PROCEEDINGS OF SCIENCE

Early detections of properties of Gamma-Ray Bursts

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Some of the Gamma-Ray Burst properties which were later much better proved were, in some cases, already reasonably evident in the first detections: in particular the X-ray afterglow, the bimodal duration and, possibly, also the optical emission.

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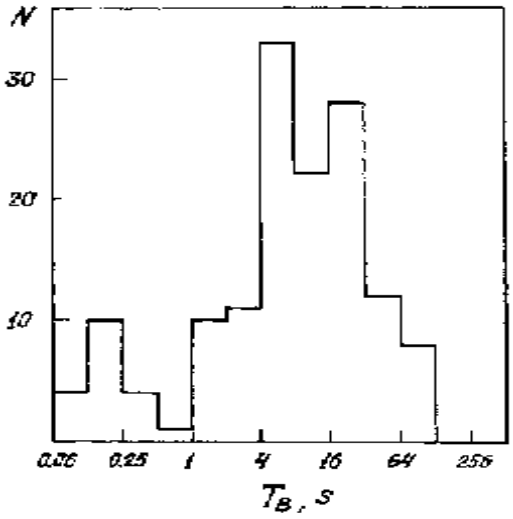

Figure 1: Histogram of GRB durations from the *Konus* catalog [2]

1. Bimodal duration

Cline and Desai [1] already suggested a different class of very short Gamma-Ray Bursts (GRBs). Mazets et al. [2] show in their I and II *Konus* catalog a clustering of GRB durations at about 2s. The bimodal distribution of GRB durations was later proved with much better statistics by Kouveliotou et al. [3]. in the *BATSE* catalog.

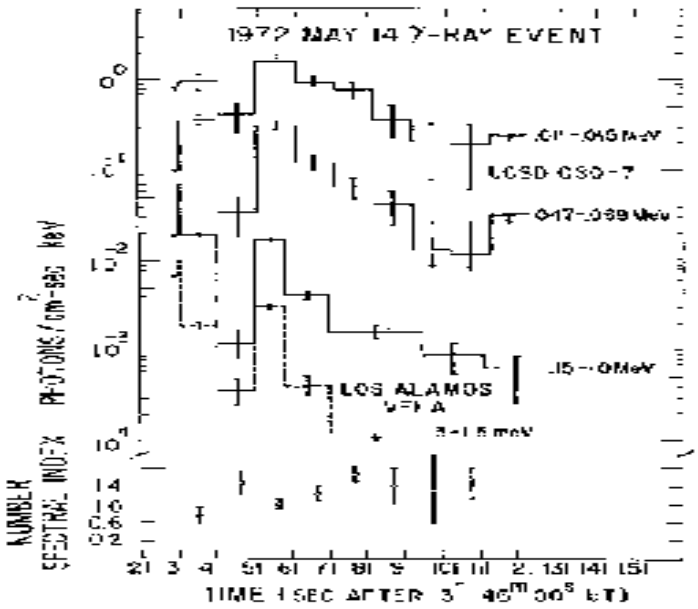

Figure 2: Detection of GRB720514 by [4]

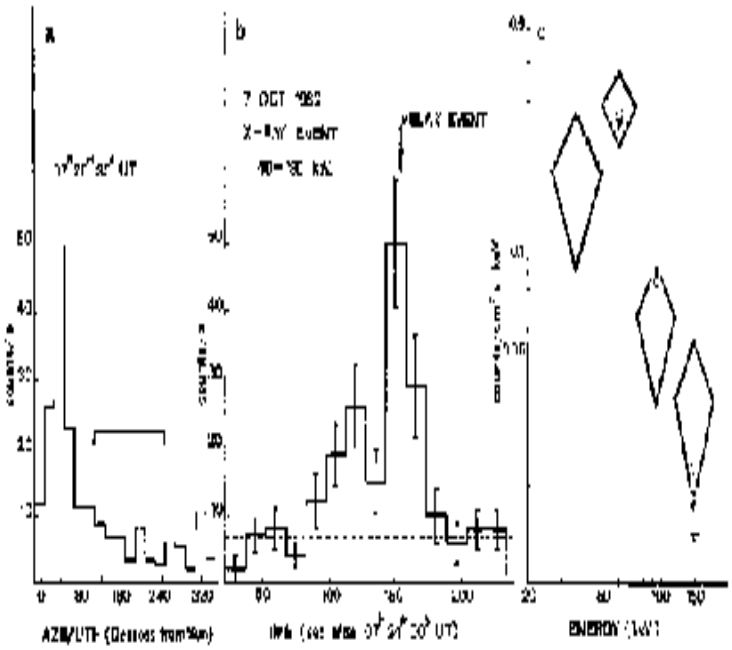

Figure 3: Detection of GRB691007 by [5]

