

High Energy Astrophysics

Group coordinator: A. Lemiere (until summer 2021)
S. Gabici (since summer 2021)

Who we are and what do we do

22 researchers (10 CNRS, 9 Univ. Paris, 3 CEA), 4 postdocs, 6 PhD students

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- Cosmic rays → Jem EUSO

- Photons → Athena, Integral, SVOM, XGRE-NG, GRINTA

- Educational nano sat → IGOSAT

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...and we do theory/phenomenology/simulations

...and multiwavelength observations

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Very short (and incomplete!) list of scientific highlights

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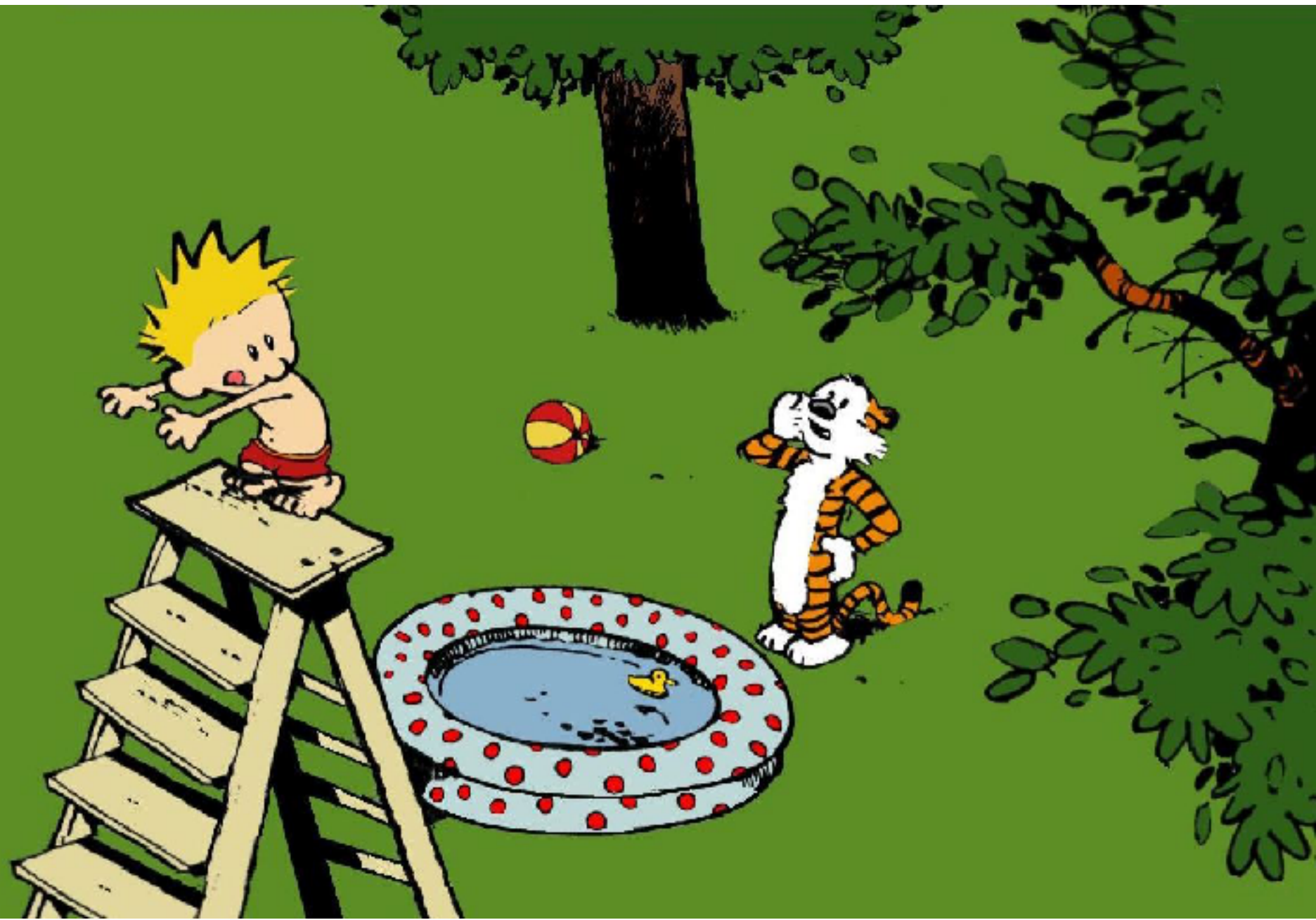
- HESS J1702-420, a cosmic PeVatron?

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- Underwater neutrino telescopes
 - Search for correlation: radio blazars and ANTARES neutrinos
- Ground based gamma ray telescopes
 - HESS J1702-420, a cosmic PeVatron?
- Space borne telescopes
 - SVOM coded mask delivered!

