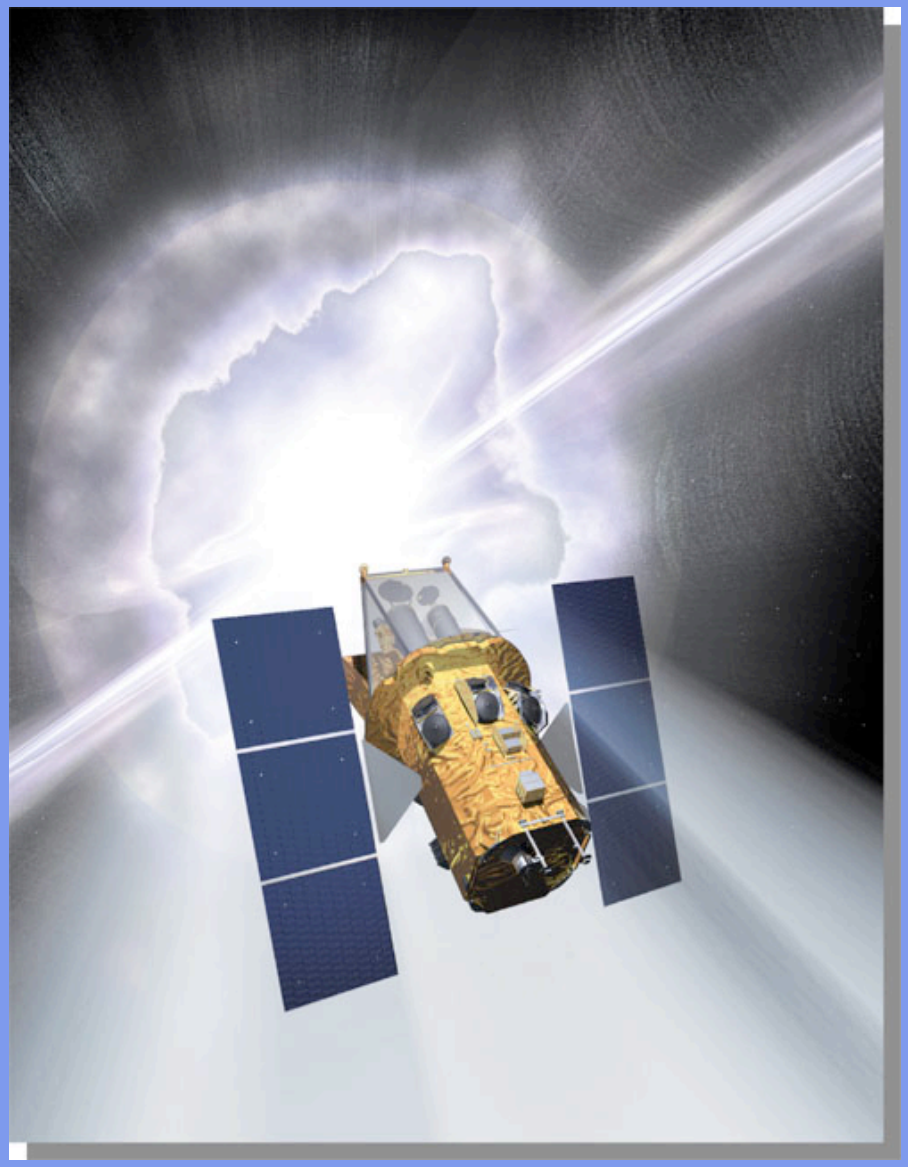


Swift First Results

Neil Gehrels

NASA-GSFC

INTEGRAL Workshop

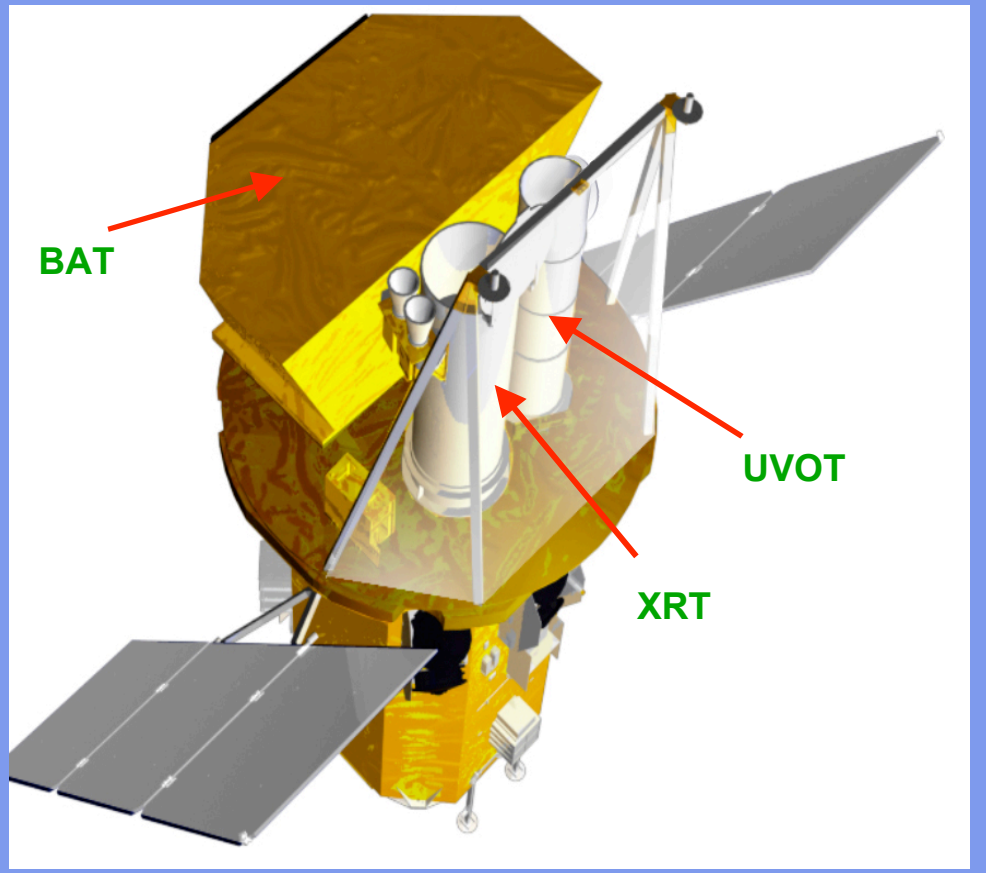
January 18, 2005

Launch on November 20, 2004

Swift Instruments

Instruments

- **Burst Alert Telescope (BAT)**
  - **New CdZnTe detectors**
  - **Most sensitive gamma-ray imager ever**
- **X-Ray Telescope (XRT)**
  - **Arcsecond GRB positions**
  - **CCD spectroscopy**
- **UV/Optical Telescope (UVOT)**
  - **Sub-arcsec positions**
  - **Grism spectroscopy**
  - **24th mag sensitivity (1000 sec)**
  - **Finding chart for other observers**

