Contributions of IFAE to the OSSR

OSSR final workshop - 01/12/2022

C. Nigro, J. Rico

ESCAPE - The European Science Cluster of Astronomy & Particle Physics ESFRI Research Infrastructures has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n° 824064.

Members and contributions

Members

- J. Rico, PI of the project;
- C. Nigro, hired in Nov 2019, finished ESCAPE funding in May 2022;

Contributions OSSR/WP3

- Onboarded two software with main developers at IFAE:
  - gLike (J. Rico),
  - agnpy (C. Nigro);
- for both software the onboarding should be completed: onboarding presentation given, metadata updated, final blessing from curators missing:
  - ossr-curation PR for agnpy,
  - ossr-curation PR for gLike.

Demonstration with our software in many ESCAPE events:

- OSSR tutorial w/ gLike, Kay, ESCAPE general assembly Sep. 2021;
- Launching agnpy from the ESAP, Gareth, ESCAPE to the future Oct. 2022;
- ROSETTA tutorial w/ agnpy, S. A. Russo, ESCAPE ESAP Training Workshop Nov. 2022.

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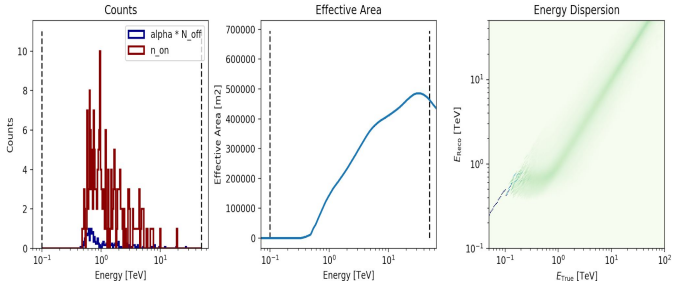
IFAE contributions to the OSSR - gLike

- Framework for numerical maximisation of joint (multi-instrument) likelihood functions;
- C++ code built on ROOT (sole dependency), hosted on github;
- already used for several publications, highlights: Fermi-LAT + MAGIC DM searches in dSphs, gloryduck project (Fermi-LAT + HESS + MAGIC + VERITAS + HAWC combined DM search, currently being expanded to also include neutrino telescopes).

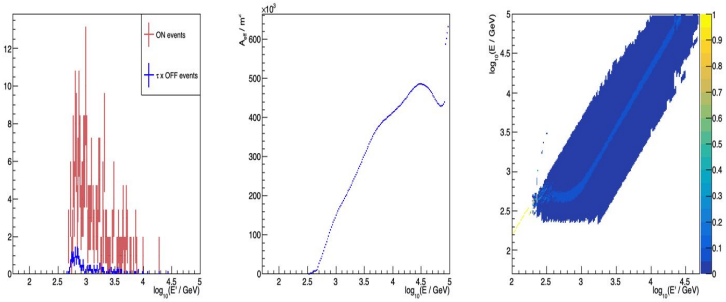
- **Work within the WP3:**
  - Improve interface with Gammapy (gLike can now read the output of Gamampy's data reduction);
  - gLike can be wrapped with pyroot and called within a jupyter notebook.
  - added several functionalities, e.g. simulations including a dark matter signal;

- **Status in the OSSR:**
  - released v00.10.03 with updated metadata. Curation PR merged.

Gammapy output (from data reduction)



gLike input (to likelihood analysis)



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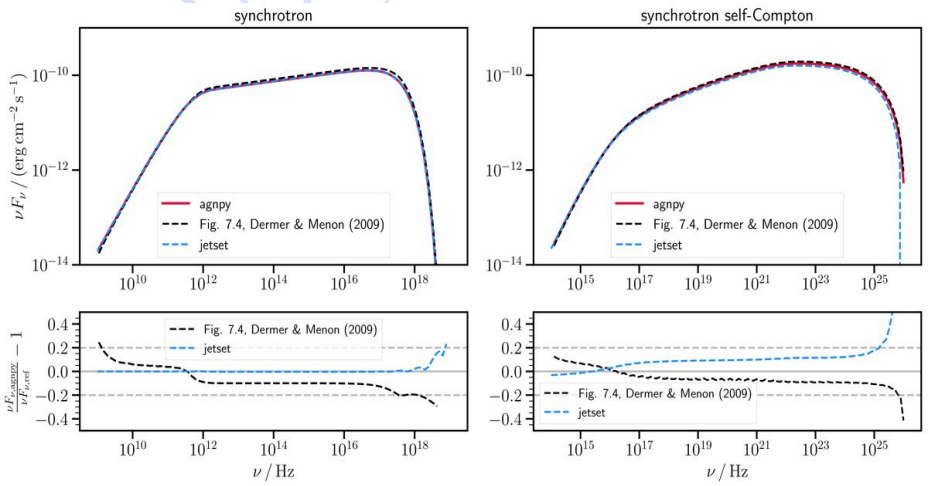
IFAE contributions to the OSSR - agnpy

