

Gamma Ray Bursts

- Gamma-ray bursts are short-lived bursts of gamma-ray photons, the most energetic form of light. At least some of them are associated with a special type of supernovae, the explosions marking the deaths of especially massive stars
- Two types long and short less 2 sec (Average 0.3 sec) and greater than 2 sec (can several minutes, avg 30 sec). Still much we don't know.
- A GRB detected about once a day. First detected by US military satellites.
- Long Gamma Ray bursts originate from the farthest reaches of the Universe, so they are bursts from events that took place Billions of years ago.
- It is hard to get information on Gamma Bursts since they happen so far away we usually can't see light from the star it came from.
- An idea where it originates from a energetic supernovae or hypernovae. Thought to happen to Wolf-Rayet stars. They are over 20 solar masses. They think a black hole forms in the center of the star, in this process a gamma rays shoot out as well as a blast wave a material at high speeds. The ejected materials collide with gas to form an afterglow of X-Rays then visible light then radio waves.
- The most well known close Wolf-Rayet star is a star in the Gamma Velorum star system about 800 light years away.
- Another idea is that they come from two colliding neutron stars. Neutron stars are very dense stars thought to be formed from the remains of a supernova.
- There is not much known about the shorter gamma ray bursts as it is hard to find their distance because of their short duration and short afterglow.
- So what happens if there were a gamma ray burst close and pointed to Earth. All that energy hitting the planet.
- A group of scientists went about trying to figure out what a 5×10^{44} W GRB at 2 kpc (6500 light years), 10 sec 100 kJ m^{-2} burst would do to earth.
 - Avg: 35% max 55% depletion of ozone, up to 3 times the UV exposure, especially in 280-315 nm range that living things are sensitive to.
 - increase in NO_2 causing a darkening of the sky reducing visible light and creating cooler temperatures
 - The NO_2 comes from the breakup of N_2 when hit by a gamma ray and then combining with O to produce NO, then later NO_2
 - Damage lasts over 5 years. But Ozone would regenerate and the NO_2 would get cleared out by rain.
- Ordovician mass extinction (443 million years ago)
 - Authors of the paper, GRB thought to be cause or contributing factor to the gamma ray bursts.
 - Mainly marine animals during this period that lived in shallow seas, which would be vulnerable to the UV light.
 - The UV is thought to have huge impact on plankton which generates lots of Oxygen and is a source of food for much marine life.
 - Current theory is extinction came from an ice age period. GRB offers a new look that still needs more evidence. Probability models could be wrong in that a dangerous GRB happens about twice every billion years.
- GRB in galaxy HESS J1303-631 maybe a GRB remnant 10 kpc (32 616 light years)

Sources:

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