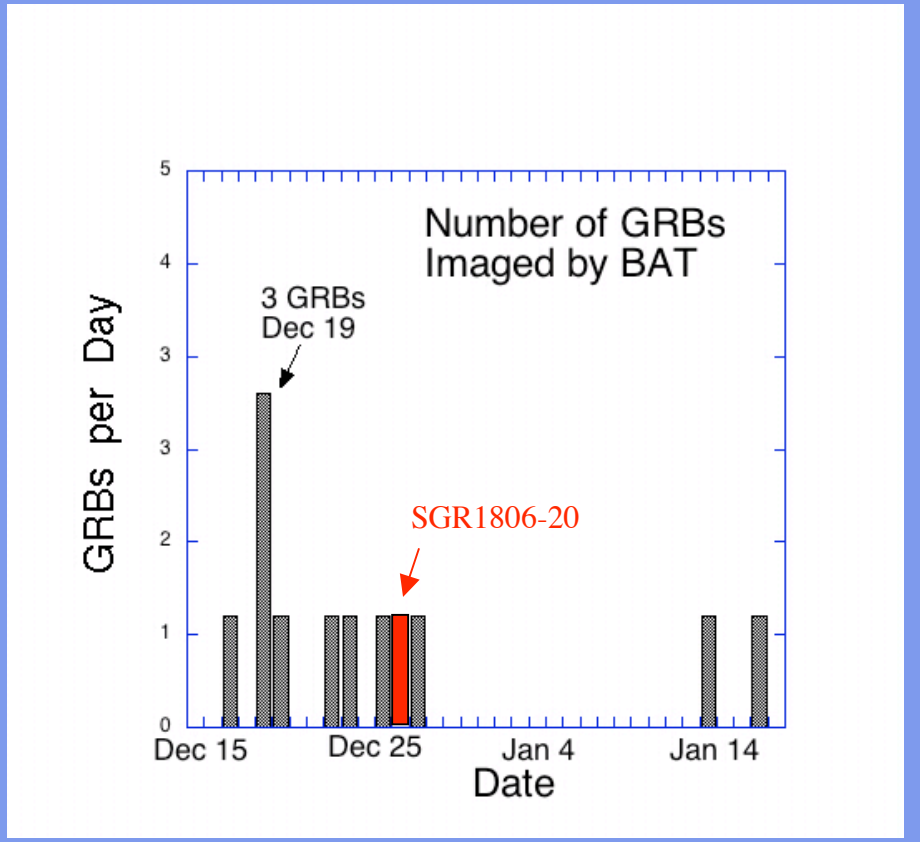


Spacecraft

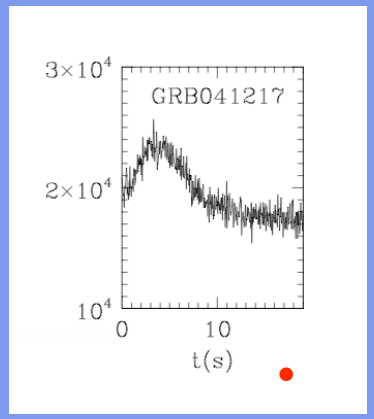
- **Autonomous re-pointing, 20 - 75 s**
- **Onboard and ground triggers**

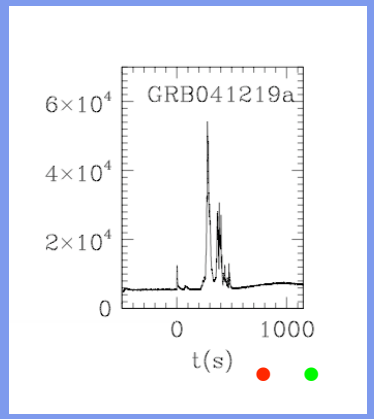
Scientific Findings To Date

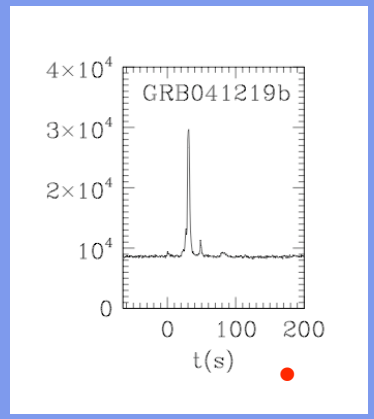
- **11 GRBs detected since Dec. 17**
- **Large GRB detected on Dec. 19 simultaneous with INTEGRAL**
- **XRT pointed at GRB 041223 via ground command at ~4.5 hours. Afterglow detected.**
- **Giant flare detected from soft gamma repeater SGR 1806-20 on Dec. 27**
- **XRT pointed at GRB 050117 autonomously. Afterglow detected during gamma-ray emission.**

