

Rapid Fermi-GBM GRB localizations / MPE GRB-Science Dashboard

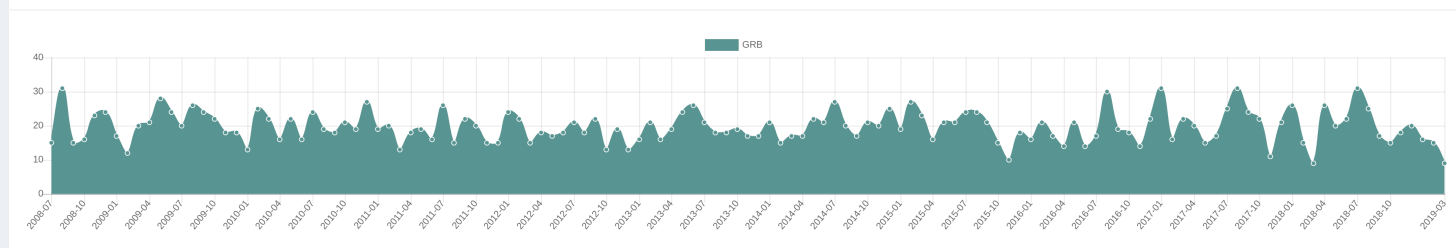


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History - Detected GRBs per month



Gamma-ray Burst Monitor (GBM):

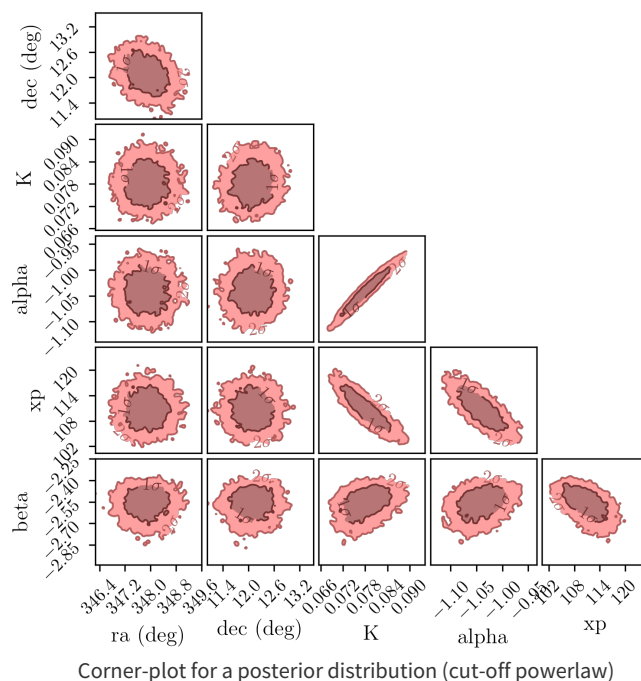
- GBM, on-board the Fermi space telescope, is the most prolific gamma-ray burst (GRB) detector.
- Due to energy dispersion, reconstructing a source position requires also reconstructing the spectrum at the same time.

GRB Localization until now:

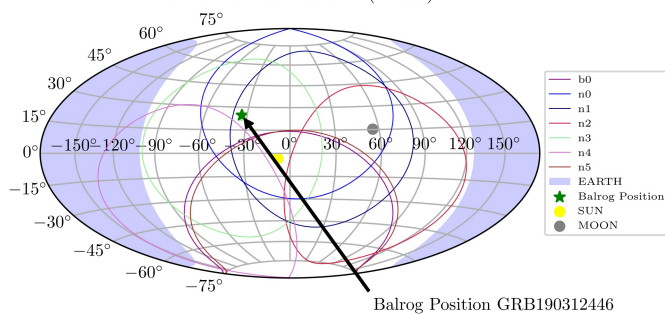
- One of three predefined spectral templates is assumed [1].
- The source location is fitted with a fixed spectrum.
- Whenever real spectrum and selected template do not match, systematics are being introduced in the localization process [2, 3].

BALROG's approach:

- Simultaneous fit for both spectrum and location of the source [2].
- The result of each fit is a posterior distribution describing all of the source parameters.
- Able to remove the systematics introduced by the use of spectral templates [3].
- BALROG (Bayesian Location Reconstruction of GRBs) is open source and available at github.com/mpe-grb.



GRB190312446 Position (J2000)



Automatically generated skymap for GRB190312446

MPE GRB Science Dashboard:

- BALROG is currently in use for rapid (~30 min delay after the trigger) automated localization of GRBs.
- The MPE GRB-Science Dashboard (grb.mpe.mpg.de) makes all locations publicly available.
- Positions, after being approved by a member of the team, are distributed through GCNs and telegram.
- API endpoints provide machine readable information to allow automated follow-up observations by other instruments.

Coming features:

- Automated spectral analysis of GRBs
- Template analysis notebooks for GRBs.
- Interactive web-based GRB-Analysis

[1] V. Connaughton, M. S. Briggs, A. Goldstein, C. A. Meegan, W. S. Paciesas et al. Localization of Gamma-Ray Bursts Using the Fermi Gamma-Ray Burst Monitor. *ApJ*, 216:32, February 2015.

[2] J. M. Burgess, H.-F. Yu, J. Greiner, and D. J. Mortlock. Awakening the BALROG: BAYesian Location Reconstruction Of GRBs. *MNRAS*, 476:1427–1444, May 2018.

[3] F. Berlato, J. Greiner, and J. M. Burgess. Improved Fermi-GBM GRB Localizations Using BALROG. *ApJ*, 873:60, March 2019.