- Second contribution to the OSSR: **agnpy** (github, readthedocs);
- python package modelling broad-band emission of jetted AGN;
- release paper published 2022;
- based on numpy + astropy, **astropy affiliated package**;
- easily interfaceable with python-based astrophysical data-analysis tools.



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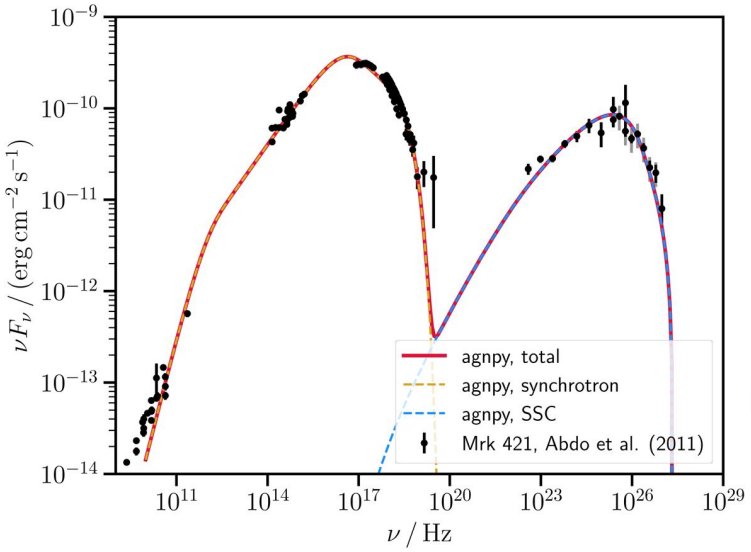
  - Improve documentation and test system;
  - worked on validation against with other software and literature;
  - include Gammapy wrapper (completed in summer 2022);



- **Status in the OSSR:**
  - released v0.3.0 with updated metadata. Waiting for curation PR to be merged.

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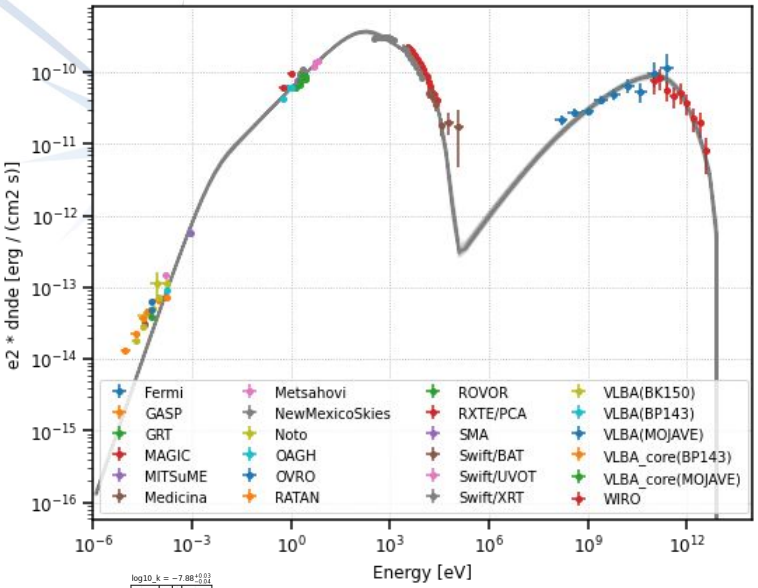