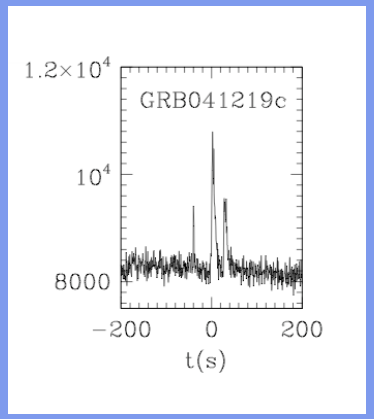


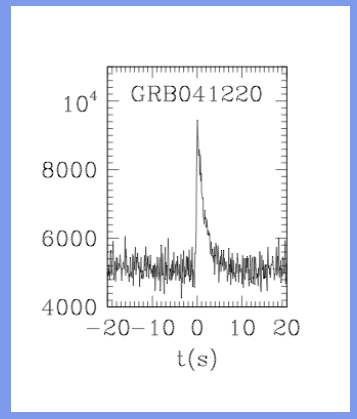
Light Curves of BAT GRBs

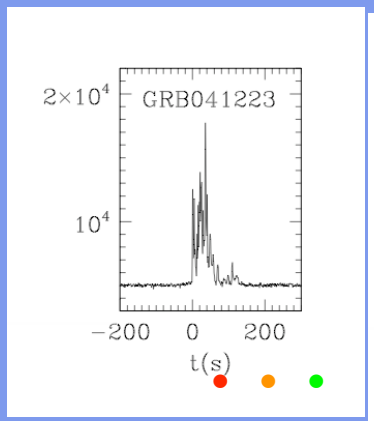


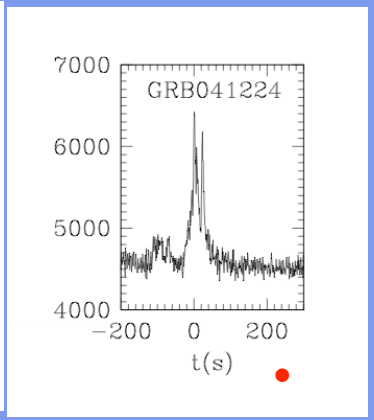


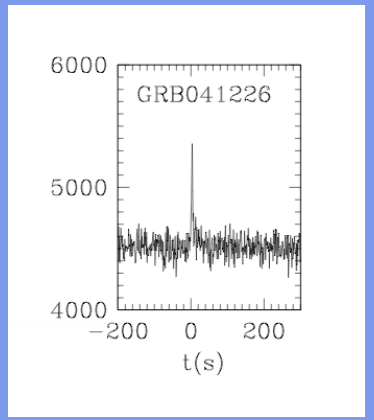


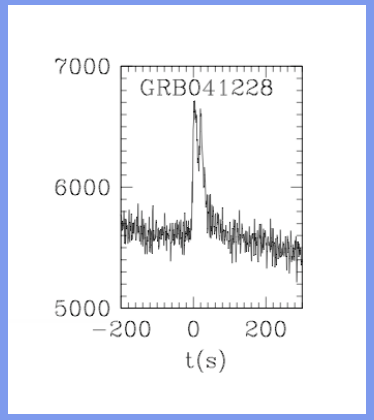






