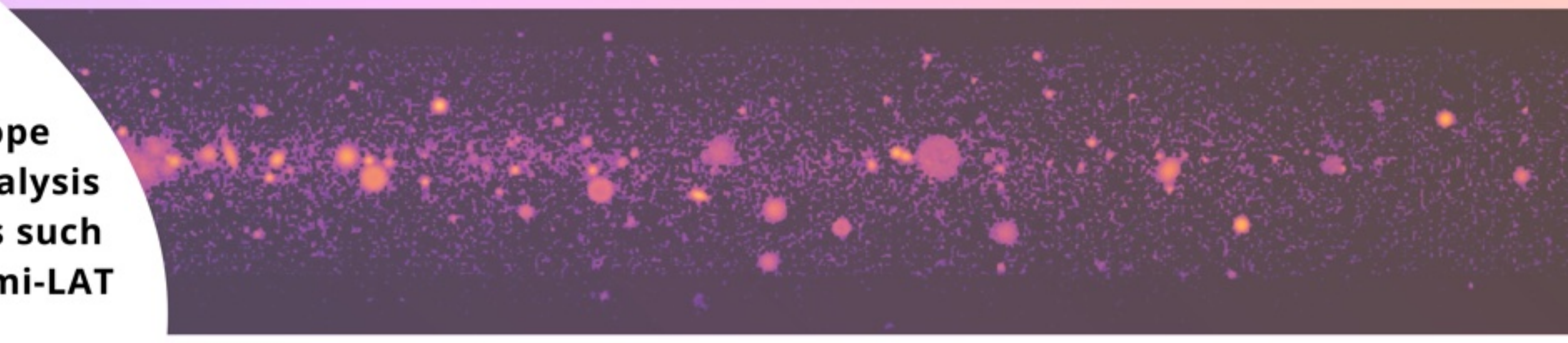
Unlocking the potential of gamma-ray astronomy with Gammapy: current status and roadmap