7 team members
2 projects

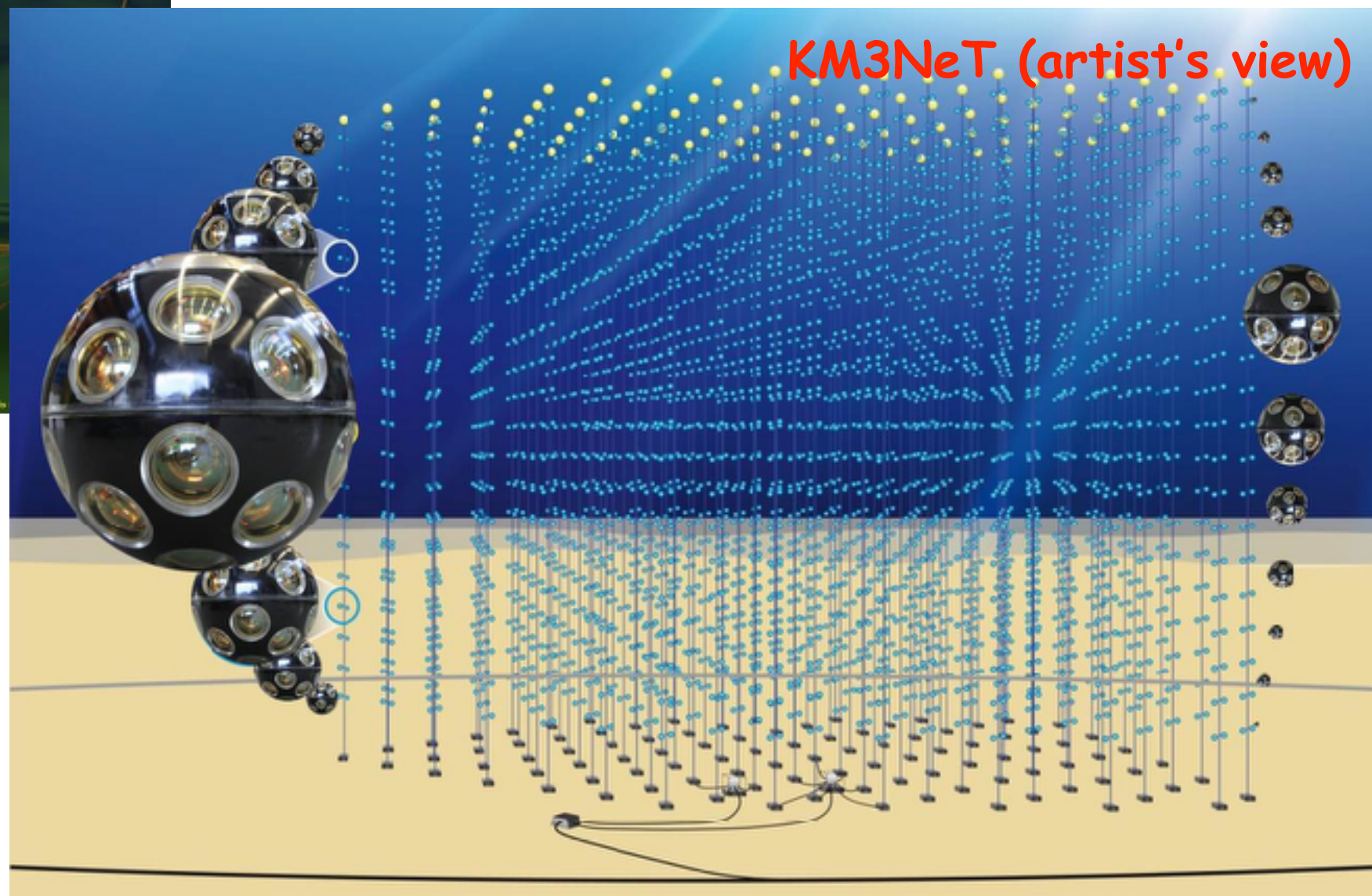


Underwater instruments

Underwater instruments: the ANTARES/KM3NeT team



Searching for very-high-energy
astrophysical neutrinos

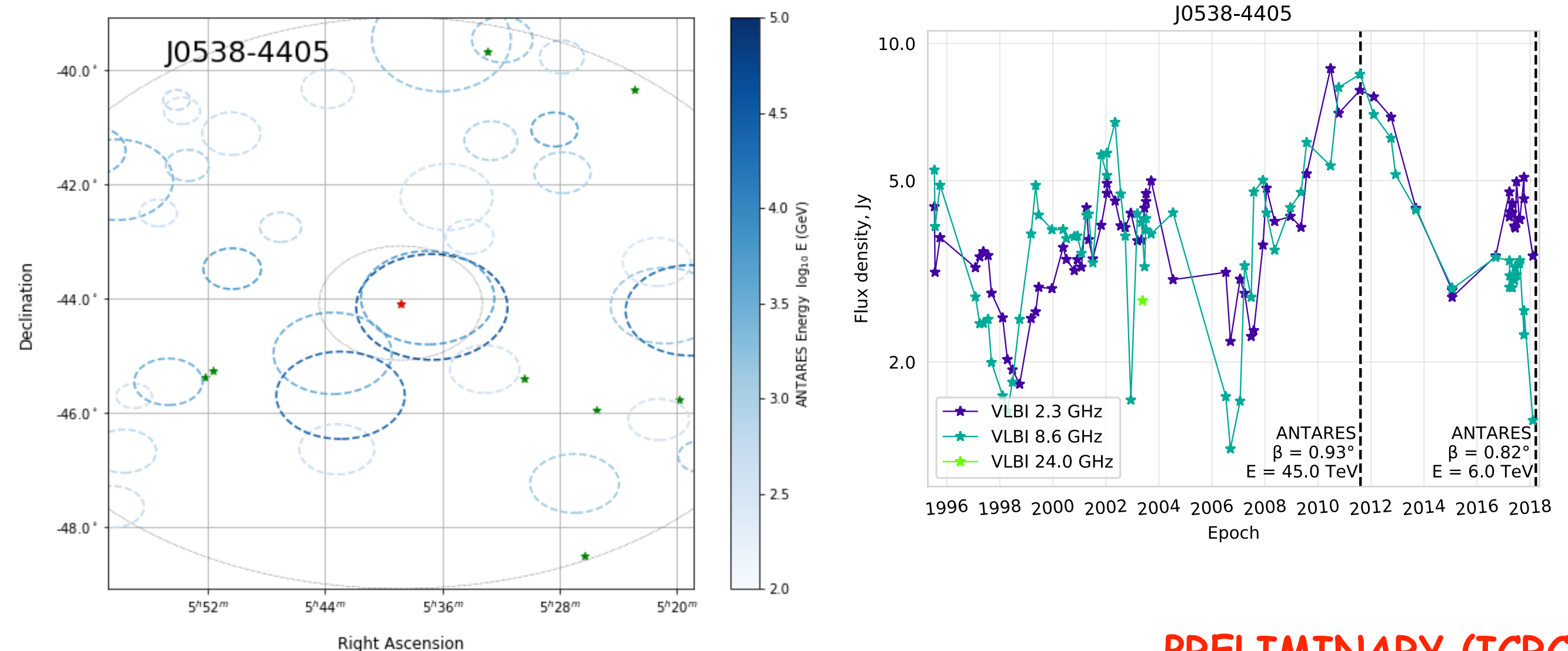




A KM3NeT detection unit ready to be deployed

Underwater instruments highlight: search for radio-selected blazars and ANTARES neutrinos

Blazars selected at 8 GHz (VLBI), about 3000 objects, 13 yrs of ANTARES DATA



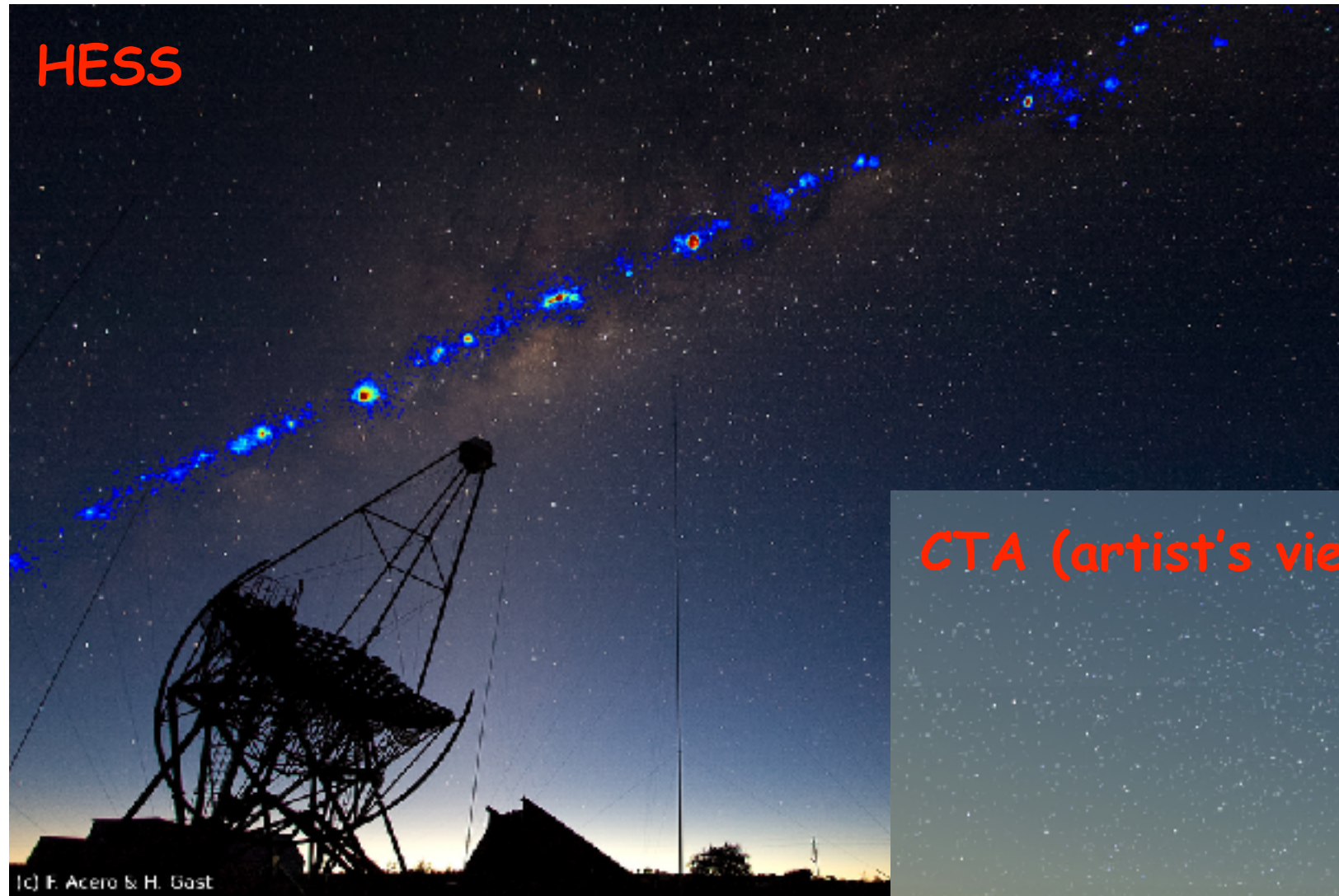
PRELIMINARY (ICRC)