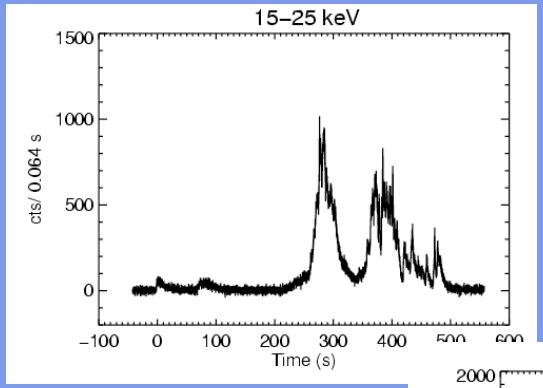




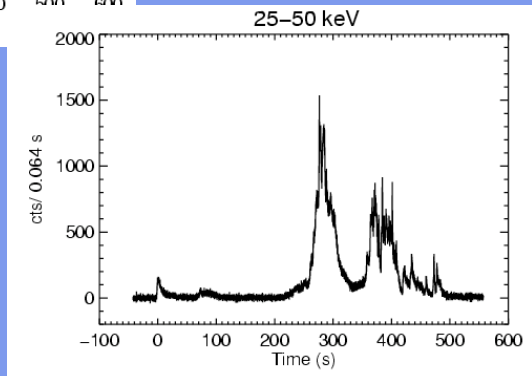


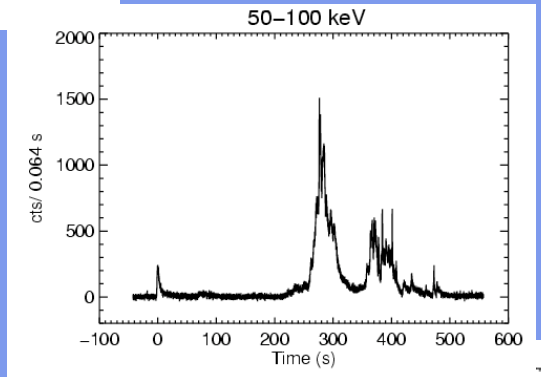
- = detected by other gamma-ray instrument
- = slewed to and imaged by XRT
- = detected by ground-based optical/IR

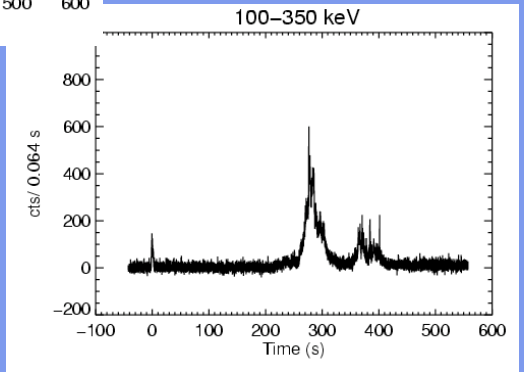
GRB 041219



(BAT Team)





