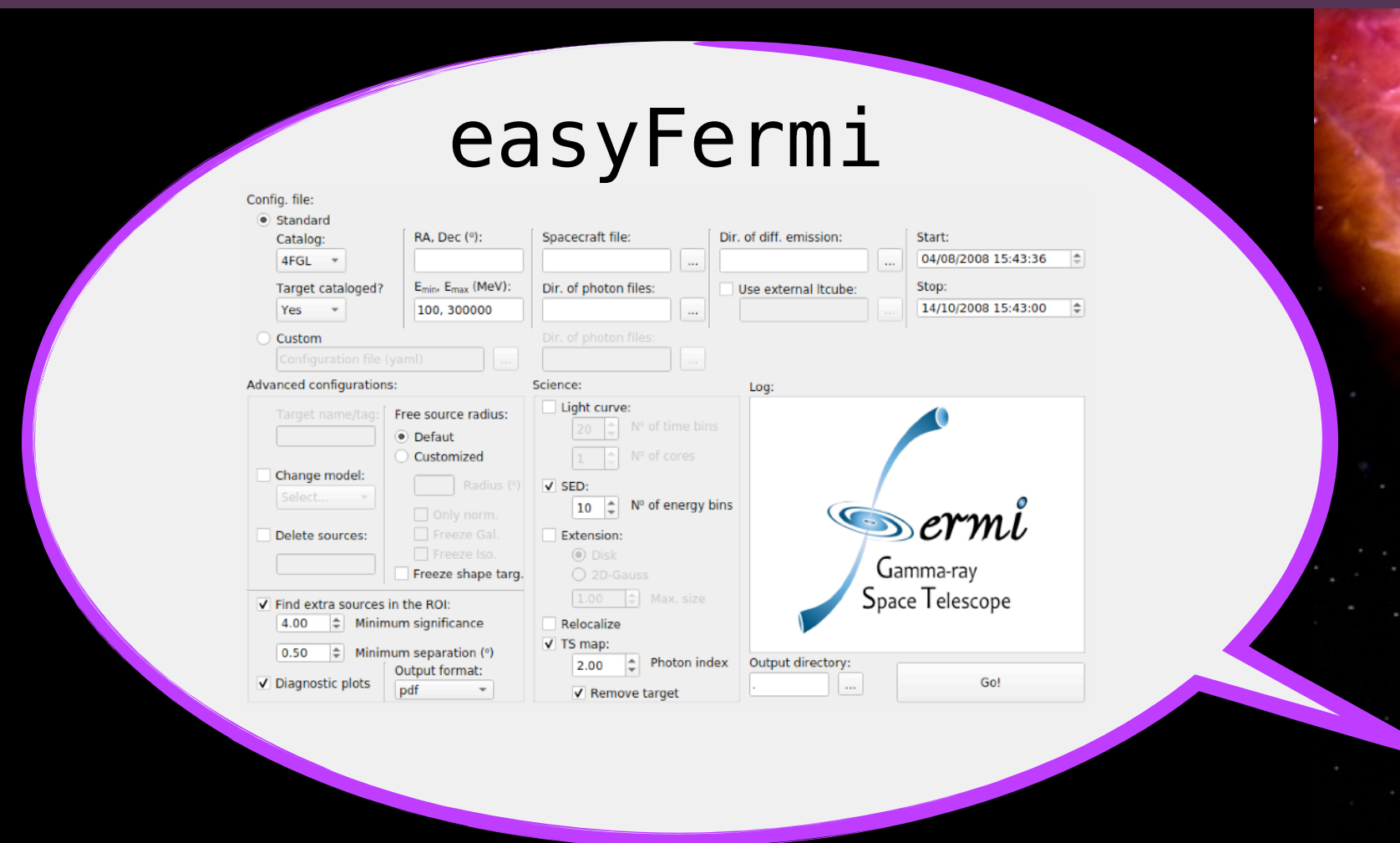


Hands-on



This work is part of the Project RYC2021-032991-I, funded by MICIN/AEI/10.13039/501100011033, and the European Union "NextGenerationEU"/RTRP.

