

High Energy Astrophysics

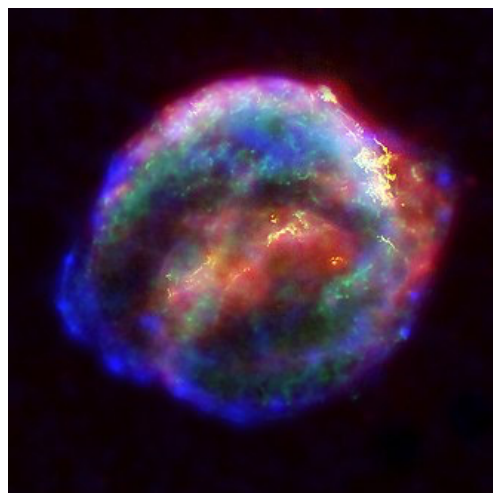
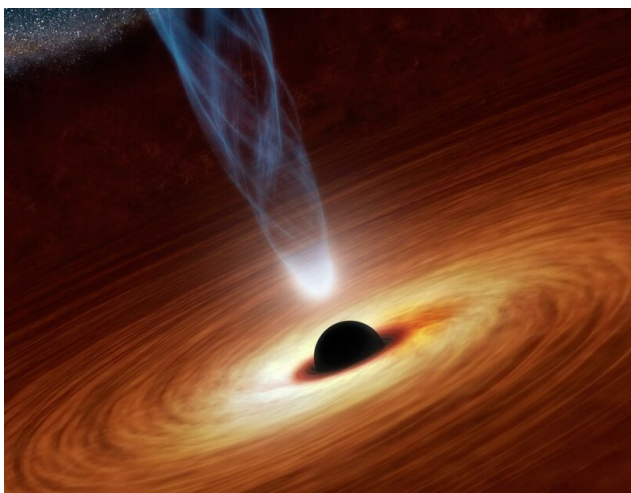
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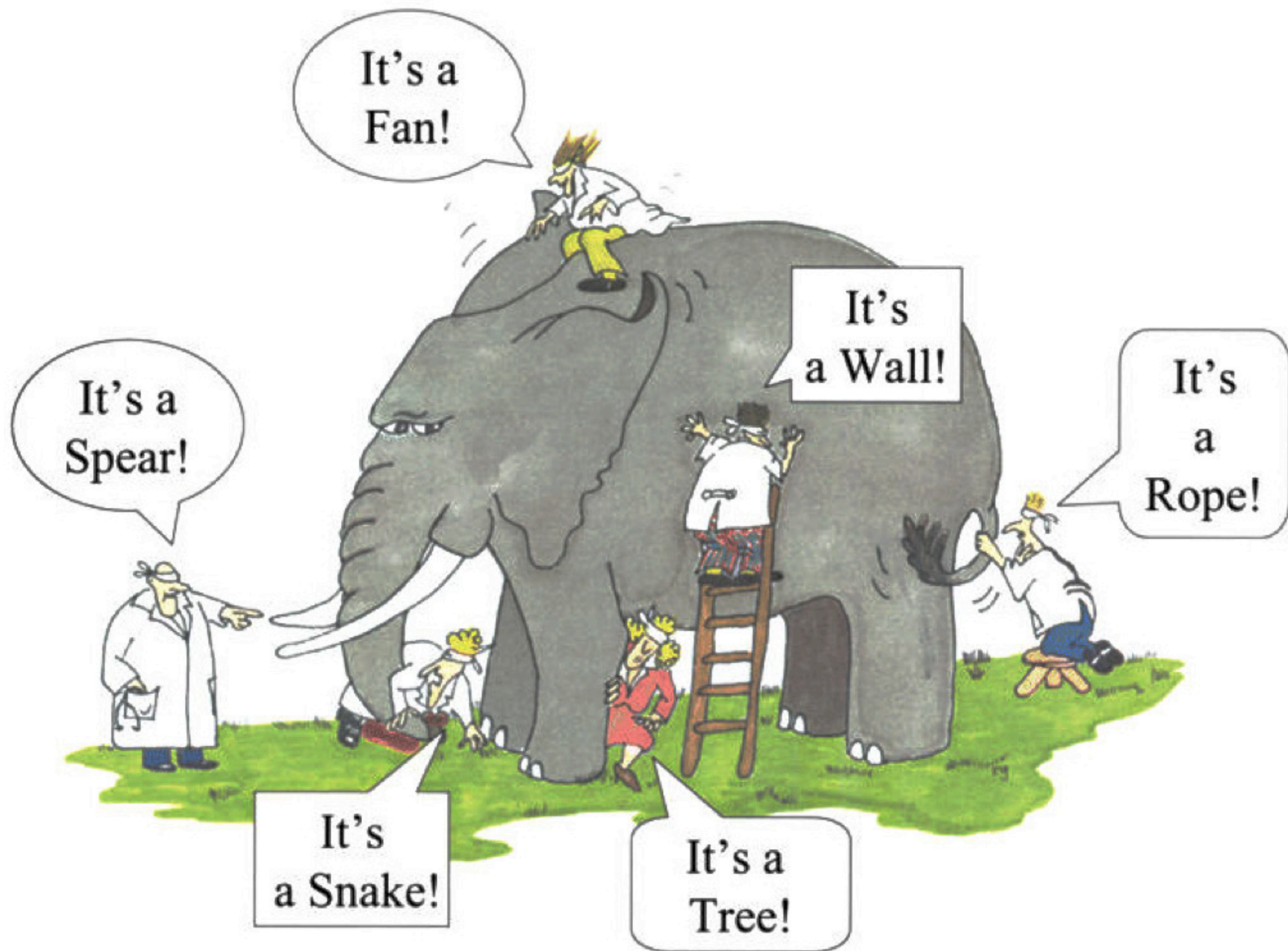
Study the high energy phenomena at play in the Universe:

- accretion and ejection processes;
- particle acceleration mechanisms;
- origin and mechanism of transient phenomena;
- nature and origin of ultra high energy cosmic ray particles