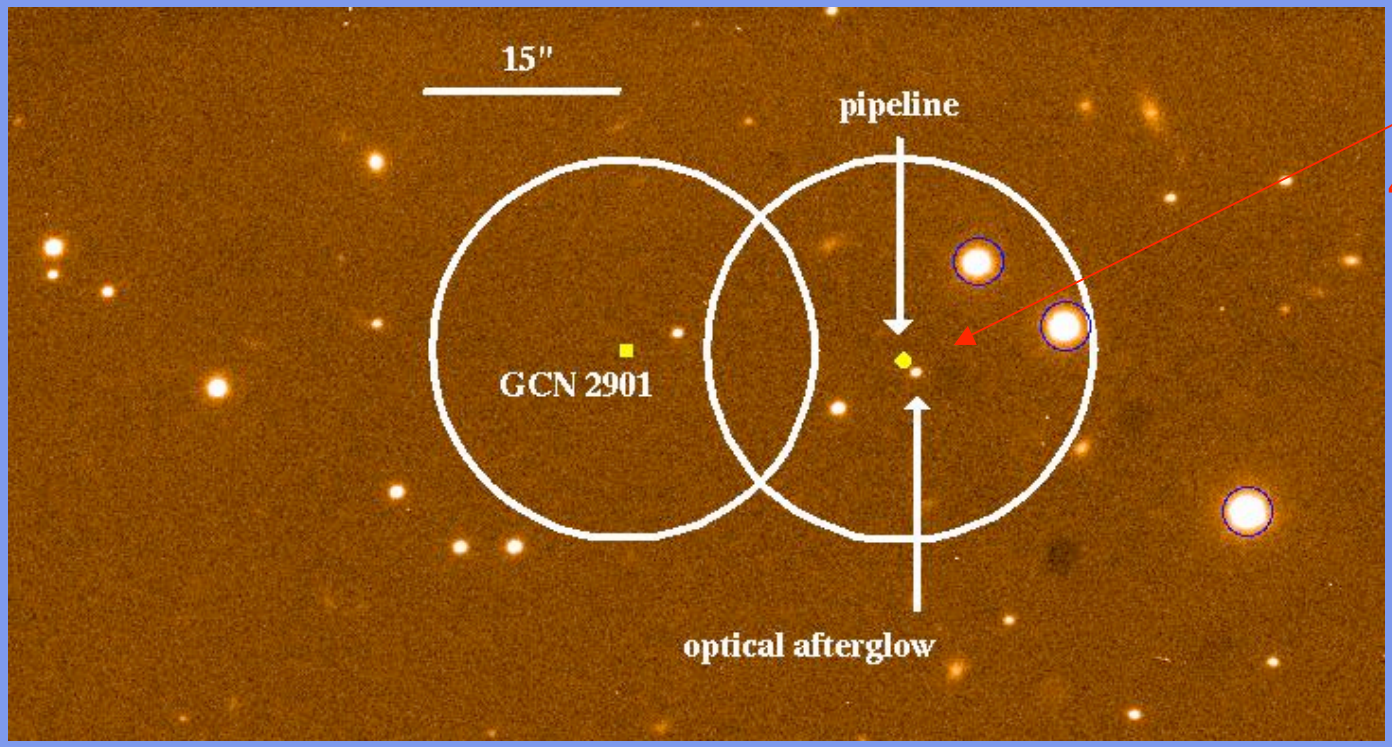


- Long duration GRB lasting 500 s
- Fluence of ~10^{-4} erg cm^{-2}
- Fluence in top 1% of CGRO/BATSE bursts
- Duration in top 2% of CGRO BATSE bursts
- Imaged by INTEGRAL & Swift

- IR fast-fading counterpart ("flash") discovered at early time
