

**SWIFT JOINT OBSERVATIONS WITH THE
INTERPLANETARY NETWORK**

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BAT BURSTS OUTSIDE THE FIELD OF VIEW

- **Thanks to Jay Cummings, Hans Krimm, & David Palmer, we know that BAT detects confirmed GRBs outside its FOV at a rate of $\sim 1/5$ days (“confirmed” means detected by at least one other IPN spacecraft)**
- **A complete survey has not been done yet, but so far we have found ~ 100 events**
- **These bursts are not imaged by BAT, but many of them can be localized to some extent by the IPN**
- **(The BAT also detects *unconfirmed* events at a similar rate; many of these are certainly GRBs, but they are not observed by the IPN because they are too weak. This means that the total rate of bursts outside the FOV is about equal to the rate inside the FOV)**

THE CURRENT IPN

- **Mars Odyssey, Ulysses (when power permits), and MESSENGER in interplanetary space**
- **INTEGRAL and Wind, at distances up to 5 light-seconds from Earth**
- **Swift, RHESSI, and Suzaku in low Earth orbit**
- **Soon to be added: AGILE and GLAST**
- **Detects 200 GRBs/year**

BAT NON-IMAGED GRBS

- **Many bursts outside BAT's FOV are eventually localized by triangulation to large error boxes and most can't be used for ToO's; what good are they?**
- 1. Neutrino searches. AMANDA, RICE, ANITA groups are now using IPN search for coincident 10 TeV – 3 PeV ν emission. AMANDA upper limits for GRBs between 1997 and 2003 are being used to constrain the Waxman-Bahcall model and others**
- 2. Gravitational radiation. LIGO group is now looking at IPN bursts which occurred in 2005-6**
- 3. VHE γ radiation. MILAGRO group is searching for coincident emission >100 GeV with 2005 – 2007 IPN GRBs**
- 4. SN Ic coincidences. Elena Pian is looking at IPN data for possible associations with 1997 – 2007 optically detected Ic's**

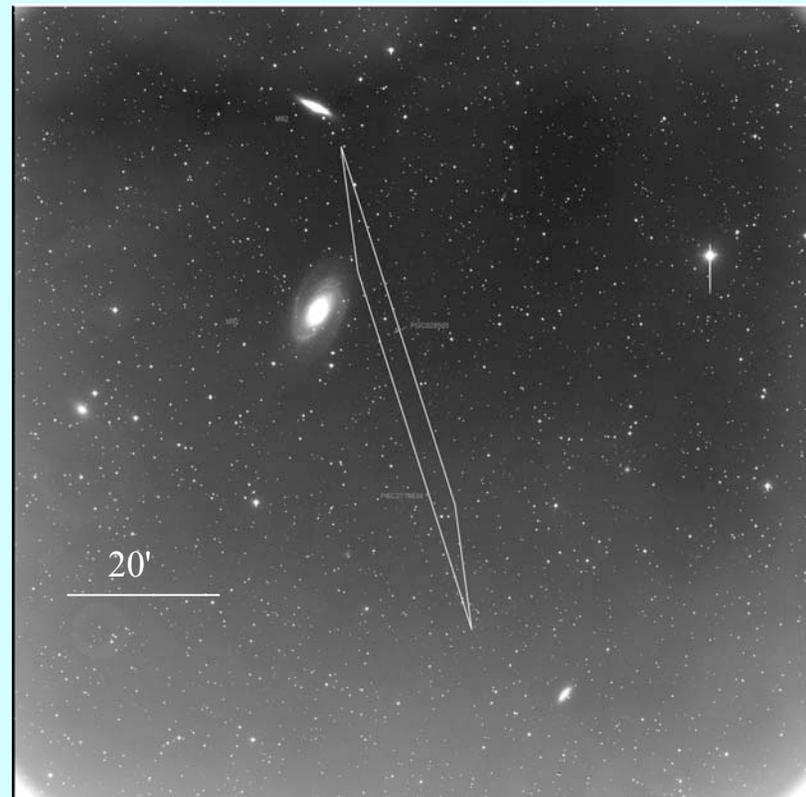
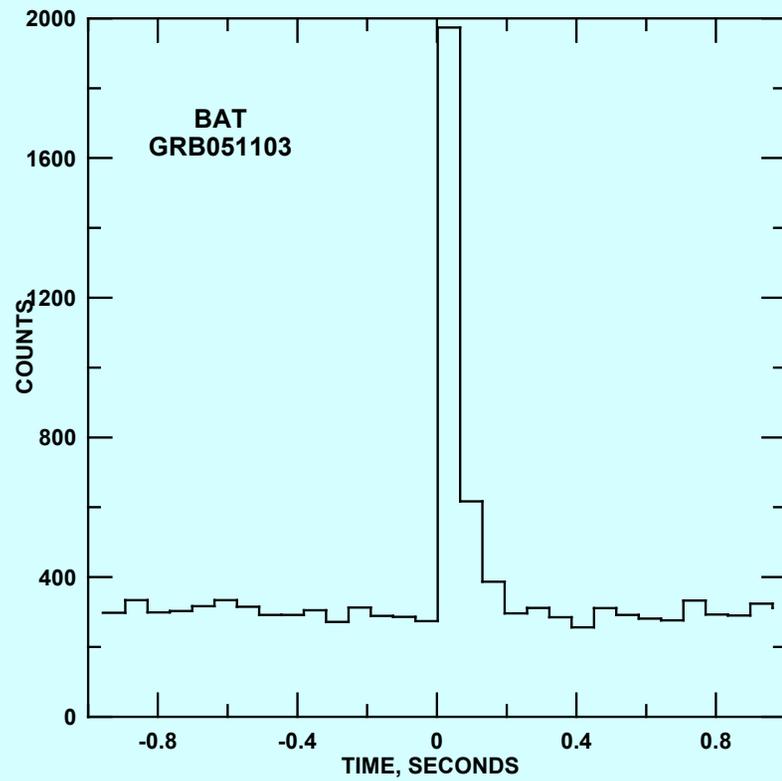
THESE STUDIES HAVE THE FOLLOWING THINGS IN COMMON