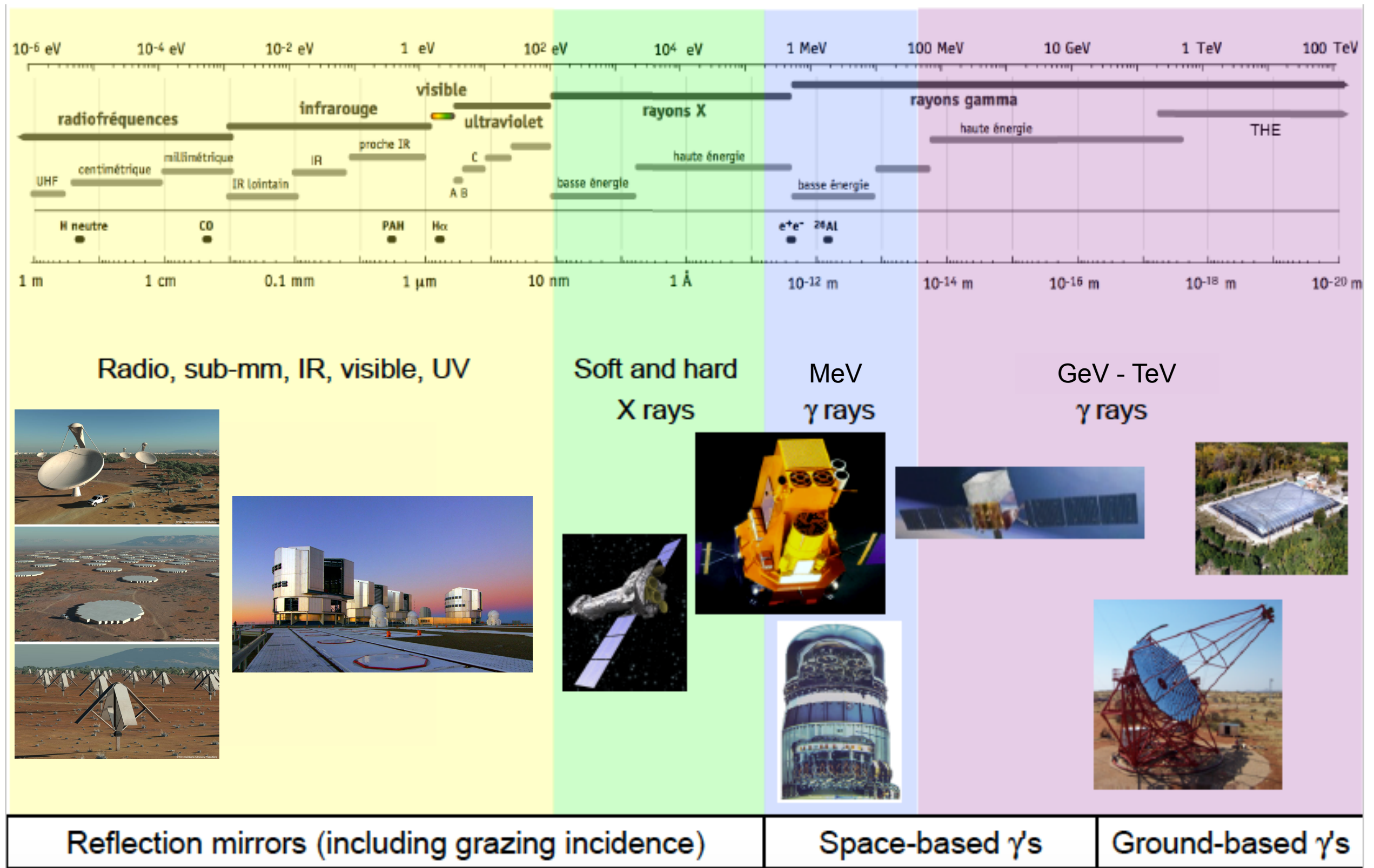
Multi-messenger / multi-wavelength approaches