Alicia López Oramas (IAC) & Douglas Carlos Ferreira (USP)
São Paulo Advanced School on Multi-Messenger Astrophysics 2023

H.E.S.S.
Namibia

VERITAS
USA

VHE: current IACTs

MAGIC
SPAIN

proprietary
only some data public

open

VHE: future IACTs

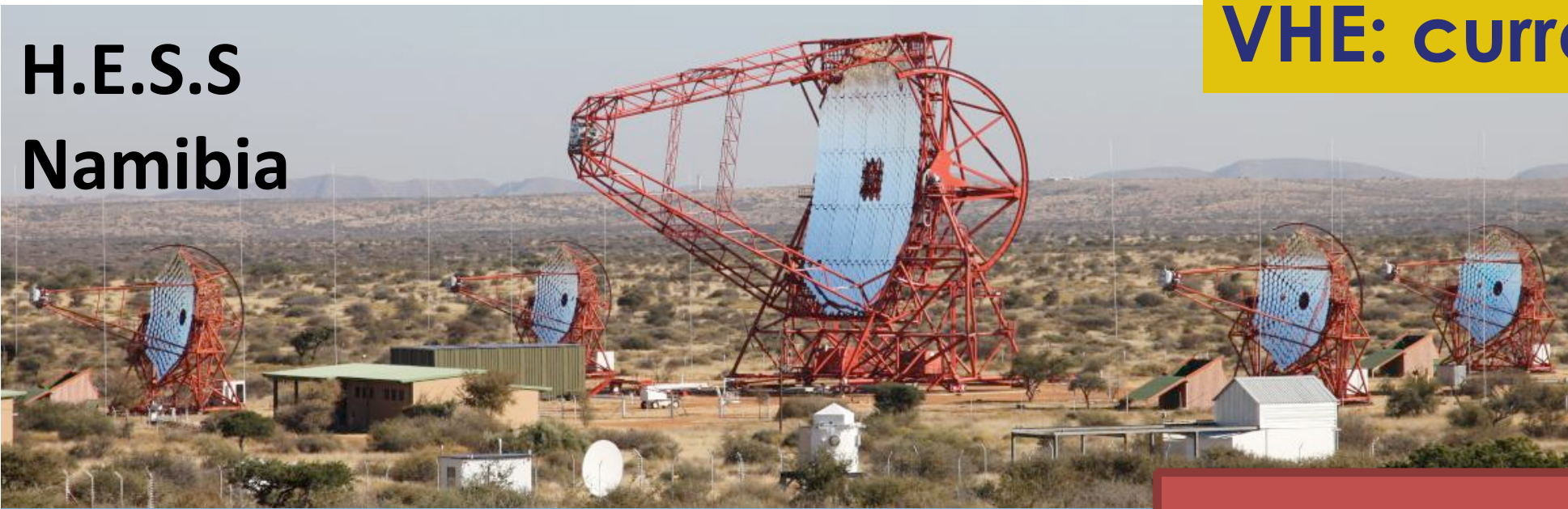
HE: Fermi-LAT

open

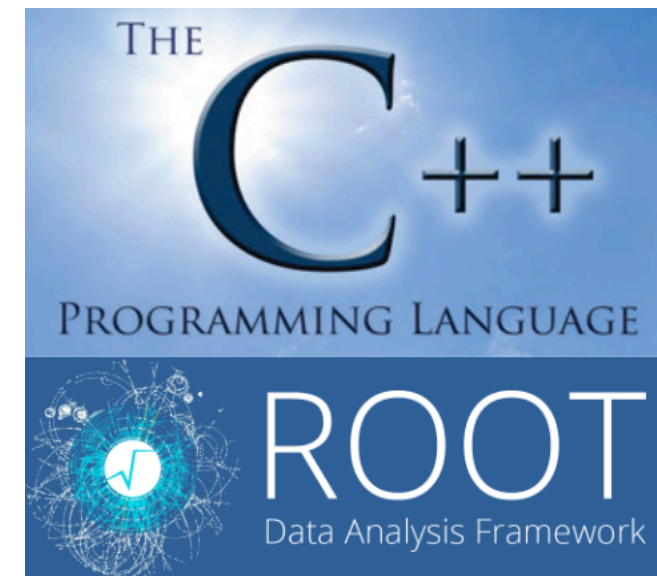
UHE: detectors

proprietary

LHAASO



Current IACTs



- Currently: ROOT/C++
- Internal use
- Public data available mostly in `fits` format (`fv`, `ds9`, `topcat`...)
- MAGIC: [fits files from published results](#)
- VERITAS: [calalogue of publications](#)
- H.E.S.S.: [first public test data release](#)
 - 27.9 hours in total of observations of the Crab nebula, PKS 2155–304, MSH 15–52 and RX J1713.7–3946 taken with the H.E.S.S. 1 array
- DL3 format

The Data Level 3 (DL3) format

The data level 3 FITS files consisting of event lists and extra information concerning the observation (pointing direction, time), as well as two index tables that list the observations and declare which response should be used with which event data.

IACT data

WORK ON OPEN DATA & TOOLS HAS STARTED ...

