



Early results from ASTRI

Stefano Vercellone – INAF OA Brera
Andrea Giuliani – INAF IASFMI
for the ASTRI Project

From 9 to 40: the SST Telescopes and Gamma-Ray Science with ASTRI and CTAO



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- ◆ The ASTRI Mini-Array science
- ◆ Early results



Photo credits : Lopez/IAC

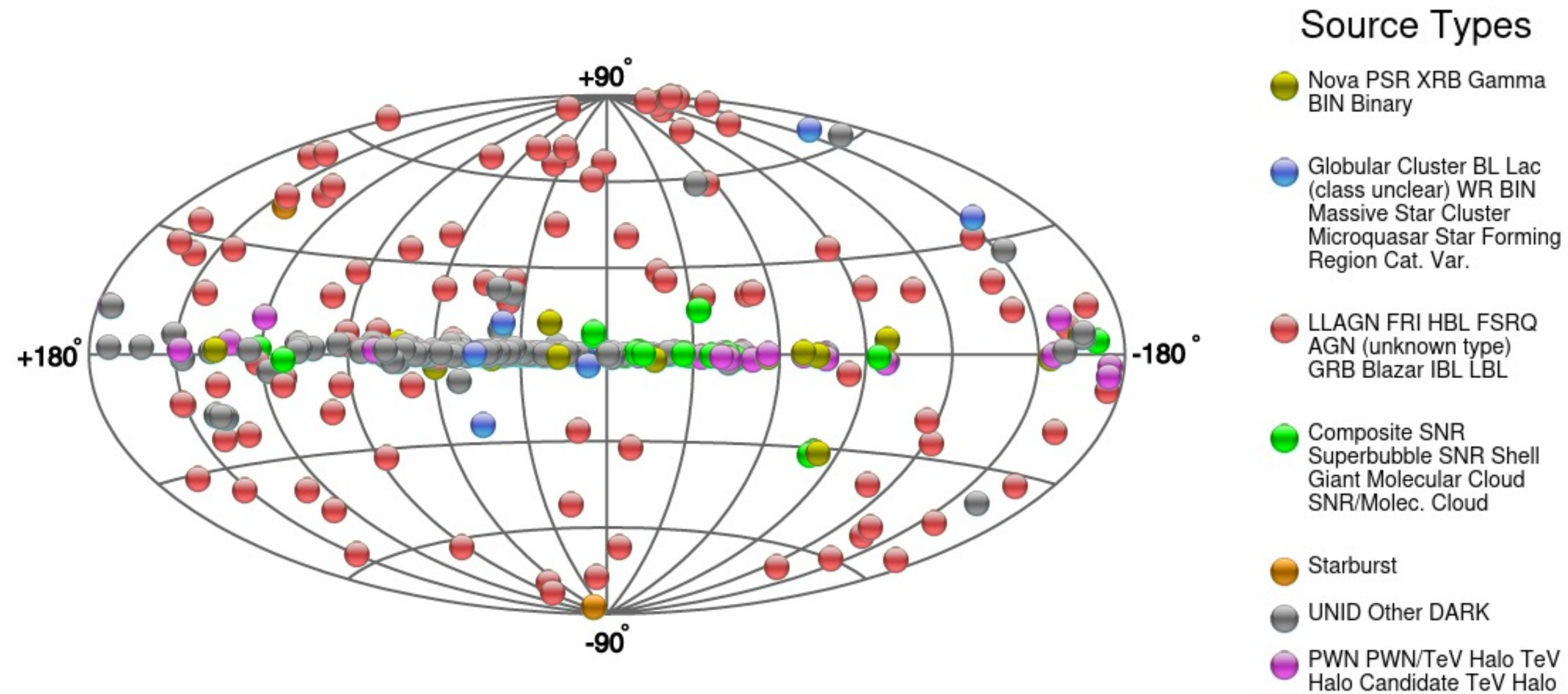
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The current VHE sky



<https://www.tevcat.org/> (Credits: Horan & Wakely)

About 350 sources

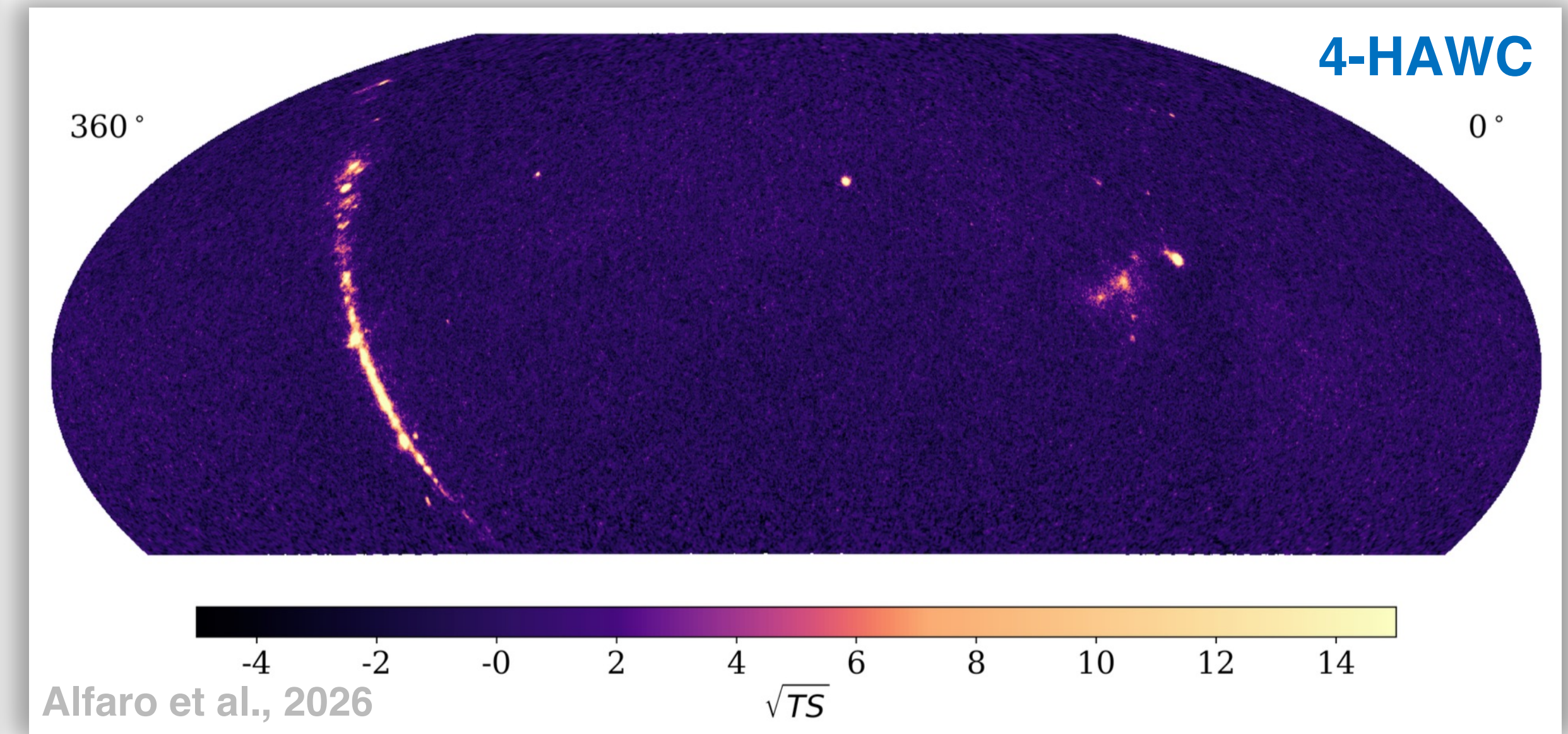
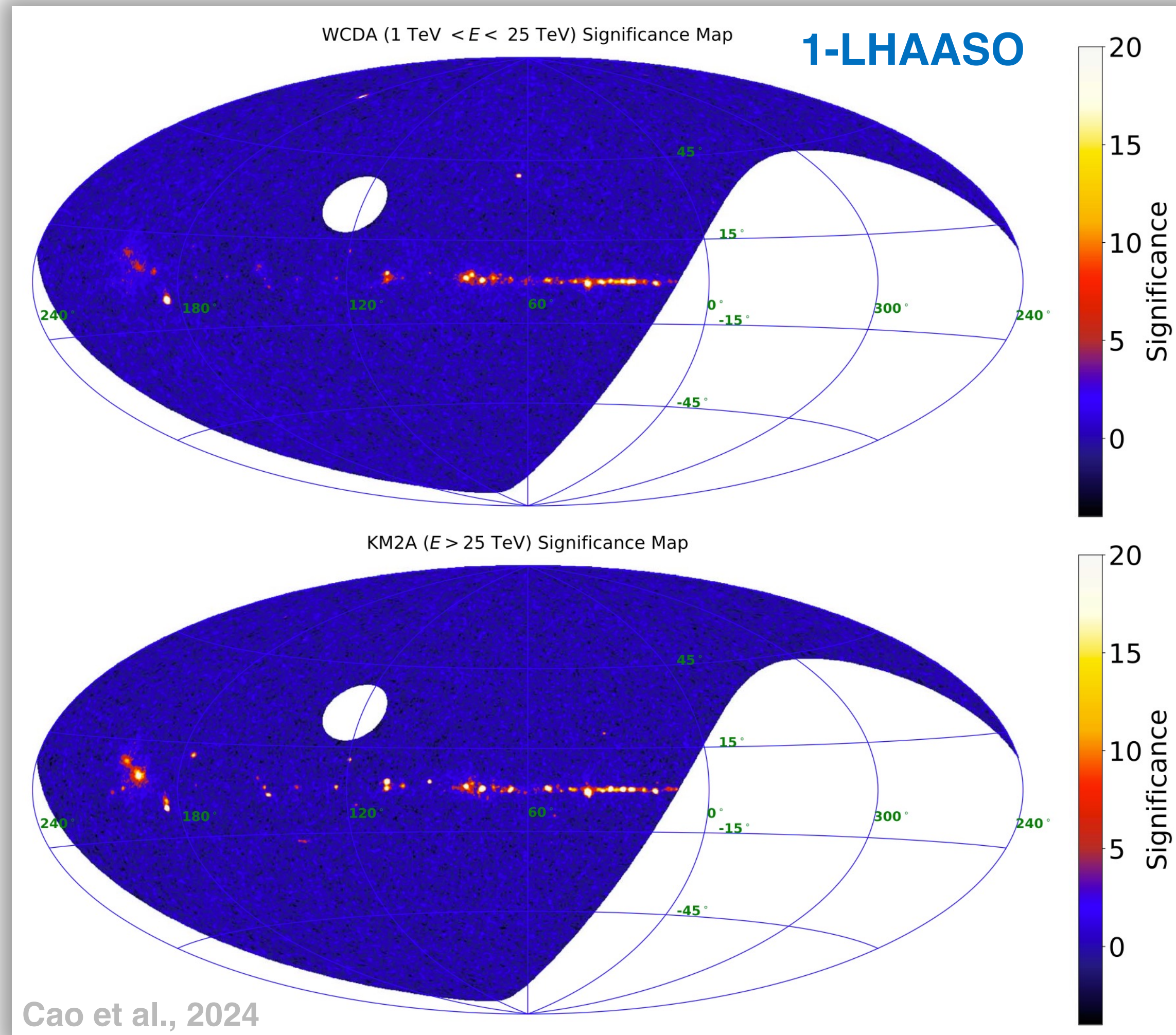
1/3 EGAL

1/3 GAL

1/3 UNID

Large discovery space!

The current UHE sky



**Tens of sources emitting
above a few TeV**

ASTRI contributions to this Meeting



2. The ASTRI Mini-Array: Current Status of the Project (Invited)

👤 Gino Tosti (Istituto Nazionale di Astrofisica (INAF))

🕒 20/07/2026, 09:30

Introduction



8. Early results from ASTRI (Invited)

👤 Dr Andrea Giuliani (Istituto Nazionale di Astrofisica (INAF))

🕒 20/07/2026, 14:30

IACT observations towar...



52. ASTRI Mini-Array flying with Cygnus

👤 Camilla Quartioli (Istituto Nazionale di Astrofisica (INAF))

🕒 20/07/2026, 16:50

Multi-wavelength synerg...



15. Extended PeVatron candidates with ASTRI Mini-Array and CTAO

👤 Alan Sunny (Istituto Nazionale di Astrofisica (INAF))

🕒 21/07/2026, 09:50

Galactic sources under t...



16. The Gamma-ray binaries as a primary scientific target for the ASTRI Mini-Array

👤 Nicola La Palombara (Istituto Nazionale di Astrofisica (INAF))

🕒 21/07/2026, 10:10

Galactic sources under t...

19. Mass Production and On-Site Deployment of the 10.4° Wide-Field SiPM Cherenkov Cameras for the ASTRI Mini-Array (Invited)

👤 Giovanni Contino (Istituto Nazionale di Astrofisica (INAF))

🕒 21/07/2026, 11:50

Cameras, detectors and ...

23. ASTRI Mini-Array preliminary results on extra-galactic sources

👤 Dr Stefano Vercellone (Istituto Nazionale di Astrofisica (INAF))

🕒 22/07/2026, 09:50

Extragalactic sources an...



26. The SCADA Software System of the ASTRI Mini-Array: Architecture, Control Workflow, and Operational Integration

👤 Andrea Bulgarelli (Istituto Nazionale di Astrofisica (INAF))

🕒 22/07/2026, 11:50

Telescopes, optics and c...

53. The ASTRI Mini-Array follow-up of transient events in the TeV band

👤 Alessandro Carosi (Istituto Nazionale di Astrofisica (INAF))

🕒 23/07/2026, 09:30

Transient phenomena at...

35. Recent developments in the ASTRI Project simulation system

👤 Fausto Casaburo (Istituto Nazionale di Astrofisica (INAF))

🕒 23/07/2026, 11:30

Data Analysis

36. New time-based parameters for the ASTRI Mini-Array gamma/hadron discrimination

👤 Valentina La Parola (Istituto Nazionale di Astrofisica (INAF))

🕒 23/07/2026, 11:50

Data Analysis

34. Optical calibration of ASTRI Mini Array telescopes with muon rings

👤 Teresa Mineo (Istituto Nazionale di Astrofisica (INAF))

🕒 23/07/2026, 12:10

Data Analysis

49. Implementing very narrow-band, sub-nanosecond Intensity Interferometry on the ASTRI Mini-Array

👤 Michele Fiori (Istituto Nazionale di Astrofisica (INAF)), Michele Fiori (Università degli studi di Padova)

🕒 23/07/2026, 14:30

Large SST arrays under ...

50. Divergent Subarray Pointing for Wide-Field VHE Multi-Messenger follow-up with CTAO-SST and ASTRI

👤 Samanta Morales (INFN - Trieste)

🕒 23/07/2026, 14:50

Large SST arrays under ...



= Science-related (ASTRI Coll.)

The ASTRI Mini-Array



The ASTRI Mini-Array science papers



For a detailed description of the Project, the Core Science and the Observatory Science see:

[Scuderi et al., 2022, JHEAP, 35, 52](#)

[Vercellone et al., 2022, JHEAP, 35, 1](#)

[Saturni et al., 2022, JHEAP, 35, 91](#)

[D’Ai et al., 2022, JHEAP, 35, 139](#)

IRF files (Prod2, V1.0) can be retrieved from Zenodo:

https://zenodo.org/record/6827882#.Y_N34-zMJ60

[Lombardi et al., 2022]

Gammapy [<https://gammapy.org/>]