Ground based instruments



13 team members
2 projects

Ground based instruments: the HESS/CTA team



Exploring the
very-high-energy
gamma-ray sky





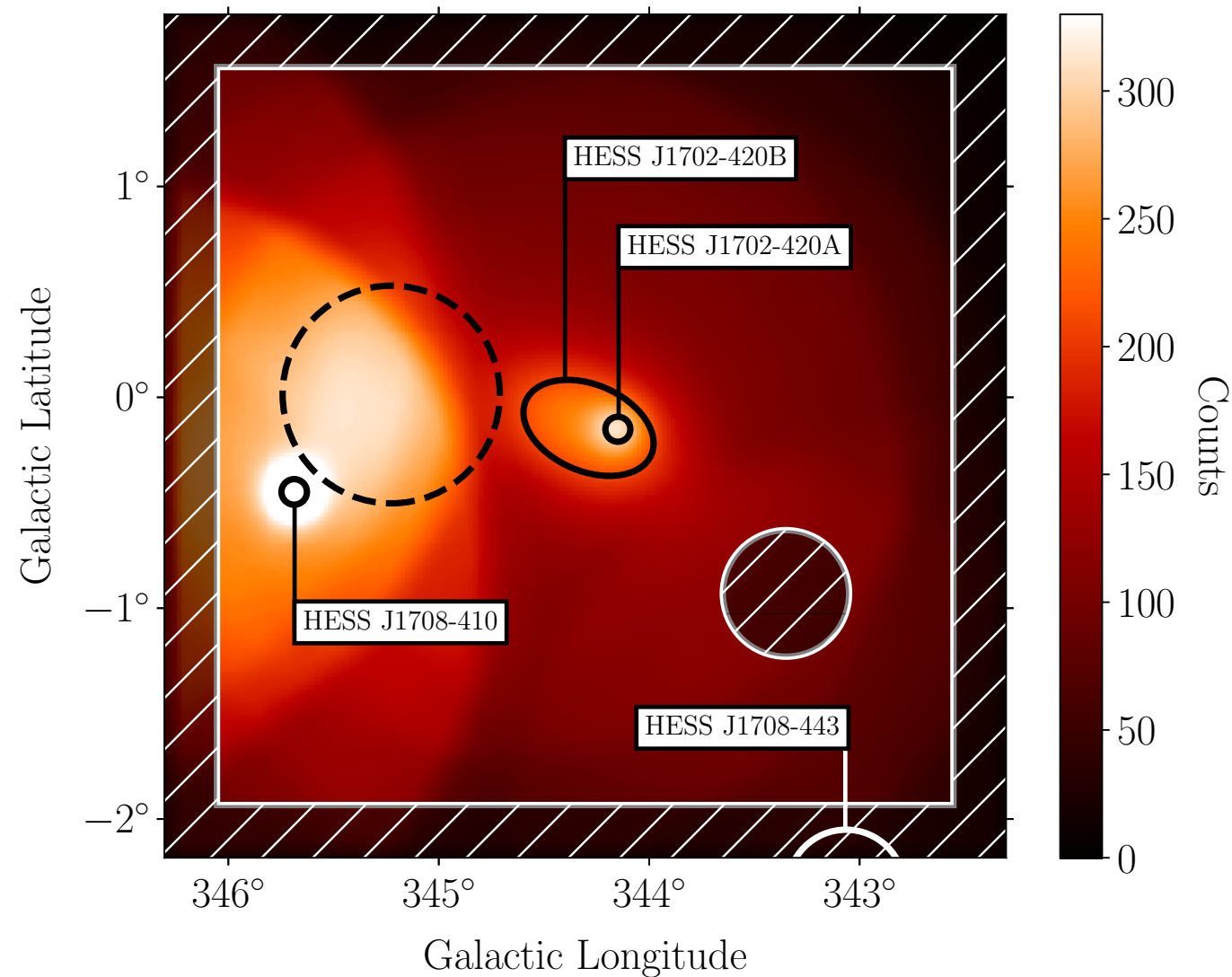
Science with the Cherenkov Telescope Array

