

An open catalog for TeV gamma-ray astronomy

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Abstract

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. 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.

We present an effort to collect the available data on TeV sources, and curate it into an as-uniform and as-complete as possible form, and have it freely available for download at <https://github.com/gammapy/gamma-cat> . This poster presents the project idea and status, as well as its technical implementation, which includes YAML, ECSV, JSON and FITS files and Python scripts using Gammapy (<http://gammapy.org>), and several other Python packages. A web front-end to browse this TeV source catalog and other gamma-ray and multi-wavelength data is under development at <http://gamma-sky.net> .

Resources

- Catalog (very preliminary): <https://gammapy.github.io/gamma-cat/>
- Project on Github <https://github.com/gammapy/gamma-cat>
- TODO: link to gamma-sky.net if the gamma-cat catalog is integrated already.
- TODO: add QR codes

Motivation

- Why are we doing this?
- What are our hopes and dreams?
- Outline possible science applications?
- Mention some previous efforts, their status, and how this effort is different.

How it works

- The idea is taken from <https://astrocats.space/>
- Inputs maintained as a bunch of text files (YAML and ECSV format)
- Outputs in FITS, VOTable, ECSV, JSON, whatever people want
- Processing with Python scripts, partly using Gammapy
- Git for version control. Github for collaboration
- Basic idea: fully open, make it easy for anyone to contribute or maintain the project -> try to achieve longevity by creating a small community of people who care from several groups.
- iteratively develop data collection and formats (link to gamma-astro-data-formats)

```
1 source_id: 1
2
3 common_name: CTA 1
4 gamma_names:
5   - VER J0006+729
6 other_names:
7   - SNR G119.5+10.2
8
9 where: gal
10 classes: [pwn, snr]
11
12 discoverer: veritas
13 seen_by: [veritas]
14
15 tevcat_id: 227
16 tevcat2_id: rC5JCj
17 tevcat_name: TeV J0006+729
18
19 tgevcad_id: 1
20 tgevcad_name: TeV J0006+7259
21
22 papers:
23   - 2013ApJ...764...38A
24
25 pos:
26   simbad_id: CTA 1
27   ra: 1.6500000
28   dec: 72.7830000
```

```
1 paper_id: 2006A&A...457..899A
2 source_id: 25
3
4 data:
5   livetime: 22.9
6
7 morph:
8   type: point
9
10 spec:
11   type: ecpl
12
13 norm: {val: 37.6, err: 0.7}
14 index: {val: 2.39, err: 0.03, err_sys: 0.09}
15 ecut: {val: 14.3, err: 2.1}
16
17 theta: 0.11
18 erange: {min: 0.44, max: 40.0}
```

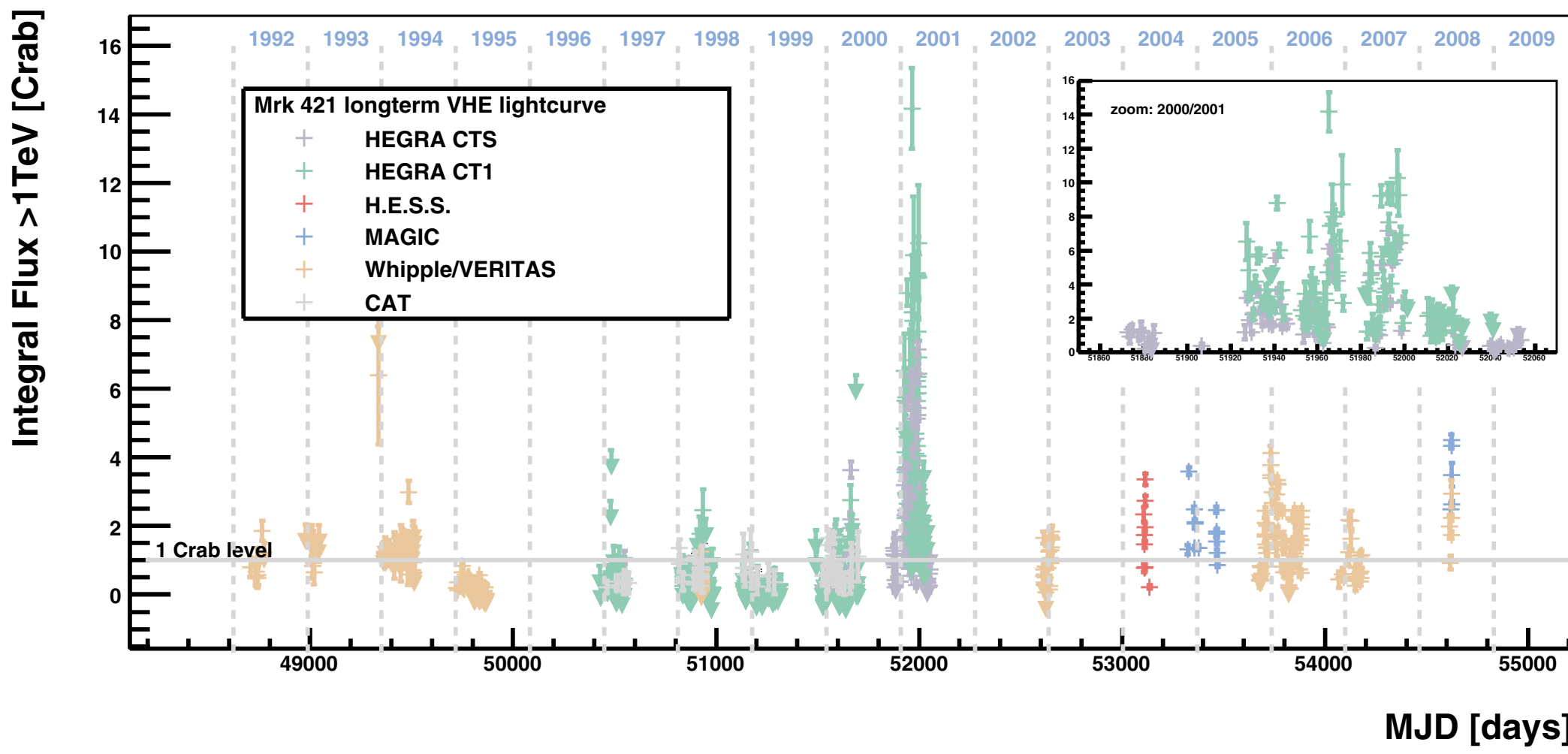
Example YAML input files

Examples

- All-sky plot with detections
- Pie chart with source classes?
- Spectrum example
- Lightcurve example

TODO: Sky-positions (Galactic coordinates) of the TODO sources in the open TeV gamma-ray source catalog.

TODO: Spectral measurements for the Crab nebula.



Light curve data for Mrk 421. Figure from [1]. We plan to add this and other data to gamma-cat.

Status & Plans

- Just started
- Feedback and contributions welcome.
- Concrete plans: tbd

References

- [1] [Tluczykont et al. A&A 524, A48 \(2010\)](#)
- Links to other papers and websites, e.g. 2010 LC paper or other things from https://github.com/gammapy/gamma-cat/blob/master/README_ABOUT.md#related-resources