can be used to simulate & analyse sources

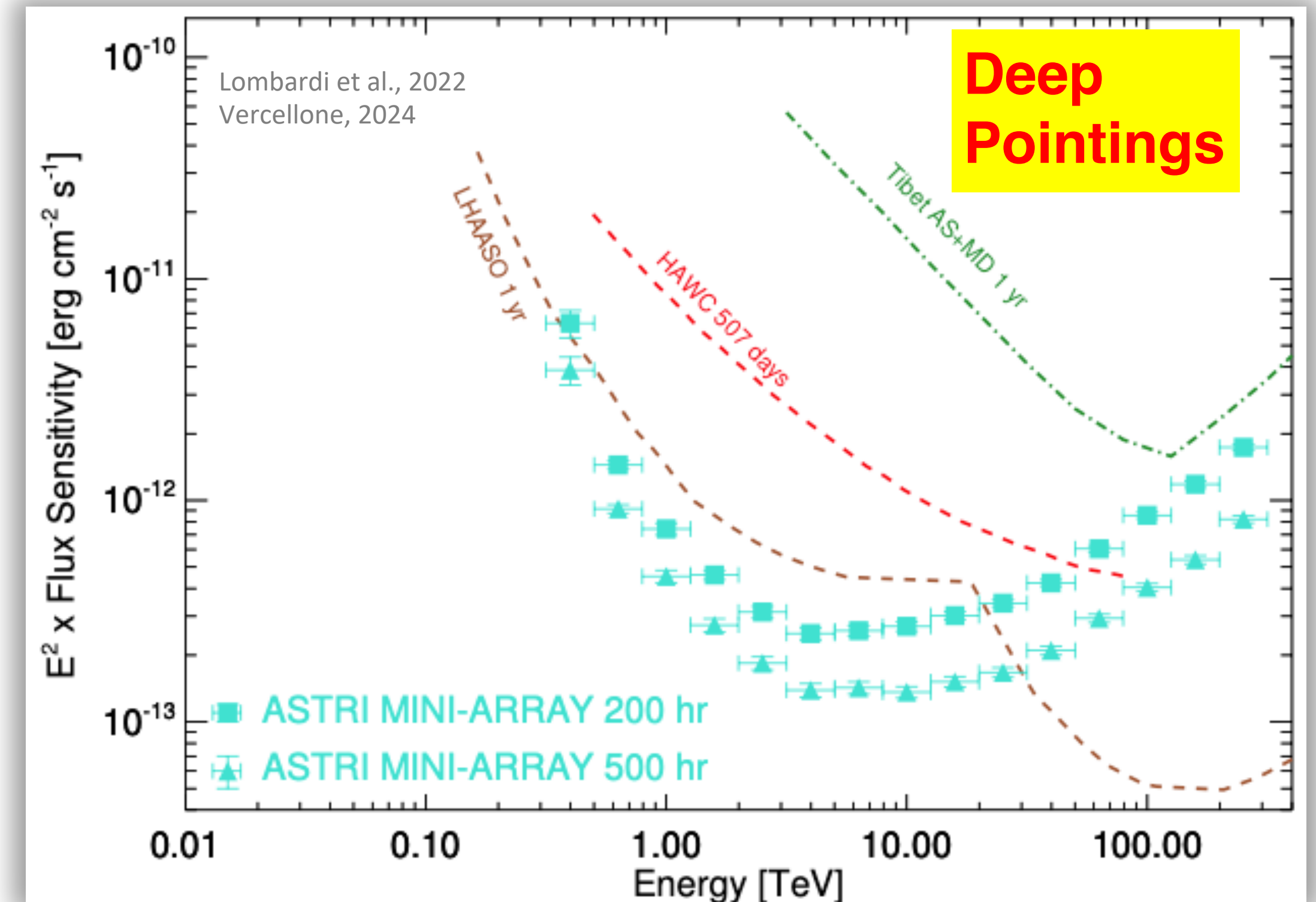
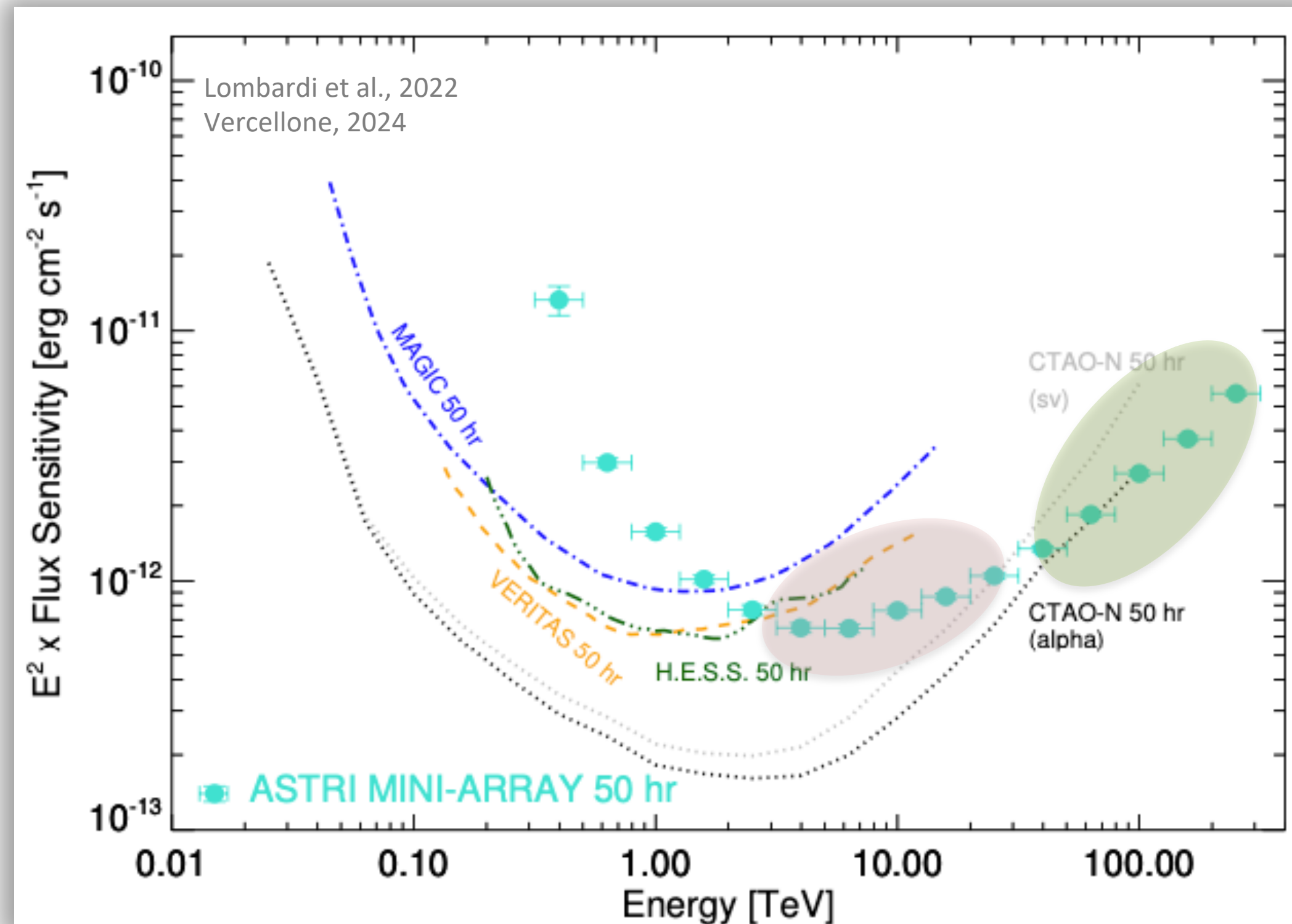
The ASTRI Mini-Array – Performance

We extend current IACTs **differential sensitivity up to several tens of TeV and beyond**

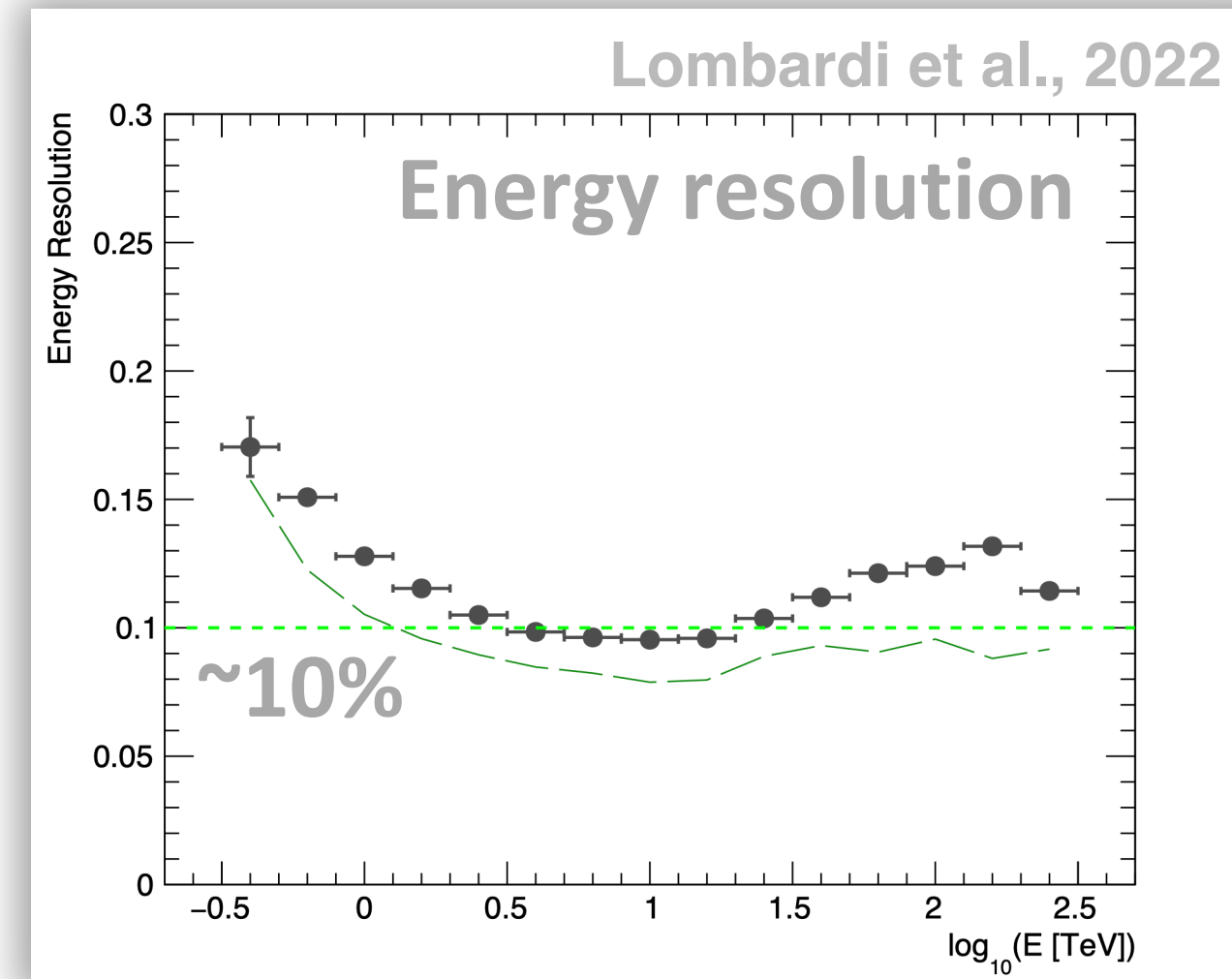
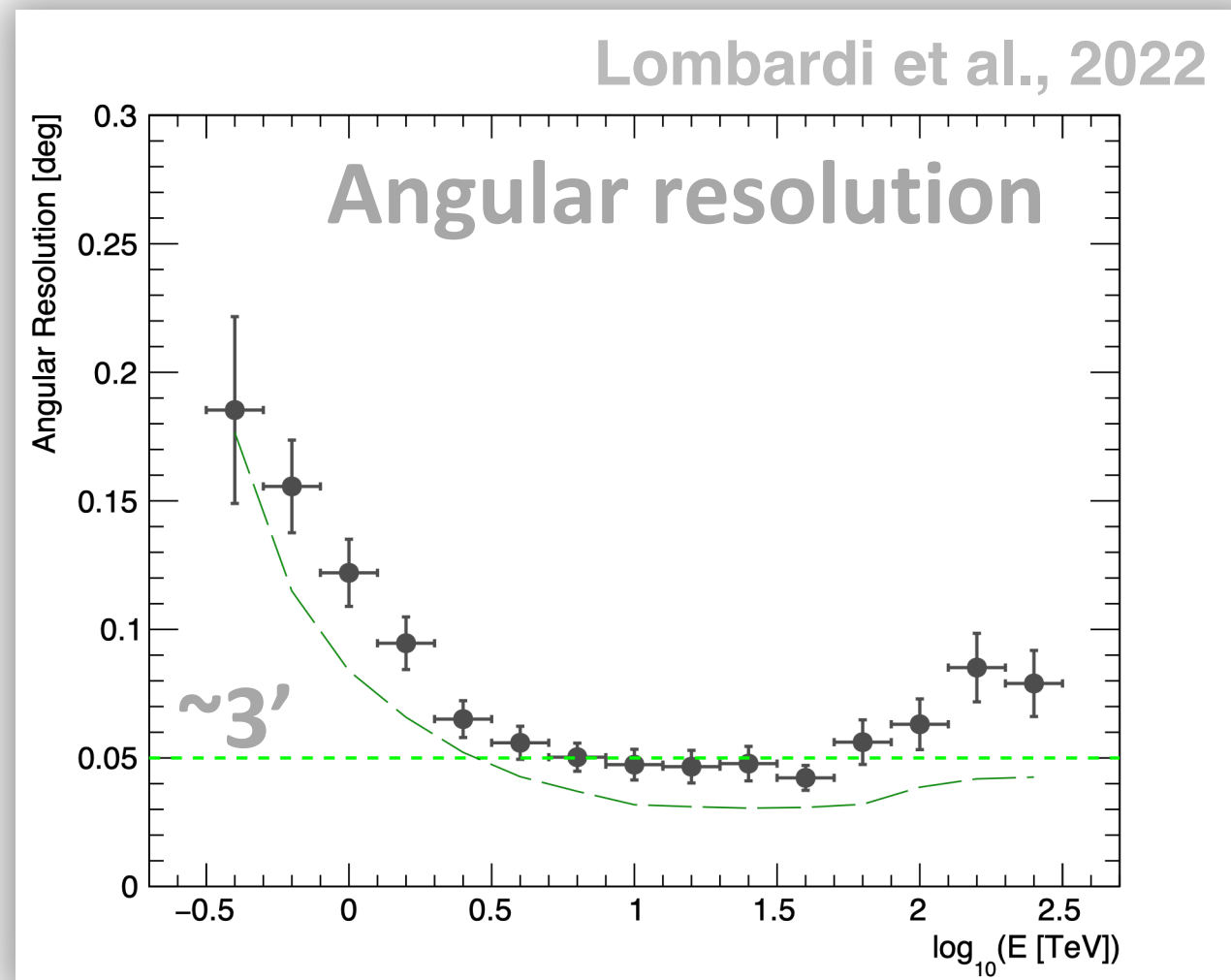
Broad-band spectra

Spectral features at VHE, such as **spectral cut-offs**

Detection of **emission up to (100-200) TeV** expected from **Galactic PeV sources**



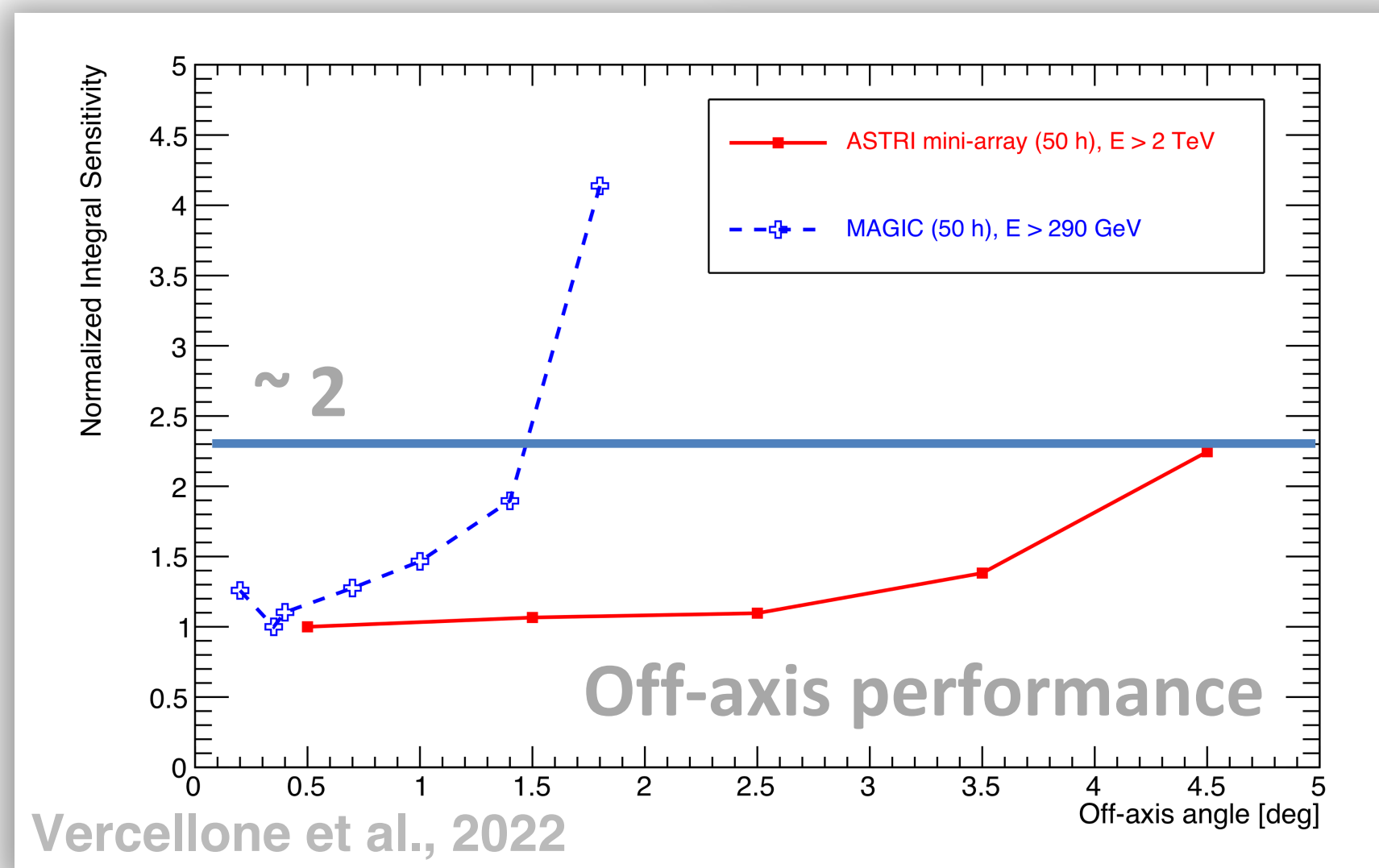
The ASTRI Mini-Array – Performance



Angular resolution: $\sim 3'$ ($E \sim 10$ TeV)

Energy resolution: $\sim 10\%$ ($E \sim 10$ TeV)