Theory / phenomenology / Numerical simulations

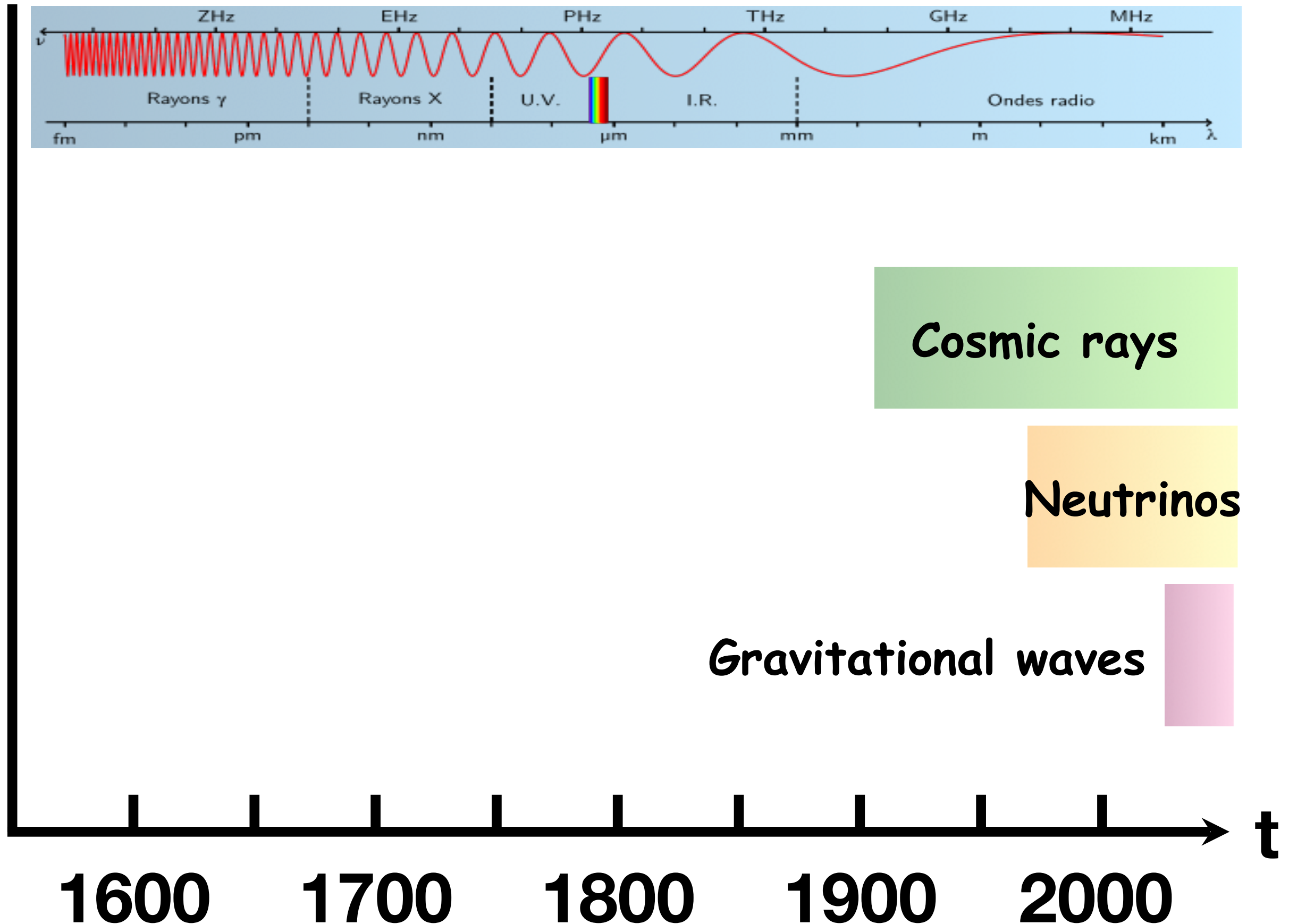




Multi-wavelength astronomy



Multi-messenger astronomy



Who we are and what we do

25 researchers (11 CNRS, 12 Univ. Paris Cité, 3 CEA), 3 (7) postdocs, 9 PhD students

We currently run/participate to 10 projects:

- Underwater neutrino telescopes
 - ANTARES
 - KM3NeT
- Ground based gamma ray telescopes
 - HESS
 - CTA
- Space borne telescopes
 - Cosmic rays → JEM EUSO
 - Photons → Athena, Integral, SVOM, (CATCH, THESEUS, ...)
 - Educational nano sat → IGOSAT
- ...and we do theory/phenomenology/simulations

