Comet ISON

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What is ISON?

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History

- Discovered September 2012 at over 6AU (~600 million miles) Vitali Nevski and Artyom Novichonok via International Scientific Optical Network (ISON) telescopes

- Caught our interest for three reasons:
  - (1) Unusually bright for such a distant object; (2) Originates in the Oort Cloud (3) Following a sungrazing orbit that brings it to just over 1 million miles of the solar surface in November 2013

  - The first recorded instance of a sungrazing Oort Cloud comet
Comet ISON Observing Campaign

• Dozens of amateur astronomers, “pro-am” astronomers, and professionals recorded images of the comet, many participating in the NASA Comet ISON Observing Campaign

• The Comet ISON Observing Campaign was a spectacular celestial success with observations from: Hubble, Spitzer, Swift, Chandra, Deep Impact, MRO, SOHO, STEREO-A, STEREO-B, Messenger, Fortis, Venus Express and the ISS

The first amateur spectrum of Comet ISON, Oct. 11, 2013, Christian Buil (Castanet-Toloson Observatory, France)

Comet ISON, Nov. 15, 2013, Damian Peach (UK)
Perihelion

• Observations from SOHO, STEREO-A and STEREO-B
From Sept. 28, 2013 to the present time, Comet ISON has been imaged by 11 instruments on three NASA satellites:

● Solar and Heliospheric Observatory (SOHO)
● Solar Terrestrial Relations Observatory (STEREO) A and B
SOHO SUMER Nov. 28, 2013
NASA STEREO/SECCHI HI-1A, Nov. 21 - Dec. 03, 2013, Enhanced image processing
Data before perihelion from MRO HiRISE

Alfred McEwen
Principal Investigator for HiRISE on MRO
Arizona State University, Tucson, Ariz., USA.
How big was the nucleus of ISON? Observations by the High Resolution Imaging Science Experiment (HiRISE) on Mars Reconnaissance Orbiter (MRO)
HiRISE: 50 cm aperture, but the electronics run hot so we can’t take long-exposure images needed to study a faint comet coma.
Ten images acquired over several days. Four images best for measuring nucleus:
At 11-14 km/pixel, HiRISE did not resolve the nucleus.

A model size of the nucleus depends on its reflectivity (albedo), phase function, and how much of the signal comes from the nucleus rather than the coma.

This gives a family of reasonable solutions ranging from ~100 to 1000 m diameter.
Discussion

- Although comets that have spent significant time in the inner Solar System are black (albedo 2-6%), ISON was making its first visit and could have been much brighter.
- HiRISE probably detected more signal from the coma than from the nucleus.
- ISON was probably smaller than ~600 m diameter, so its breakup and evaporation is not surprising.
Next October: **Siding Springs comet**

- Siding Springs will pass much closer to Mars than did ISON; ~140 m/pixel HiRISE images.
- Only five other comet nuclei imaged this well to date.

![Wild 2, 5 km](image1)

![Halley, 10 km](image2)

![Borrelly, 8 km](image3)

![Tempel 1, 6 km](image4)

![Harley 2, 2 km](image5)
MESSENGER Observations

Ralph McNutt
Project Scientist for MESSENGER
Johns Hopkins Applied Physics Laboratory, Laurel, Md. USA
Comet ISON Brightens Noticeably During a Single Day of the MESSENGER Monitoring Campaign

November 16 01:42 UTC

November 16 22:53 UTC
Confirmed detections of H, S, Na, CS, OH, NH and CN and suspected detections of CO$^+$ and/or C$_2$ at other wavelengths.
Narrow-Angle Camera Series-of-Stills “Movie” Has Potential to Reveal Outburst in Action
Perihelion data and conclusions

Geraint Jones
Mullard Space Science Laboratory, University College London, UK
C/2011 W3 (Lovejoy)

A sungrazer that survived perihelion
A dust tail reveals a comet’s history of activity.
Comet ISON in NASA STEREO SECCHI COR2-A
2013 November 29 08:24

Dust Tail Model
Why did ISON brighten after perihelion?
Why we didn't see ISON in SDO

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Project Scientist for the Solar Dynamics Observatory
NASA Goddard Space Flight Center, Greenbelt, Md., USA
Comet C/2012 S1 (ISON) was discovered Sept. 21, 2012 by two amateur astronomers, Artyom Novichonok (Belarus, left) and Vitali Nevski (Russia) while using the International Scientific Optical Network near Kislovodsk, Russia. After they reported the sighting, it was confirmed by other observers and found in observations taken at earlier times.