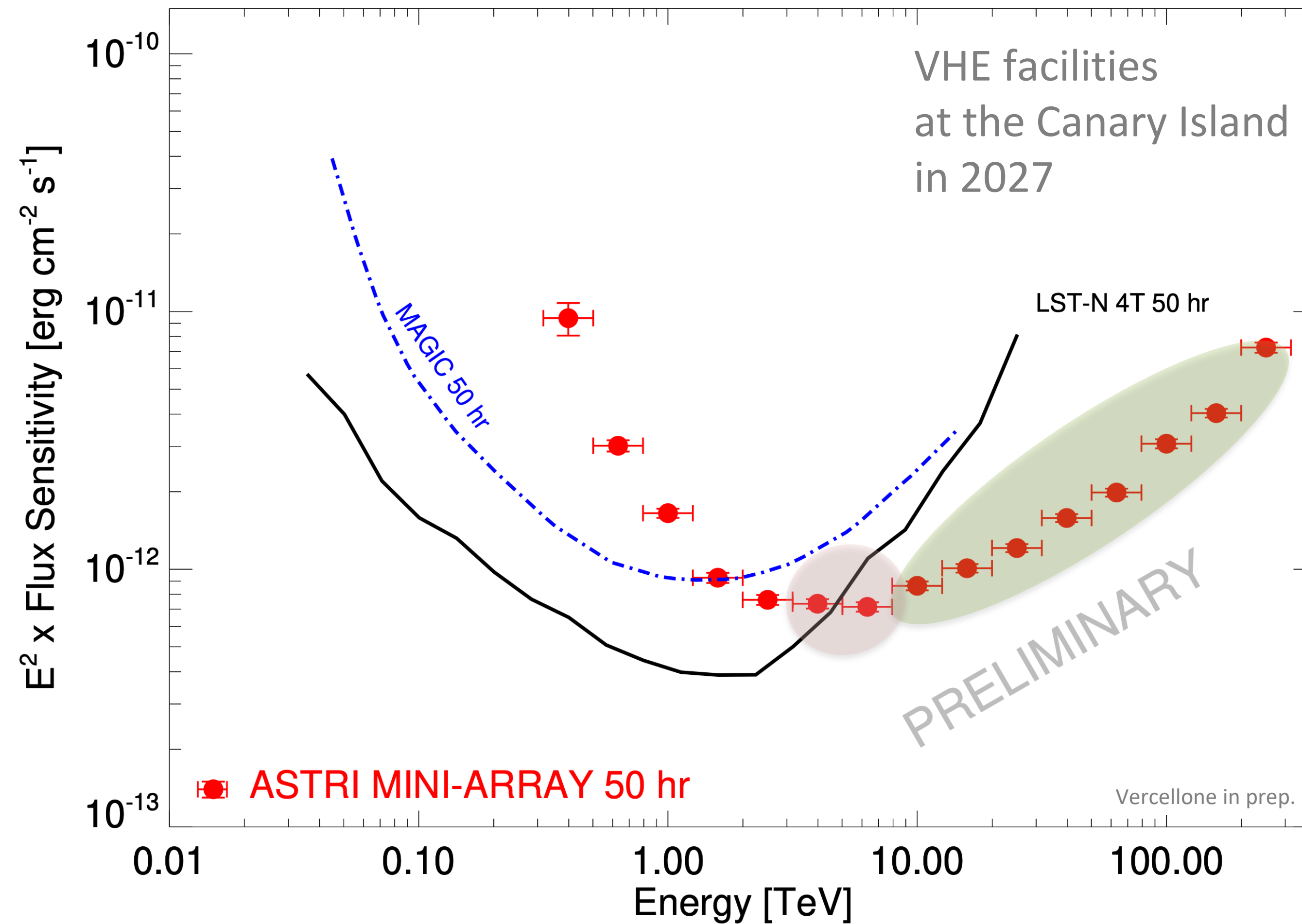
- Morphological and spectral studies of extended sources at VHE



10° field of view with excellent off-axis performance

- Several sources in single pointing
- Serendipitous discoveries

The VHE status at the Canary Island in 2027



Core Science & Pillars

Pillar 1

The origin of cosmic rays

Quest for PeVatrons
Particle propagation
PWN HE emission
UHECR from SB galaxies

Pillar 2

Fundamental physics

IR EBL constraints
Probing IGMF
Blazars & hadron beams
Test on ALPs & LIV

Time-domain

GRB, GW, ν

Synergies

MWL, Legacy

Non γ -ray

UHECR measure
 S_{I}^3

ASTRI Science Working Groups

Science WG Coordinator: stefano.vercellone@inaf.it

Origin of the cosmic rays

Co-chairs

G. Peron (INAF - OAA)
M. Rigoselli (INAF - IASFMI)

GRB & time- domain astrophysics

Co-chairs

L. Nava (INAF - OAB)
A. Stamerra (INAF - OAR)

Cosmology & fundamental physics

Co-chairs

J.B. González (IAC & CSIC)
F. Tavecchio (INAF - OAB)

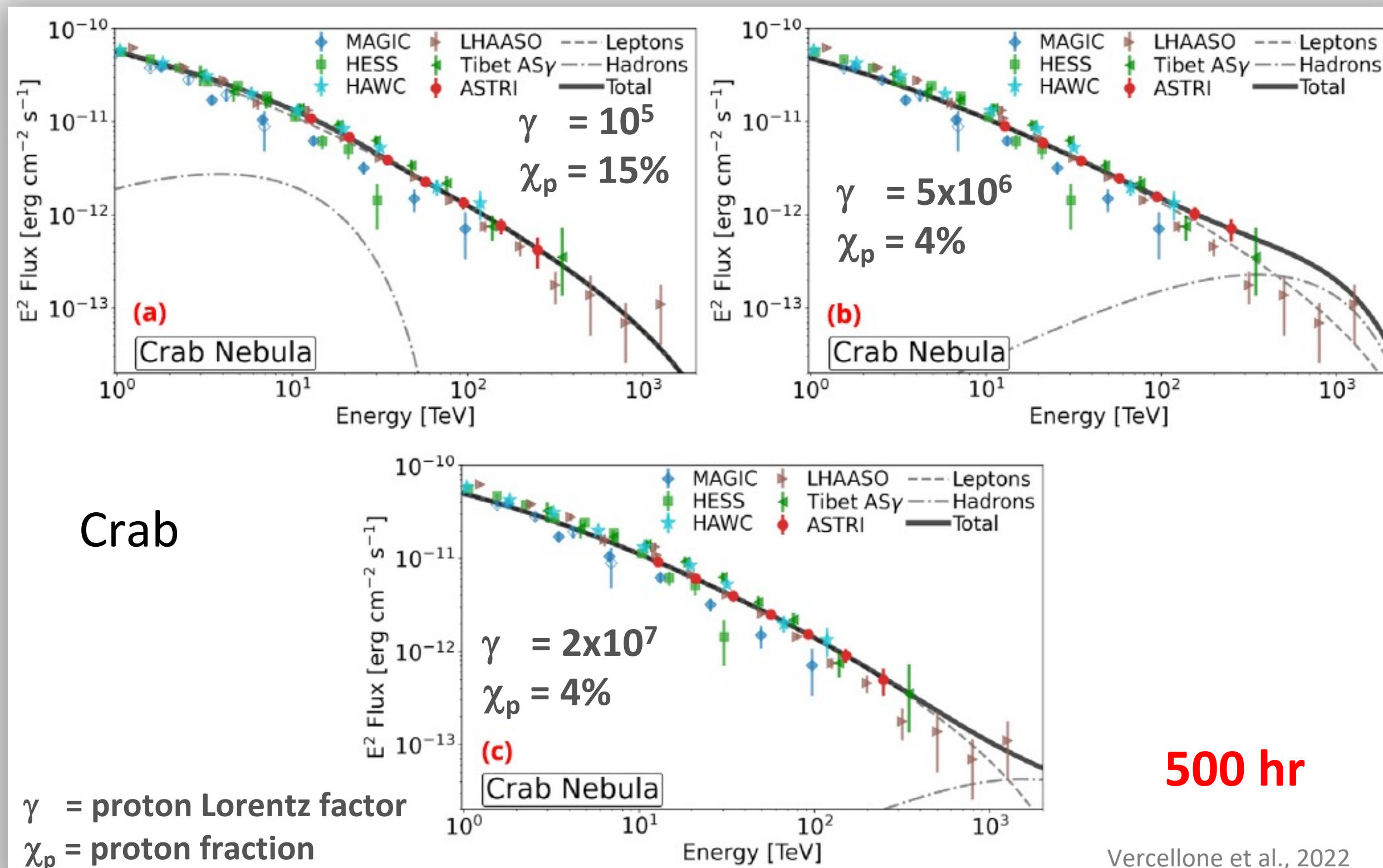
**SWGs are pivotal
in shaping the
ASTRI Mini-Array
scientific
exploitation**

Examples of Pillar-1 science

N. La Palombara talk

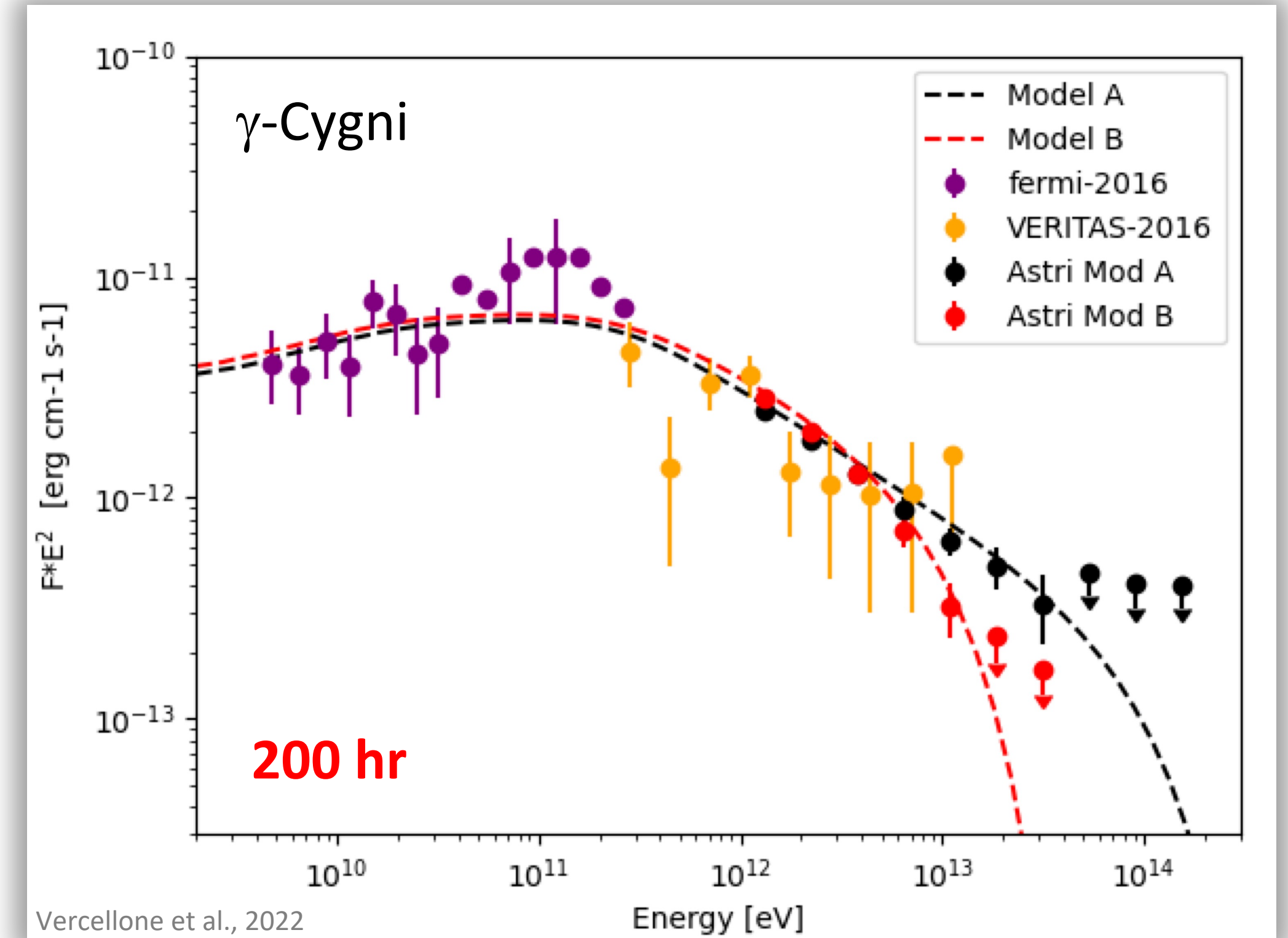
A. Sunny talk

Leptonic or hadronic PeVatron?



