

Death from across the galaxy

by Bend_Weekly_News_Sources

A type of cosmic explosion could beam lethal radiation across a galaxy, frying any life forms in its path, a new analysis has found. The blasts are thought to occur rarely in our Milky Way galaxy, but more often in those where stars are born and die more frequently. These include areas where astronomers hope to find Earth-like planets ripe for life.

In a 1995 study, Steve Thorsett of Princeton University in Princeton, N.J. calculated that such events, called gamma-ray bursts, might wreak havoc on an Earth-like planet if they occurred near it. But scientists don't fully understand the extent of the possible damage. Especially unclear is how far a burst would have to occur to affect life, according to the authors of the new study.

Artist's concept of life in the Ordovician era (490 million to 443 million years ago). (Courtesy NASA)

Gamma-ray bursts are flashes of high-energy radiation found to occur randomly in space. At least some are thought to be associated with extremely massive stars that, having burnt out, collapse to form black holes. In the new research, Douglas Galante and Jorge Ernesto Horvath of the University of São Paulo, Brazil, argued that gamma-ray bursts could shine their lethal effects across a whole galaxy, and damage life over great distances still. The study is to appear in a forthcoming issue of the International Journal of Astrobiology. The bursts could cause "global environmental changes and biospheric damage" even at distances five times the Milky Way's width, they wrote. Our Milky Way is a relatively large, spiral galaxy, about 100,000 light-years wide (a light-year is the distance light travels in a year).

Gamma-ray bursts are thought to emerge mainly from the poles of a collapsing star. This creates two, opposite-site-like shining beams of radiation shaped like narrow cones. Planets not lying in these cones would be comparatively safe; the chief worry is for those that do. Galante and Horvath identified three aspects of gamma-ray bursts as particularly deadly. The first is a flash of gamma rays, the highest-energy form of light. The flash can impair even the most radiation-resistant organisms known, the bacterium *Deinococcus radiodurans*, the researchers wrote. This microbe can take 3,000 times the radiation that would kill a human: the assault shreds its genome to hundreds of bits, but the hardy bug stitches them back together. Galante and Horvath calculated that for a planet with a thin atmosphere, the gamma flash could kill 90 percent of *D. radiodurans* from distances up to three times our galaxy's width. A thick atmosphere would protect the microbes from this, but not necessarily from a second component of the beam,

ultra-low-energy gamma-rays. Ultra-low-energy is a type of light slightly lower in energy than gamma-rays, but lethal, largely because it penetrates DNA very easily.

For thick-atmosphere planets, a gamma-ray burst's ultra-low-energy rays would kill 90 percent of the radiation ranging from 13,000 to 62,000 light years, about two-thirds the galactic width, the researchers calculated. Life surviving that onslaught would have to contend with a third effect, depletion of the atmosphere's protective ozone layer by the burst. This would kill 90 percent of the radiation at up to 40 percent of the distance across the Milky Way, Galilee and Horvath estimated. Gamma-ray bursts are detected roughly once daily somewhere in the sky. The likelihood of one striking Earth has been debated. Researchers at Ohio State University calculated, in a paper in the research journal *Astrophysical Journal* late last year, that the probability is virtually nil. Our galaxy's chemical composition is incompatible with strong gamma-ray bursts, they wrote. On the other hand, astronomers at the University of Kansas in Lawrence, Kan. and at NASA hypothesized in 2004 that at least one has already struck Earth, causing the so-called Ordovician Mass Extinction 450 million years ago. The Earth's second most devastating extinction, it destroyed an array of the life forms that had flourished until then, restricted in that time to the seas. Recently, gamma-ray bursts were recognized as some of the most energetic astrophysical events since the Big Bang that gave birth to our universe, Galilee and Horvath wrote. It is undeniable that damage to the biota could be severe if a burst strikes (or has struck) the planet.

Courtesy World Science staff

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