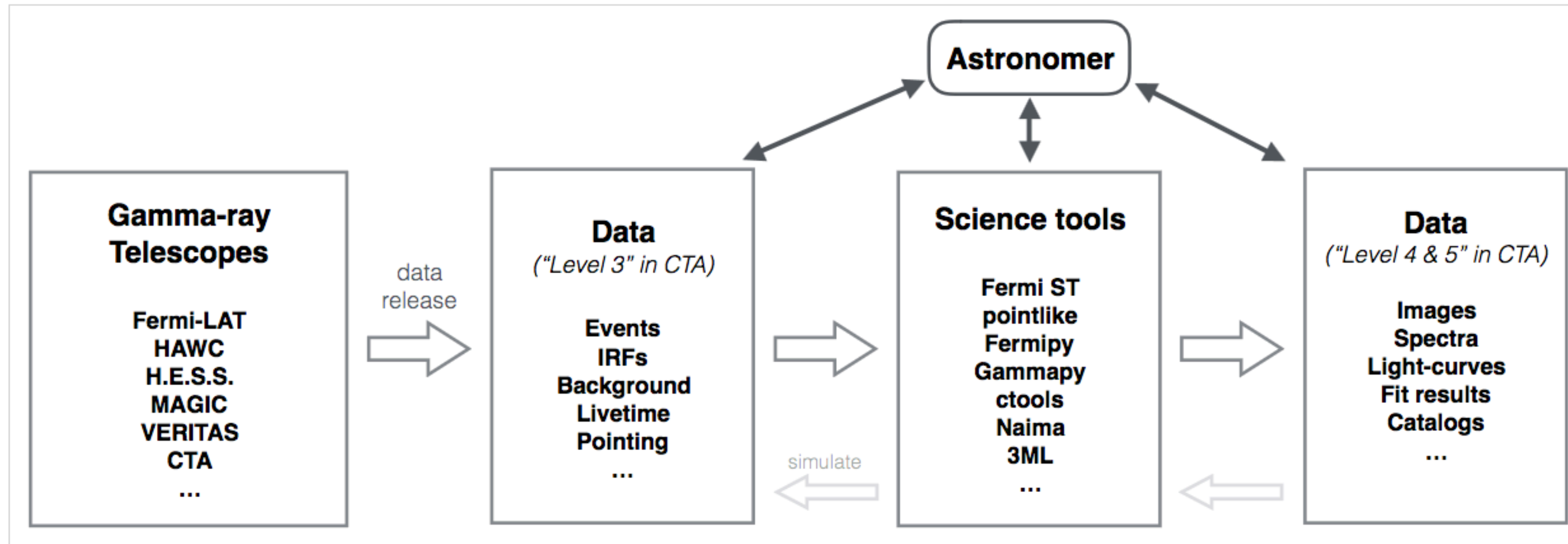
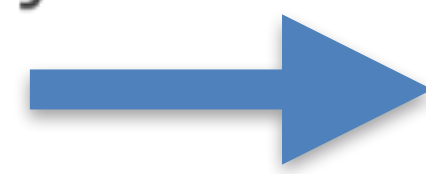