500 hr

Vercellone et al., 2022



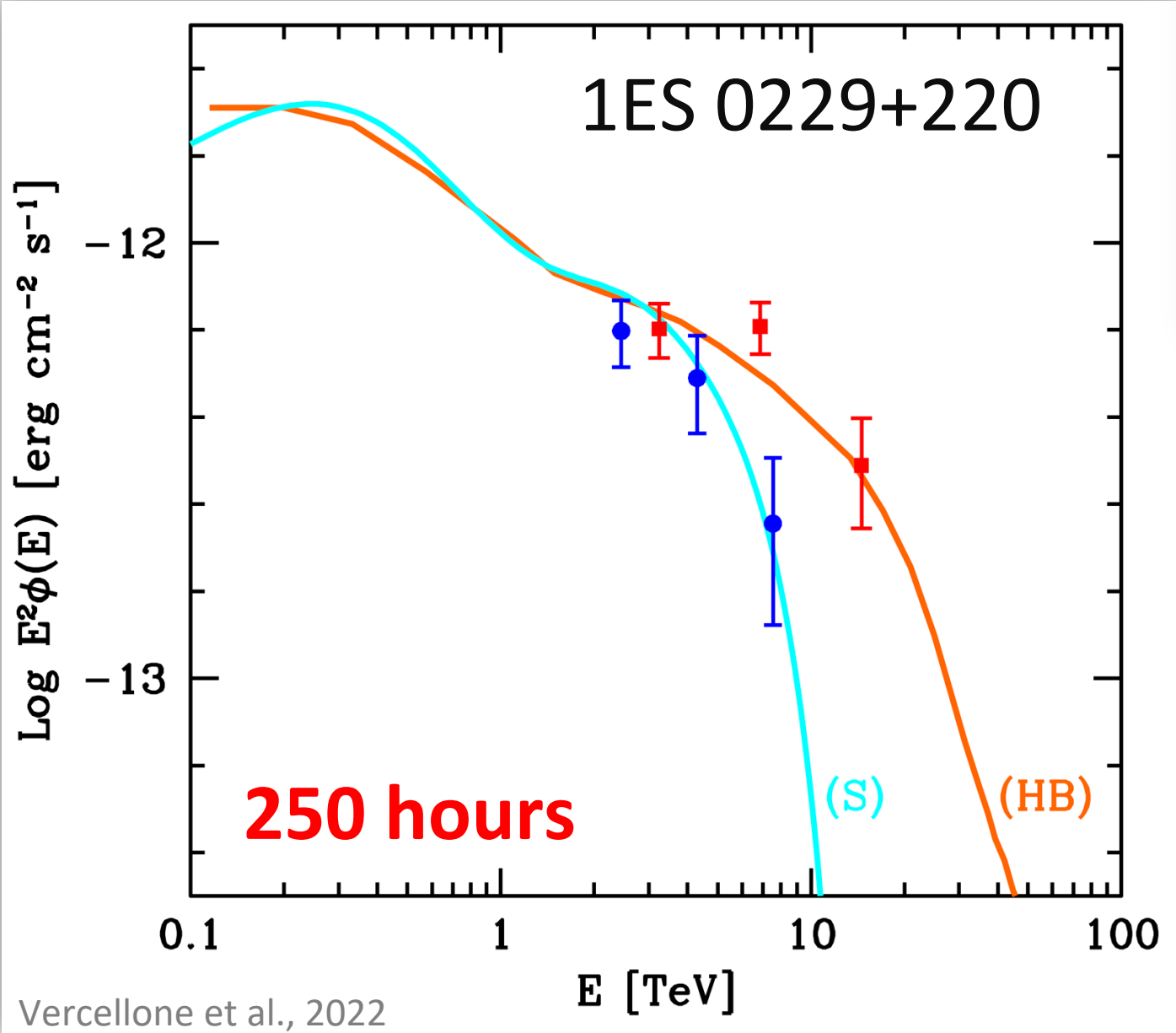
Quartiroli talk

Cosmic-ray propagation
Morphological studies

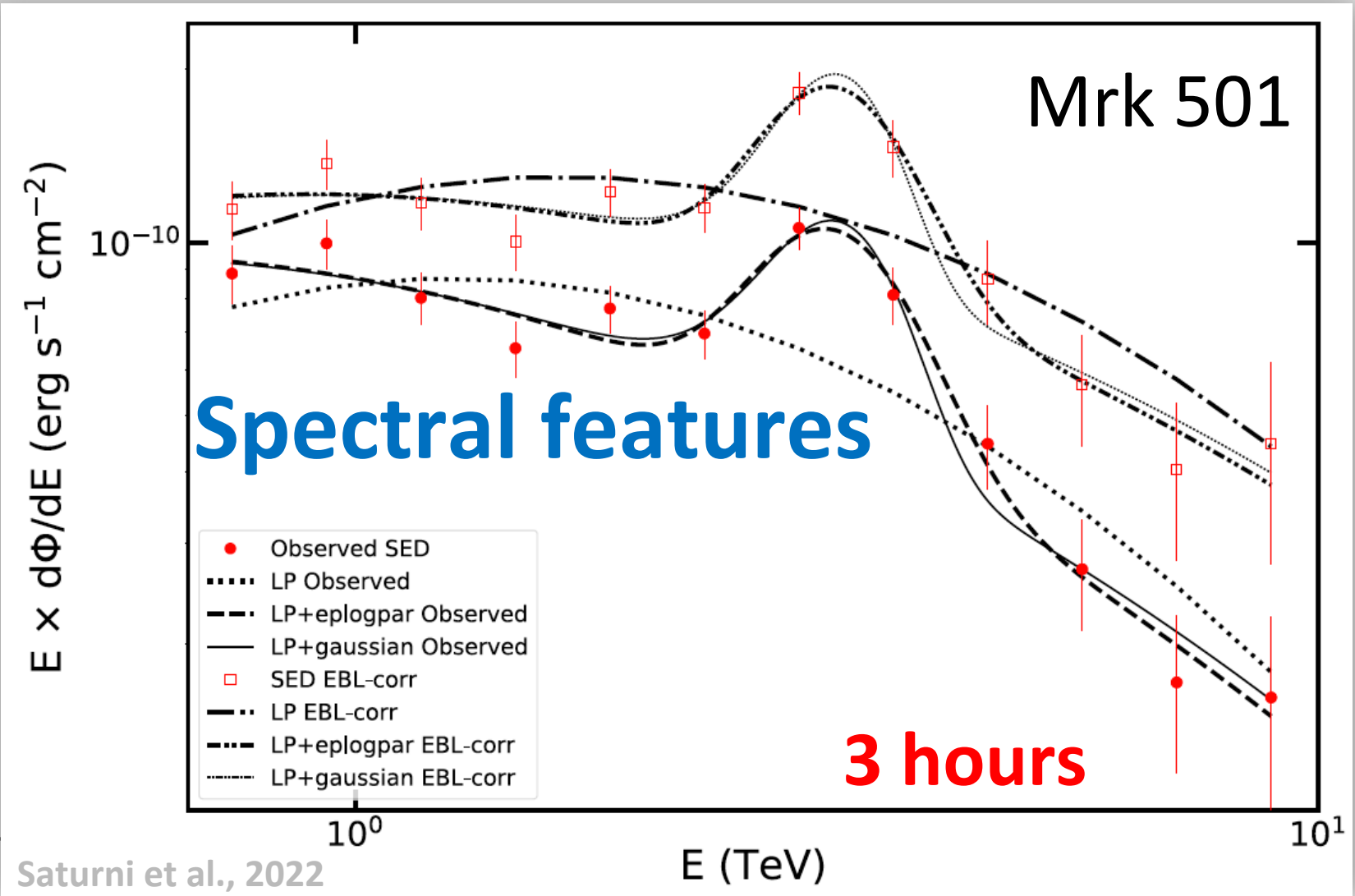
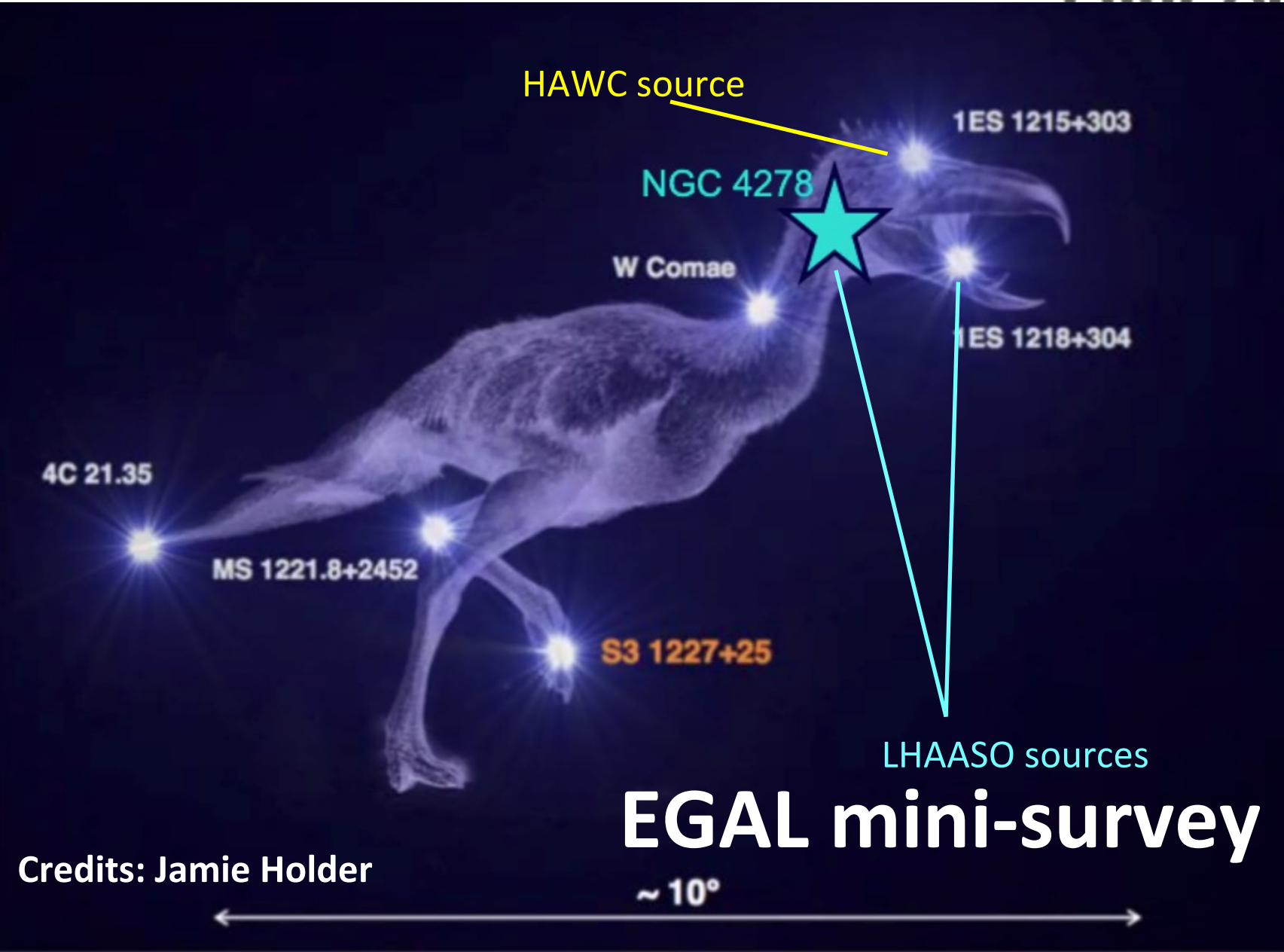
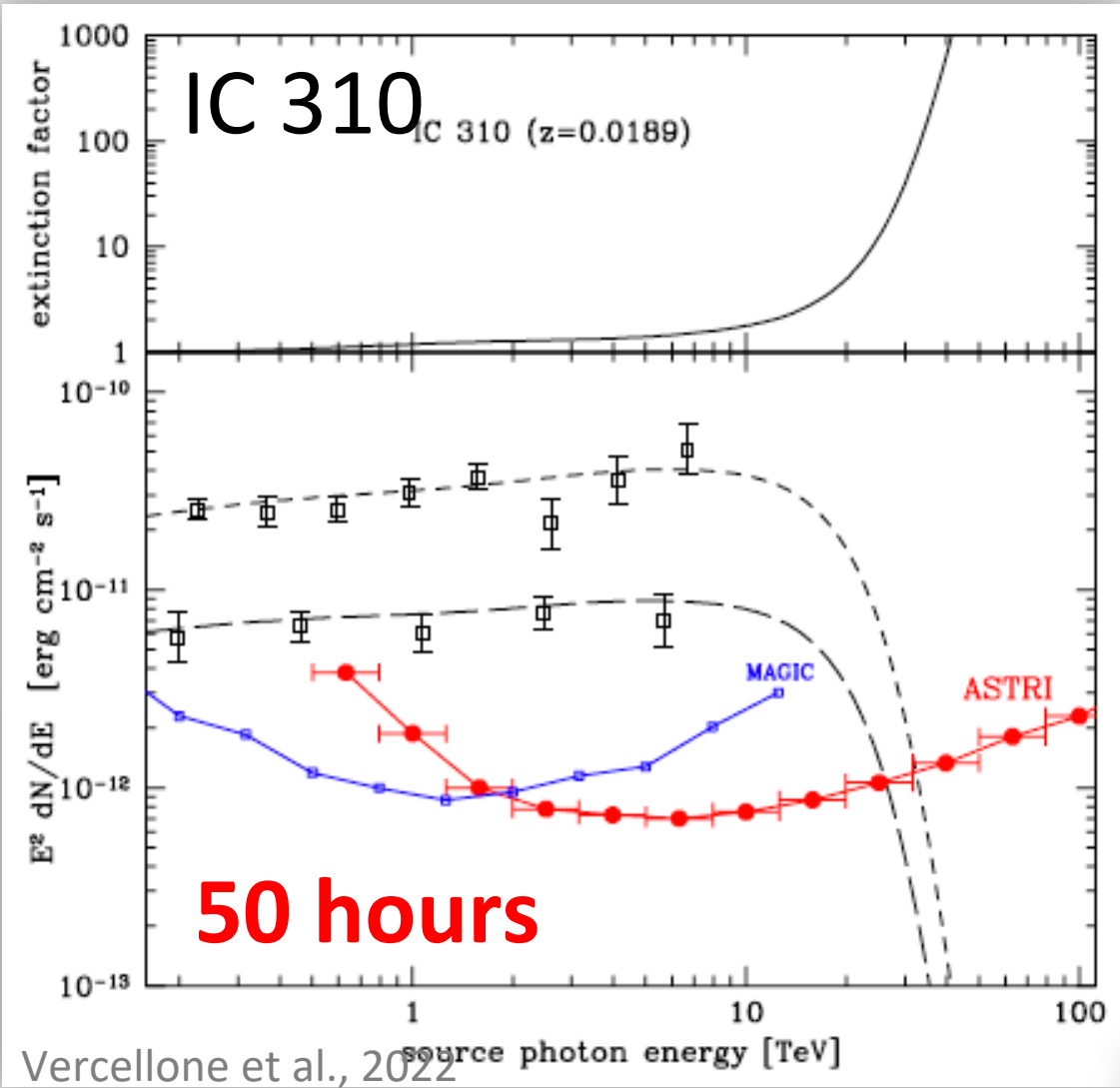
Examples of Pillar-2 science

S.V talk

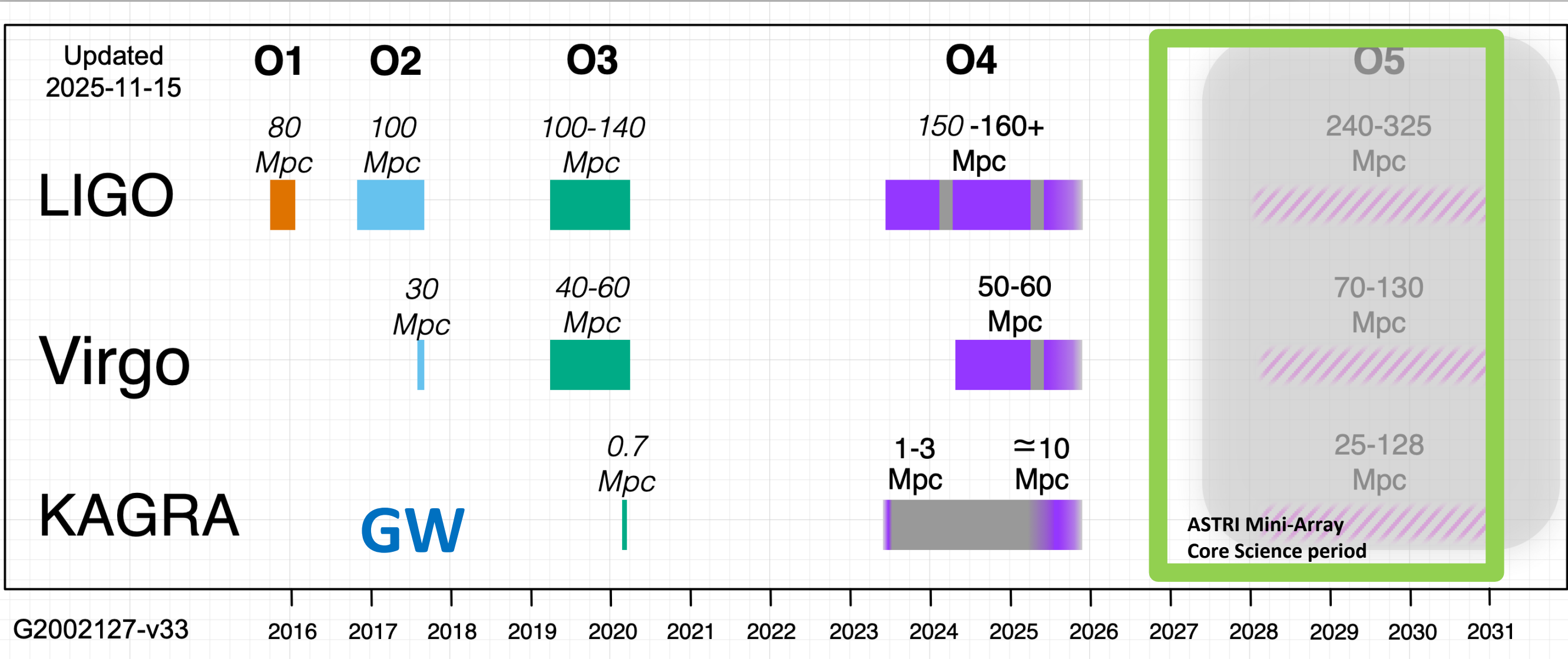
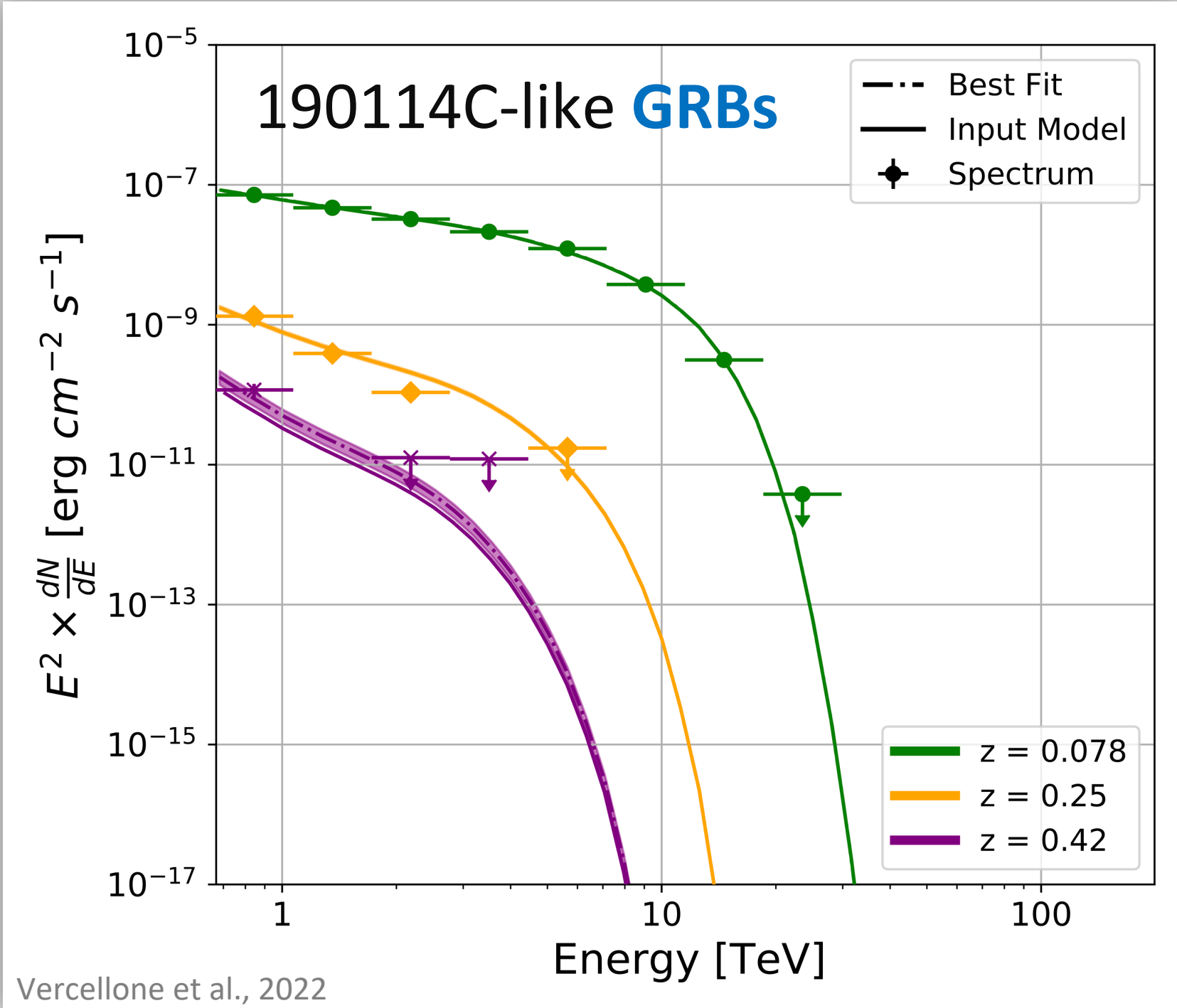
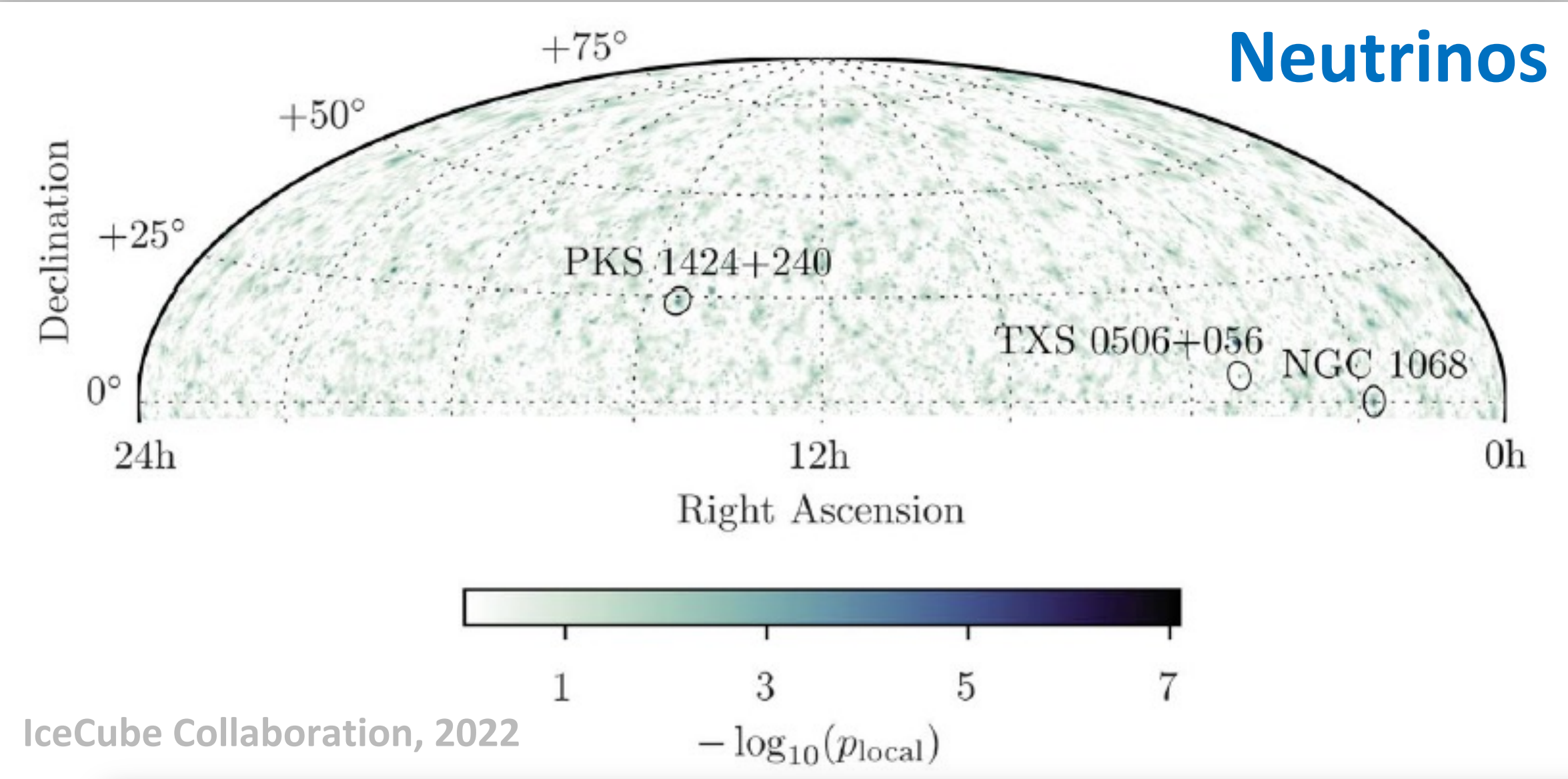
Hadron beams