The gammapy team

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

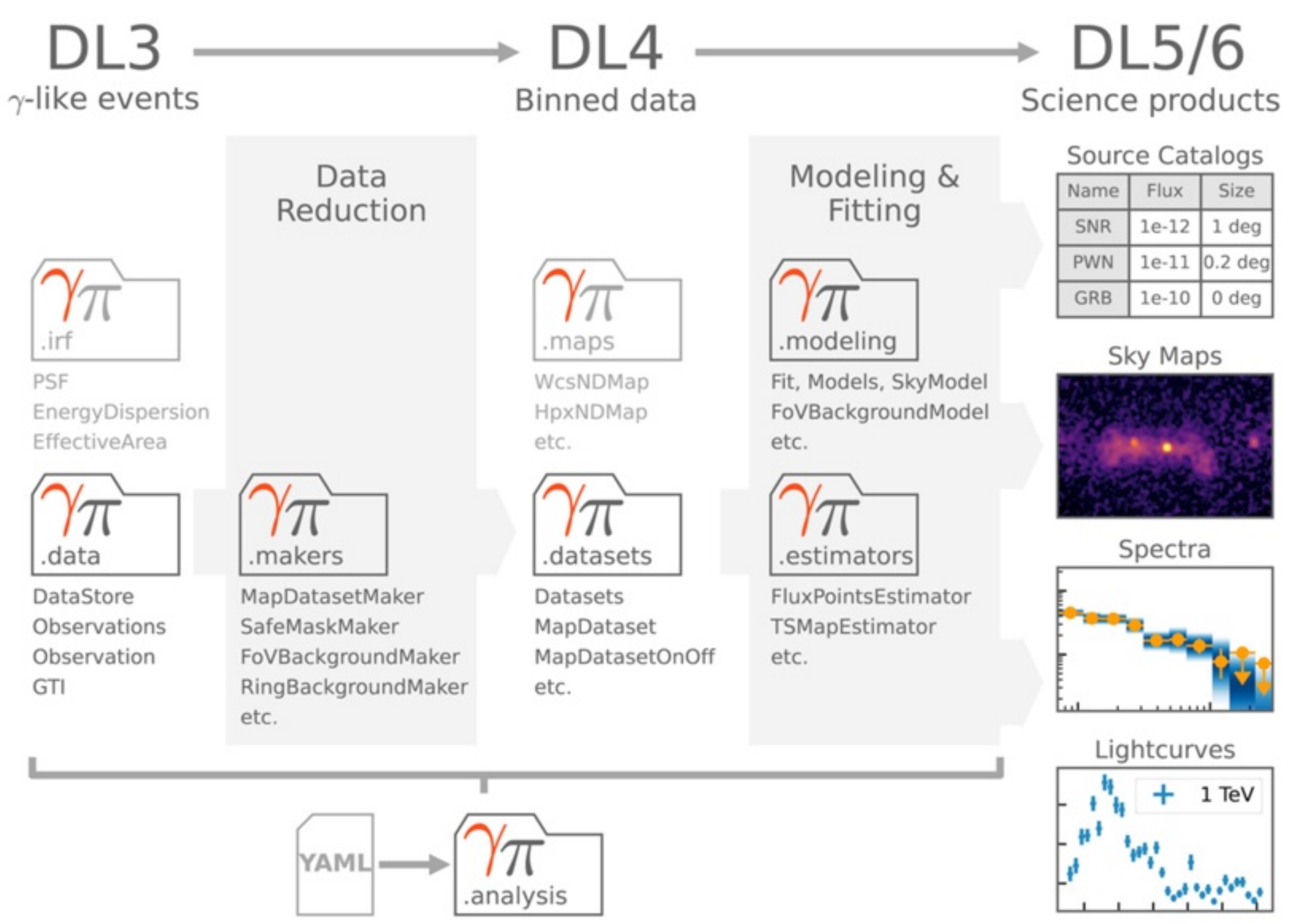


WHAT IS GAMMAPY ?

Gammapy is an open-source Python package designed for the analysis of astronomical gamma-ray data.
It provides a uniform platform for reducing and modeling data from various gamma-ray instruments across many analysis scenarios.
It has been selected as the core library for the Cherenkov Telescope Array Observatory (CTAO) Science Tools and also supports the analysis of data from existing Imaging Atmospheric Cherenkov Telescopes such as H.E.S.S., MAGIC, and VERITAS, along with some support for Fermi-LAT and HAWC data.

Look at the documentation here:

GAMMAPY DATAFLOW



Gammapy supports the high-level analysis of gamma-ray data, which involves extracting physical quantities related to gamma-ray sources and producing science products like spectra, light curves, and catalogs. The process generally follows these stages:

- **DL3:** Reading events and Instrument Response Functions (IRFs)
- **DL4:** Data Reduction and creating binned data structures
- **DL5/6:** Modeling and fitting

OPEN SOURCE IS THE WAY: JOIN US !

- **Slack:** Have questions, get in touch via Slack and the #help or #dev. *gammapy.slack.com*
- **Github:** Issues, bug, features request. Just one contribution makes you an author of the next gammapy release.
- **Become a gammapy developer:** All expertise are useful (code, documentation, package release, CI, benchmarks, etc). Weekly dev calls !
- **Gammapy user calls:** Showcase your gammapy work (contact us on Slack).
- **Gammapy-mwl:** Affiliated package for MWL analysis in gammapy (optical, X-rays, etc). *github.com/gammapy/gammapy-mwl/*

WHAT'S NEW IN V2.0?

Enhanced multi-instrument joint-likelihood. In particular for Fermi-LAT data (weighted likelihood + performance improvements).

Joint-likelihood analysis on multiple instruments allows to perform a fit on the DL4 datasets and NOT the flux points which is statistically not accurate.