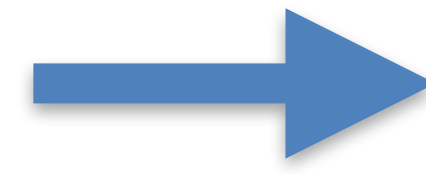
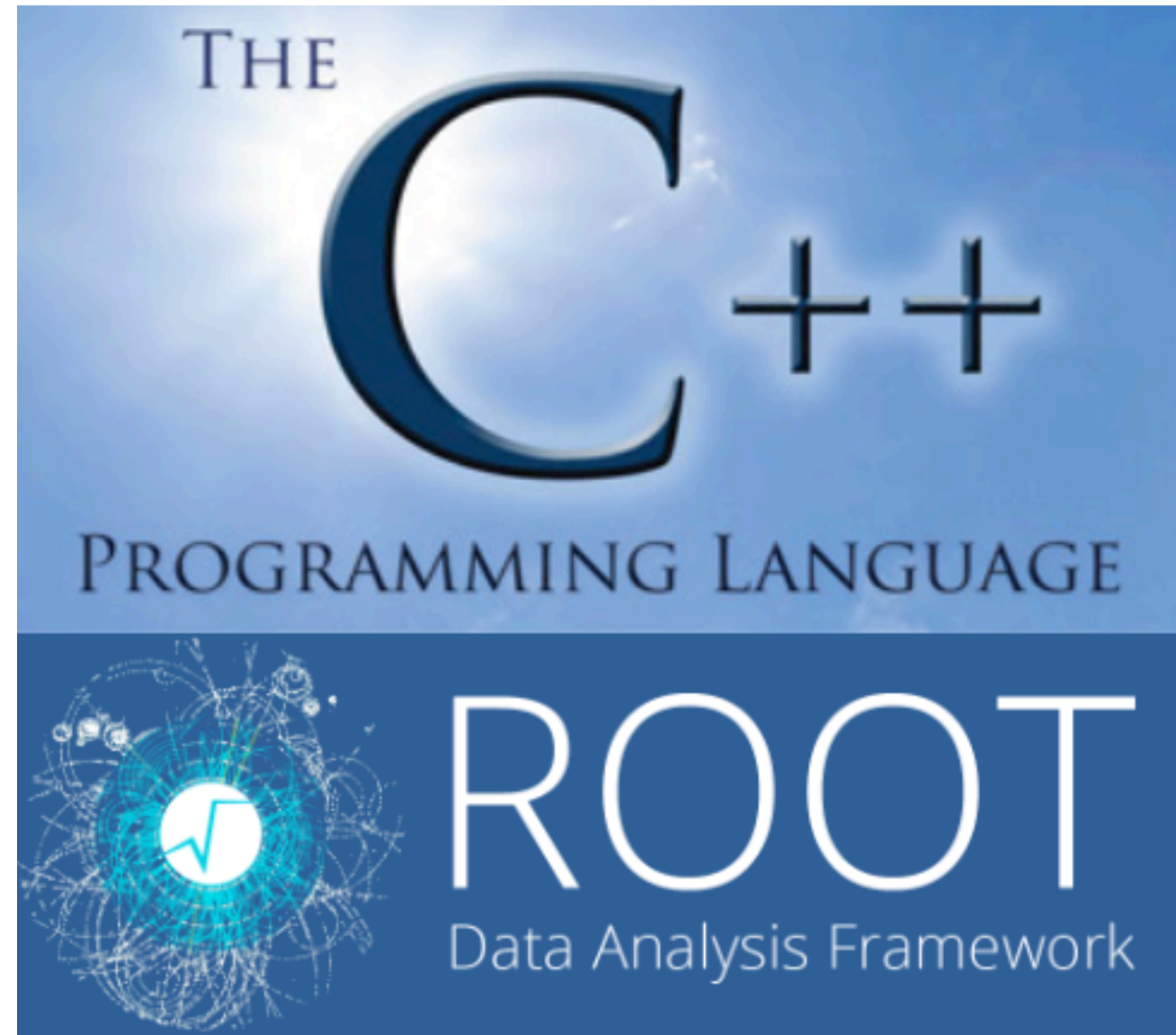