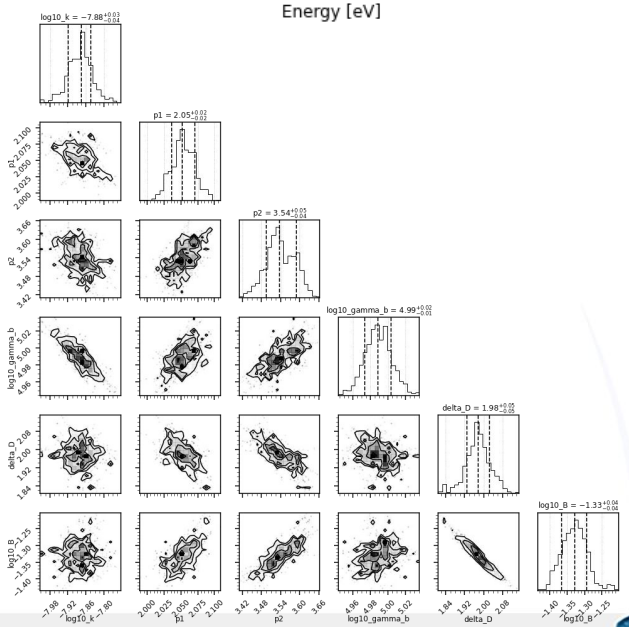

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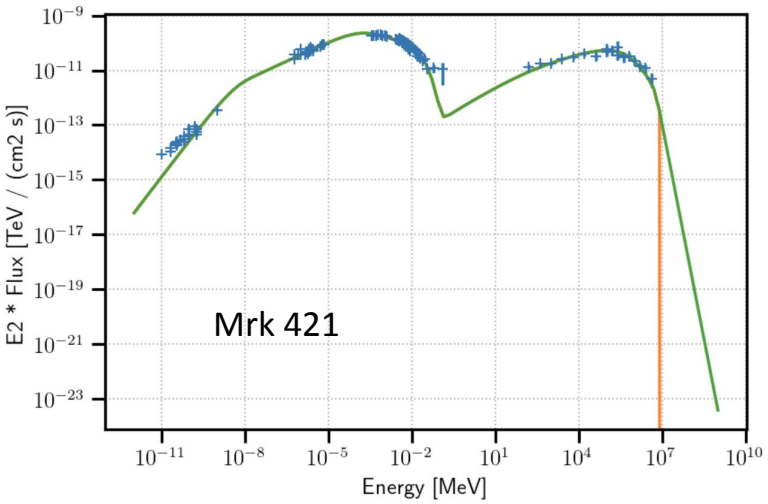
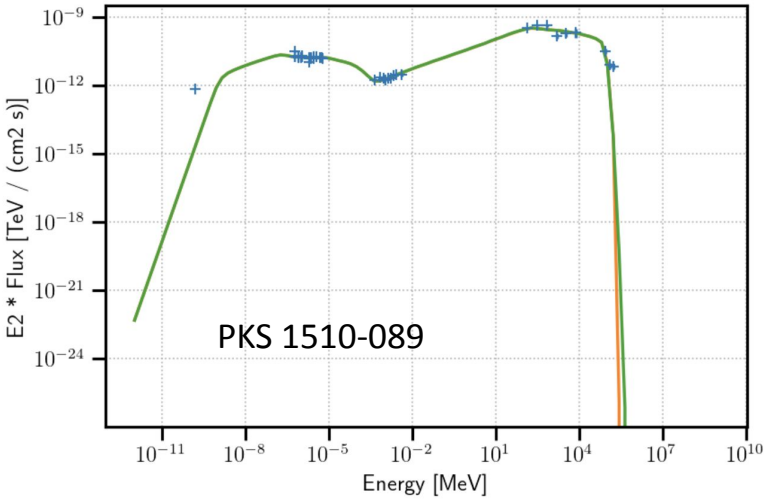
CTA ESCAPE science cases, WP(2,3,5)

- Two CTA science cases defined involving **agnpy** and **Gammapy**:

- **CTA005a**: simulation of a source high-energy emission using a physical model from agnpy wrapped with Gammapy. Re-analysis of the simulated DL3 data with a parametric model;

- **CTA005b**: fitting MWL SED flux points wrapping agnpy physical models with Gammapy.





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Conclusions

Expectations from OSSR

- IFAE onboarded two software to the OSSR;
- beside populating the repository, our contribution were helpful to test the onboarding procedures;
- agnpy one of the first examples of software with interactive analysis launched from the ESAP.

Future perspectives for cooperation

- Will maintain our software up to the OSSR standards;
- will be ready to provide any support needed if further problems arise with onboarding / launching from the ESAP.

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