

Chandra observatory searches for trigger of nearby supernova

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Credit NASA/CXC/SAO/R.Margutti et al

(Phys.org) —New data from NASA's Chandra X-ray Observatory offer a glimpse into the environment of a star before it exploded earlier this year, and insight into what triggered one of the closest supernovas witnessed in decades.

The data gathered on the Jan. 21 explosion, a Type Ia supernova, allowed scientists to rule out one possible cause. These supernovas may be

triggered when a white dwarf takes on too much mass from its [companion star](#), immersing it in a cloud of gas that produces a significant source of X-rays after the explosion.

Astronomers used NASA's Swift and Chandra telescopes to search the nearby Messier 82 galaxy, the location of the explosion, for such an X-ray source. However, no source was found, revealing the region around the site of the supernova is relatively devoid of material.

"While it may sound a bit odd, we actually learned a great deal about this supernova by detecting absolutely nothing," said Raffaella Margutti of the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Massachusetts, who led the study. "Now we can essentially rule out that the explosion was caused by a white dwarf continuously pulling material from a companion star."

This supernova, SN 2014J, could instead have been caused by the merger of two white dwarf stars, an event that should result in little or no X-rays after the [explosion](#). Further observations could rule out or confirm other possible triggers.

"Being able to eliminate one of the main possible explanations for what caused SN 2014J to explode is a big step," said CfA's Atish Kamble, a co-author of the study. "The next step is to narrow things down even further."

Type Ia supernovas are used as cosmic distance-markers, and have played a key role in the discovery of the universe's accelerated expansion. At about 12 million light-years from Earth, SN 2014J and its host galaxy are close—from a cosmic perspective. This offers scientists a chance to observe details that would be too hard to detect in more [distant supernovas](#).

"It's crucial that we understand exactly how these stars explode because so much is riding on our observations of them for cosmology," said co-author Jerod Parrent, also from CfA. "SN 2014J might be a chance of a lifetime to study one of these supernovas in detail as it happens."

The study of SN 2014J is similar to a study led by Margutti about another [supernova](#), SN 2011fe, in the nearby galaxy M101.

This study was conducted by CfA's Supernova Forensics Team, led by Alicia Soderberg. The results were published online and in the July 20 print issue of *The Astrophysical Journal*.

More information: *The Astrophysical Journal*:
[dx.doi.org/10.1088/0004-637X/790/1/52](https://doi.org/10.1088/0004-637X/790/1/52) . On *Arxiv*:
arxiv.org/abs/1405.1488 [preprint]

Provided by Chandra X-ray Center

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