FIGURE 1. The purpose of the `gamma-astro-data-formats` effort is to encourage collaboration between high-level gamma-ray data producers, science tool developers, and data analysts. The goal is to develop common data formats to avoid duplication of efforts and confusion by astronomers working with multi-mission gamma-ray data or multiple analysis tools.

2016arXiv161001884D

IACT data





<https://gammapy.org/>



<http://cta.irap.omp.eu/ctools/index.html>

Execute notebooks with <https://jupyter.org/try-jupyter/lab/>

Fermi-LAT data



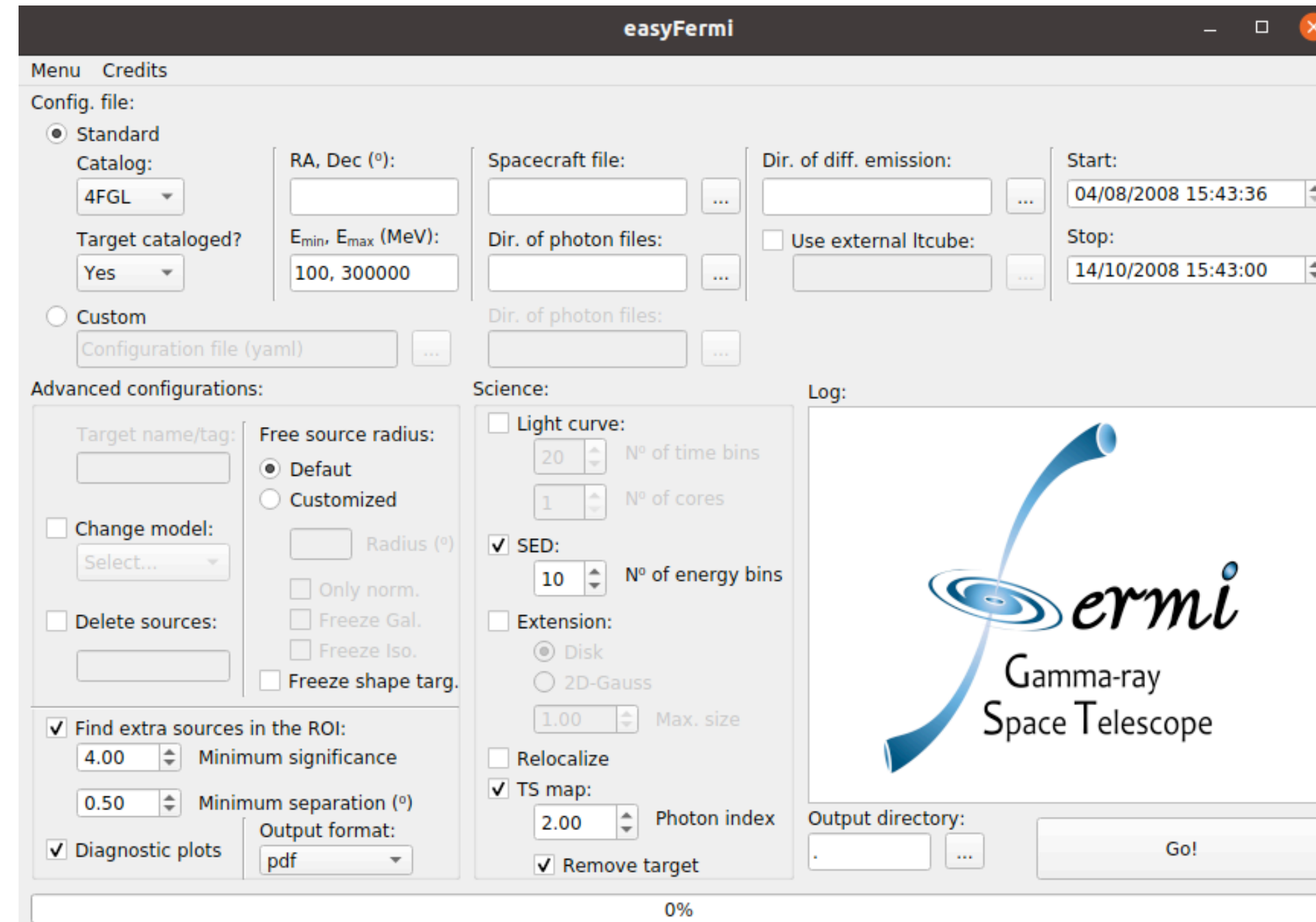
- Analysis via [Fermitools](#)
- Science Support Center Data: <https://fermi.gsfc.nasa.gov/ssc/data/>
 - LAT Data Queries: <https://fermi.gsfc.nasa.gov/cgi-bin/ssc/LAT/LATDataQuery.cgi>
 - Data Analysis: <https://fermi.gsfc.nasa.gov/ssc/data/analysis/>
 - Installation of tools (see Fermitools)
 - Analysis Threads: how to analyze the data