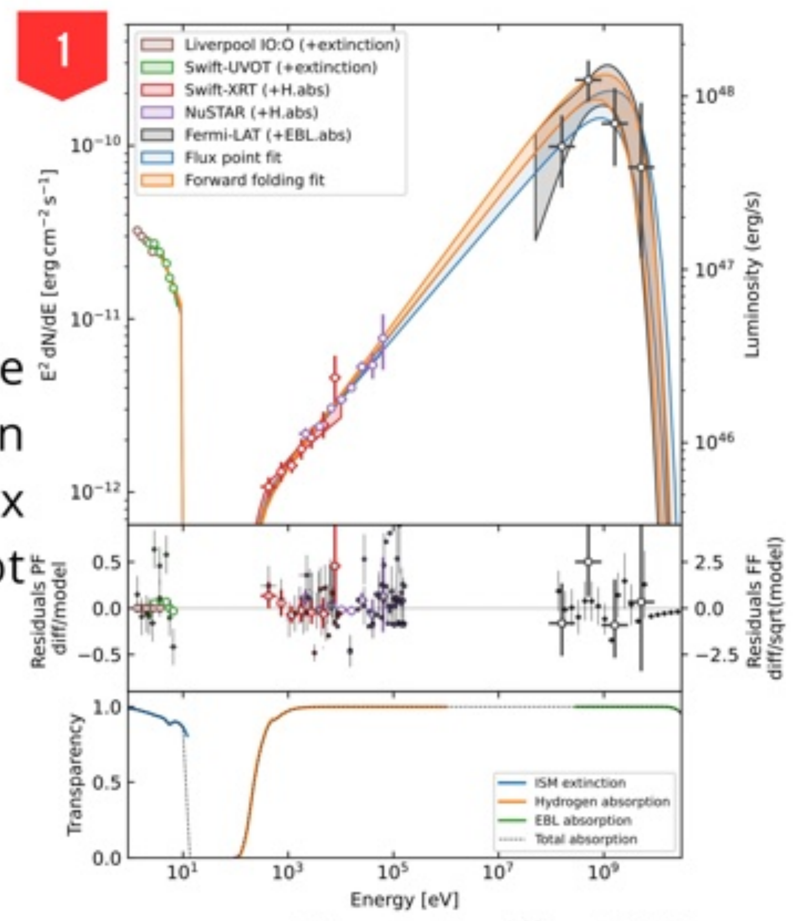


Fig.1: Multi-instrument fitting of the flaring AGN OP313 from optical to Fermi-LAT energies (10 decades in energy) !

Nievas-Rosillo, 2025

See tutorial on Liverpool optical telescope, Swift-XRT, NuSTAR, and Fermi-LAT gammapy analysis here :

What is nested sampling ?

Bayesian inference using the nested sampling method via UltraNest.

Nested sampling overcomes some limitations of MCMC methods and estimates the Bayesian evidence which can be used for non-nested model comparison.

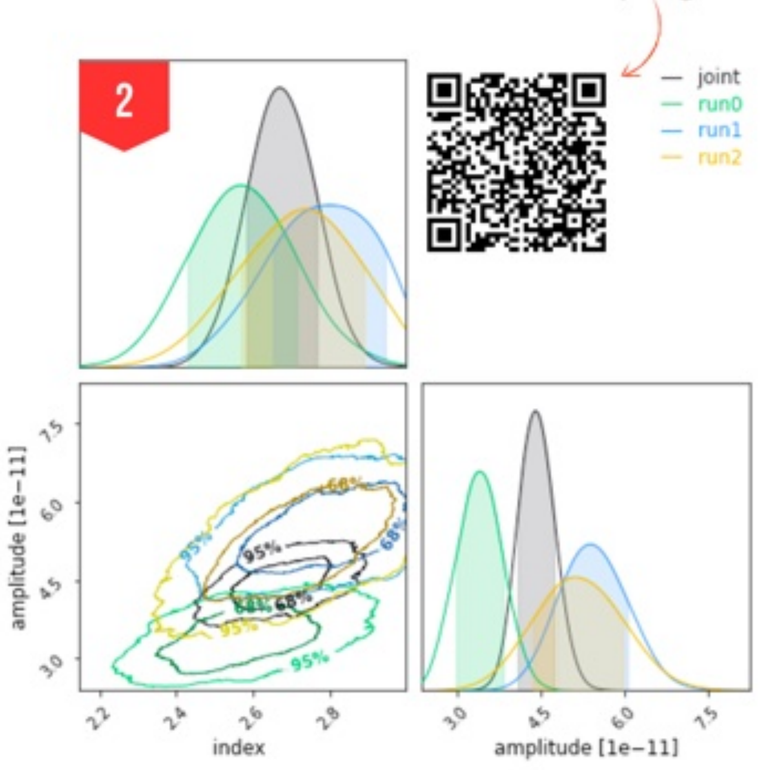


Fig.2: Posterior distribution of three Crab runs fitted separatly or jointly.

General improvements

- New tutorial (e.g. VERITAS data, sampling, upper-limits)
- Improved spectral error band using sampling method
- Performance improvements (e.g. with large edisp matrix)
- Add Asimov dataset for simulation and sensitivity estimate

HELP US CHOOSE OUR NEXT SONG : VOTE

With the v2.0 release, the gammapy team is looking for feedback to add new gammapy songs.
Help us choose which one you like best !