Five Years of Monitoring the Transient Sky with the SPI-ACS

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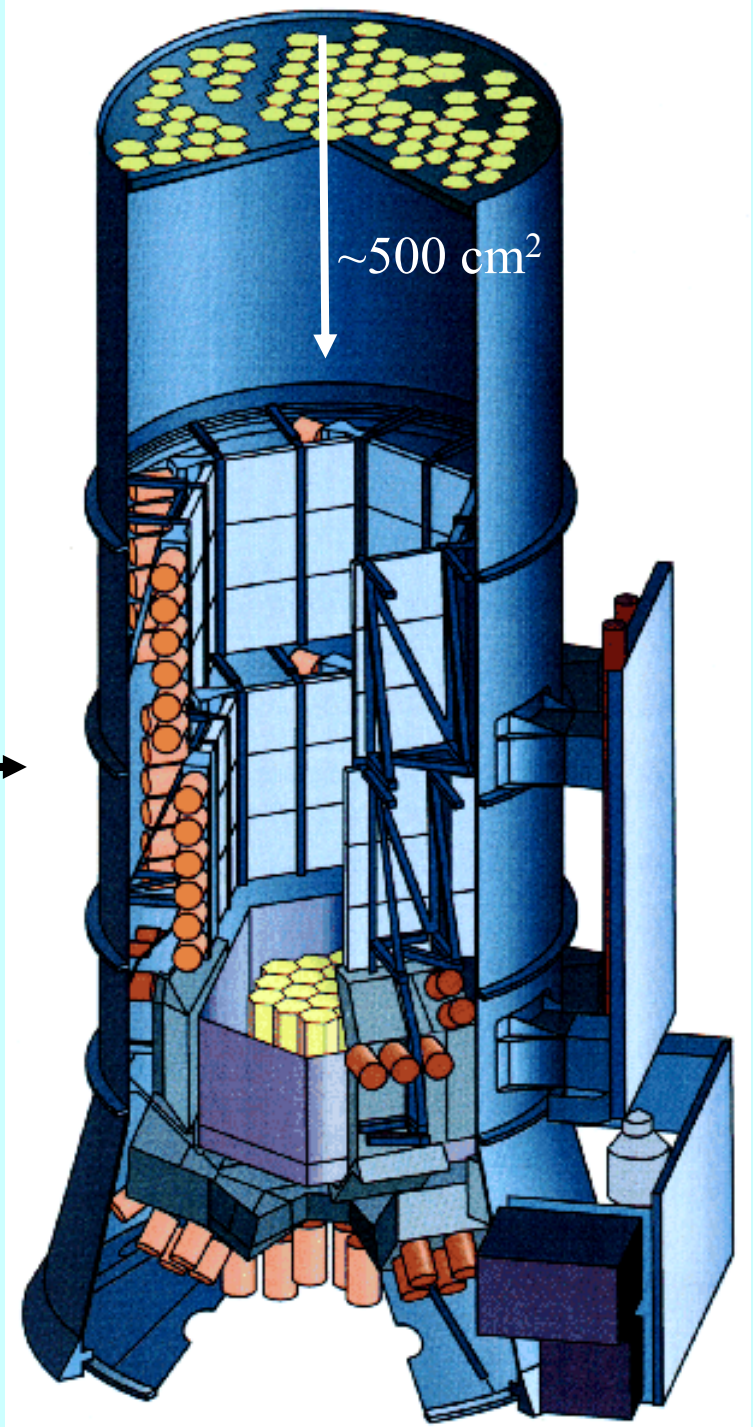
THE SPI ANTI-COINCIDENCE SYSTEM

- First proposed as a GRB detector at the 2nd INTEGRAL workshop by H. Pedersen, B. Teegarden, G. Lichti, A. von Kienlin and others (St. Malo, September 1996 – 11th anniversary!)
- BGO shield has a maximum effective area up to 5250 cm^2 at 100 keV, 1.6 – 5 cm thick (cf. BATSE: 2000 cm^2, Swift: 5240 cm^2, GLAST Burst Monitor: ~200 cm^2)
- No energy spectra, no independent GRB localization capability
- 105 s long, 50 ms resolution time histories are transmitted for a single energy channel