Fermi-LAT data



- Useful links:
 - Fermi-LAT monitored bright sources: https://fermi.gsfc.nasa.gov/ssc/data/access/lat/msl_lc/
 - Lightcurve repository: <https://fermi.gsfc.nasa.gov/ssc/data/access/lat/LightCurveRepository/#>
 - database of multi-cadence flux calibrated light curves for over 1500 sources deemed variable in the 10 year Fermi LAT point source (4FGL-DR2) catalog ([Ballet et al. 2020](#))

Hands-on: Fermi-LAT with easyFermi



- Graphical interface to perform Fermi-LAT data analysis in a user-friendly way (de Menezes 2022)
- **Disclosure: it is not the official tool by Fermi-LAT**

Hands-on: Fermi-LAT with easyFermi

- <https://github.com/ranieremenezes/easyFermi>
- <https://pypi.org/project/easyFermi/>
- <https://github.com/ranieremenezes/easyFermi>
- <https://www.youtube.com/@easyfermi4427>
- Data Query: <https://fermi.gsfc.nasa.gov/cgi-bin/ssc/LAT/LATDataQuery.cgi>

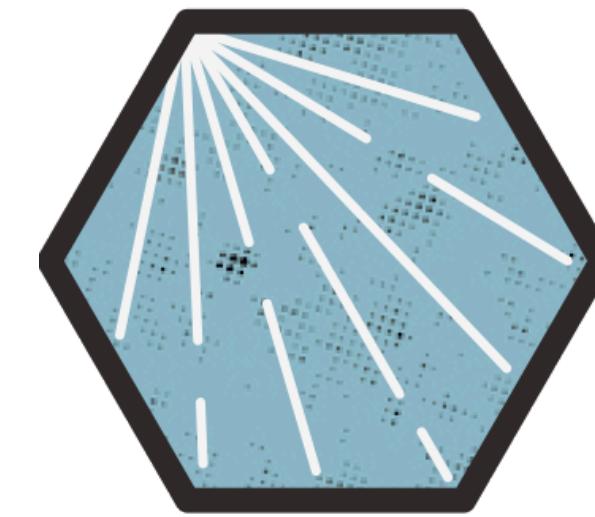
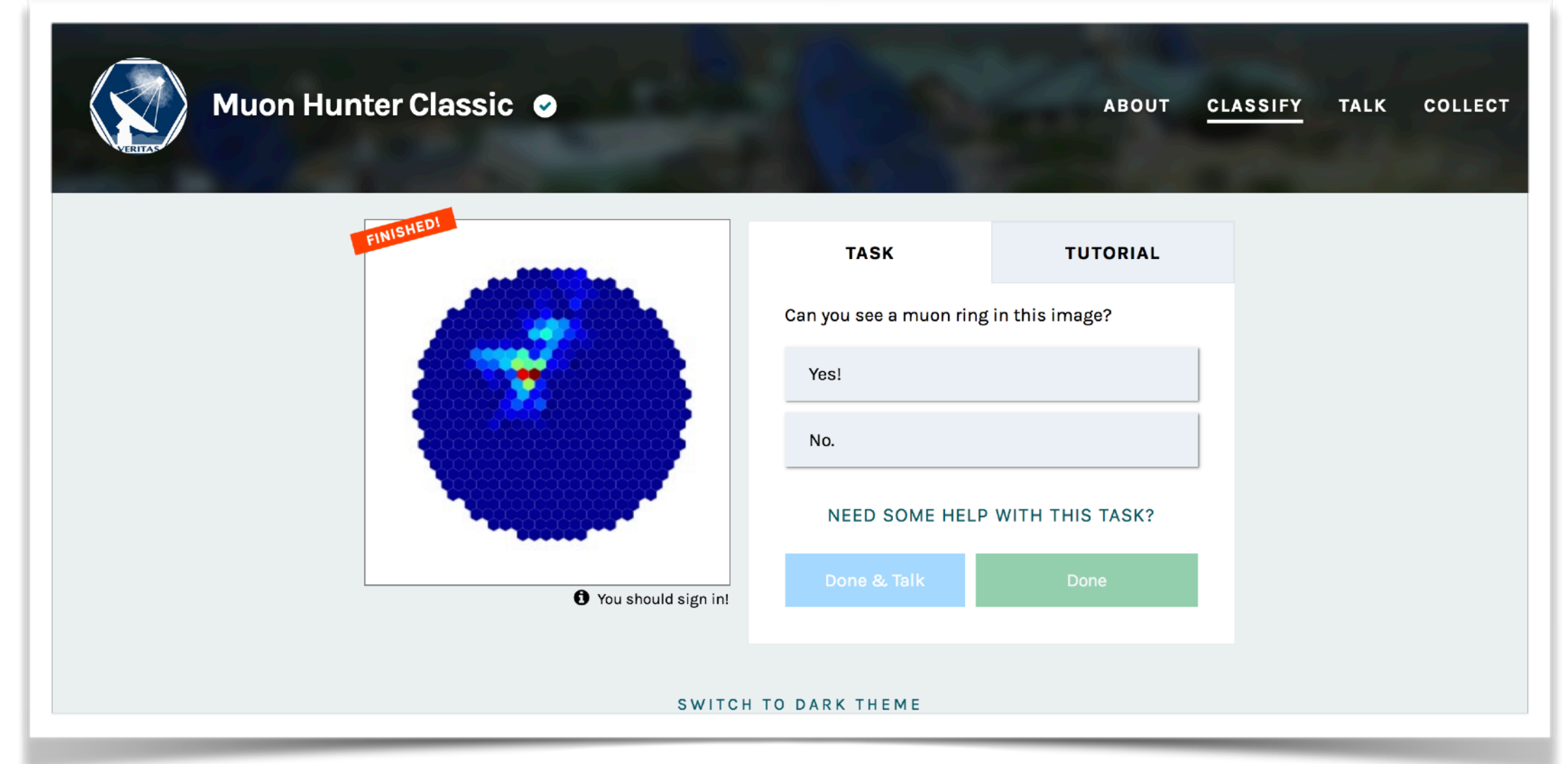
Other stuff to play with

- VERITAS:

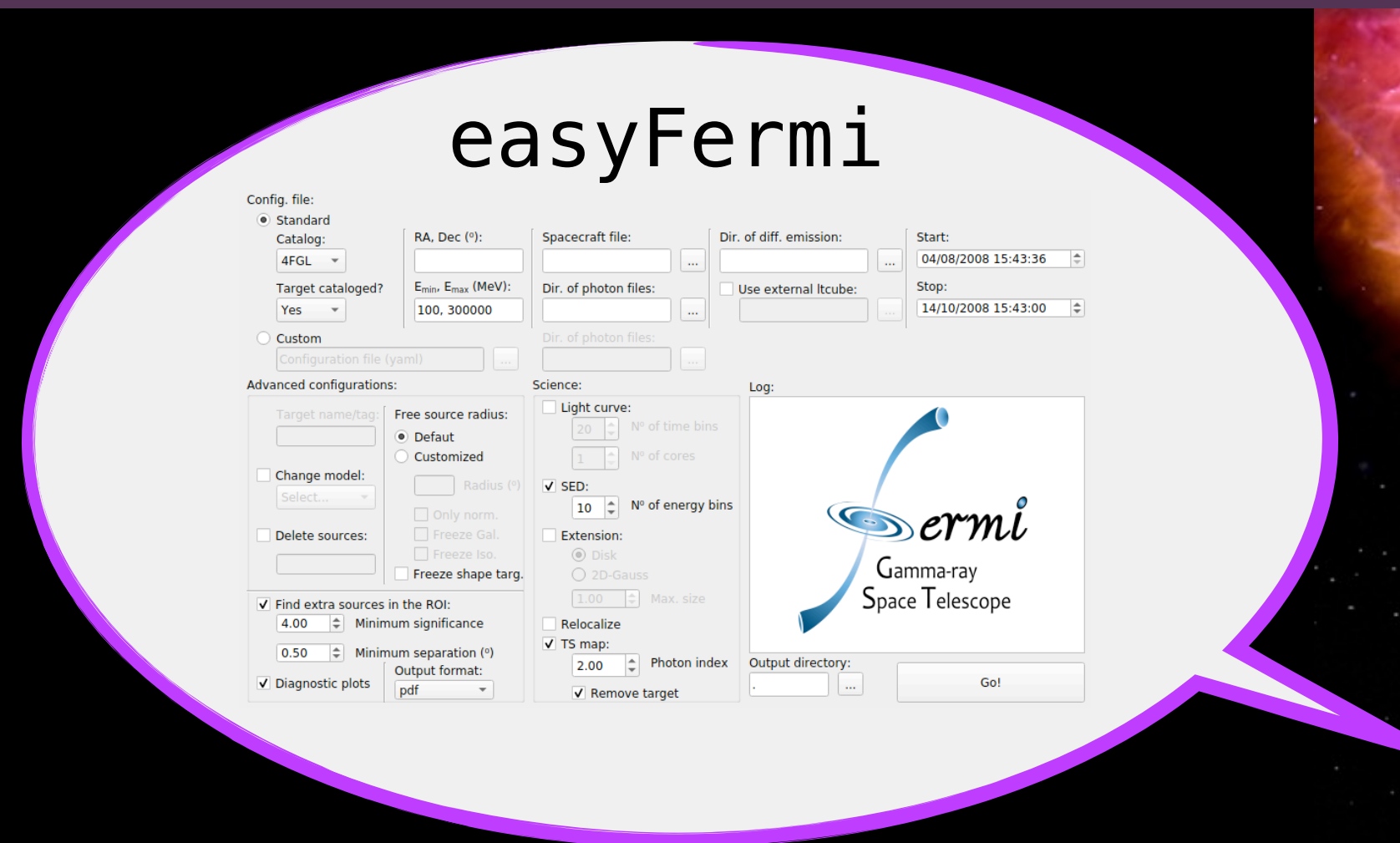
- Muon hunters: <https://www.zooniverse.org/projects/zooniverse/muon-hunter-classic>
- Muon hunters 2: <https://www.zooniverse.org/projects/dwright04/muon-hunters-2-dot-0>

- MAGIC:

- <https://cazadoresderayosgamma.com/en/>



Hands-on



Thanks

✉ alicia.lopez@iac.es

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