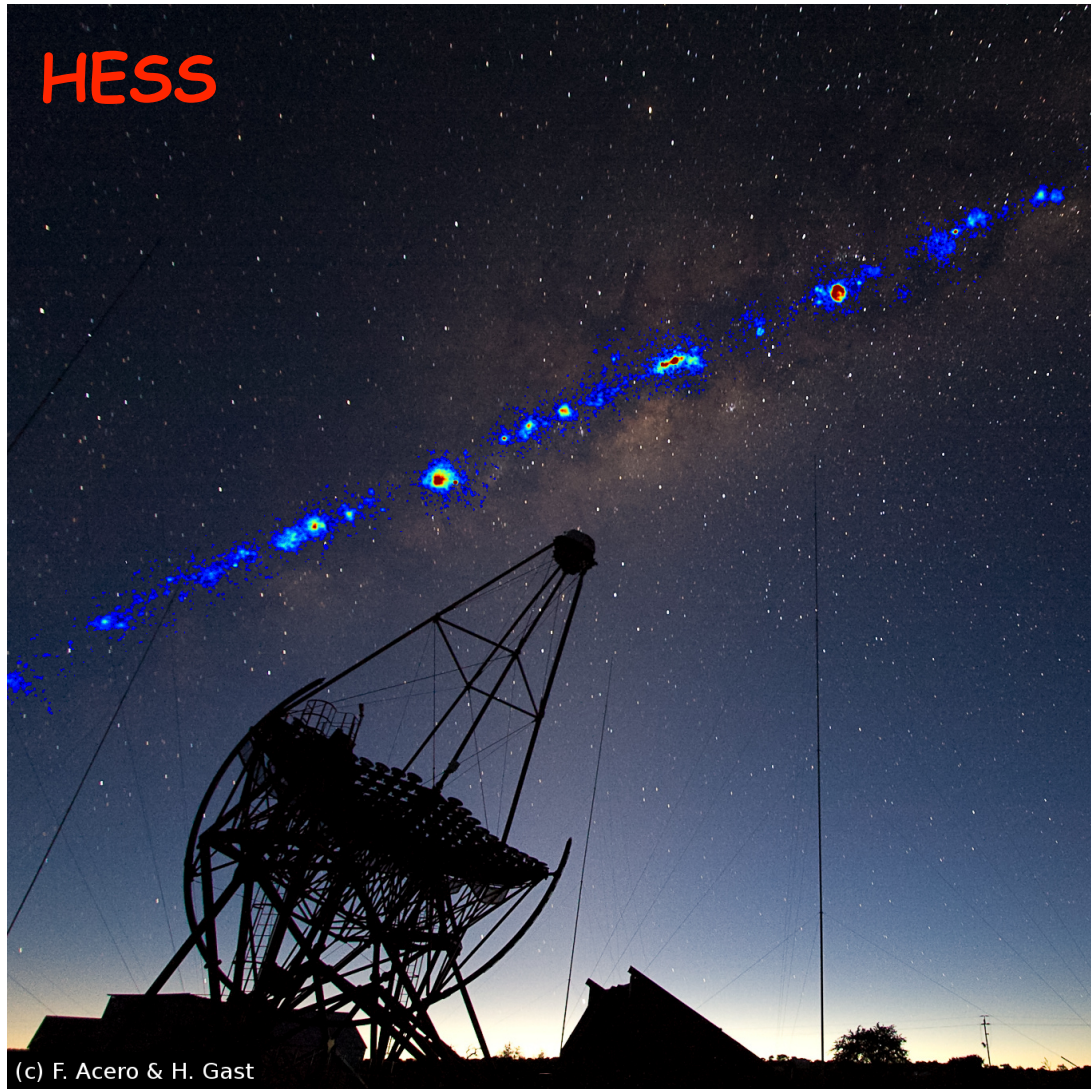
Ground based instruments



19 team members
2 projects

Ground based instruments: the HESS/CTA team

HESS



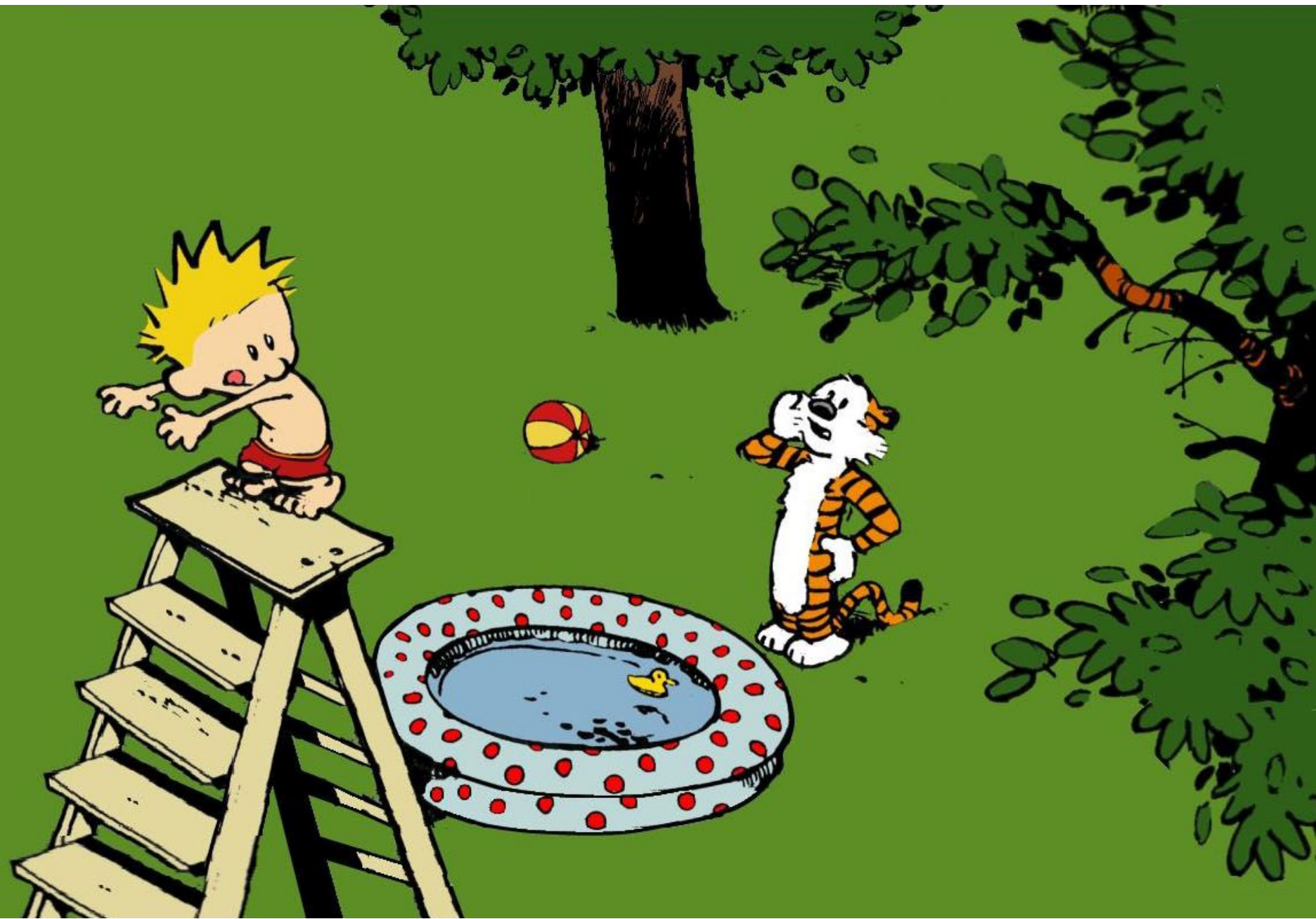
(c) F. Acero & H. Gast

Exploring the very-high-energy
gamma-ray sky ($E > \text{GeV}$)
(understand particle
acceleration)

CTA (artist's view)