arXiv:1709.07997v2 [astro-ph.IM] 22 Jan 2018

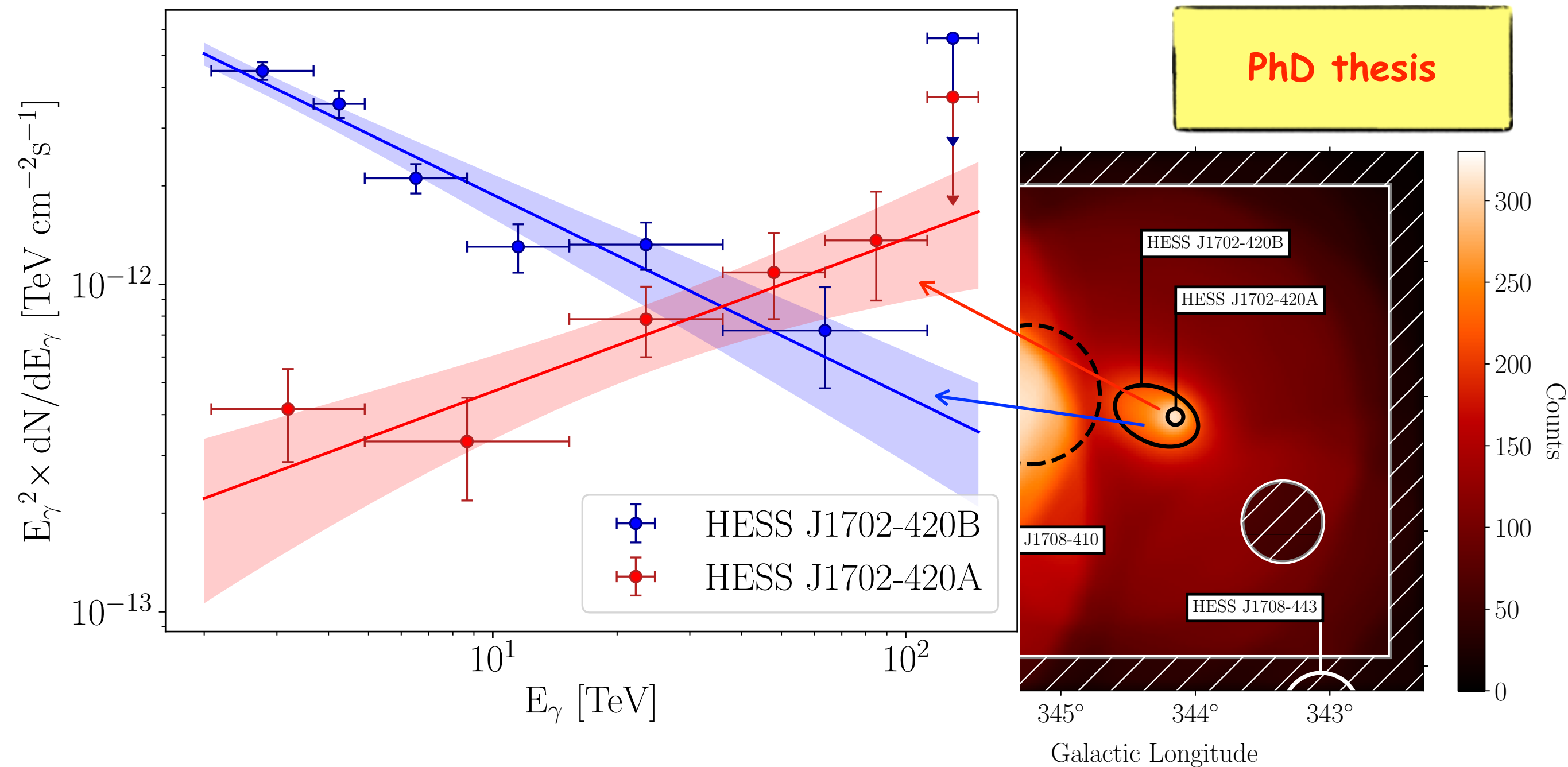
Strong implication on
GammaPy!

Ground based instruments highlight: A potential PeVatron seen by HESS

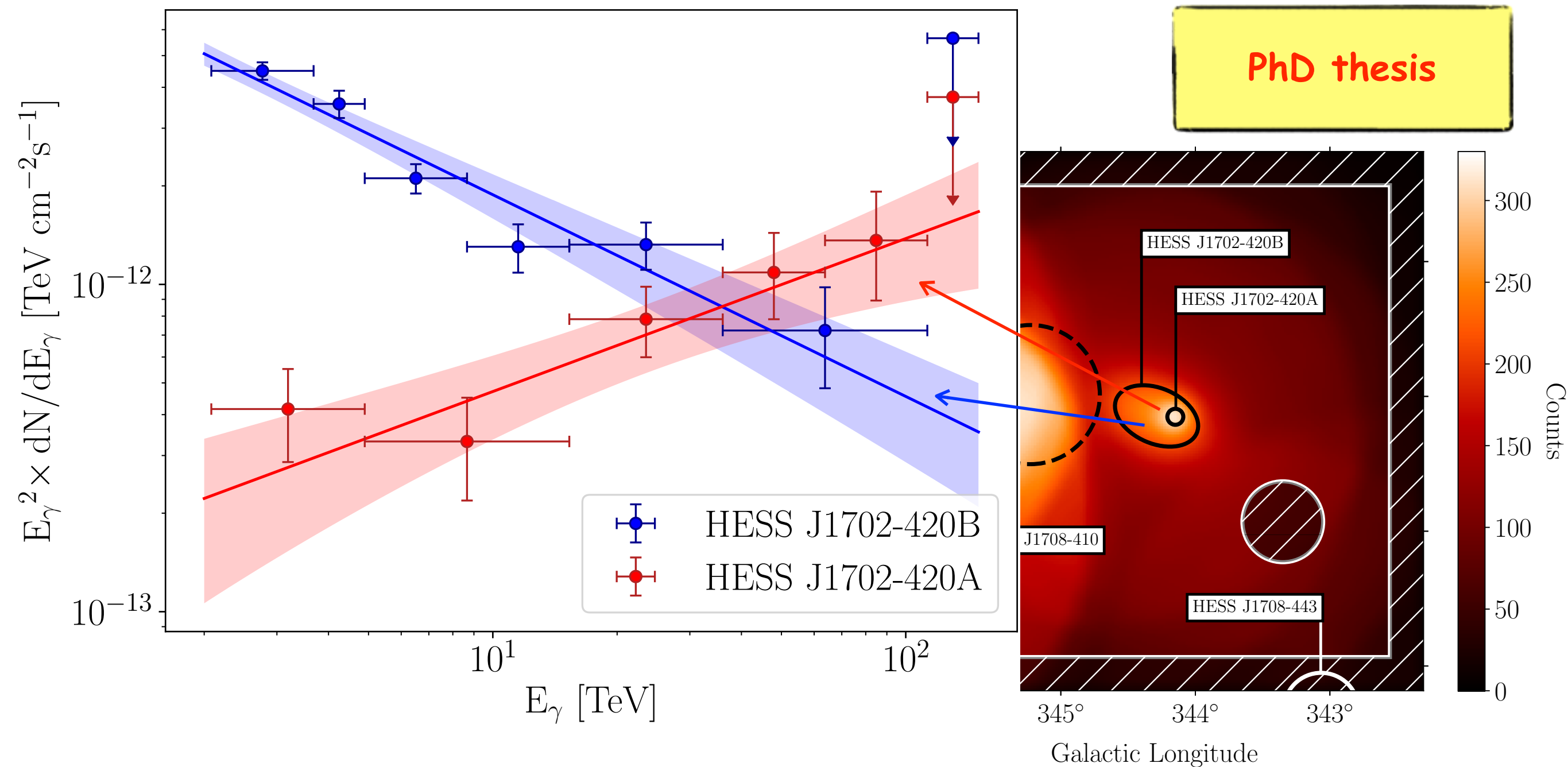
PhD thesis



Ground based instruments highlight: A potential PeVatron seen by HESS



Ground based instruments highlight: A potential PeVatron seen by HESS



Leptonic emission not ruled out, but disfavoured → very solid PeVatron candidate

11 team members
6 projects



Space borne instruments

Seven space projects:

- Educational nano sat

- IGOSAT

- Cosmic ray studies

- JEM-EUSO

- Photon detectors

- INTEGRAL (the past...)

- SVOM (...the present...)