- Real-time (RAPTOR) optical detection
- Radio counterpart
- Campaign underway to determine host and redshift

GRB 041223
First XRT GRB Afterglow

J-Band Image with XRT Position



BAT position

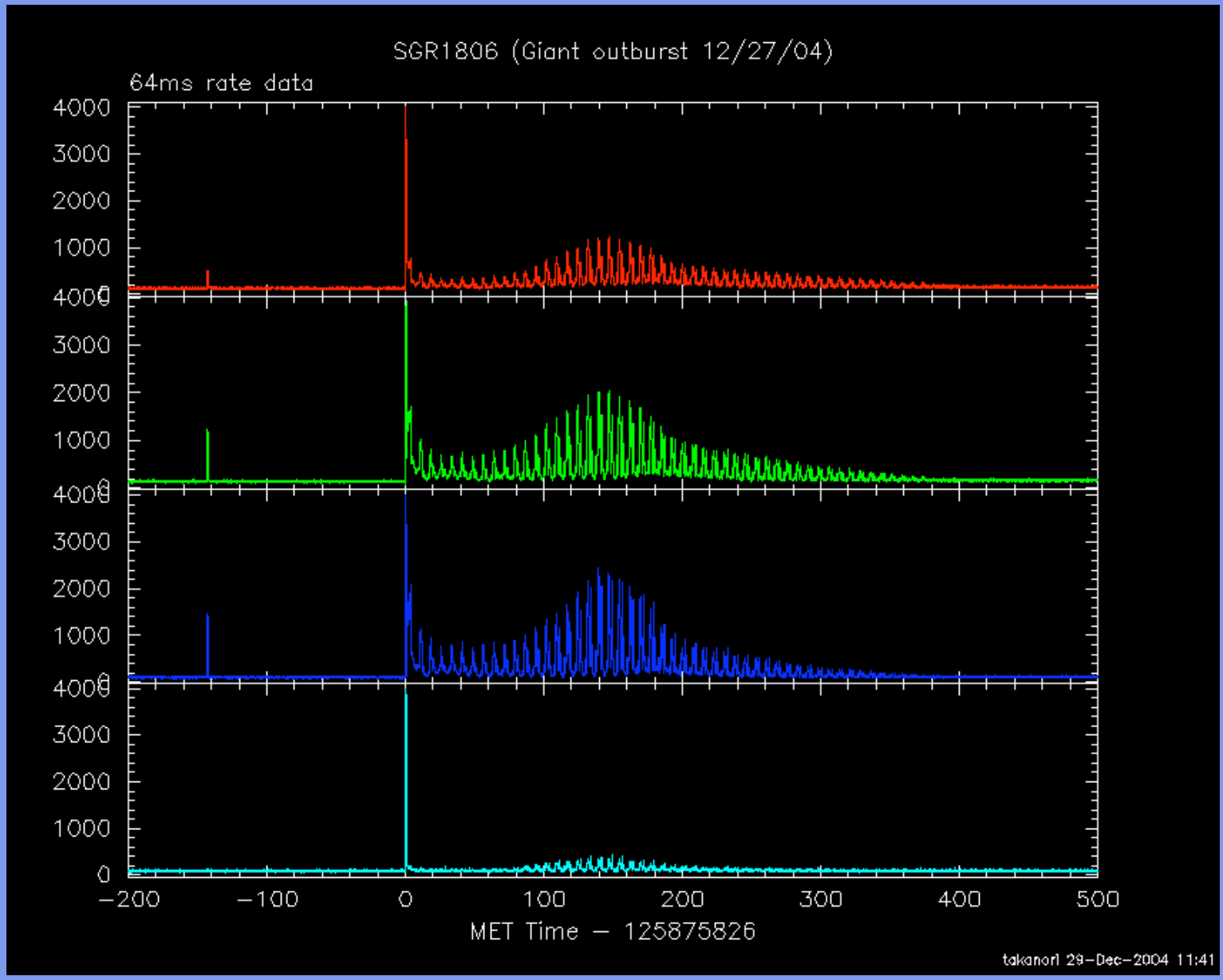
48"

