Researchers 'clear away the dust,' get better look at youngest supernova remnant

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(PhysOrg.com) -- Researchers at North Carolina State University have used a mathematical model that allows them to get a clearer picture of the galaxy's youngest supernova remnant by correcting for the distortions caused by cosmic dust. Their new data provides evidence that this remnant is from a type Ia supernova - the explosion of a white dwarf star - and raises questions about the ways in which magnetic fields affect the generation of the remnant's cosmic ray particles.

NC State physicists Dr. Stephen Reynolds and Dr. Kazimierz Borkowski, with colleagues from Cambridge University and NASA, re-examined their original X-ray images of supernova remnant G1.9+0.3 in an attempt to glean more information about the remnant's origins, rate of expansion, and any cosmic particles that may have resulted from the explosion. Scientists know that supernovae create cosmic rays - fast-moving subatomic particles that play a role in the formation of stars - but they aren't sure how this occurs or what other functions the particles may serve.

"We knew the dust was a problem - it's why we never saw the original supernova light in Victorian times," Reynolds says. "Our high-powered orbiting telescopes use X-rays to take pictures of these objects, and the dust scatters these X-rays, so in order to get data that might be helpful to us, we first had to correct for the dust distortion."

A mathematical model allowed the scientists to deduce how many X-rays from each part of the remnant were scattered from another part.

After this correction, they found that the "bright" and "dim" sides of the remnant had more and fewer of the highest-energy X-rays, respectively. Reynolds says that this pattern is best explained by a type Ia supernova, and that the difference in brightness corresponds to the level of synchrotronic X-rays present. Synchrotronic X-rays (like those produced by terrestrial synchrotron particle accelerators) are produced by high-energy cosmic particles, making this remnant one of the best examples of a cosmic ray accelerator that scientists have.

In addition, the location of the bright and dim sides point to the presence of a magnetic field that is affecting the remnant's acceleration process, and the distribution of cosmic rays.

The results were published in the April 20 edition of *Astrophysical Journal Letters*.

"We use supernovae as flashbulbs across the universe (a means to make assumptions about how the universe works," Reynolds says. "Shockwaves from the explosions and the fast-moving cosmic particles that come from them play roles in galaxy formation. If we can figure out how these particles are energized, and how magnetic fields affect them, we'll be able to answer all sorts of questions about our universe."

Source: North Carolina State University (news : web)