Clearing the cosmic fog of the early universe: Massive stars may be responsible

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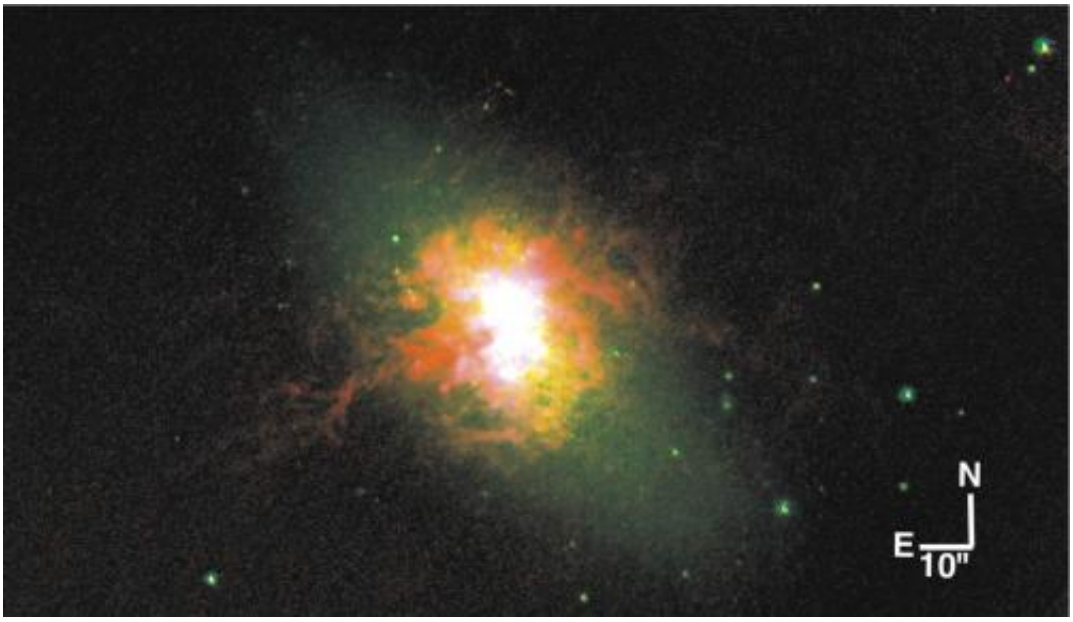

This is a three-color image of the dwarf starburst galaxy NGC 5253. Green corresponds to star light. The yellow shows the gas that is being lit up by the starburst at the galaxy's core. The red shows where ultraviolet light from massive stars is evaporating gas, exposing the central starburst along a narrow cone. Credit: Jordan Zastrow

The space between the galaxies wasn't always transparent. In the earliest times, it was an opaque, dense fog. How it cleared is an important question in astronomy. New observational evidence from the University of Michigan shows how high energy light from massive stars could have been responsible.

Astronomers believed that early star-forming galaxies could have provided enough of the right kind of radiation to evaporate the fog, or turn the neutral hydrogen intergalactic medium into the charged hydrogen plasma that remains today. But they couldn't figure out how that radiation could escape a galaxy. Until now.

Jordan Zastrow, a doctoral astronomy student, and Sally Oey, a U-M astronomy professor, observed and imaged the relatively nearby NGC 5253, a dwarf starburst galaxy in the southern constellation Centaurus. Starburst galaxies, as their name implies, are undergoing a burst of intense star formation. While rare today, scientists believe they were very common in the early universe.

The researchers used special filters to see where and how the galaxy's extreme ultraviolet radiation, or UV light, was interacting with nearby gas. They found that the UV light is, indeed, evaporating gas in the interstellar medium. And it is doing so along a narrow cone emanating from the galaxy.

A paper on their work is published today (Oct. 12) in Astrophysical Journal Letters.

"We are not directly seeing the ultraviolet light. We are seeing its signature in the gas around the galaxy," Zastrow said.

In starburst galaxies, a superwind from these massive stars can clear a passageway through the gas in the galaxy, allowing the radiation to escape, the researchers said.

The shape of the cone they observed could help explain why similar processes in other galaxies have been difficult to detect.

"This feature is relatively narrow. The opening that is letting the UV

light out is small, which makes this light challenging to detect. We can think of it as a lighthouse. If the lamp is pointed toward you, you can see the light. If it's pointed away from you, you can't see it," Zastrow said. "We believe the orientation of the galaxy is important as to whether we can detect escaping UV radiation."

The findings could help astronomers understand how the earliest galaxies affected the universe around them.

More information: The paper is titled "An ionization cone in the dwarf starburst galaxy NGC 5253."

Provided by University of Michigan