EBL in IR



Examples of Transients science



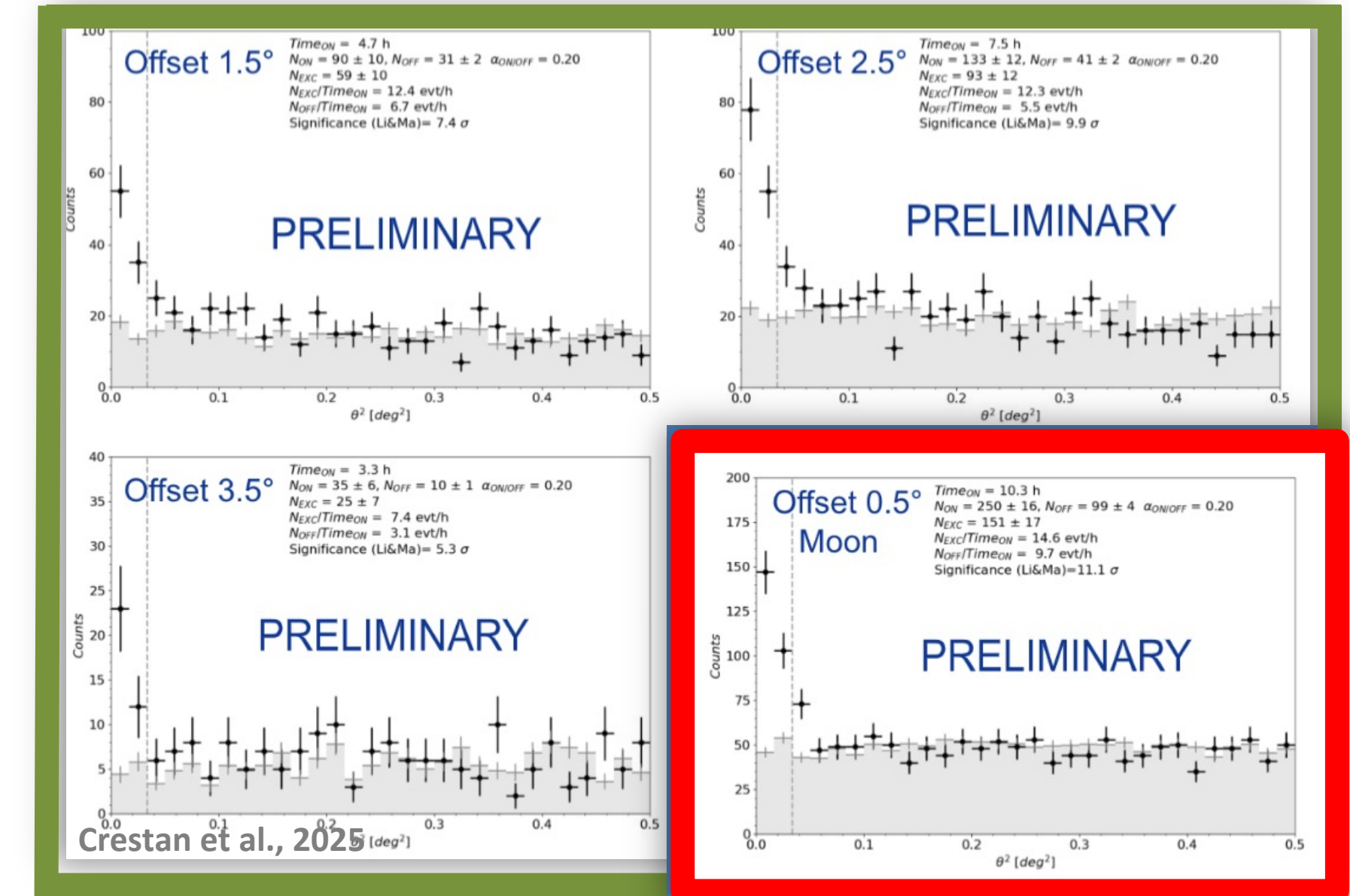
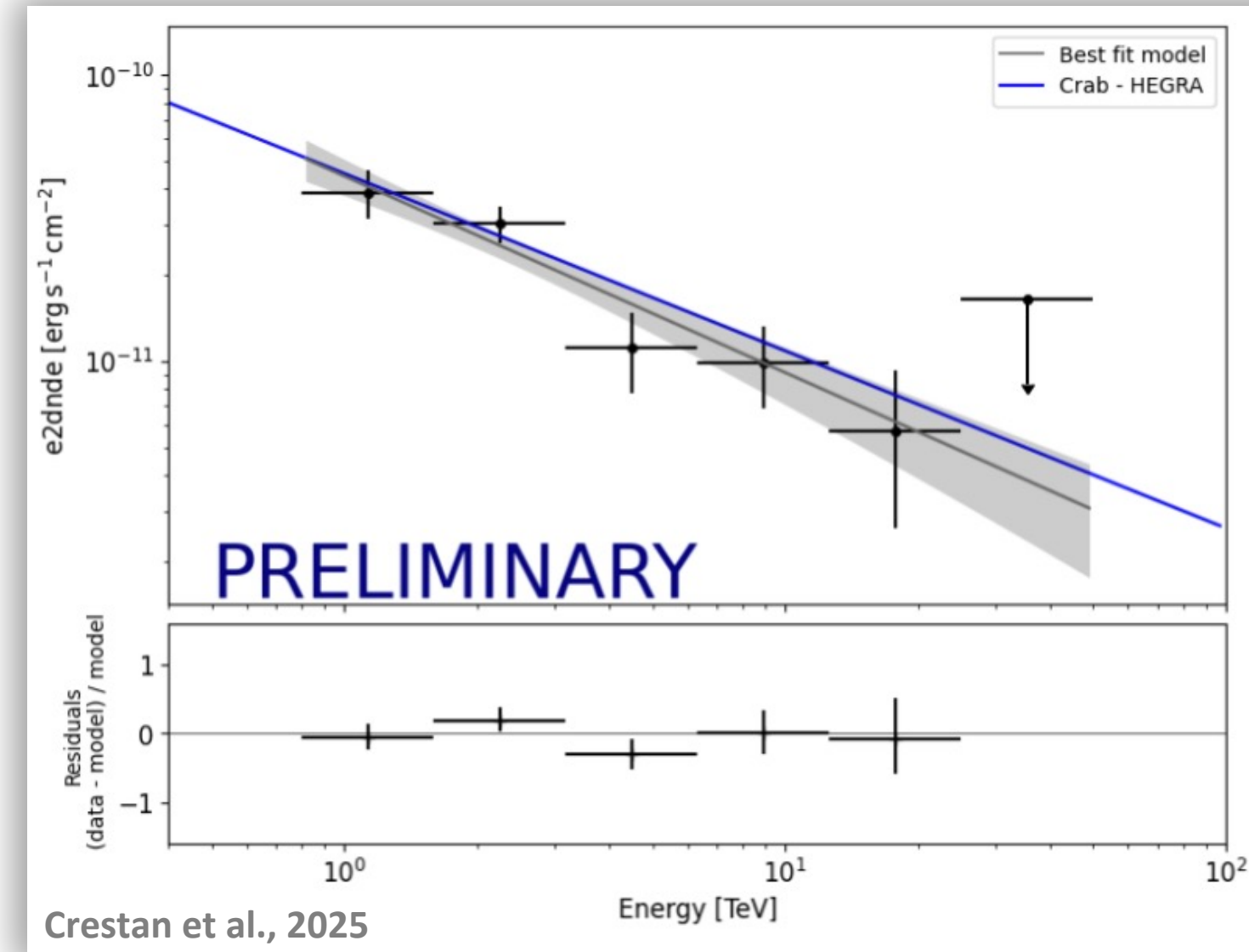
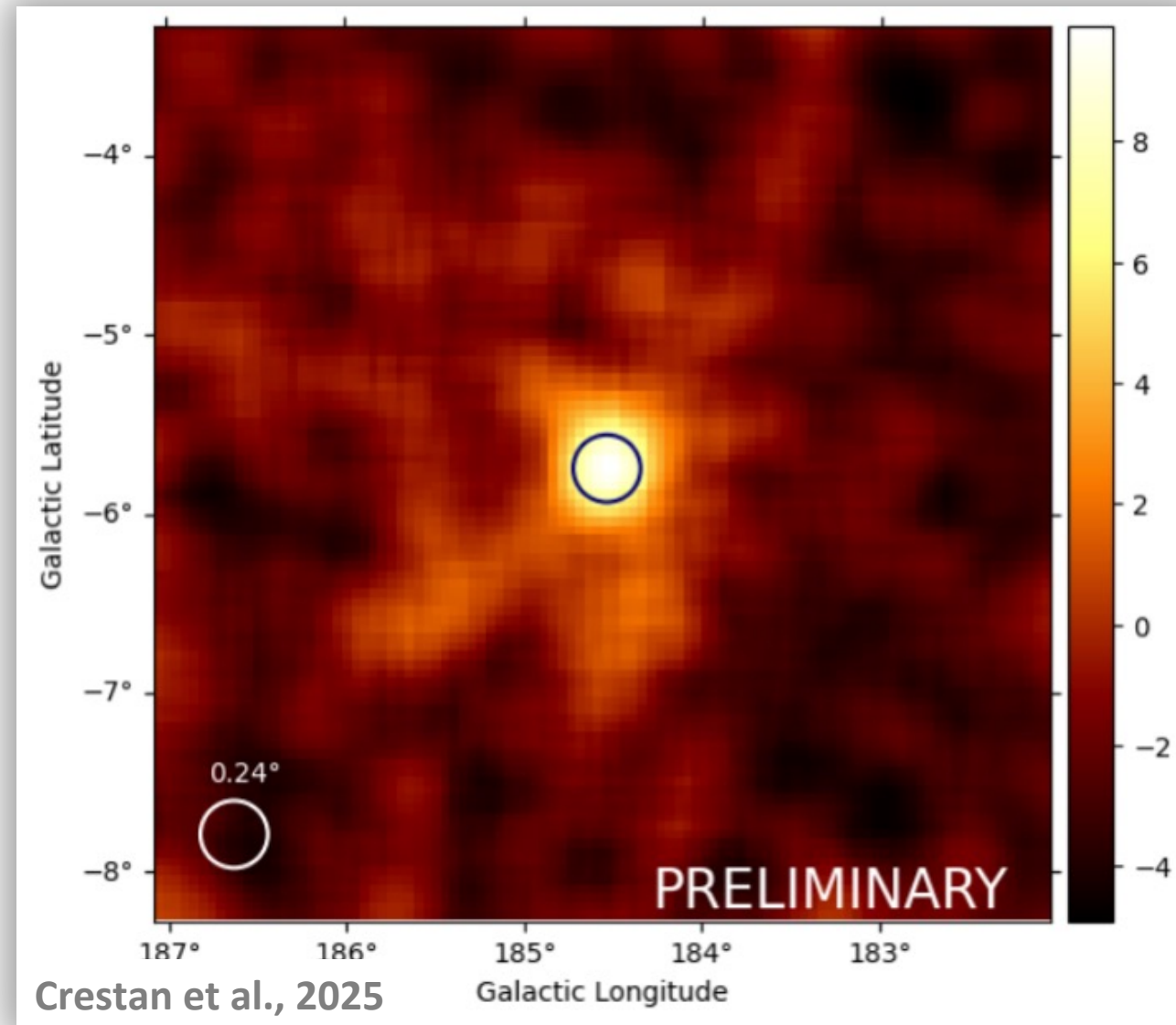
A. Carosi talk

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MONO → ASTRI-1

ASTRI-1 Crab Nebula: Nov. 2024 – Feb. 2025



Crab Nebula commissioning
Nov. 2024 – Feb. 2025

Sub-sample of ~9 hr

Power-law fit (1-30 TeV)

$$\Gamma = 2.68 \pm 0.13$$

$$N = 3.7 \pm 0.5 \text{ TeV}^{-1} \text{ cm}^{-2} \text{ s}^{-1}$$

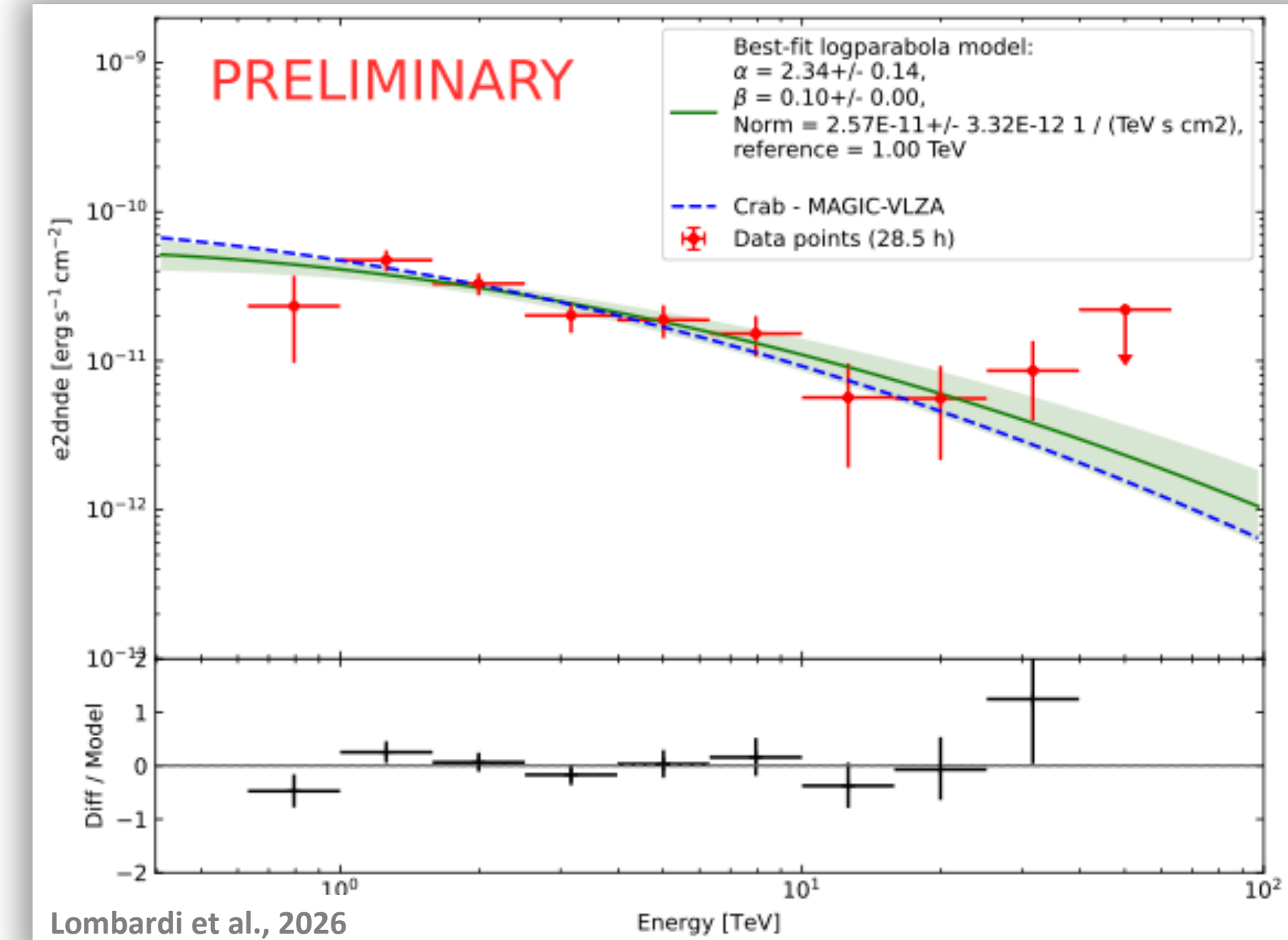
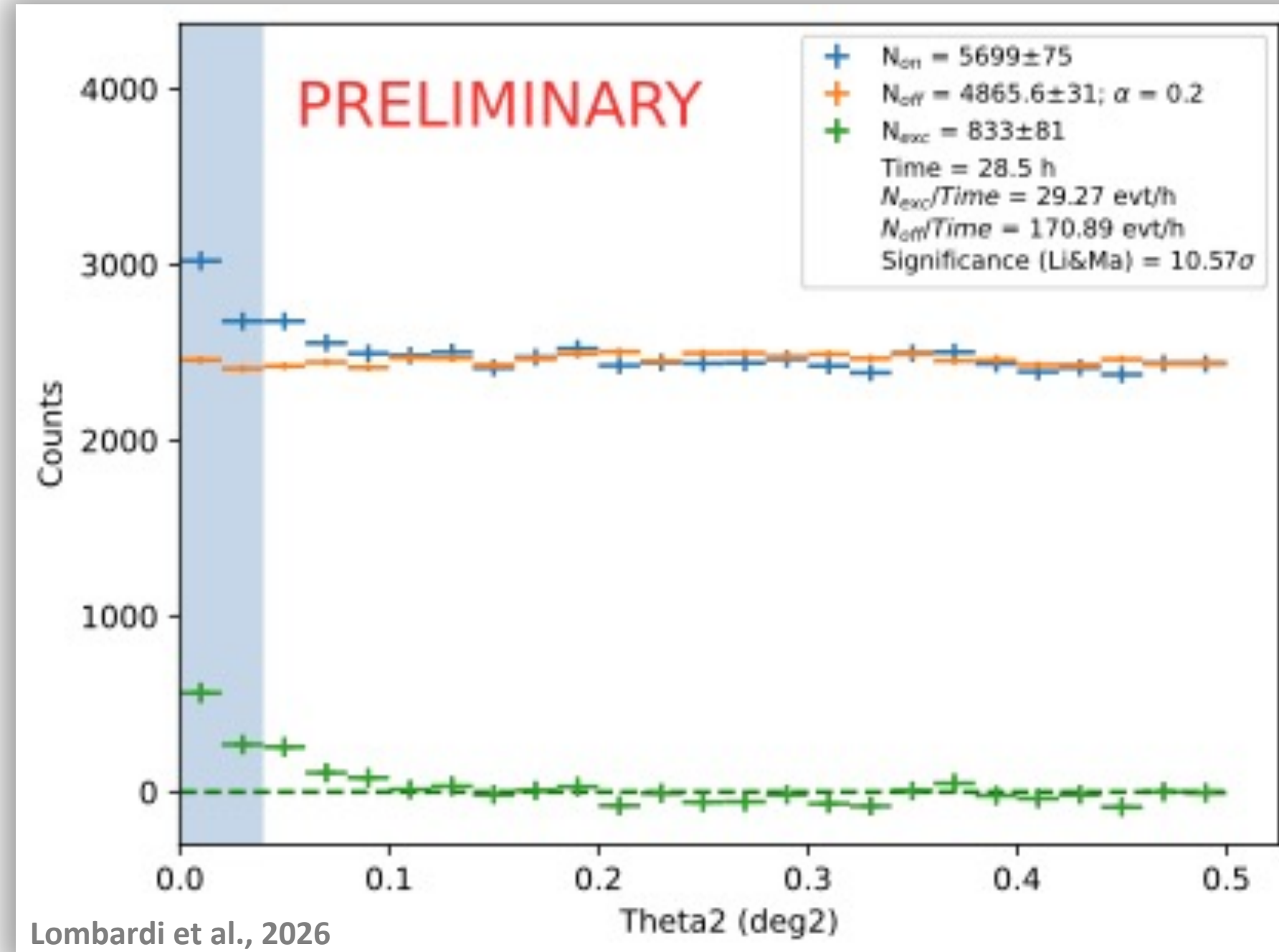
Up to ~20 TeV in 9 hr