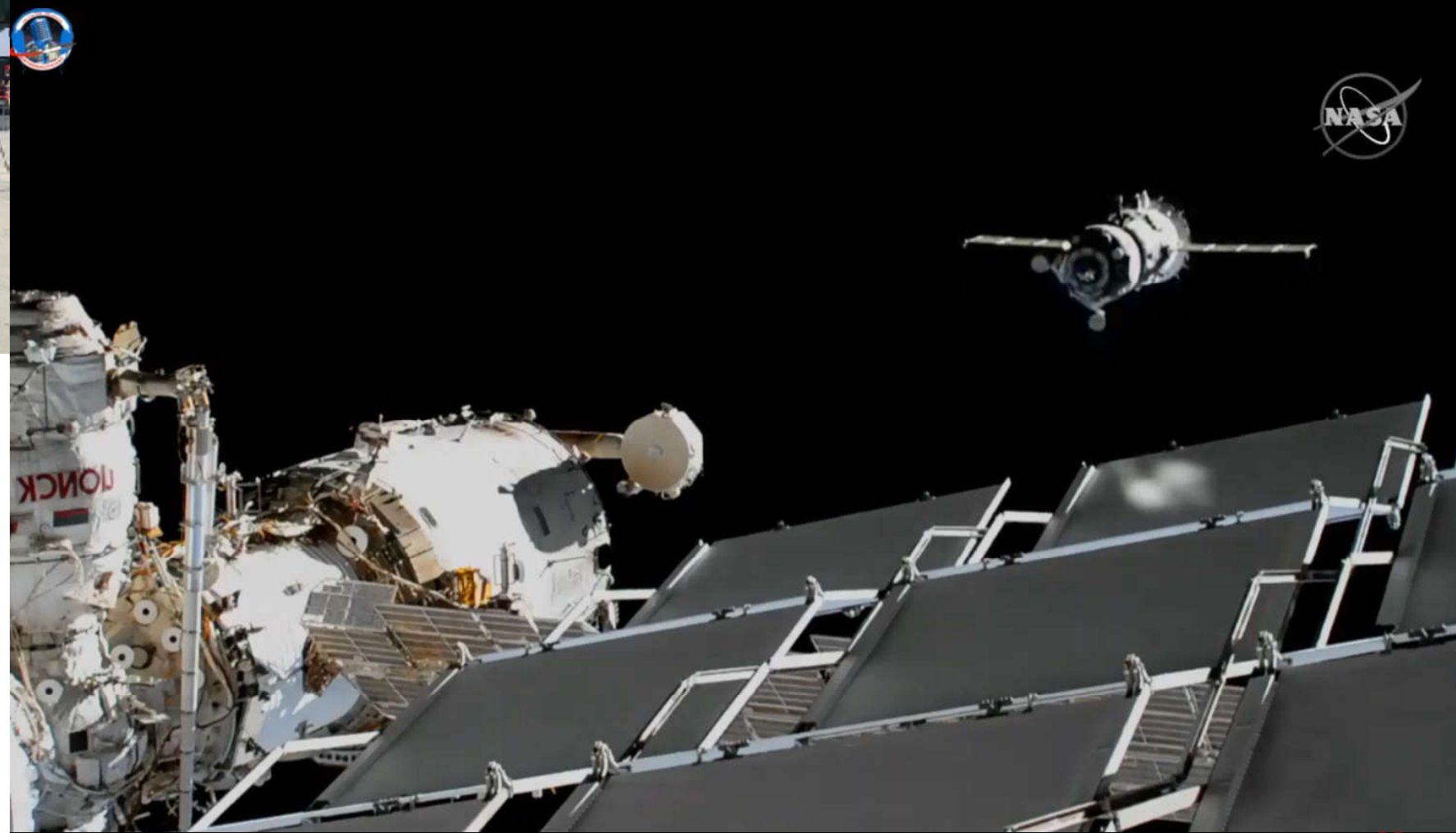
- XGRE-NG, GRINTA (...and the)

- ATHENA (future...)

Space borne instruments



IGOSAT team in 2016





INTEGRAL: TOWARDS THE THIRD DECADE OF X AND GAMMA RAY OBSERVATIONS

11-16 October 2021

Hybrid event (in-person and online meeting)

Hotel Flamingo resort in Santa Margherita di Pula, Sardinia, Italy

Topics

Surveys from hard X-rays to
soft X-rays

Multi-messenger and time
domain astronomy

Extragalactic astronomy

Galactic astronomy

Gamma-ray lines

From INTEGRAL to the next
generation of X/gamma-ray
facilities: heritage and future

Scientific Organizing Committee (SOC)

Pietro Ubertini (Chair), INAF-IAPS Roma (I)
Lorraine Hazen (Chair), University College Dublin (Ir)
Angela Bazzano, INAF-IAPS Roma (I)
Guillaume Bellanger, ESA ESAC Madrid (E)
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Eino Pizzi, INAF-IAPS, Roma (I)
Giulia Martovani, INAF-IAPS, Roma (I)



