

Fermi LAT Flare Advocate Activity

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(on behalf of the Fermi LAT collaboration)

Abstract. The Fermi Flare Advocate (also known as Gamma-ray Sky Watcher, FA-GSW) service provides a daily quick-look analysis and review of the high-energy gamma-ray sky seen by the Fermi Gamma-ray Space Telescope. The duty offers alerts for potentially new gamma-ray sources, interesting transients and flares. A weekly digest containing the highlights about the GeV gamma-ray sky is published in the web-based Fermi Sky Blog. During the first 3 years of all-sky survey, more than 150 Astronomical Telegrams, several alerts to the TeV Cherenkov telescopes, and targets of opportunity to Swift and other observatories, were realized. That increased the rate of simultaneous multi-frequency observing campaigns and the level of international cooperation. Many gamma-ray flares from blazars (such as extraordinary outbursts of 3C 454.3, intense flares of PKS 1510-089, 4C 21.35, PKS 1830-211, AO 0235+164, PKS 1502+106, 3C 279, 3C 273, PKS 1622-253), short/long flux duty cycles, unidentified transients near the Galactic plane (like J0910-5041, J0109+6134, the Galactic center region), flares associated with Galactic sources (like the Crab nebula, the nova V407 Cyg, the microquasar Cyg X-3), emission of the quiet and active sun, were observed by Fermi and communicated by FA-GSWs.

Keywords. surveys, gamma rays: observations, quasars: general, BL Lacertae objects: general, pulsars: general, stars: novae, Sun: gamma rays

The Large Area Telescope (LAT), on board the Fermi Gamma-ray Space Telescope (Atwood *et al.* 2009), is a pair-conversion gamma-ray telescope that is sensitive to photon energies from about 20 MeV up to >300 GeV. The LAT consists of a tracker (two sections, front and back), a calorimeter and an anti-coincidence system to reject the charged-particle background. Fermi LAT, working in all-sky survey mode, is an optimal hunter for high-energy flares, transients and new gamma-ray sources, and is an unprecedented monitor of the variable gamma-ray sky, thanks to its large peak effective area, wide field of view (≈ 2.4 sr), improved angular resolution and sensitivity. This all-sky monitor is complemented by the Flare Advocate service (a.k.a. Gamma-ray Sky Watcher, FA-GSW), belonging to the LAT Instrument Science Operations.

FA-GSWs highlight news of potential interest for LAT science groups and the external community, and offer the first seeds for variability and multiwavelength (MW) investigations; <https://confluence.slac.stanford.edu/x/YQw>, the LAT MW Coordinating Group page, shows examples. Information and news about the gamma-ray sky are communicated through internal daily reports, Astronomical Telegrams (Fig. 1), notes via the LAT-MW mailing-list (<https://lists.nasa.gov/mailman/listinfo/gammamw/>), special GCNs for flares, and weekly digests in the Fermi Sky Blog (fermisky.blogspot.com).

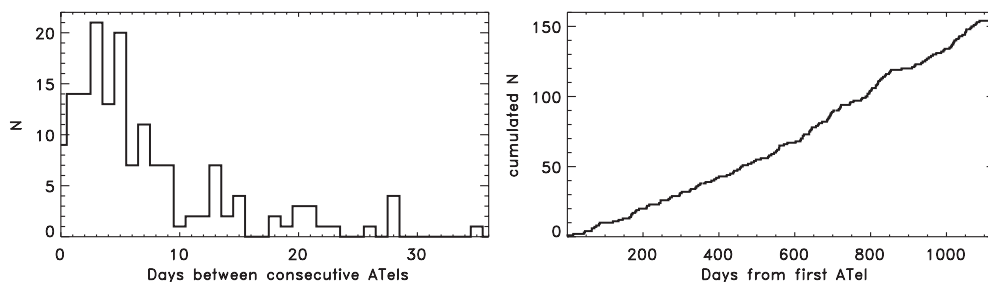


Figure 1. Distribution of the 159 Astronomical Telegrams (ATels), published on behalf of the Fermi LAT Collaboration in about 3 years of Fermi all-sky survey mission, from 2008 July 24 (ATel#1628) to 2011 August 24 (ATel#3580); www.astronomersteletgram.org. ATels and other information about the day-by-day gamma-ray sources detected above 100 MeV are summarized every week in the public Fermi Sky Blog (fermisky.blogspot.com).

The role and activity of the FA-GSW is therefore twofold:

- Gamma-ray Flare Advocate task. Flaring sources approaching a daily flux of 10^{-6} photons $\text{cm}^{-2} \text{s}^{-1}$ deserve attention (detection, localization, flux, photon index checked, count maps and exposure maps revised). Internal/public notes, ATels, Target of Opportunity (ToO) are submitted; MW observing campaigns are organized when needed.
- Gamma-ray Sky Watcher task. Results from the LAT Automatic Science Processing (ASP) pipeline are checked in 1-day and 6-hour time intervals for transients, brightness trends and new gamma-ray source candidates.

The list of discoveries triggered by FA-GSWs is substantial: many flares from gamma-ray blazars (the extraordinary outburst of 3C 454.3, very bright and large flares, for example from PKS 1510-089, 4C 21.35, PKS 1830-211, AO 0235+164, PKS 1502+106, 3C 279, 3C 273, PKS 1622-253), short/long duty cycles of bright gamma-ray blazars, unidentified transients near the Galactic plane (like J0910-5041, J0109+6134, Galactic centre region) or associated with Galactic sources (like the Crab nebula, the nova V407 Cyg, the micro-quasar Cyg X-3, the binary star system 1FGL J1018.6-5856), intense emission from the quiet and active sun (for example Abdo *et al.* 2011a, Abdo *et al.* 2011b, Abdo *et al.* 2010a, Abdo *et al.* 2010b, Abdo *et al.* 2010c, Ackermann *et al.* 2010).

About a dozen ToOs per year were also submitted to SWIFT following gamma-ray flares detected by the LAT. The all-sky variability monitor run by FA-GSW advocates represents the liaison between the Fermi LAT Collaboration and the MW astrophysical/astroparticle community, and always invites observations of Fermi LAT sources and proposals for MW collaborations.

References

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