Excellent off-axis performance
Cherenkov wide FoV demonstration

Detection during Moon observations
Increase the available time ~(50-80)%

Crestan et al., 2025, PoS(ICRC2025), 617

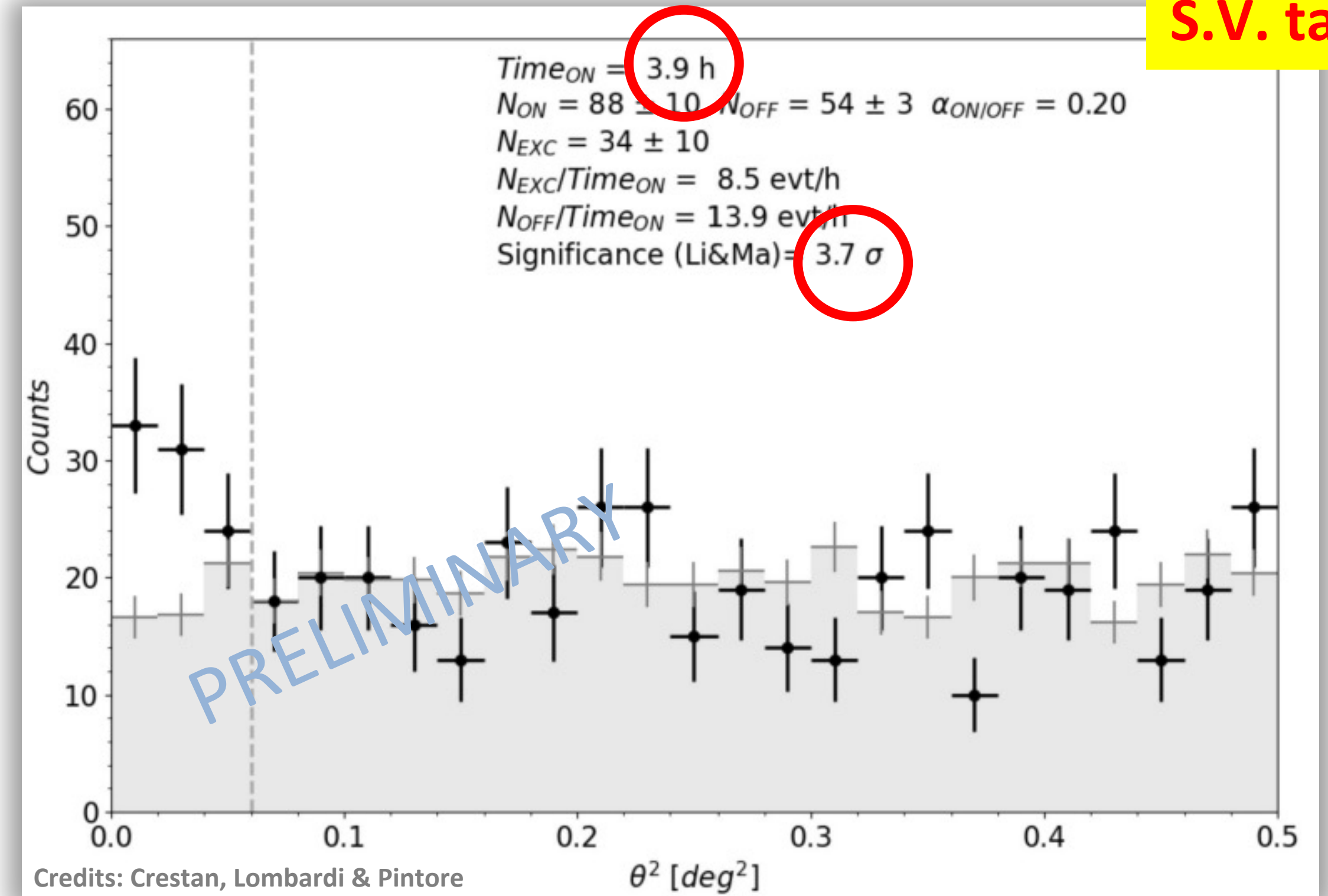
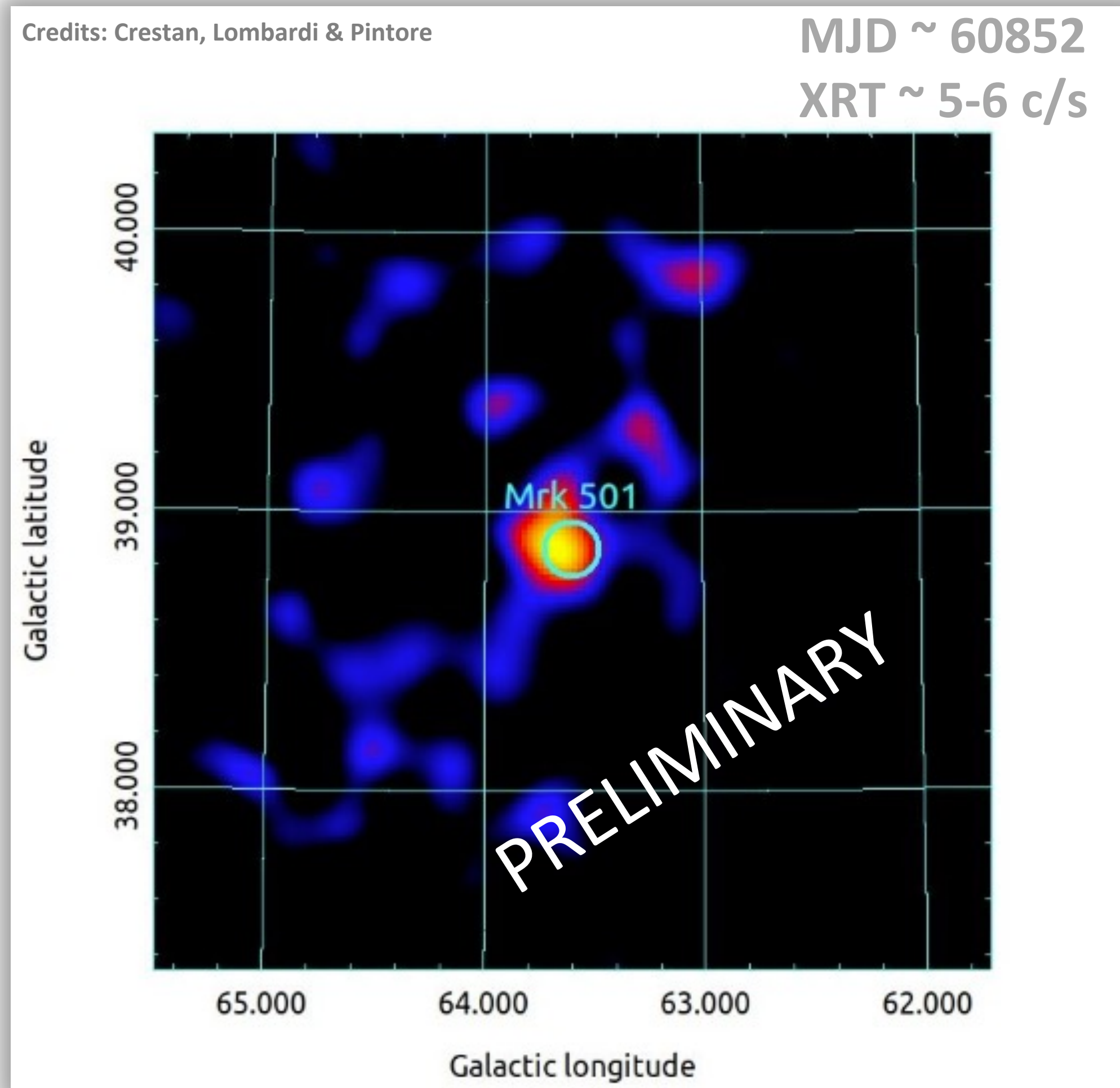
ASTRI-1 Crab Nebula: Nov. 2024 – Feb. 2025



Zenith angles below 30° . Total exposure time of 28.5 hr.

Crab Nebula detection plot and spectral energy distribution in the energy range 0.6-60 TeV.

ASTRI-1 Mrk 501: June 2025



Weak detection of Mrk 501 (~ 0.5 Crab) 26-06-2025

First source detected after the Crab

ASTRI-1 Mrk 421: Jan. – Feb. 2026

S.V. talk

ASTRI-1 detection of enhanced very high-energy gamma-ray emission from Mrk 421 at TeV energies

ATel #17602; *S. Crestan (INAF/IASF Milano), C. Quartaoli (INAF/IASF Milano), A. Sunny (INAF/IAPS Roma), S. Lombardi (INAF/OAR Roma), F. Lucarelli (INAF/OAR Roma), F. Pintore (INAF/IASF Palermo), for the ASTRI Project*

on 15 Jan 2026: 17:41 UT

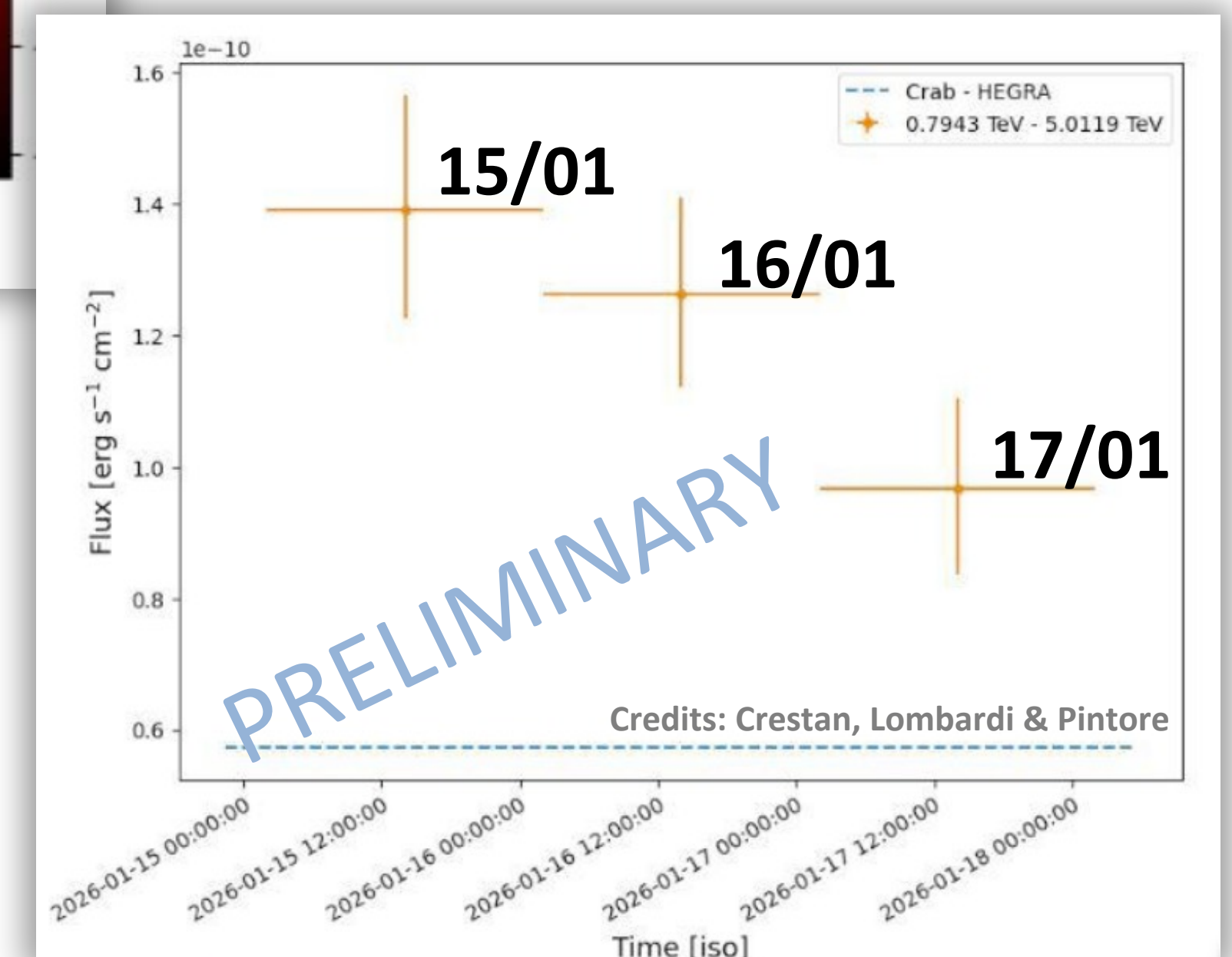
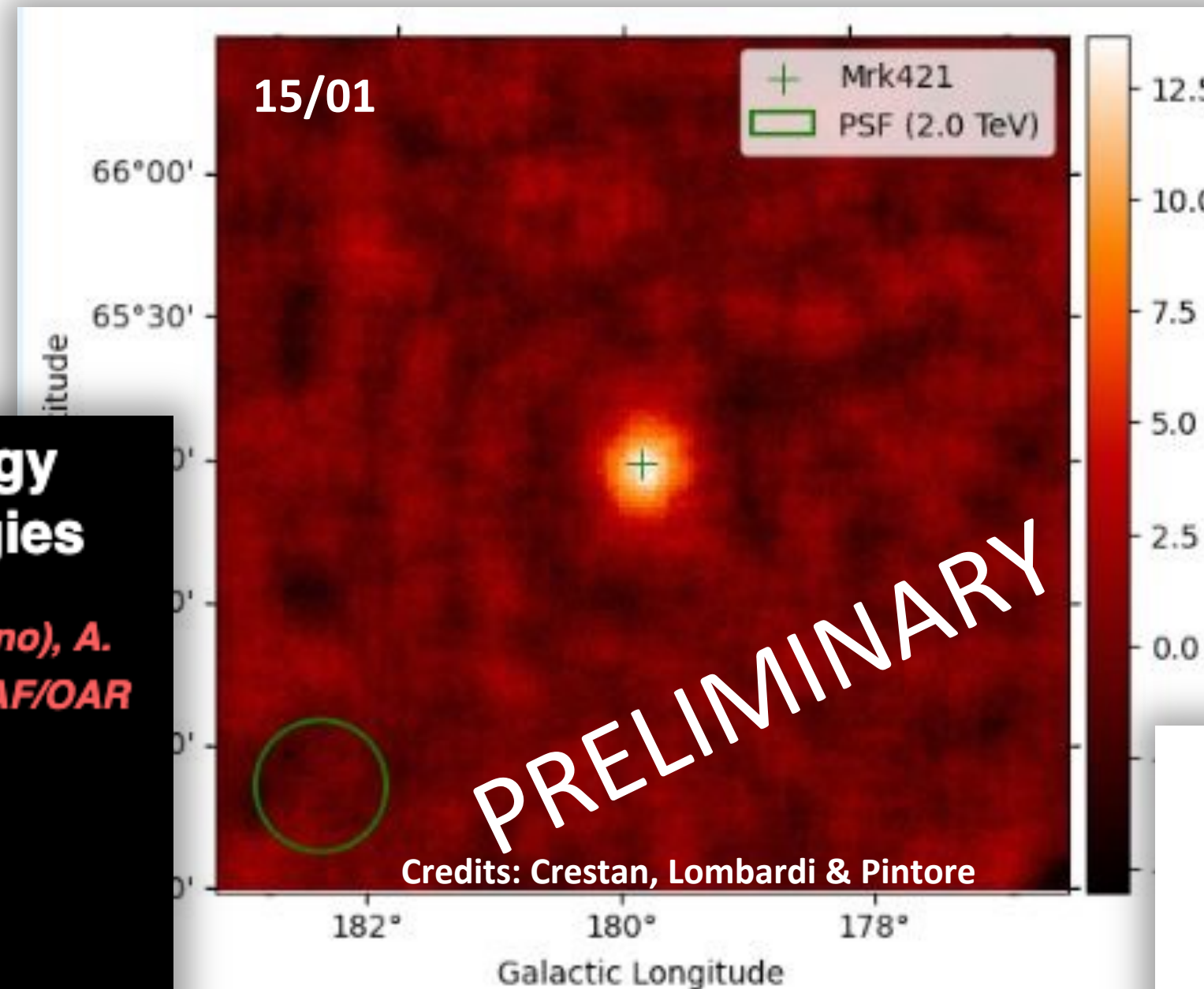
Credential Certification: Fabio Pintore (fabio.pintore@inaf.it)