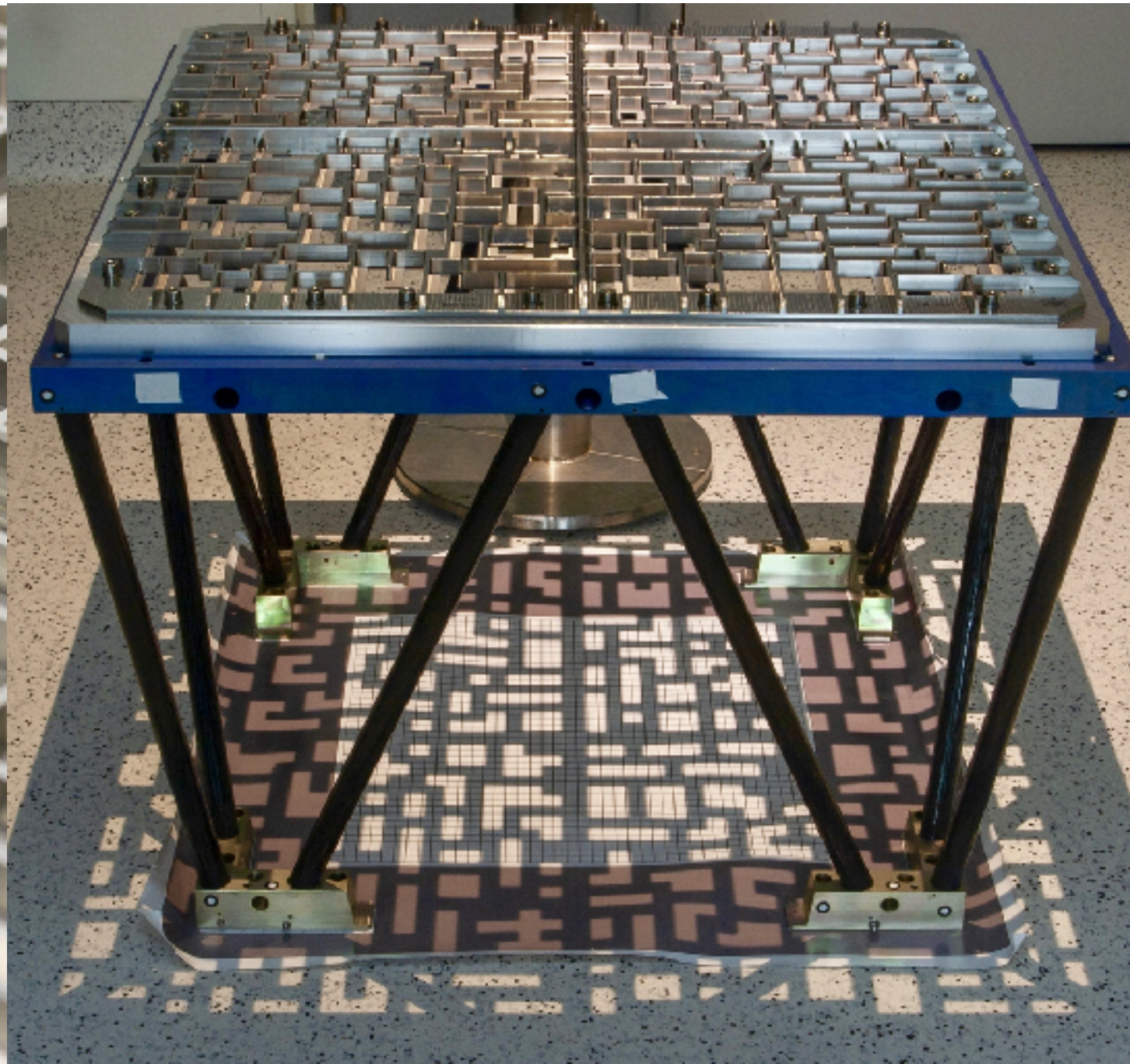
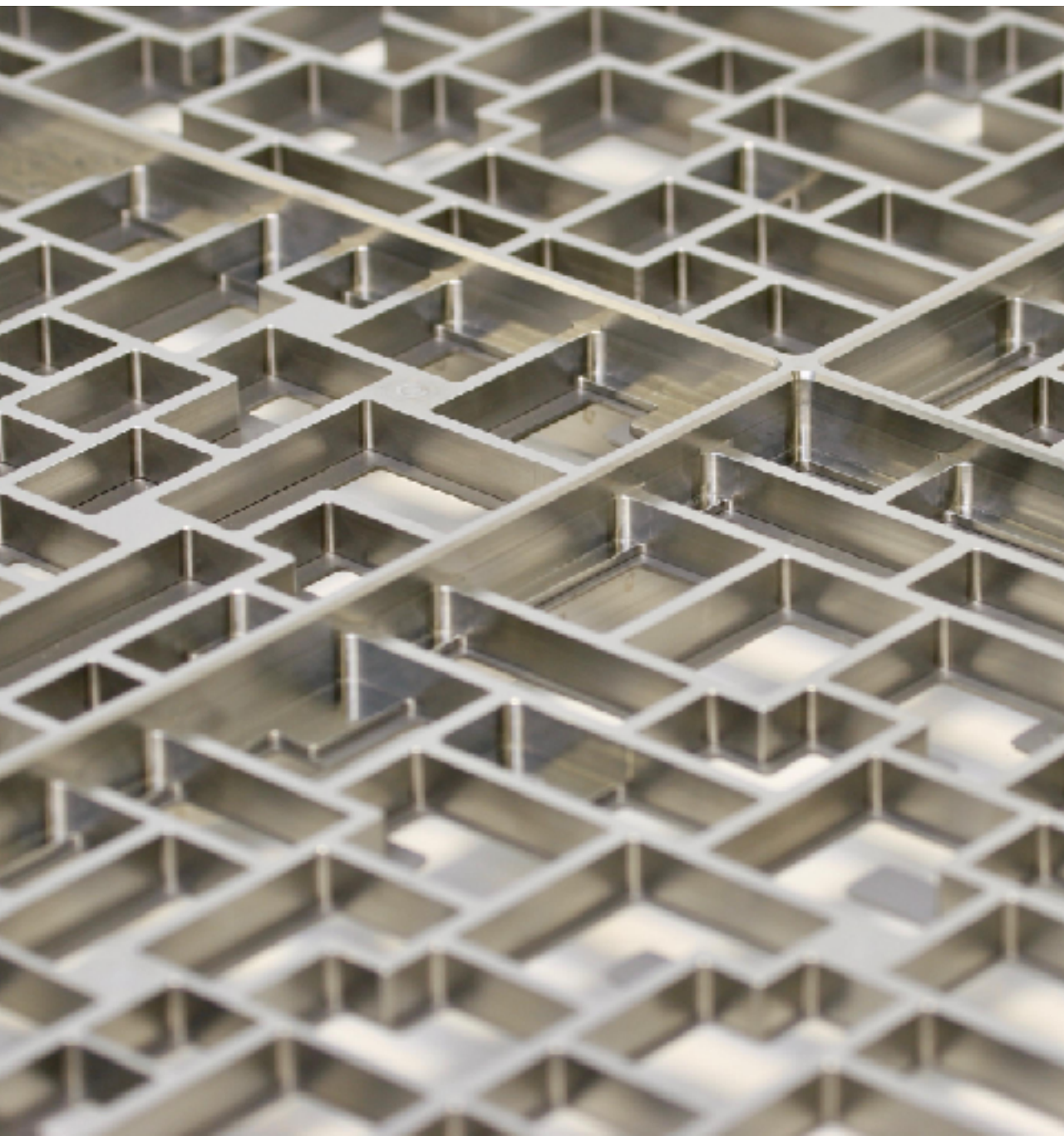
<https://indico.ic.inaf.it/event/1001>



Space borne instruments highlight: *SVOM* coded mask delivered

ECLAIRs — main wide field of view instrument onboard SVOM

Hard x-rays (4 – 150 keV) → first **self supporting coded mask** to be sent in space





Multiwavelength observations

4 team members
several lines of research



Multiwavelength observations

SOME OF THE ACTIVITIES INCLUDE

- X-ray and MW observation of the *Galactic centre*
- studies of *binary systems/compact objects*
- *MWL* study of *SNRs/PWNae*

Theory, simulations...



