A MODEL FOR THE 1979 MARCH 5 GAMMA-RAY TRANSIENT

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We have constructed a model for the 1979 March 5 γ-ray burst (Cline et al. 1980; Evans et al. 1980). This event is characterized by a rapid rise ($\leq$ 250 μs), an intense flash of duration ~0.15s, followed by a decaying, lower intensity phase which lasted a few minutes, and was modulated with a period of 8s. The timing position error box includes a supernova remnant in the LMC, which suggests a distance of 55 kpc. At this distance the energy in the event is $\sim 10^{44}$ erg and the peak luminosity $\sim 10^7$ greater than the Eddington limit for a 1.4 $M_\odot$ object.

We propose that a 10^{-6} $M_\odot$ lump of "strange matter" fell into a "strange star" (strange matter is described in this volume and in Alcock, Farhi, and Olinto 1986). The lump was not tidally disrupted because of its high density, and the duration of the impact was ~1 μs. Most of the kinetic energy of impact goes into the excitation of normal modes of the star, but $\sim 10^{45}$ erg is dumped into a small hot spot. This hot spot radiates its internal energy in ~0.1s, and is responsible for the high intensity phase of the event. The radiation is produced at an exposed quark matter surface which, since it is held together by the strong force, is not subject to the Eddington limit.

The impacting lump punched a hole through the thin crust on the star. The hot spot radiates through this hole. Another consequence of the local heating is the photo disintegration of nuclei in the crust. The neutrons liberated in this way diffuse out of the crust and react with the strange matter, releasing ~20 MeV per neutron in the form of heat. The timescale for the diffusion is a few minutes, and this process is responsible for the low intensity phase of the event. The 8s modulation is caused by rotation.

Cline, T. L., et al. 1980, Ap. J. (Letters), **237**, L1.

Evans, W. D., et al. 1980, Ap. J. (Letters), **237**, L7.

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