Subjects: Gamma Ray, TeV, VHE, AGN, Blazar

Referred to by ATel #: **17622**

Tweet

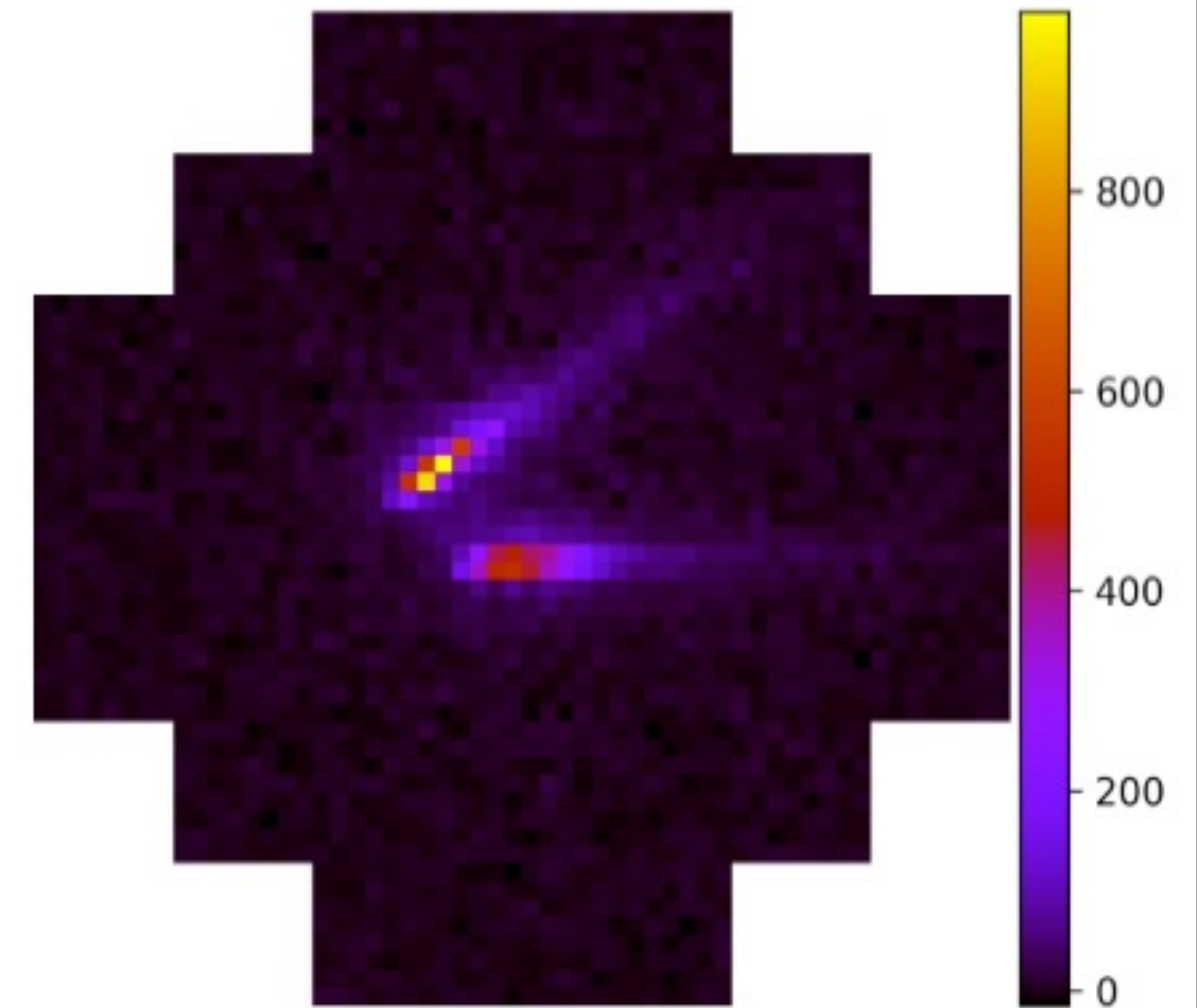
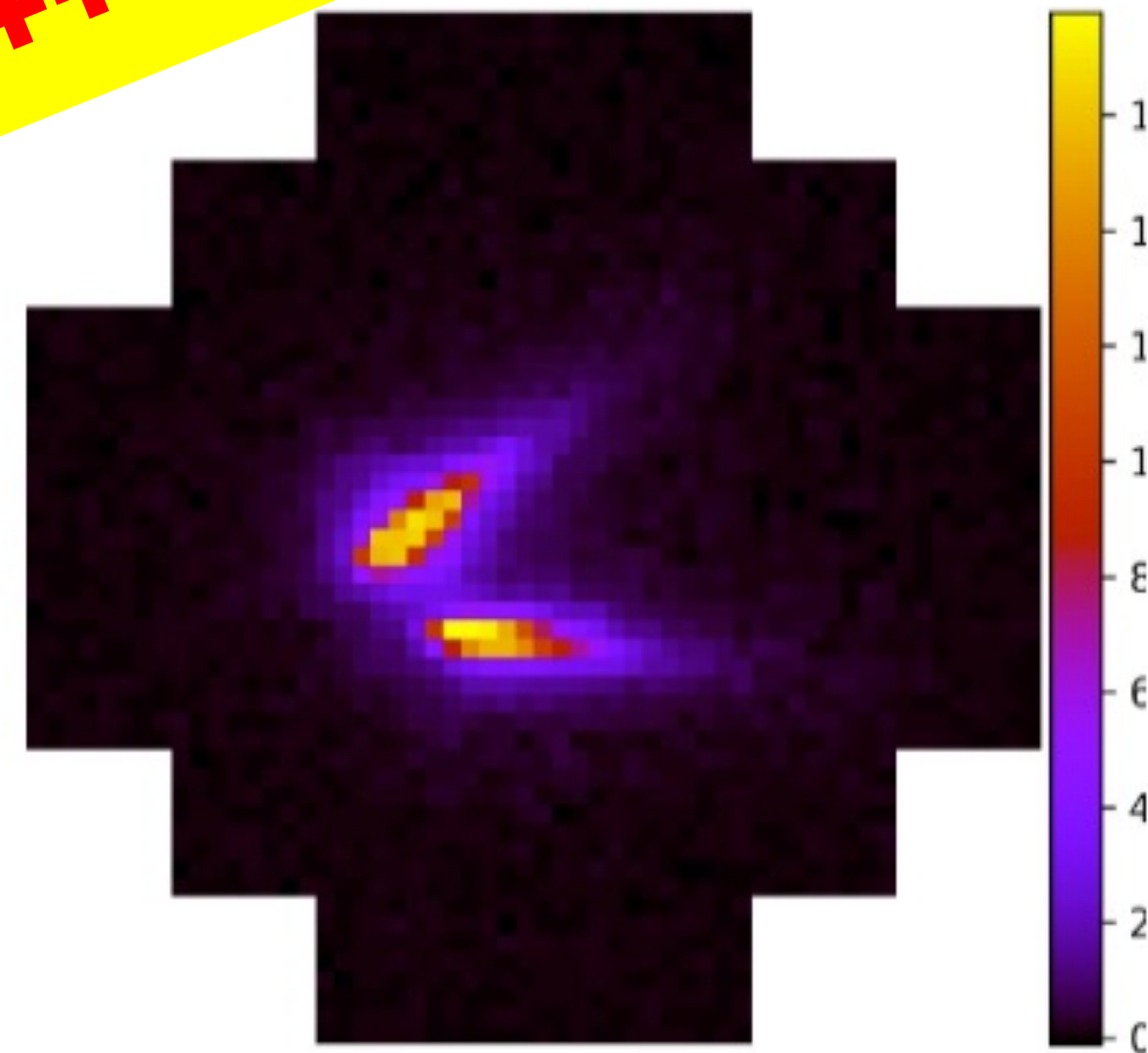
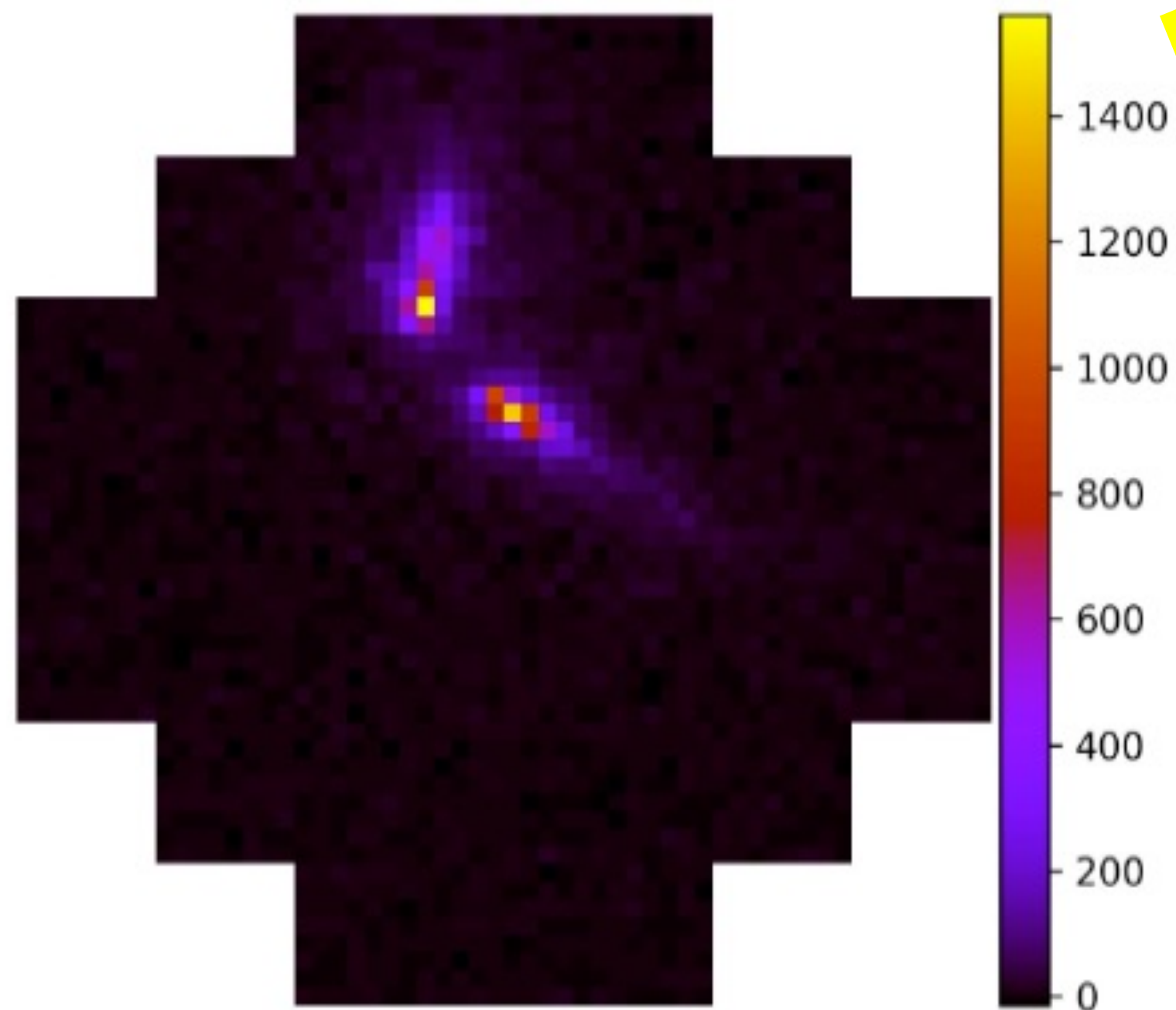
The ASTRI-1 telescope has observed an increase in the very high-energy gamma-ray flux from the blazar Mrk 421 ($z = 0.031$). Observations were performed between 2026/01/15 - 2:00 UTC (MJD 61055.08) and 04:40 UTC (MJD 61055.20) for a total effective observation time of approximately 2.5 hr. A preliminary analysis of the collected data reveals a significant detection of 11 sigma. The detected gamma-ray flux between 0.8 and 5 TeV is estimated to be 2.3 ± 0.3 (stat) Crab Units.



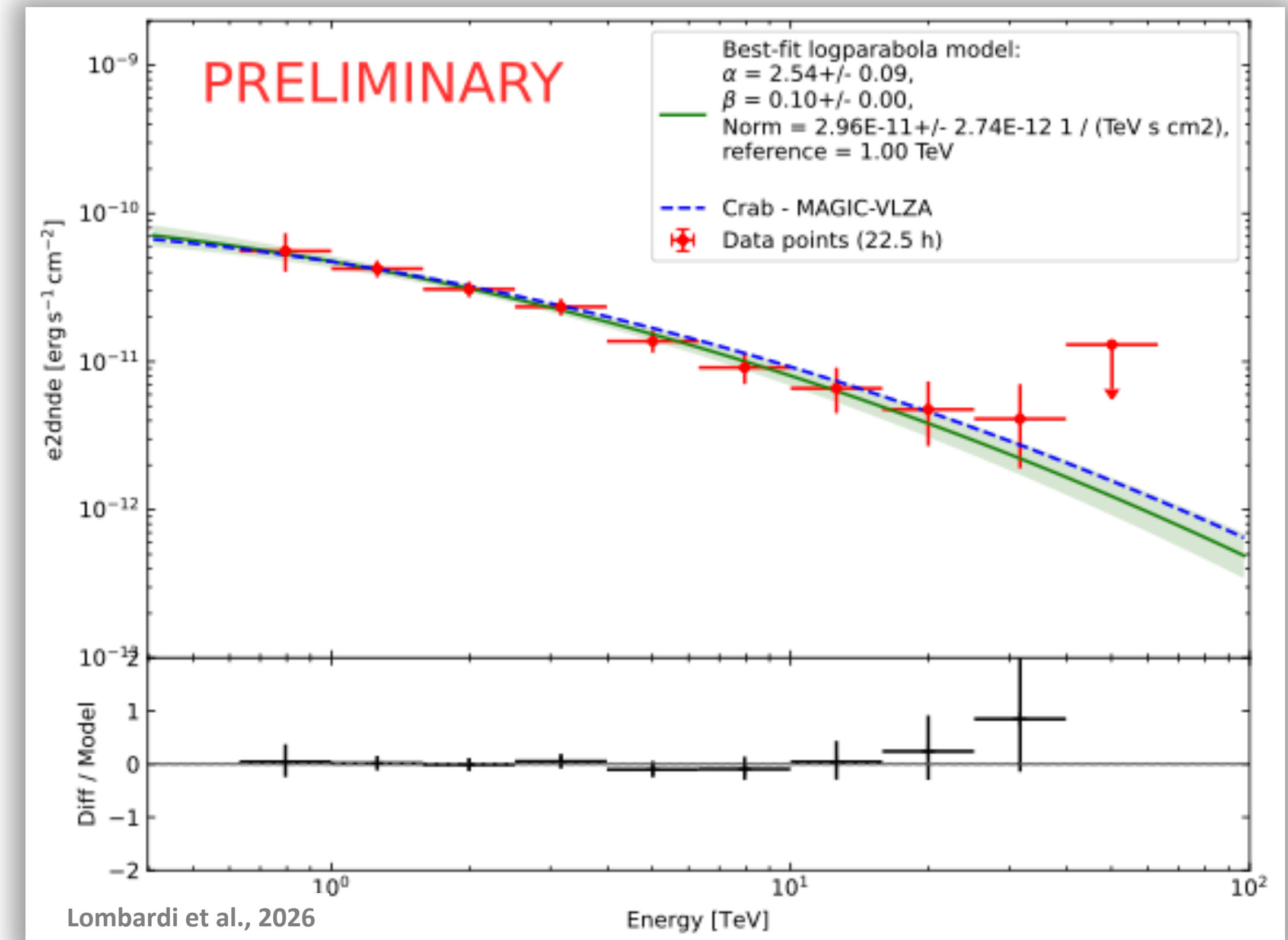
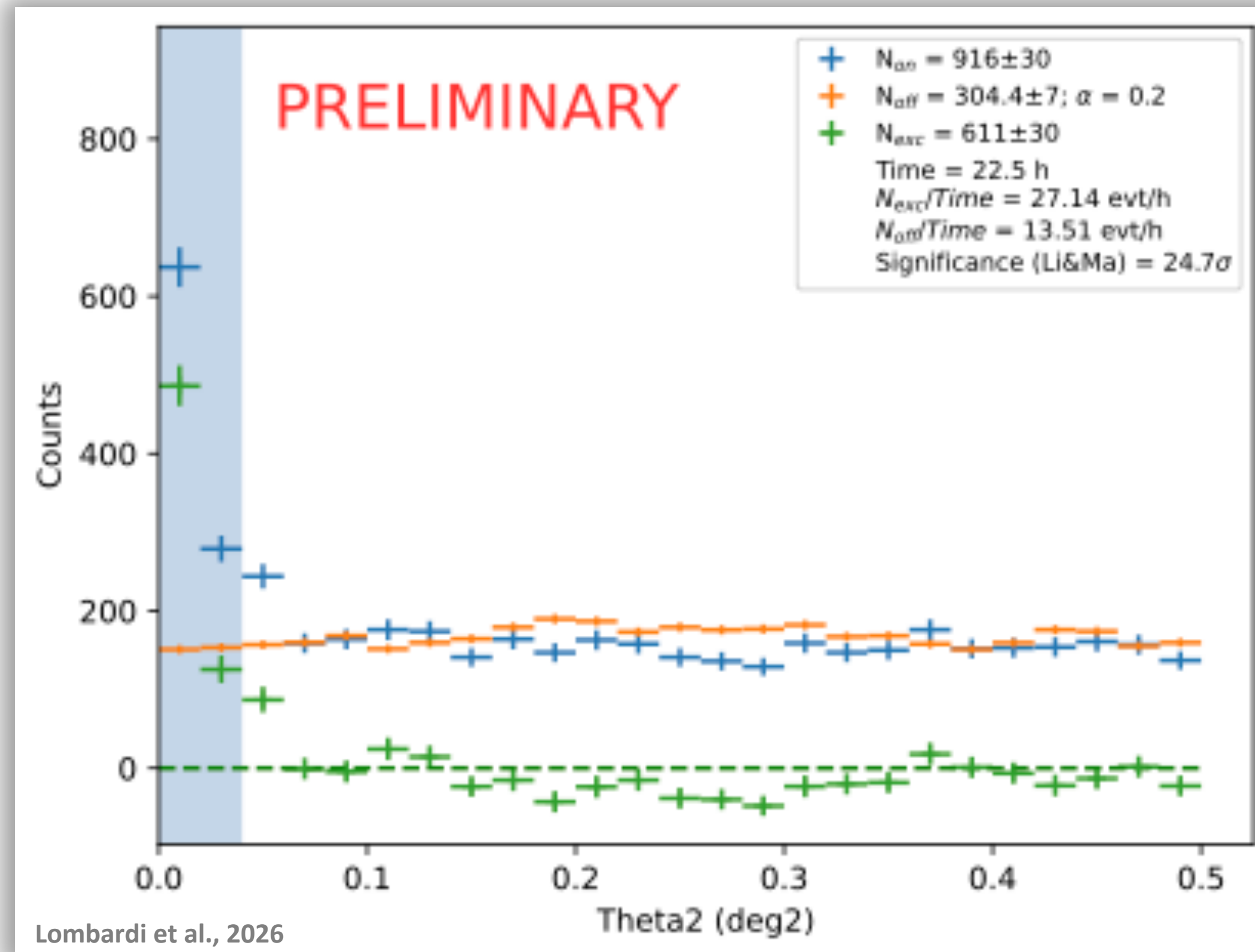
STEREO → ASTRI-1 + ASTRI-3

ASTRI-1 and ASTRI-3 stereo observations!