8 team members
4 main lines of research

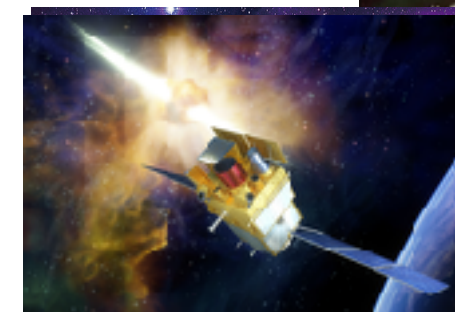
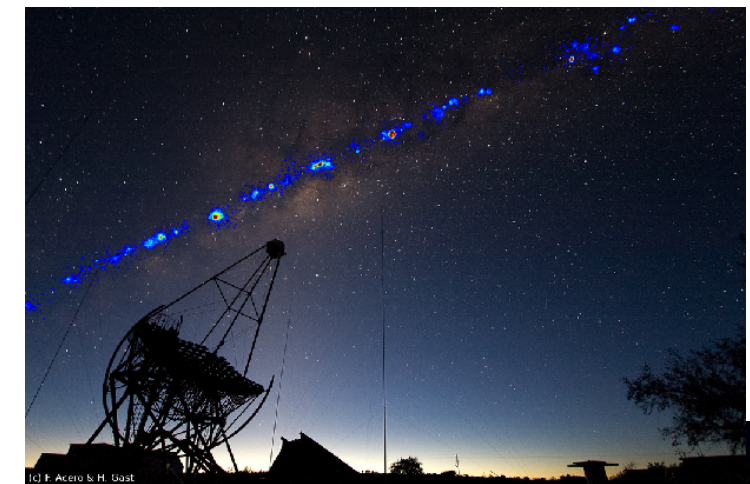
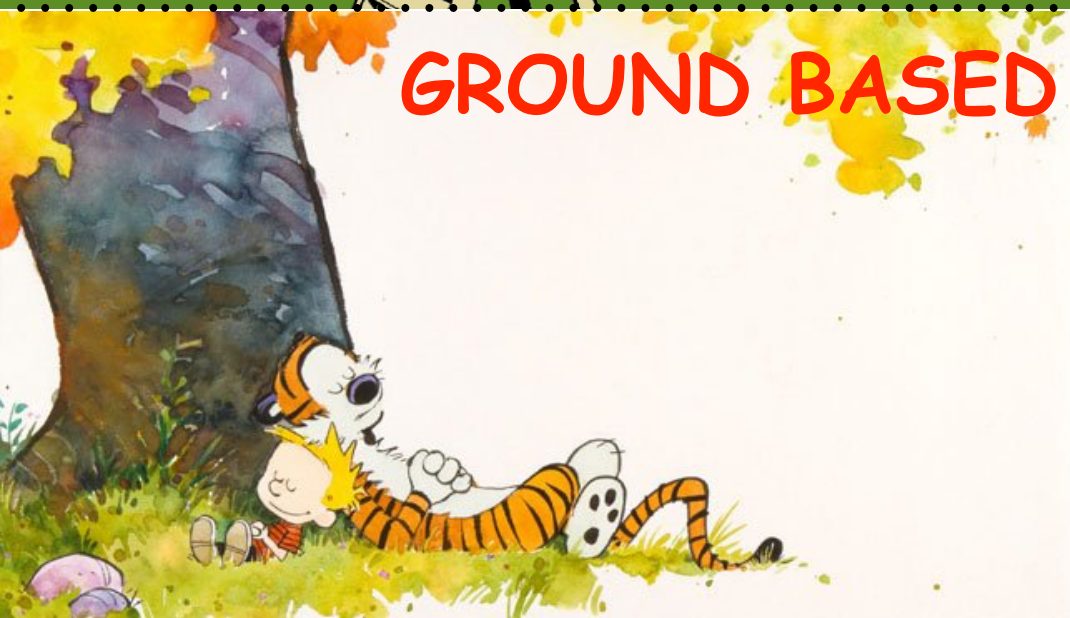
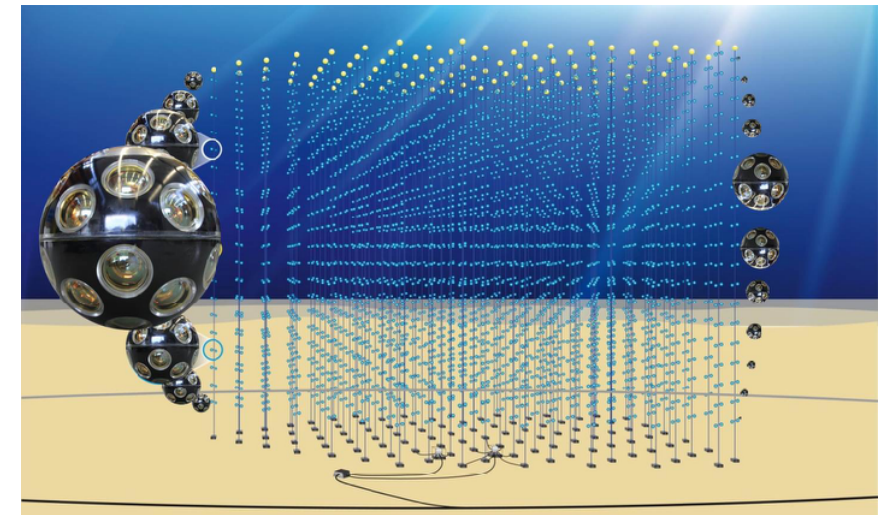
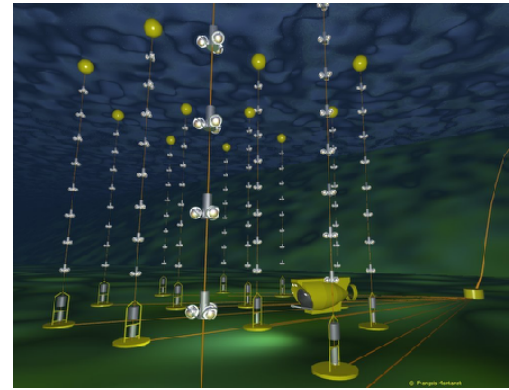
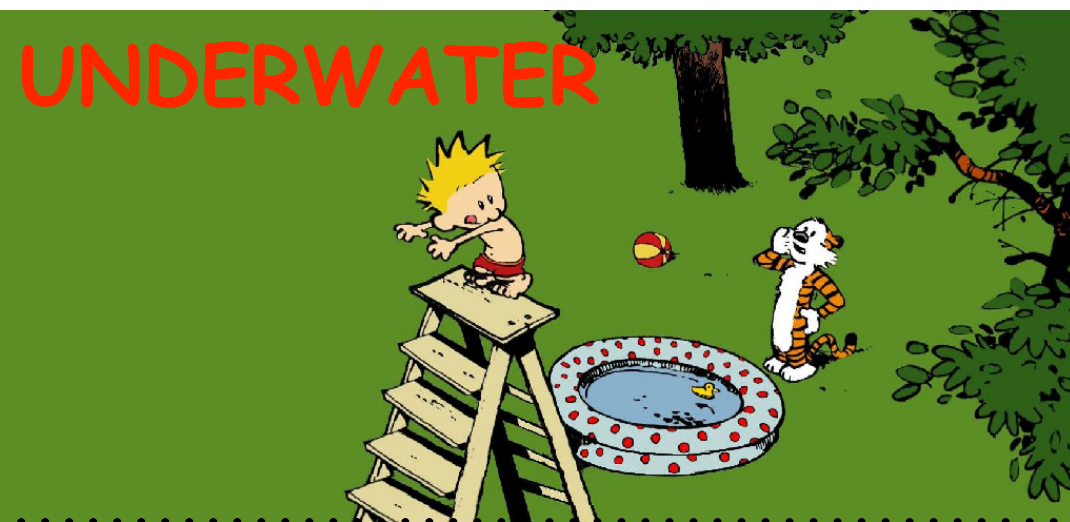
Theory, phenomenology, simulations...