- 1. They do not require rapid GRB localization**
- 2. Very small error boxes are not critical**
- 3. Many GRBs are needed to build statistics, so they take years to complete**
- 4. Scientific payoff is potentially very large**

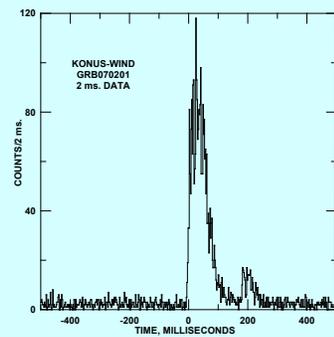
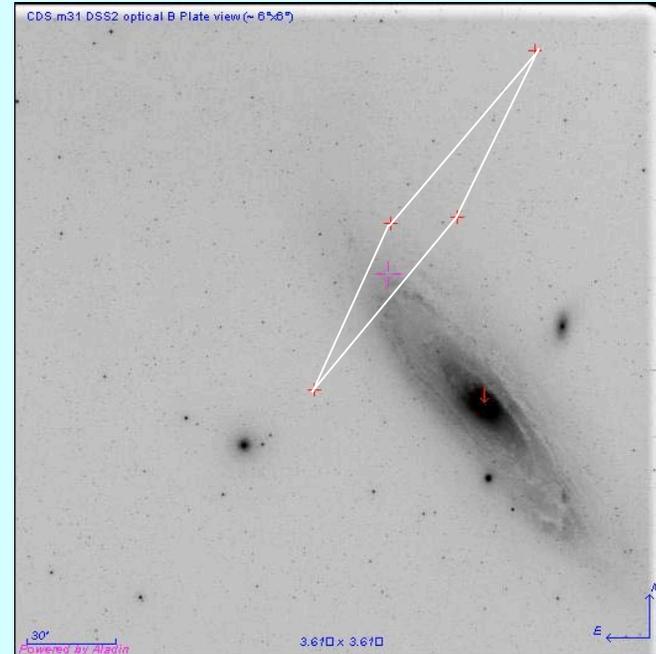
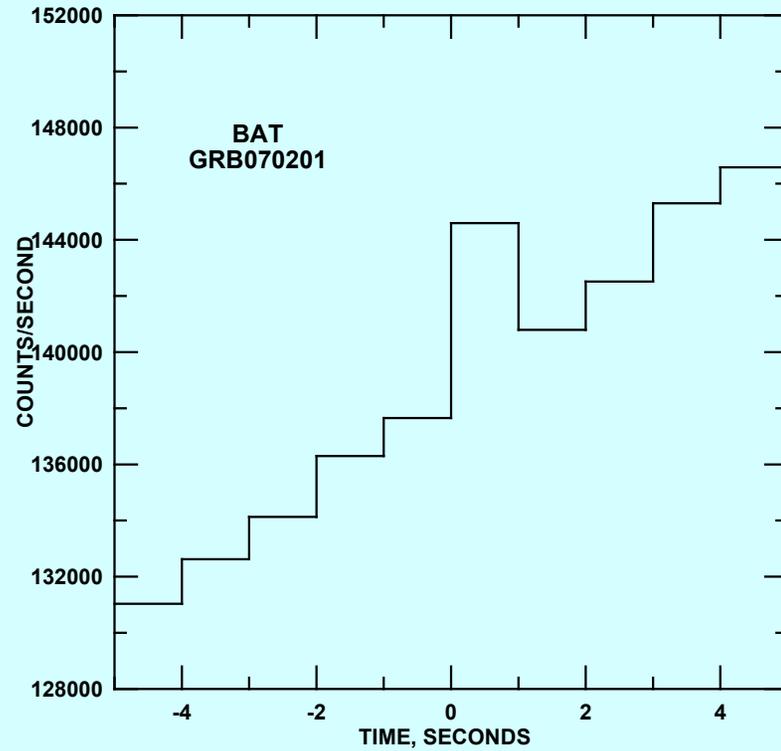
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 5. **Serendipity: GRB051103, 070201 – possible extragalactic magnetar flares**

GRB051103 - 120° OFF AXIS
ORIGIN: M81/82?



GRB070201 - 93° OFF AXIS ORIGIN: M31?



WHAT NEXT?

- **Take the long view**
- **The BAT data can be used for studies that will take years to complete**
- **1 burst \neq 1 paper for these bursts**
- **The science is no less compelling**
- **This is part of Swift's legacy**