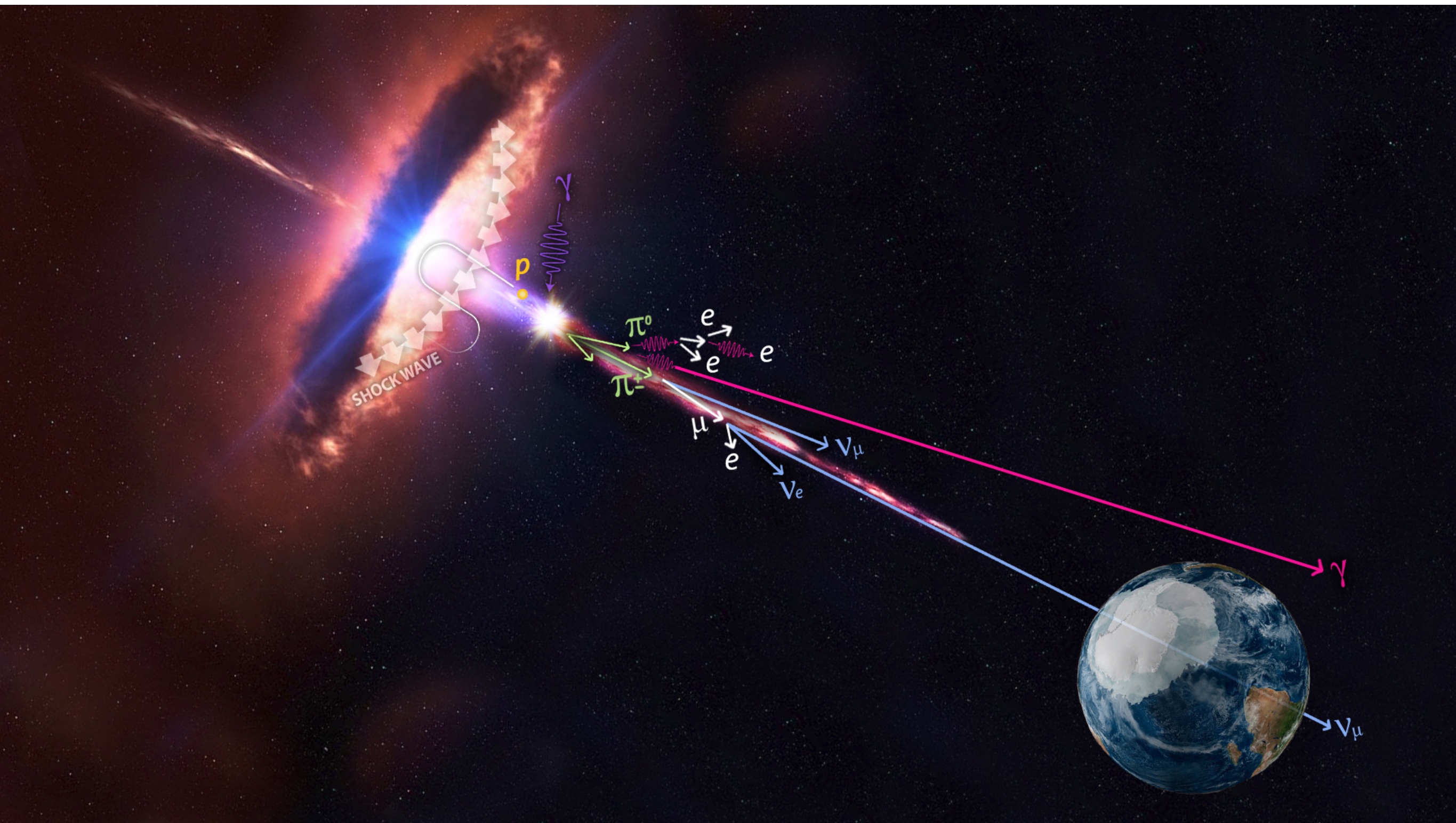


15 team members
2 projects

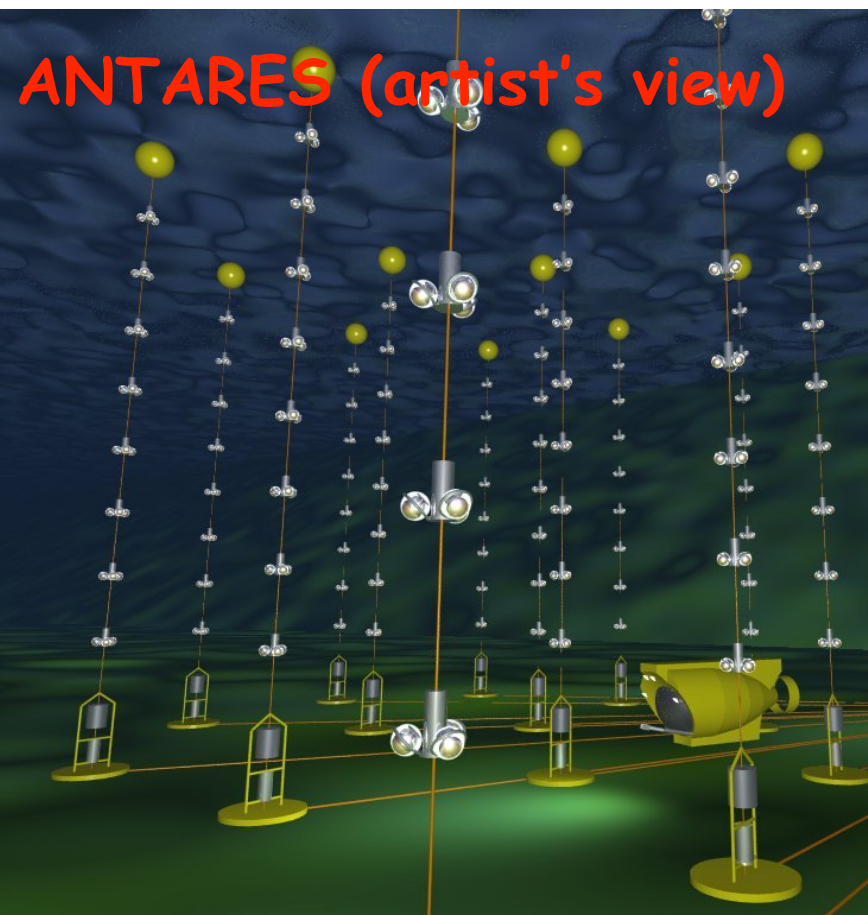


Underwater instruments

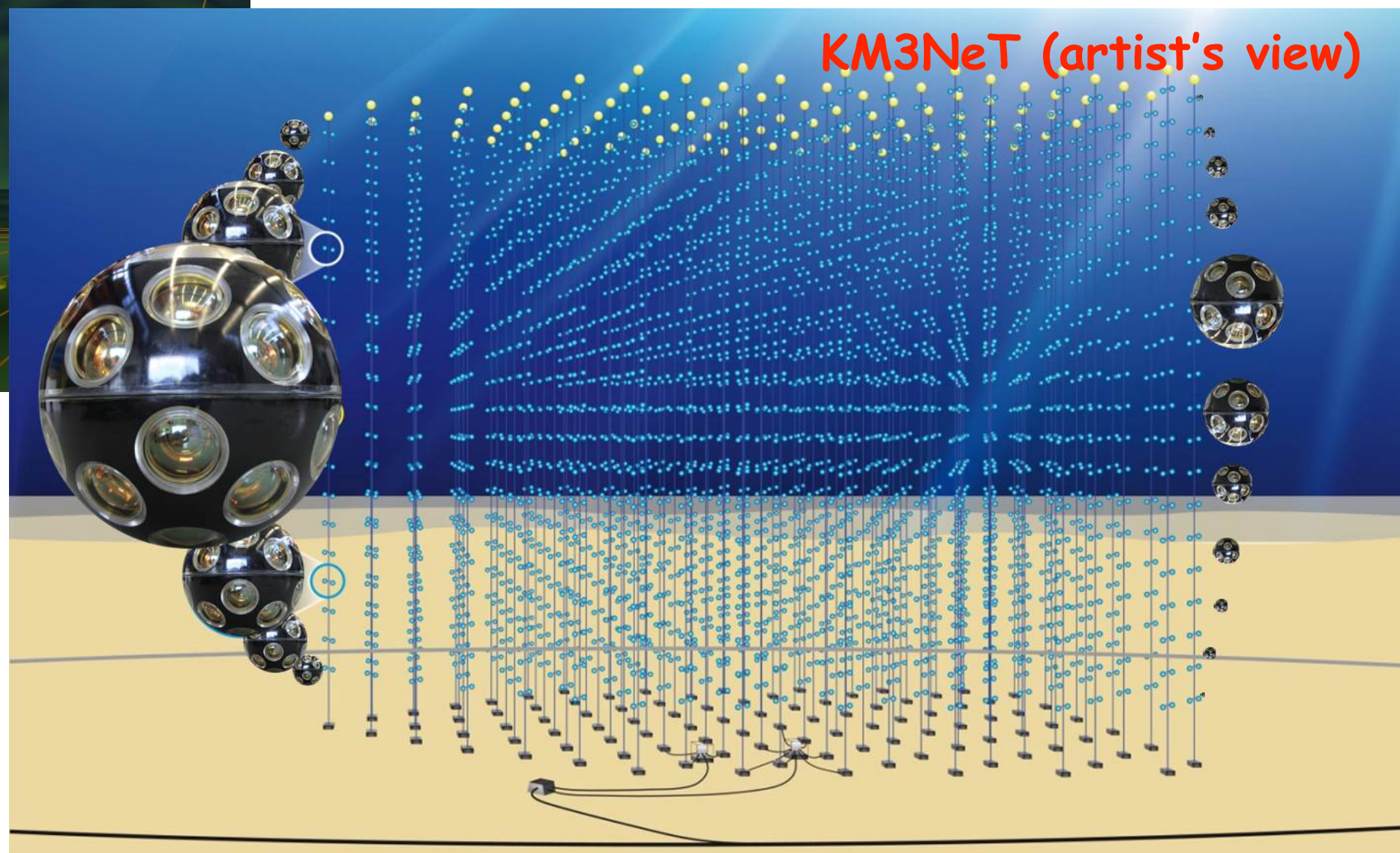
Underwater instruments: the ANTARES/KM3NeT team



Underwater instruments: the ANTARES/KM3NeT team



Searching for very-high-energy astrophysical neutrinos
⇒ understand the origin of high-energy cosmic rays



11 team members
6 projects



Space borne instruments

Space borne instruments

Six space projects:

- Educational nano sat
 - IGOSAT
- Cosmic ray studies
 - JEM-EUSO
- Photon detectors
 - INTEGRAL (the past...)
 - SVOM (...the present...)
 - CATCH (future)
 - THESEUS (future)
 - ATHENA (future...)

Cosmic ray observations from space: JEM EUSO

Detection of the highest energy cosmic rays ($>10^{19}$ eV)

HIGHLIGHTS

MINI-EUSO on the ISS since 2019 and operative since then.

- PI/Spokesperson @APC

- WP leadership

- ☐ Detection Units (Elementary Cells - ECs)

