and dust particles from the comet's icy nucleus, which is approximately 3-4 miles wide.

Credit: NASA, ESA, J.-Y. Li (Planetary Science Institute), and the Hubble Comet ISON Imaging Science Team

VOCABULARY

Coma: The cloud of gas and dust released from a comet's nucleus as it is warmed by the Sun.

Nucleus: The icy core of a comet.

Sungrazing comet: A class of comets that pass extremely close to the Sun.

For images and information on the Hubble mission, go to **www.nasa.gov/hubble** and **hubblesite.org**. Follow the Hubble mission on social media: **@NASAHubble**.

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