γπ A **Python** package for **gamma-ray** astronomy

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astropy-powered astropy.org

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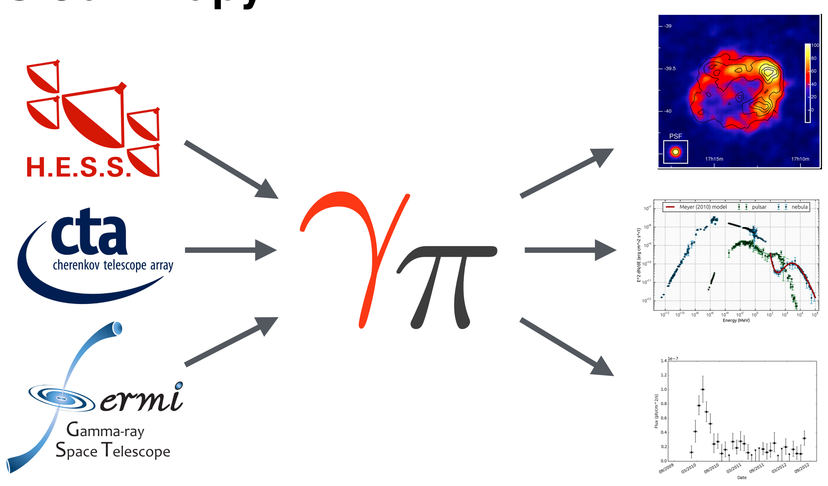
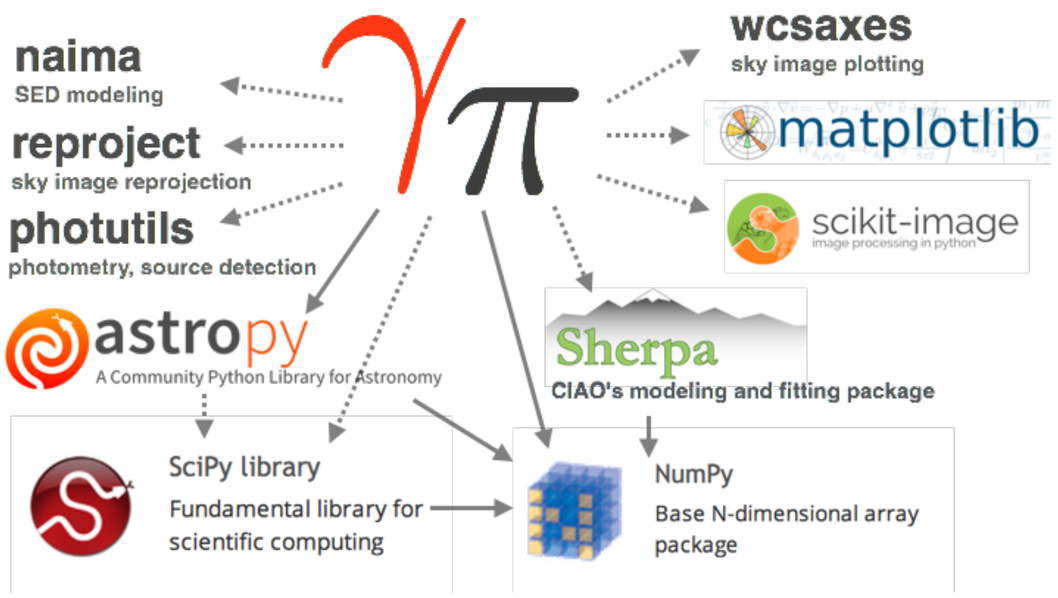
What is Gammapy?



Gammapy is an open source gamma-ray astronomy Python package. It is an in-development affiliated package of Astropy that builds on the core scientific Python stack to provide tools to simulate and analyse the gamma-ray sky for telescopes such as CTA, H.E.S.S., and Fermi.

Gammapy is a place for Python-coding gamma-ray astronomers to share their code and collaborate.
Feature requests or contributions welcome!

The Stack



Gammapy builds on the scientific Python stack (Numpy, Scipy, scikit-image, matplotlib), the core Astropy package and a few Astropy-affiliated packages (reproject, photutils, wcsaxes). For flexible and robust morphology and spectrum modeling and fitting we use Sherpa, for non-thermal (synchrotron, bremsstrahlung, inverse Compton, pion decay) SED modeling we use Naima.

By using these powerful packages we only have to implement gamma-ray astronomy-specific methods. And at the same time we are part of and collaborate with a larger community, e.g. some code that was initially implemented in Gammapy, but wasn't really gamma-ray specfic, has been moved to the other packages in the meantime, where they can benefit a larger user base.

Development

https://github.com/gammapy/gammapy

python™ pytest SPHINX open source™ github SOCIAL CODING Travis CI Google groups Read the Docs

Gammapy is open source software (BSD-3 licensed like Astropy) hat uses the very nice software development setup that most open-source projects have adopted nowadays.
We use Github for development (git repository, issue tracker, pull requests and code review). Users can get help on the mailing list. Tests are run with pytest and docs are generated with Sphinx. We use travis-ci for continuous integration and readthedocs for docs hosting.