- ☐ Calibration focal surface

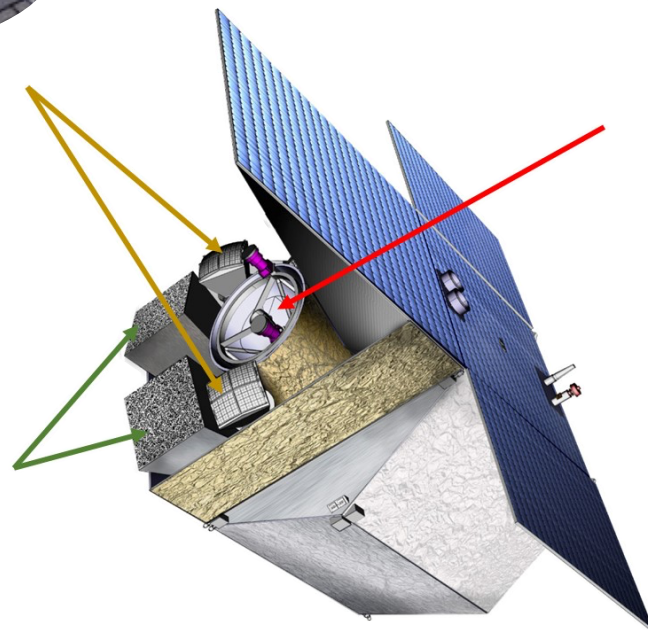
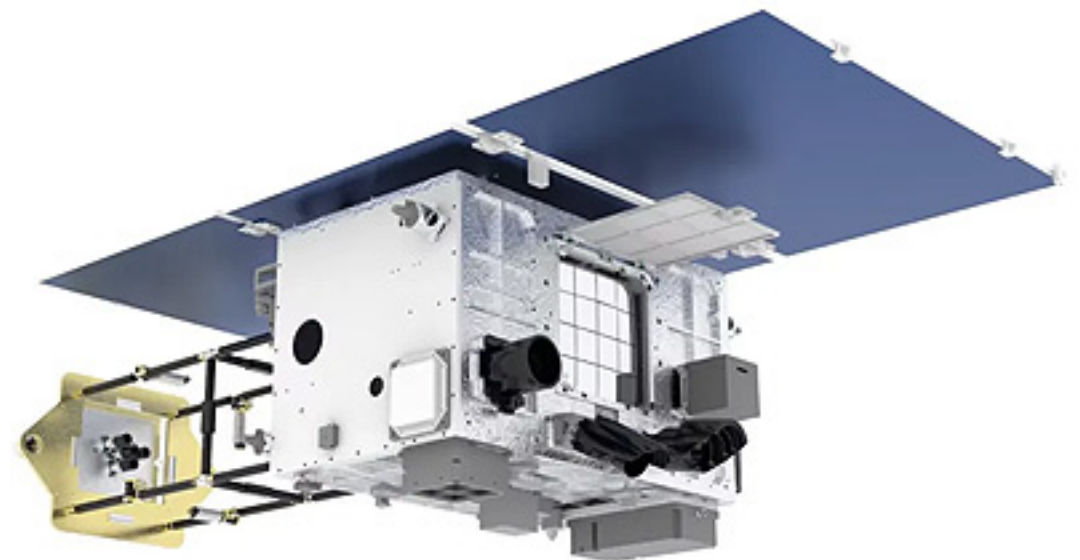
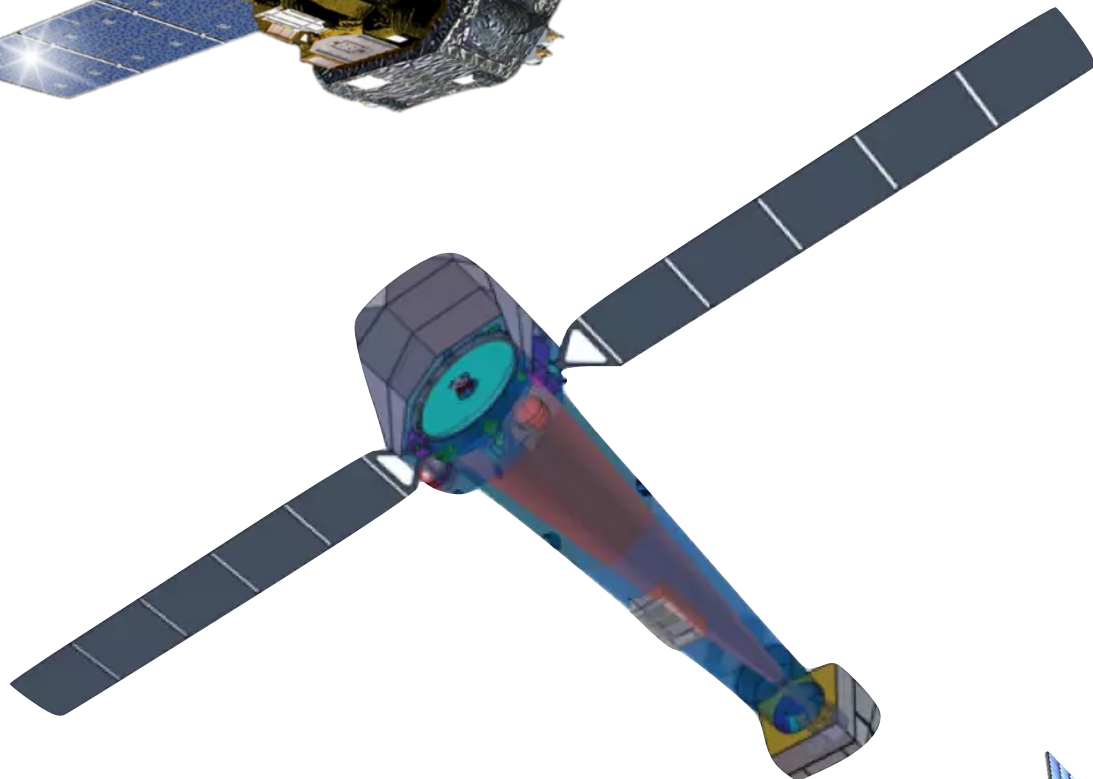
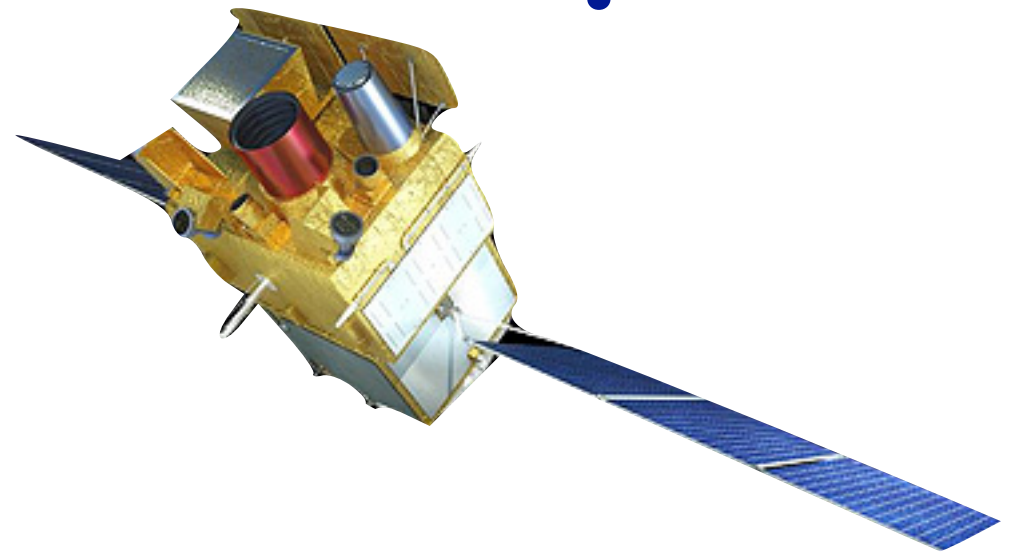
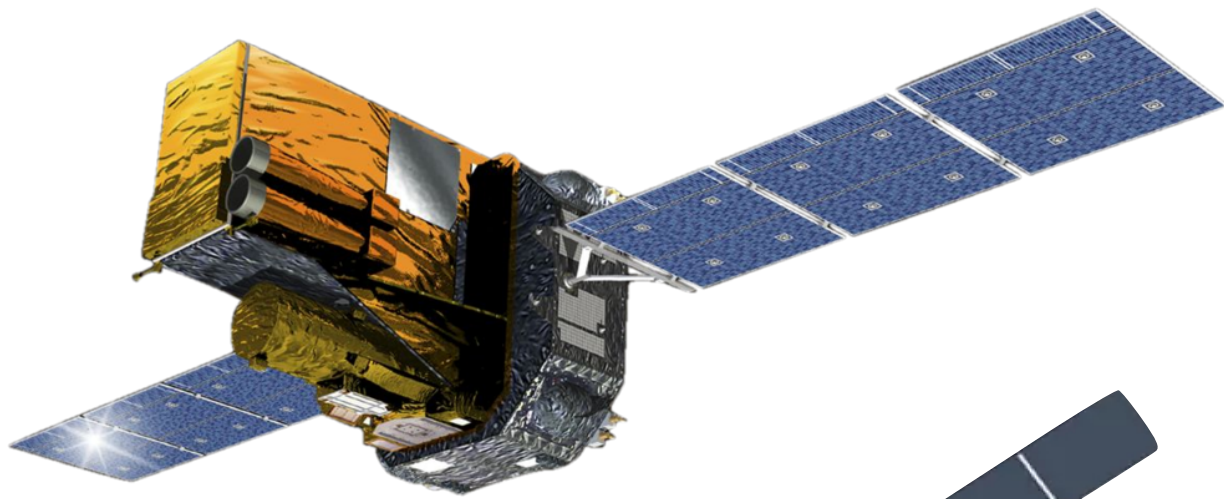
- Technical activities