ACTIVITIES INCLUDE

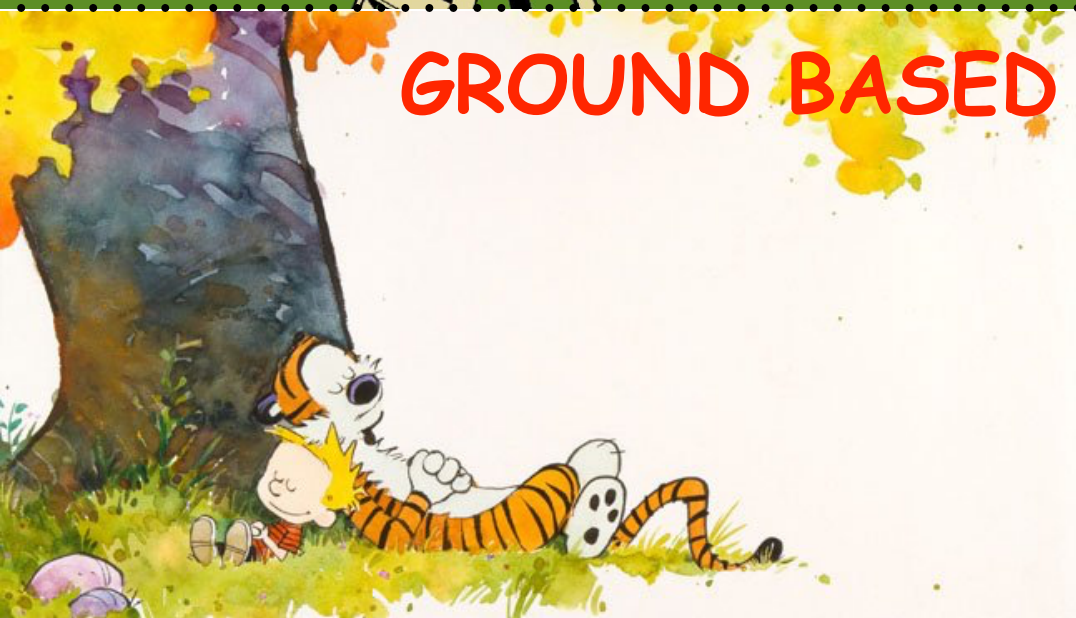
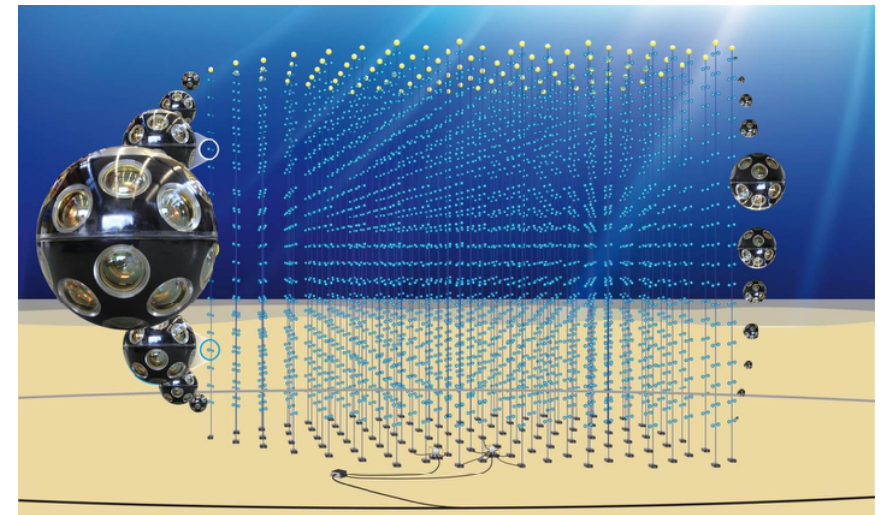
Research activities in:

- Galactic cosmic rays
- Ultra High Energy Cosmic Rays
- AGNs modelling
- Simulations

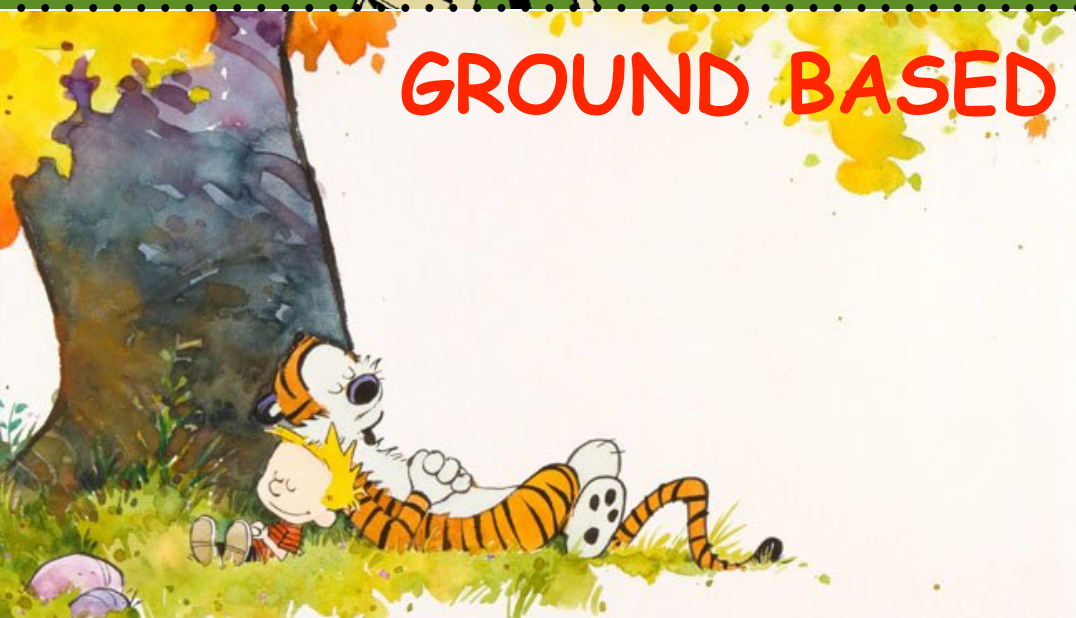
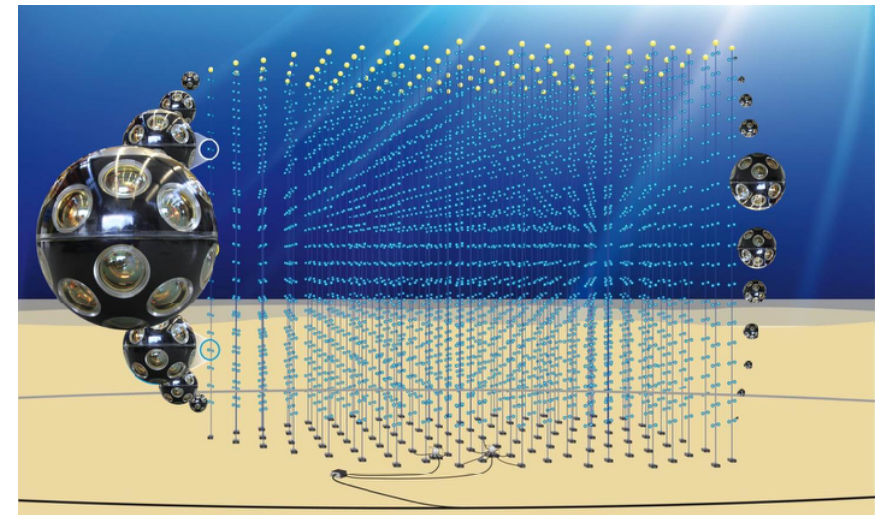
Now



2025



2030



The future

Large group (22 permanent researchers) involved in many (11) projects

- Smooth transition from current to next generation of instruments

- Underwater: ANTARES → KM3NeT (7 researchers)

- Ground based: HESS → CTA (13 researchers)

- Many space projects (7), 12 researchers

- INTEGRAL will end operations soon

- the Athena team will be busy for >10 yr

- SVOM is now! (nominal duration 5 years)

- difficult to predict what will happen for JEM-EUSO, GRINTA and XGRE-NG

The truth is... (?)

