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Astronomers Study Deep-Space Blast

.c The Associated Press

By PAUL RECER

WASHINGTON (AP) - The most powerful explosion ever witnessed - a gamma ray burst 12 billion light years distant - released in one second almost as much energy as all the stars of the universe, astronomers said Wednesday.

It was too far away to affect the Earth or the sun, but the astronomers said they were astounded by the might of the blast and mystified about what astronomical process could have caused it.

"The energy released by this burst in its first few seconds staggers the imagination," said Shrinivas Kulkarni, a professor of astronomy at California Institute of Technology and leader of a team that helped calculate the explosion size.

Kulkarni is co-author of a study being published Thursday in the journal Nature. He and others appeared at a Washington news conference Wednesday.

Gamma ray bursts are common, occurring once or twice a day, but the rays are invisible and can be detected only by satellites orbiting above the Earth's atmosphere. Since a burst lasts only seconds, astronomers rarely are able to focus telescopes on the source and capture light measurements needed to calculate the size of the explosion or pin down its location.

But on the night of Dec. 14, an Italian team detected a gamma ray burst with the BeppoSAX orbiting observatory and quickly alerted David J. Helfand, a Columbia University astronomer. Helfand relayed the information to astronomers operating telescopes at Kitt Peak near Tucson, Ariz., who were able to photograph the source site of the burst.

Later, the Hubble Space Telescope and others captured views of the explosion's afterglow, which was in visible light. The studies revealed the source as a very faint and distant galaxy.

Kulkarni and others analyzed the energy and light released from the object and concluded it was about 12 billion light years away. A light year, the distance light travels in a year, is

about 5.9 trillion miles. This great distance meant that the explosion was immensely powerful, Kulkarni said.

``I was astounded when I heard these results,'' said Stan Woosley, a professor of astronomy at the University of California, Santa Cruz, and an expert on astronomical explosions. ``This was the brightest documented explosion in history.''

Woosley said the total energy release was equal to about 5 billion supernovae, exploding stars that previously provided the most powerful documented sudden releases of energy. In visible light alone, Woosley said, the gamma ray burst energy was equal to about 1,000 supernovae.

By some calculations, the gamma ray burst release equaled as much energy in one second as all of the 10 billion trillion stars in the universe combined.

Woosley said it is difficult to relate the power to common terms. For instance, he said, if all of the nuclear weapons ever made were exploded at once, the energy released would equal about 1/100,000 of a second of the energy from Earth's sun. Yet, over its 10 billion-year history the sun will produce only about 1 percent of the energy of the gamma ray burst, the astronomer said.

Gamma ray bursts were unknown until the launch of U.S. military satellites designed to detect radiation from the explosion of atomic bombs.

Later, scientific satellites were launched to study the bursts, but astronomers remained mystified.

``We had no idea where they came from or what was responsible for them,'' said Alan Bunner, a science program director at NASA.

More than 2,000 of the brief bursts have been recorded, but astronomers were unable until recently to pinpoint their location or measure their distance from Earth. The location of three has been determined.

Kulkarni said all the bursts have been located in dusty regions where stars form, suggesting the massive explosions may play a role in the birth of new stars.

Woosley and others speculate that the explosion may occur when a black hole swallows a neutron star. A black hole is a collapsed object that is so dense that its gravity permits not even light to escape, and a neutron star is a massive collapsed star. Woosley acknowledged the explanation remains only speculation.

Astronomers believe the immense explosion just detected sent matter, such as neutrons and electrons, streaking outward at near the speed of light. About a day later, the matter smashed into gas and dust particles. The violence and heat of the collision created gamma rays, X-rays, then visible light.

It was these energy sources detected by the orbiting instruments and later by the telescopes.

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