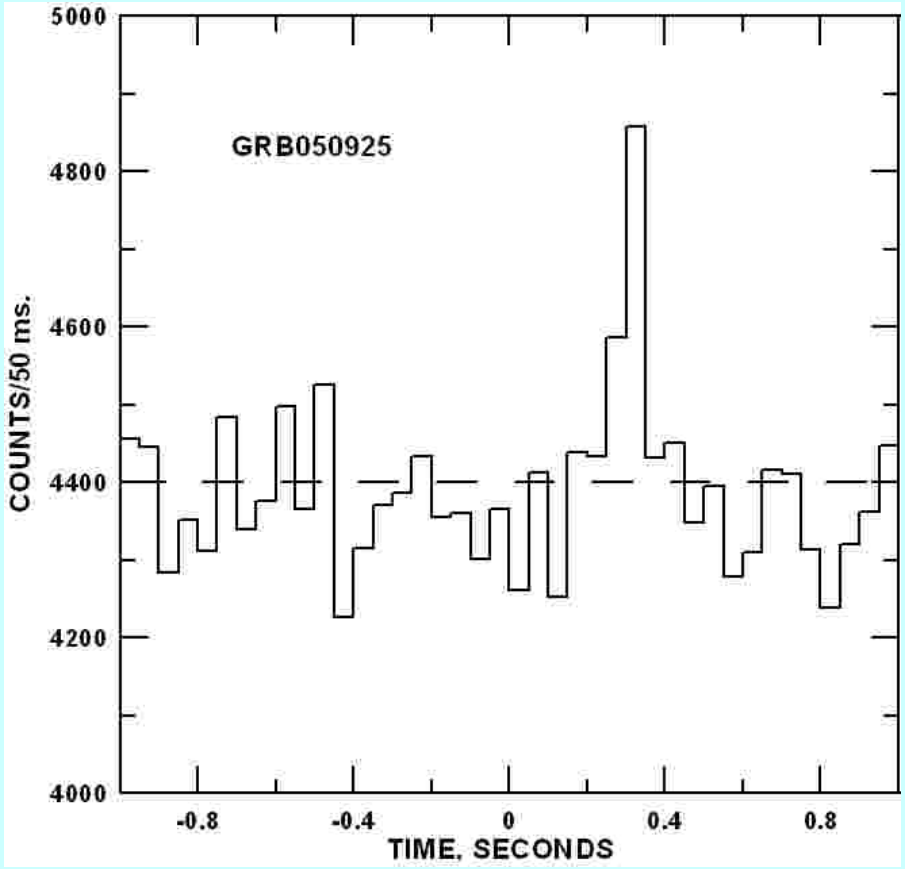


Sensitivity is a function of zenithal, azimuthal angles

THE SCORE SO FAR

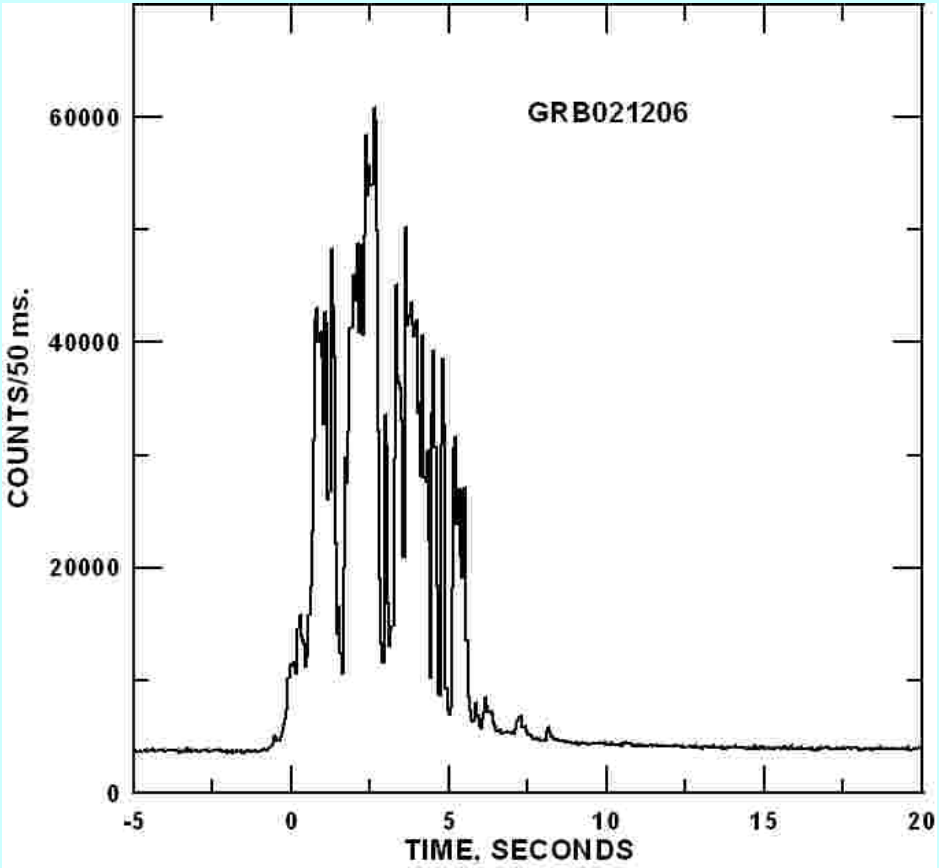
- 420 confirmed cosmic gamma-ray bursts (~1 every 3 days)
- "Background": ~5.8 triggers/day, some random/noise/cosmic rays, others almost certainly weak GRBs
- 45 confirmed short bursts and 1 giant flare from the magnetar SGR1806-20 (D. Götz's presentation)
- 1 short burst from the magnetar SGR1900+14
- Numerous unconfirmed bursts – probably weak GRBs below the thresholds of other IPN experiments (number unknown, ~1/3 days?)
- Weakest confirmed event: GRB050925, 7.5×10^{-8} erg cm^{-2}

THE WEAKEST BURST



- Resembles many of the “background” triggers

- Also observed and localized by Swift; otherwise, it would have been unconfirmed