+++ Stereo Events +++



ASTRI-1&3 Crab Nebula: February 2026



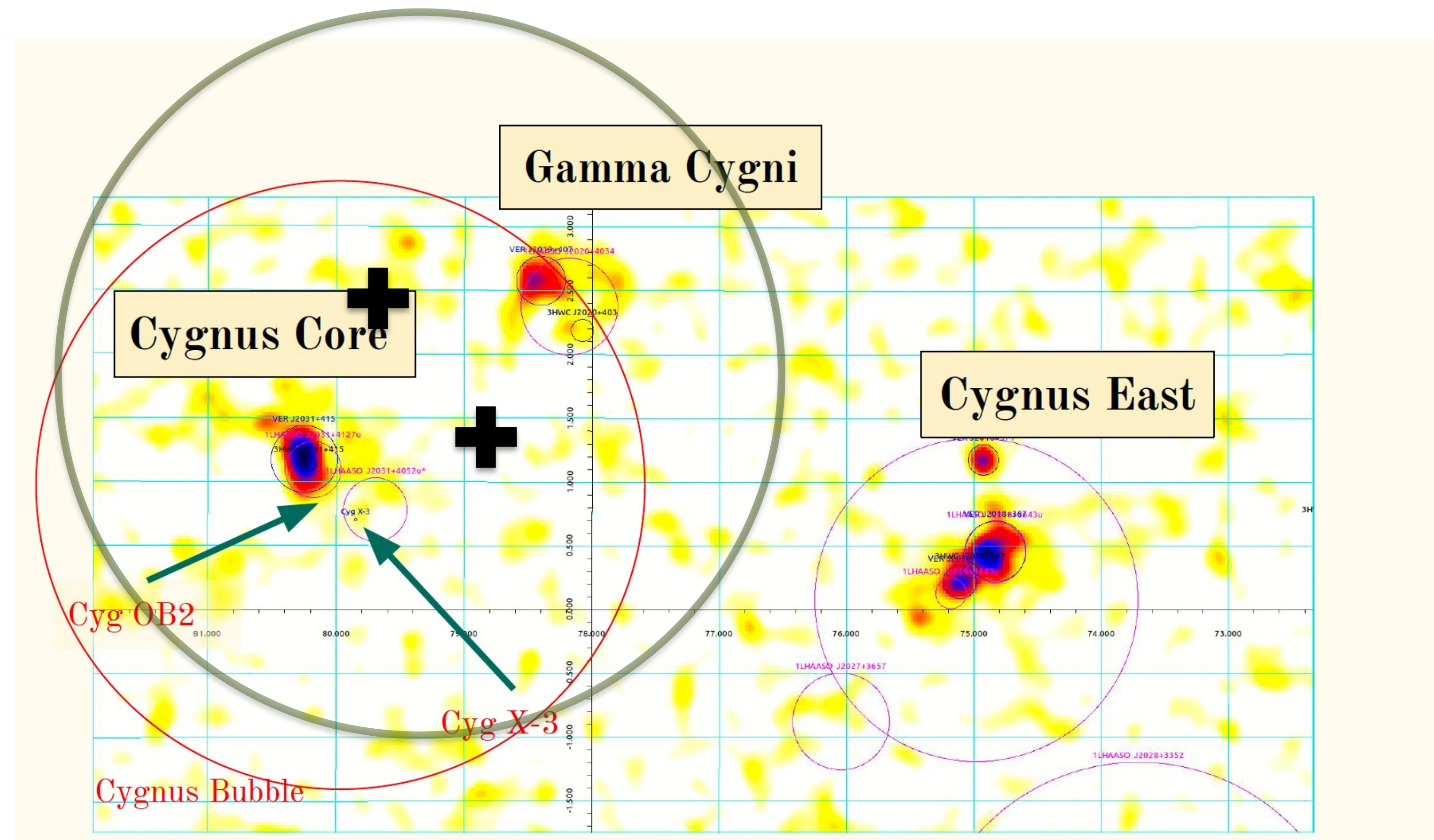
Total exposure time of 22.5 hr.

Crab Nebula detection plot and spectral energy distribution in the energy range 0.6-60 TeV.

STEREO →
ASTRI-1 + ASTRI-2 + ASTRI-3

The ASTRI early science

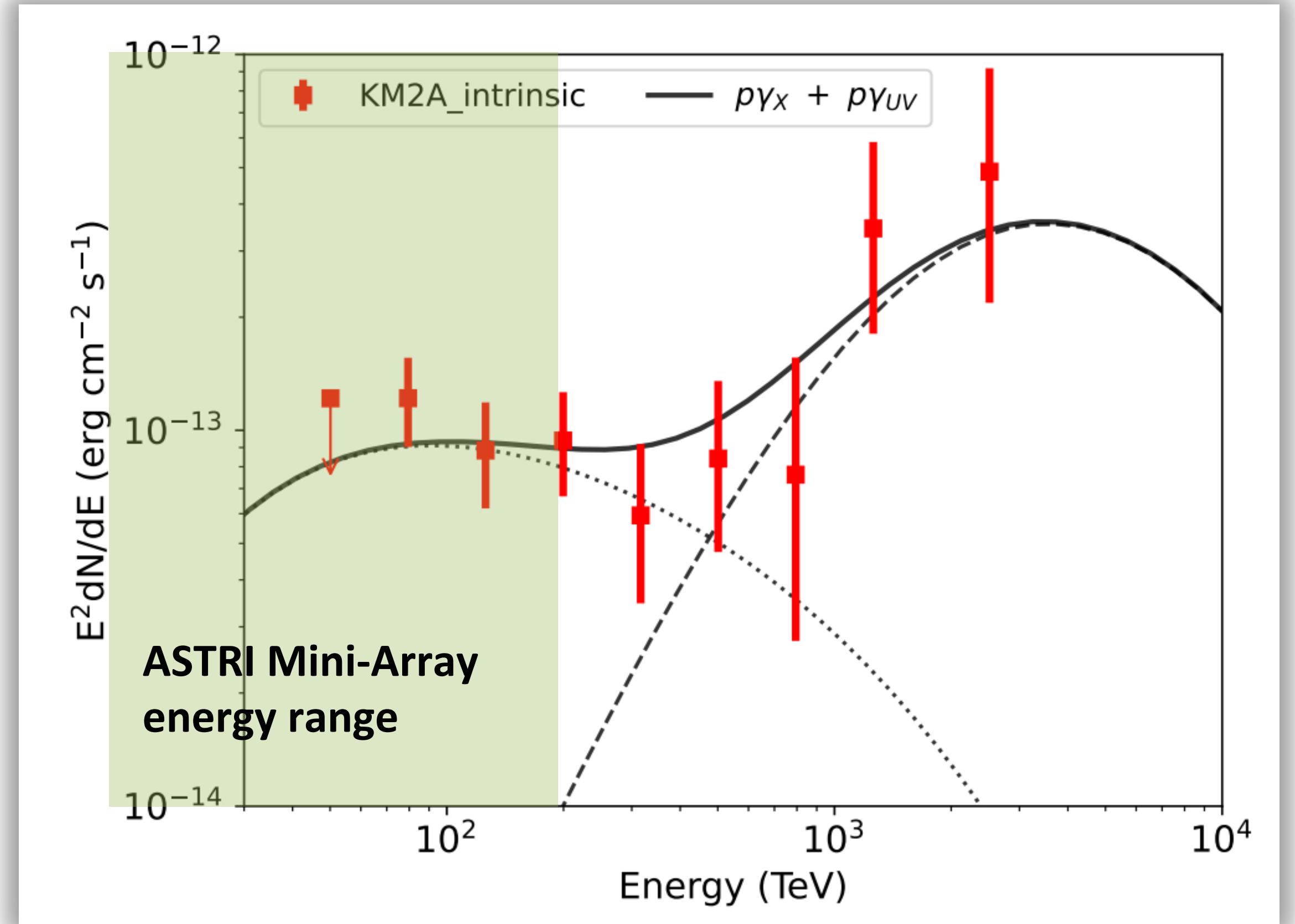
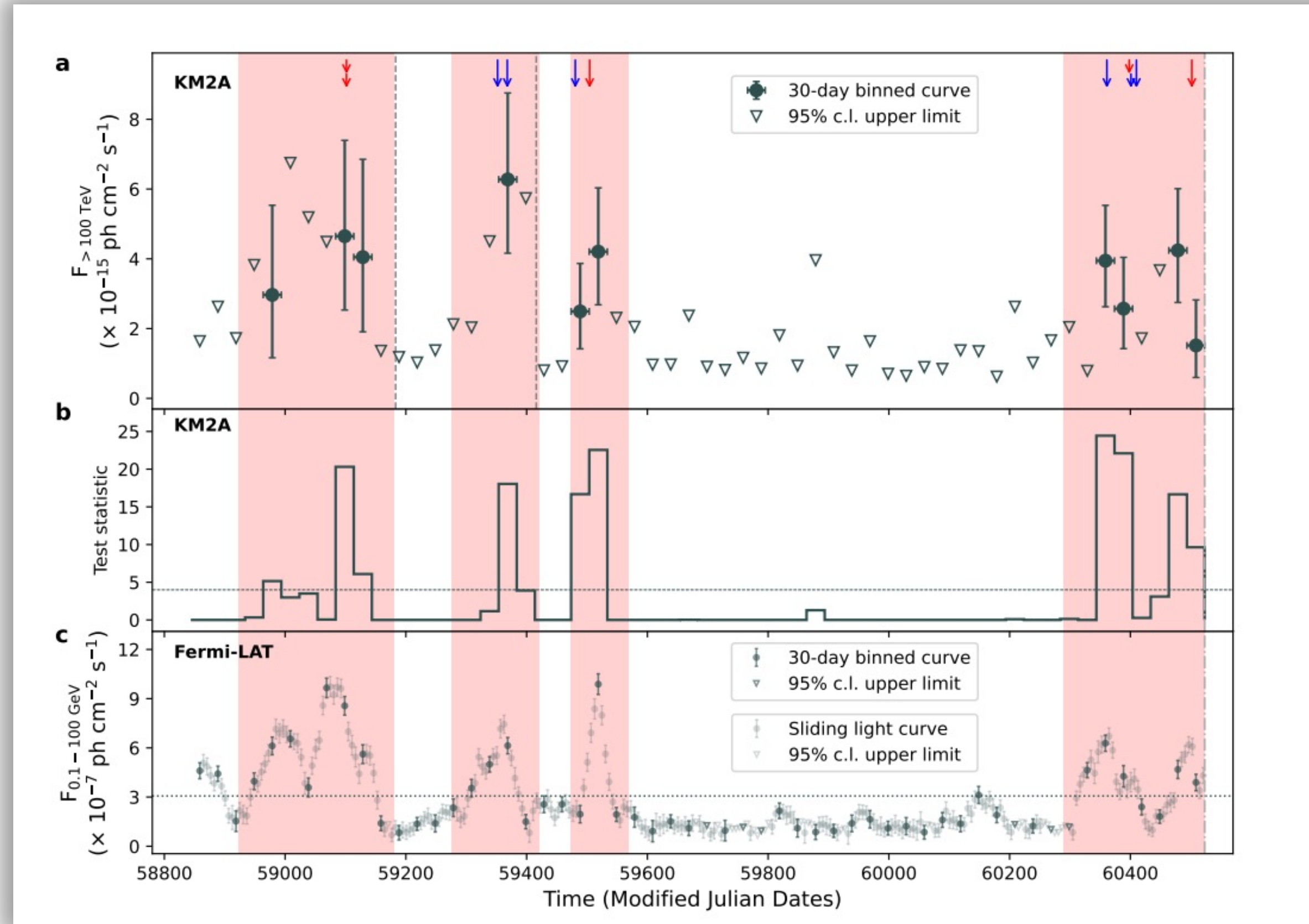
ASTRI wide FoV → simultaneous pointing at the Cygnus core and γ Cyg



Quartiroli talk

Month	Visibility (Dark sky and moderate Moon)	Visibility (Dark sky)
June	73.0	52.0
July	125.0	76.0
August	126.0	71.0
September	106.0	63.0
October	76.0	48.0

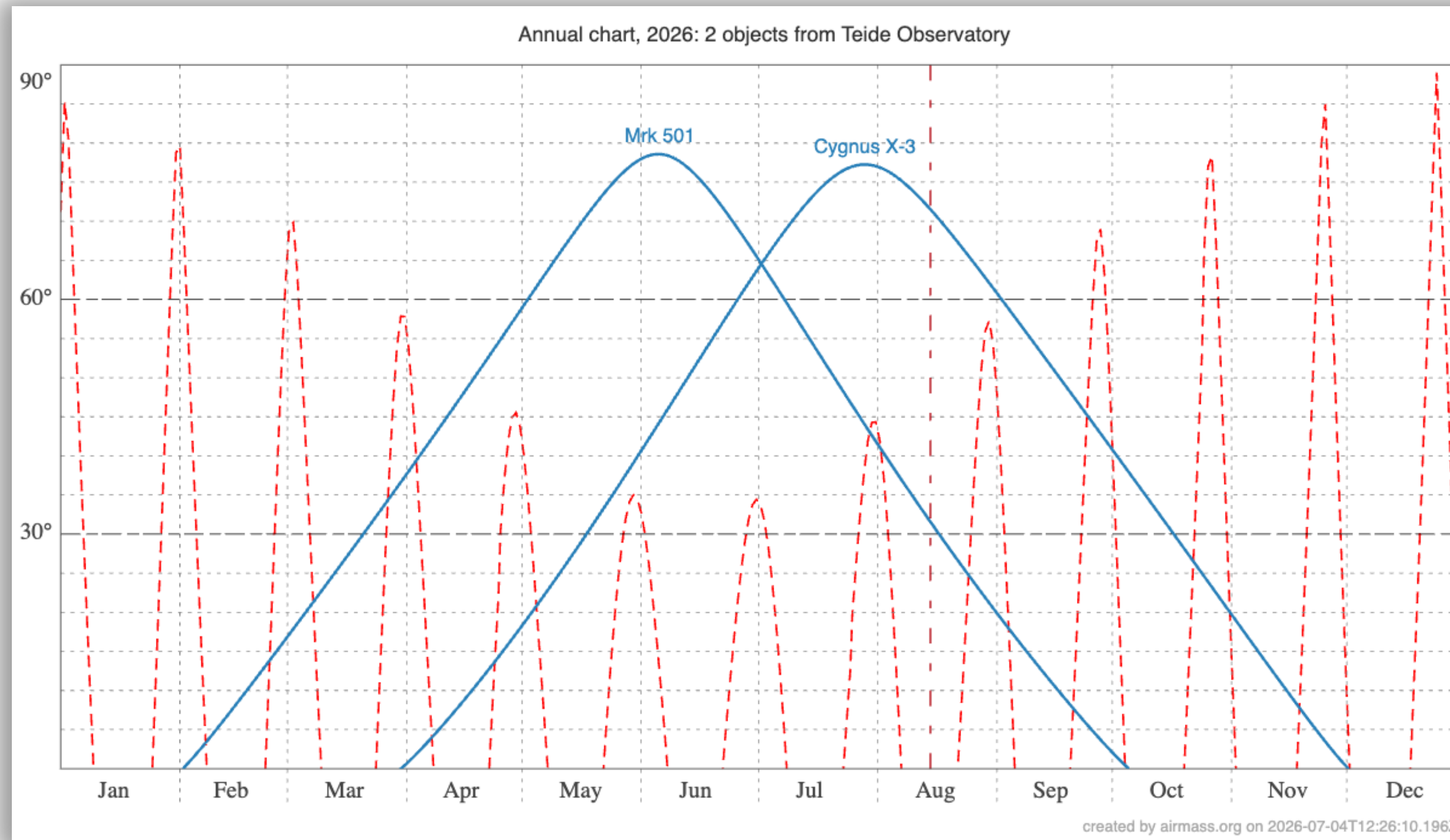
Cygnus X-3: A variable PeV source



Cao et al., 2026

Insight-HXMT (PI Heshou Zhang, INAF/OAB) observations in June 10 – 28, 10-20 ks/day, almost simultaneous with ASTRI Mini-Array

ASTRI Mini-Array & MAGIC Intercalibration



Mrk 501 as a secondary target w.r.t. the Cygnus Region

Inter-calibration with MAGIC (Paneque, Arbet-Engels et al.)

- ◆ **Crab:** 10.6σ in 28.5hr (mono) vs 24.7σ in 22.5hr (stereo 2T)
Crestan et al., 2025, PoS(ICRC2025), 617; Lombardi et al., 2026, SPIE, 14155-100
- ◆ **Crab:** Log-parabola SED in agreement with the MAGIC one up to 40 TeV
Lombardi et al., 2026, SPIE, 14155-100
- ◆ **Mrk 501:** hint of detection at 3.7s in 3.9hr (mono)
- ◆ **Mrk 421:** 11σ in 2.5hr, $F(0.8-5\text{TeV}) = (2.3 \pm 0.3)$ C.U. (mono)
Crestan et al., 2026, Atel #17602; Vercellone et al., in prep.
- ◆ **Cygnus Region:** ongoing campaign (stereo 3T+)

Questions & Comments

<https://www.astri.inaf.it/>

@ASTRIgamma



Thank you!

stefano.vercellone@inaf.it



Credits: INAF/R. Bonuccelli