

An open catalog for TeV gamma-ray astronomy

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Abstract.

We present the `gamma-cat`, an online data collection and source catalog for TeV gamma-ray astronomy. Currently data from TODO papers is available, and the catalog contains TODO sources. Data is input using the hierarchical, human- and machine-readable YAML format and the tabular ECSV text formats, processed using Python scripts into an as-uniform form as possible. The data can be browsed on the `gamma-sky.net` web page, analyzed using `Gammapy`, or fully downloaded in FITS and other formats and used in whatever way the user likes. Data is collected in a git repository on Github, providing transparency, version control as well as simple maintenance and contribution workflow. This data repository was started in August 2016, the data collection as well as the specification of the input and output formats is work in progress. Here we present the project for the first time, and discuss its context, implementation, status, plans as well as some possible use cases for science analysis.

1. Introduction

The first cosmic TeV gamma-ray source detected from the ground was the Crab nebula in 1989. Since then, TeV astronomy has seen rapid growth. By now, over 160 sources have been detected (see Figure 1). Measurements of source position, morphology, spectrum and sometimes lightcurves have been published, mostly in individual papers. Often the source parameters are not given in a machine-readable format, and even if they are, there is no common data format.

Multi-mission analysis with Sherpa (Freeman et al. 2001)

Other projects:

- Guillochon et al. (2016) and <https://astrocats.space/>
- Carosi et al. (2015) and <http://www.asdc.asi.it/tgevcats/>
- Wakely & Horan (2008) and <http://tevcat.uchicago.edu/>

Data:

- Open gamma formats: Deil et al. (2016) and <http://gamma-astro-data-formats.readthedocs.io/>

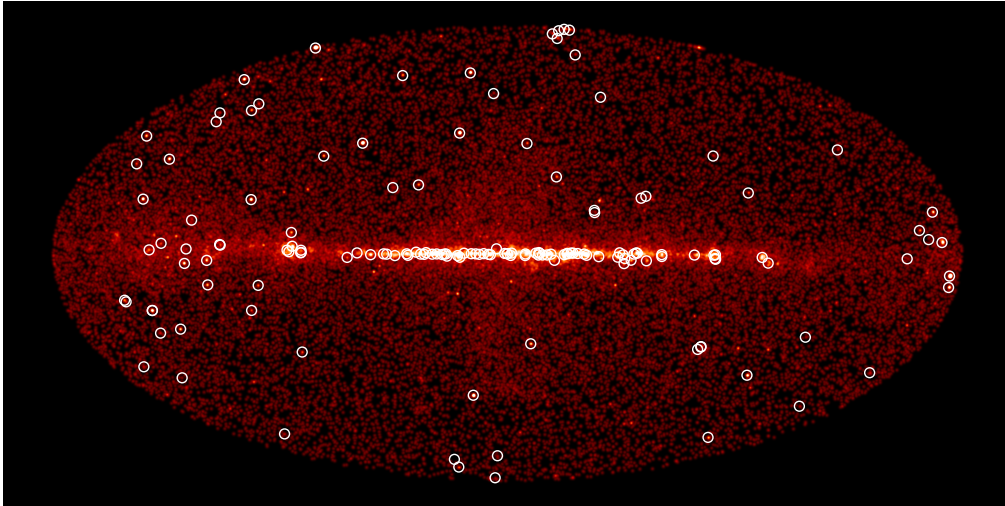


Figure 1. TeV gamma-ray sources from gamma-cat (white circles, TODO sources, status October 2016). The image (counts, smoothed with a Gaussian of width $\sigma = 0.3$ deg) shows the gamma-ray sky above 50 GeV using the Fermi-LAT 2FHL dataset (Ackermann et al. 2016).

- Lightcurves: [Tluczykont et al. \(2010\)](https://astro.desy.de/gamma_astronomy/magic/projects/light_curve_archive/) and https://astro.desy.de/gamma_astronomy/magic/projects/light_curve_archive/
- H.E.S.S. data: <http://hess.obspm.fr/> and <https://www.mpi-hd.mpg.de/hfm/HESS/pages/home/sources/>
- VERITAS data: <http://veritas.sao.arizona.edu/veritas-science/veritas-results-mainmenu>
- MAGIC data: <http://vobs.magic.pic.es/fits/>

Tools:

- PyYAML: <http://pyyaml.org/>
- Astropy: Astropy Collaboration (2013)
- Gammapy: Donath et al. (2015)
- <https://github.com/andycasey/ads>

2. Usage

tbd

3. Implementation

tbd

4. Examples

4.1. Spectra

Example spectrum, see Figure 2.

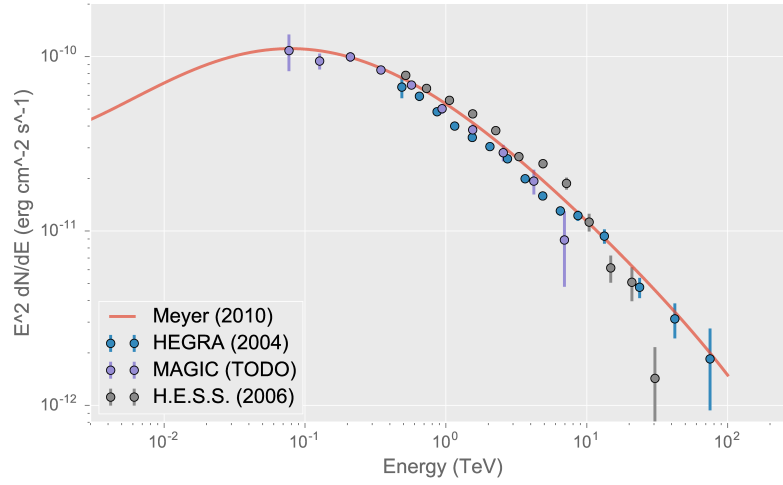


Figure 2. Spectrum example. Crab nebula.

4.2. Light curves

Example lightcurve, see Figure 3.

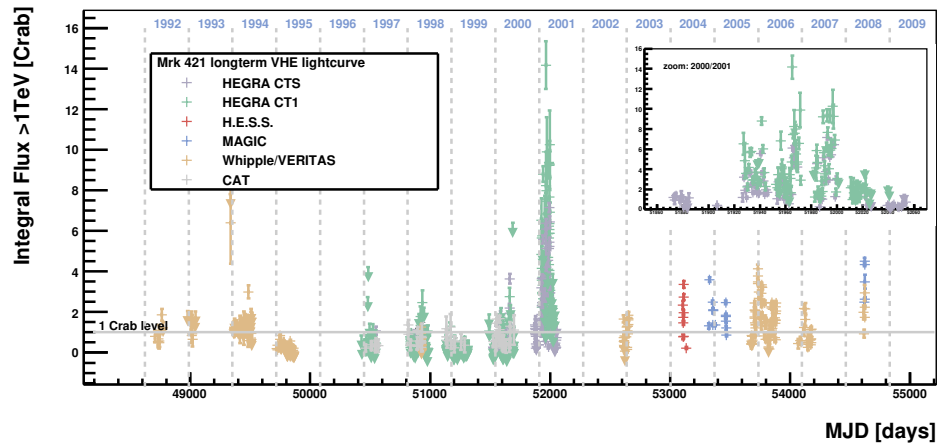


Figure 3. Lightcurve example. Mrk 421. Figure from *Thurykont et al. (2010)*. Data not yet available in gamma-cat.

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5. Conclusions

Remember: gammatcat this is useful and awesome.

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References

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