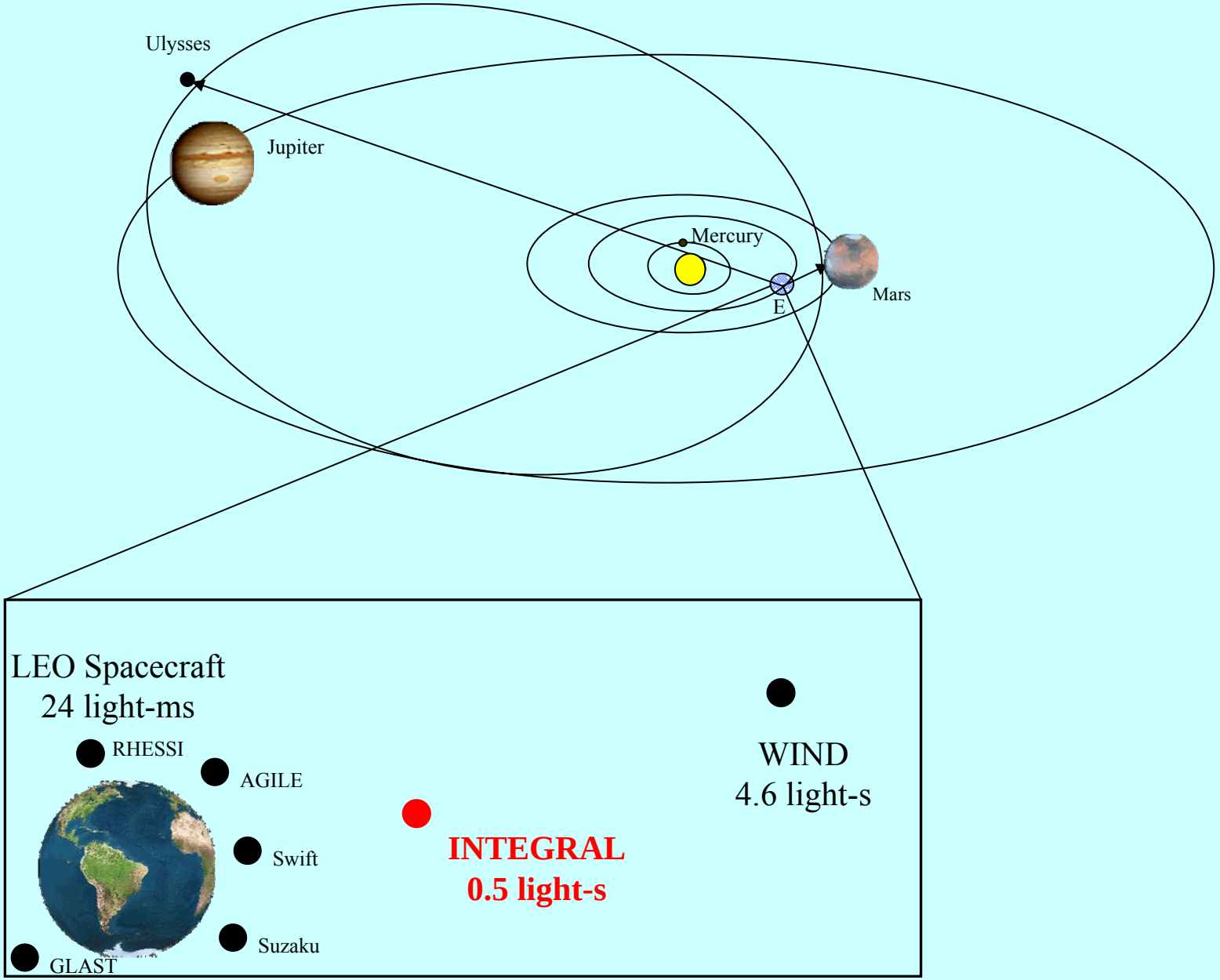
Fluence: 1.6×10^{-4} erg cm^{-2}

THE ROLE OF SPI-ACS IN THE IPN

- The IPN is the only all-sky, full time GRB monitor

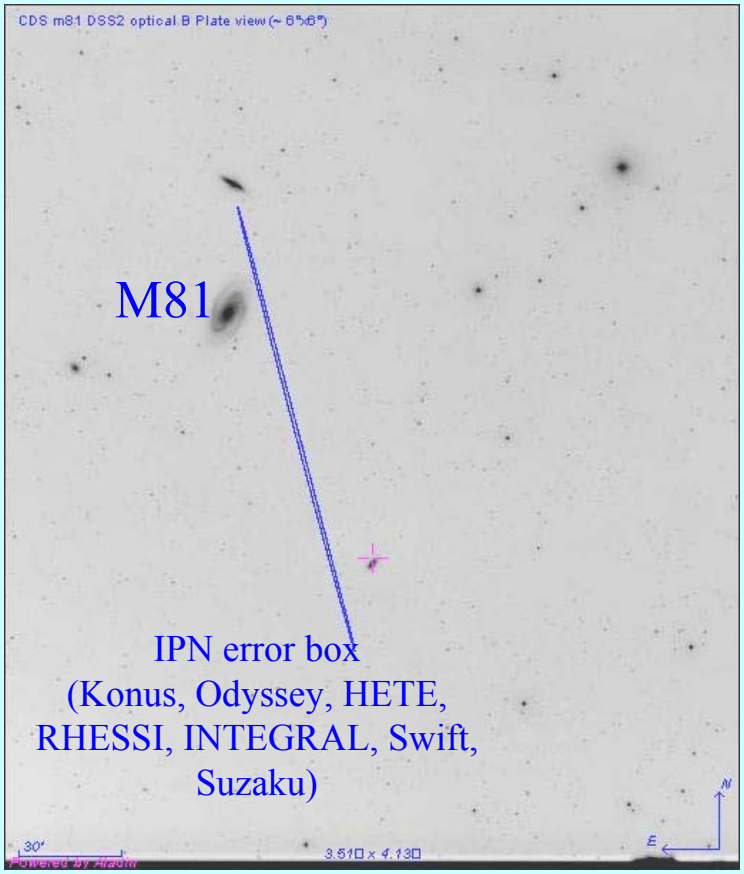
- The SPI-ACS is one of 10 instruments in it:
  - RHESSI, Suzaku WAM, AGILE (Super-AGILE + mini-calorimeter), Swift BAT, GLAST Burst Monitor, all in low-Earth orbit (.024 light-seconds from Earth center)
  - Konus-Wind (~4.6 light-s)
  - MESSENGER, en route to Mercury (up to ~700 light-s)
  - Mars Odyssey (HEND & GRS, up to ~1200 light-s)
  - Ulysses (up to ~3000 light-s)