(XRT Team)

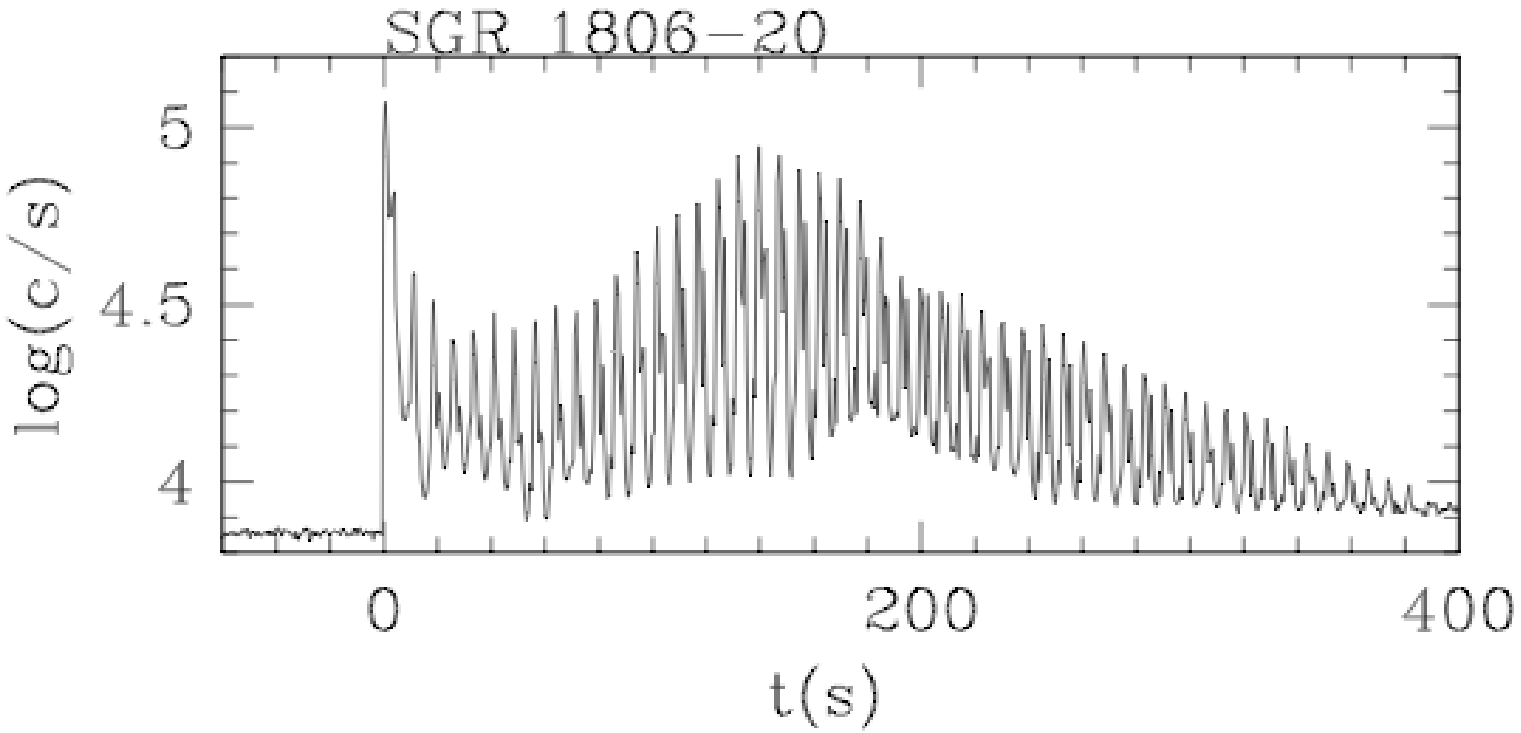
Giant Flare from SGR 1806-20

- **Giant flare detected 27 Dec. 2004 by all non-occulted gamma-ray detectors in space**
- **Huge main peak lasting 0.5 sec followed by 400 sec of pulsations**
- **Estimate (Boggs et al.) puts fluence greater than ~0.3 erg cm^{-2}, 1-2 orders of magnitude greater than SGR 1900+14 1998 and SGR 0526-66 1979 flares.**
- **Radio transient detected. Slightly extended source. Polarization detected.**
- **Observed through side of BAT.**

BAT Observations

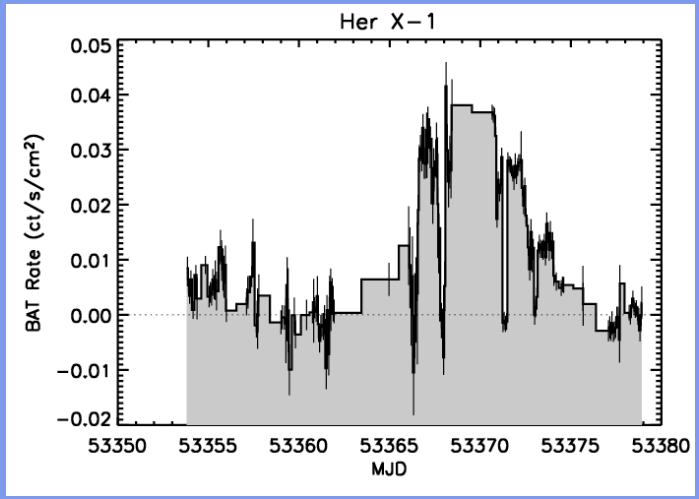


BAT Detection of 7.6 sec Pulsations



Synergies with INTEGRAL

- **Swift XRT & UVOT follow-up of INTEGRAL GRBs**
- **BAT monitoring of the sky for transients**
  - **Frequent covering of full sky**
  - **Less sensitive than INTEGRAL GP**



- **Nuclear line observations**
  - **BAT has similar energy resolution to IBIS/ISGRI (5%)**
  - **BAT and ISGRI have similar sensitivities for line detection**
  - **BAT scans sky and monitors for short-lived lines like Ni-56 158 keV**
  - **Can add to statistics to INTEGRAL studies of Ti-44 68 & 78 keV lines**