Status, origin, goal and plan

Gammapy 0.3 (released July 2015) is still alpha quality software!

Gammapy started as a set of Python scripts to do our research (analysis of Galactic sources with H.E.S.S. and Fermi-LAT data).

Since then the Astropy project was born and recently Sherpa became an open project. There's a movement in science towards open, reproducible research.

We would like Gammapy to grow into a package where standard gamma-ray analyses are available and prototyping of new methods happens. Your contributions are welcome! If you don't know how to turn your scripts into production-quality, re-usable functions and classes, just talk to us and we'll help you get there.

We are planning a coding sprint / workshop at MPIK Heidelberg in fall 2015, and a Gammapy 1.0 release and paper towards the end of 2015. But that's just the next step, hopefully development and use will continue for many years …

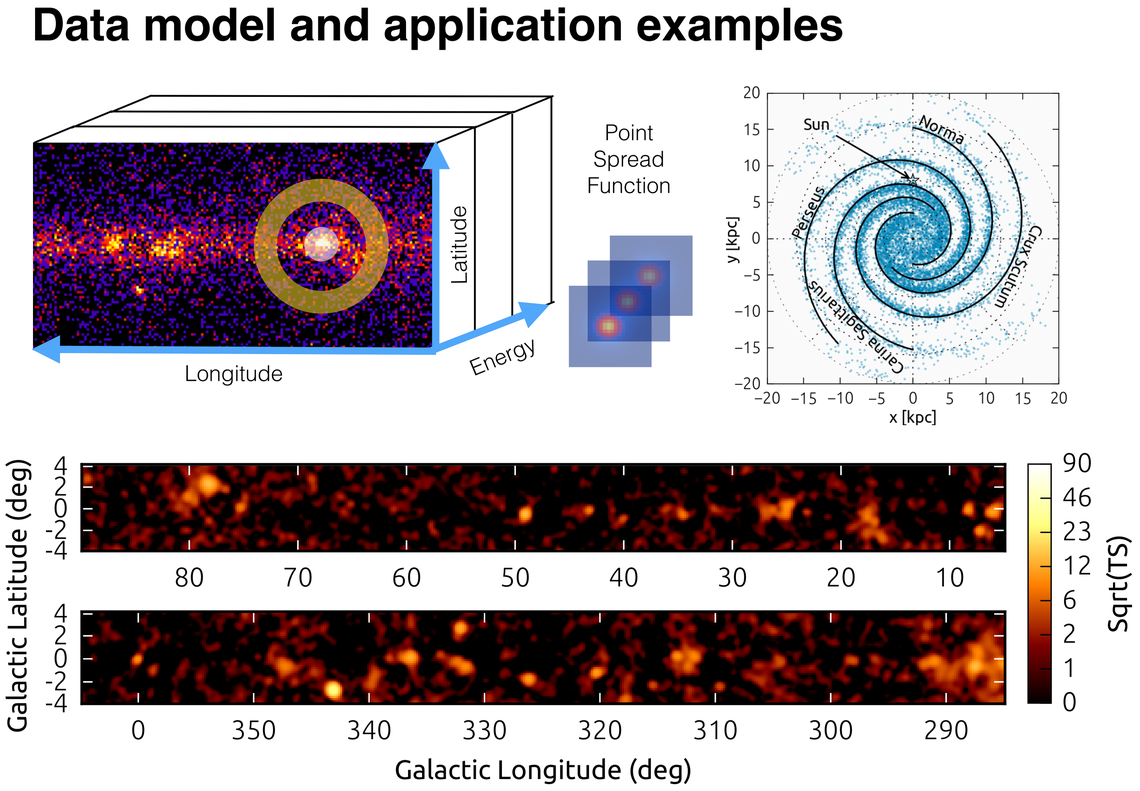
The toolbox

- `gammapy.astro`: Galactic population and emission models of TeV sources.
- `gammapy.background`: Background estimation and modeling
- `gammapy.catalog`: γ-ray source catalog access and processing
- `gammapy.datasets`: Easy access to bundled and remote datasets
- `gammapy.detect`: Source detection tools and algorithms.
- `gammapy.hspec`: Interface to spectral fitting with Sherpa.
- `gammapy.image`: Image processing and analysis tools
- `gammapy.irf`: Instrument response function (IRF) access and handling
- `gammapy.morphology`: Morphology models and tools
- `gammapy.obs`: Observation bookkeeping
- `gammapy.spectrum`: Spectrum models and tools
- `gammapy.stats`: Statistics functions
- `gammapy.time`: Handling of time series and γ-ray lightcurves.
- `gammapy.utils`: Utility functions and classes (in sub-modules)

Gammapy is organised into sub-packages (like Scipy or Astropy). Its API is mostly object-oriented, but where it makes sense we use functions; not everything has to be a class.

Easy-to-use command-line tools are available for the most common tasks, i.e. even if you don't want to learn Python, you can use a limited subset of Gammapy.

Data model and application examples



Please read the Gammapy ICRC 2015 proceeding or go to https://gammapy.readthedocs.org/ for an explanation of the data model we use as well as application and code examples.