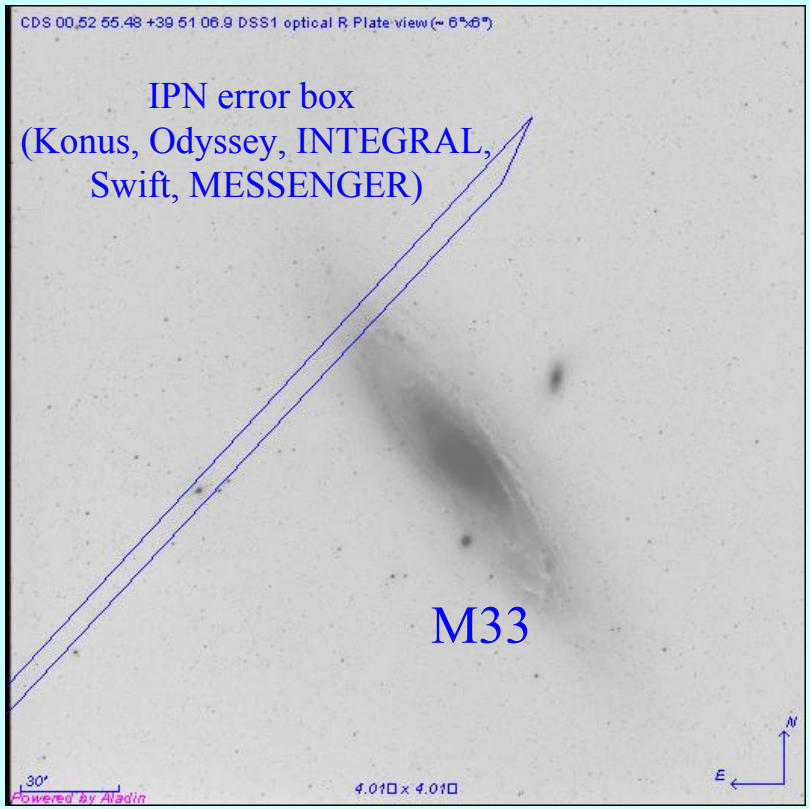
- INTEGRAL's orbit is unique (up to 0.5 light-s); as far as GRB triangulation is concerned, the SPI-ACS is not redundant with respect to low-Earth orbiters


Ulysses
Jupiter
Mercury
E
Mars
LEO Spacecraft
24 light-ms
RHESSI
AGILE
Swift
Suzaku
GLAST
INTEGRAL
0.5 light-s
WIND
4.6 light-s

GRB051103

GRB070201





Two short-duration, hard spectrum GRBs that may be extragalactic giant magnetar flares, from M81 and M33

THE DATA

- ~200 GRBs/year are detected by the IPN; in general these are not the same bursts that Swift and IBIS detect (more intense, $>10^{-6}$ erg cm^{-2})
- IPN localizations are utilized by groups such as LIGO, Milagro, AMANDA, and others, who do not require "instant" localizations, but do require a large, isotropic sample of the stronger (and therefore generally closer) GRBs
- GCN Circulars are only released for events of special interest (e.g. very long, very short, very intense GRBs), but all the data and localizations are public
- SPI-ACS light curves are available at ftp://isdcarc.unige.ch/arc/FTP/ibas/spiacs/
- IPN data are available at ssl.berkeley.edu/ipn3/index.html
- Happy birthday, INTEGRAL!