- ☐ Integration of the focal plane from EUSO-SPB2 (NASA long duration balloon flight in 2023)

- ☐ ECs used for EUSO-SPB2 and will be used for POEMMA (NASA)



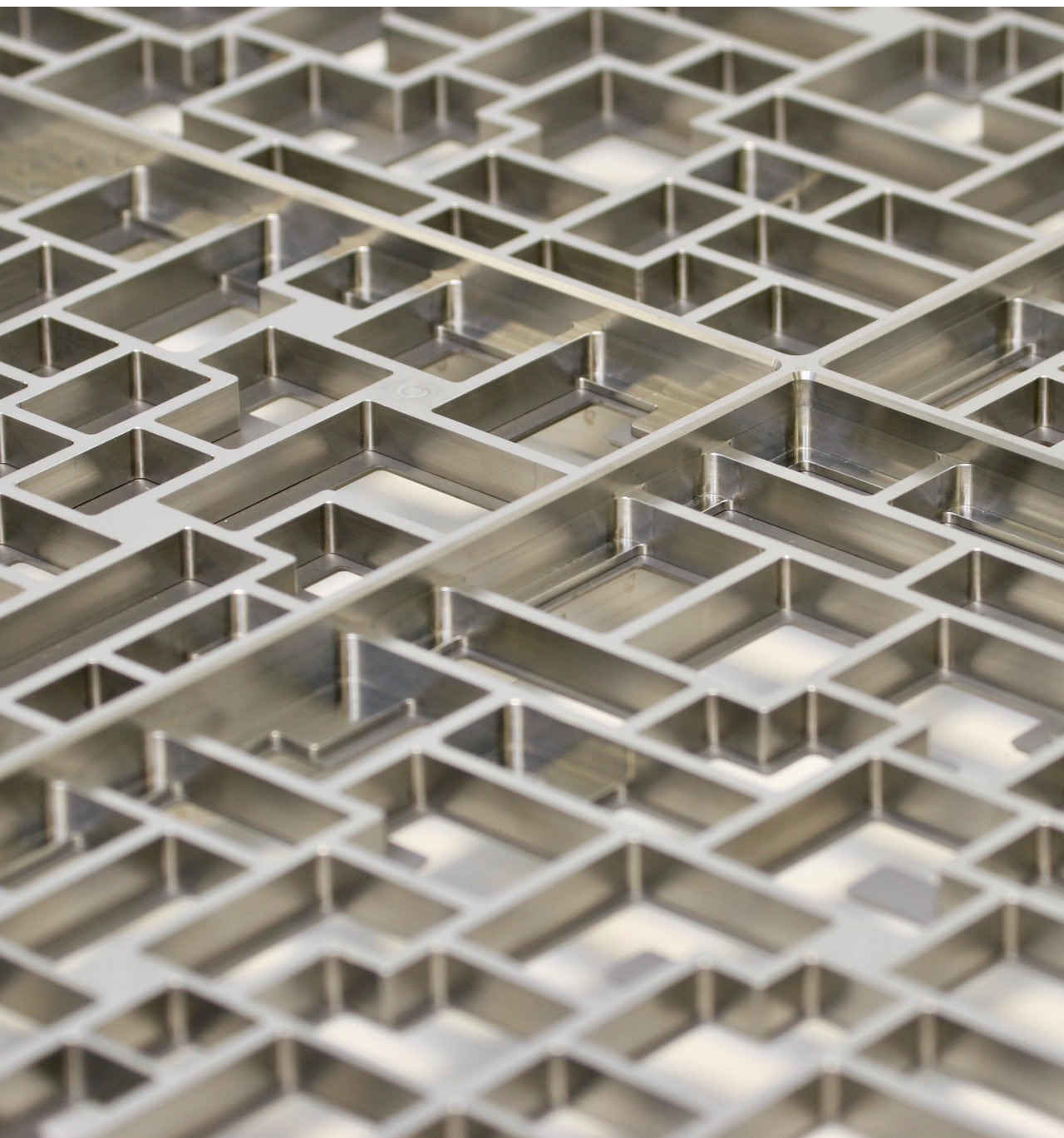
Space-based telescopes



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

HIGHLIGHTS

Main lines of research:

- X-ray and multi-wavelength observation of the Galactic centre
- Studies of binary systems/compact objects
- Multi-wavelength study of SNRs/PWNae



Theory, simulations...



8 team members
4 main lines of research

Theory, phenomenology, simulations...

HIGHLIGHTS

Research activities in:

- Galactic cosmic rays
- Ultra High Energy Cosmic Rays
- AGNs modelling
- Numerical simulations