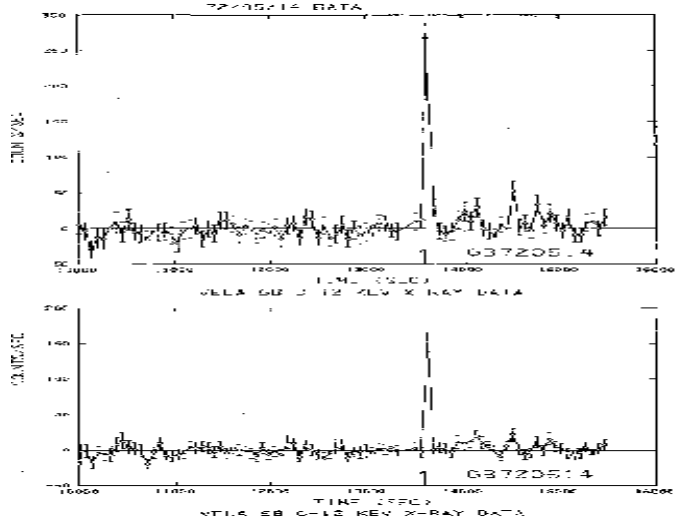

Figure 4: Detection of GRB720514 by [7]

2. X-ray afterglow

X-rays down to 10 keV were already detected by Wheaton et al. [4] from GRB720514. Palumbo, Pizzichini and Vespignani [5] detected 49-189 keV hard X-rays from GRB691007 for a much longer duration than the one reported by Klebesadel, Strong and Olsen [6]. Terrell et al. [7] detected 3-12 keV photons from GRB720514 and GRB740723, also probably for a much longer duration than the Vela detections. In all three cases X-ray error boxes, although quite large, were

obtained.

3. Optical emission

Schaefer et al., [8] encouraged the search for optical counterparts of GRBs by showing "Two probable optical flashes from Gamma-Ray Bursters" (GRB791105 and GRB790113) on archival photographic plates, taken however at distant times from the two GRBs. Then Van Paradijs et al. [9] detected the contemporaneous OT from GRB970228.

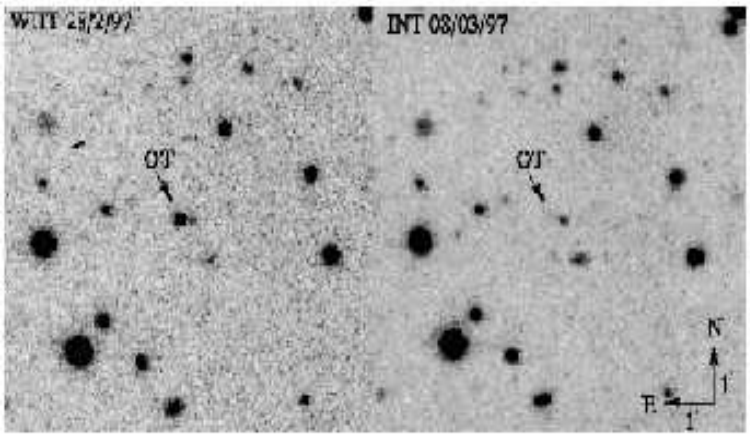

Figure 5: Detection of the OT from GRB970228 by [9]

References

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[8] B. E. Schaefer et al., *Two probable optical flashes from gamma-ray bursters*, *ApJ* **286**(1984) L1

[9] J. van Paradijs et al., *Transient optical emission from the error box of the gamma-ray burst of 28 February 1997*, *Nature* **386** (1997) 686