



# Exploring the transient sky with *SVOM*

Alexis Coleiro | APC - Université Paris Cité



October 13 2025 | Assemblée Générale GdR Ondes Gravitationnelles

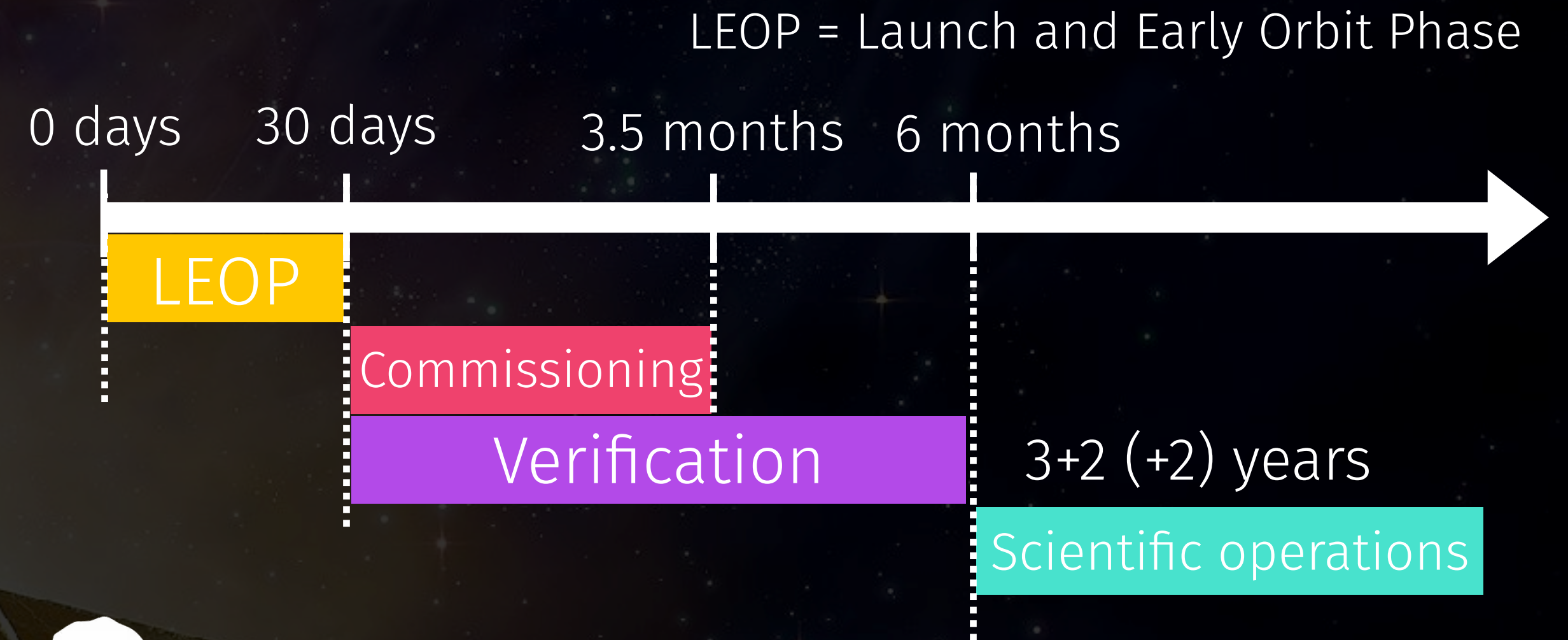
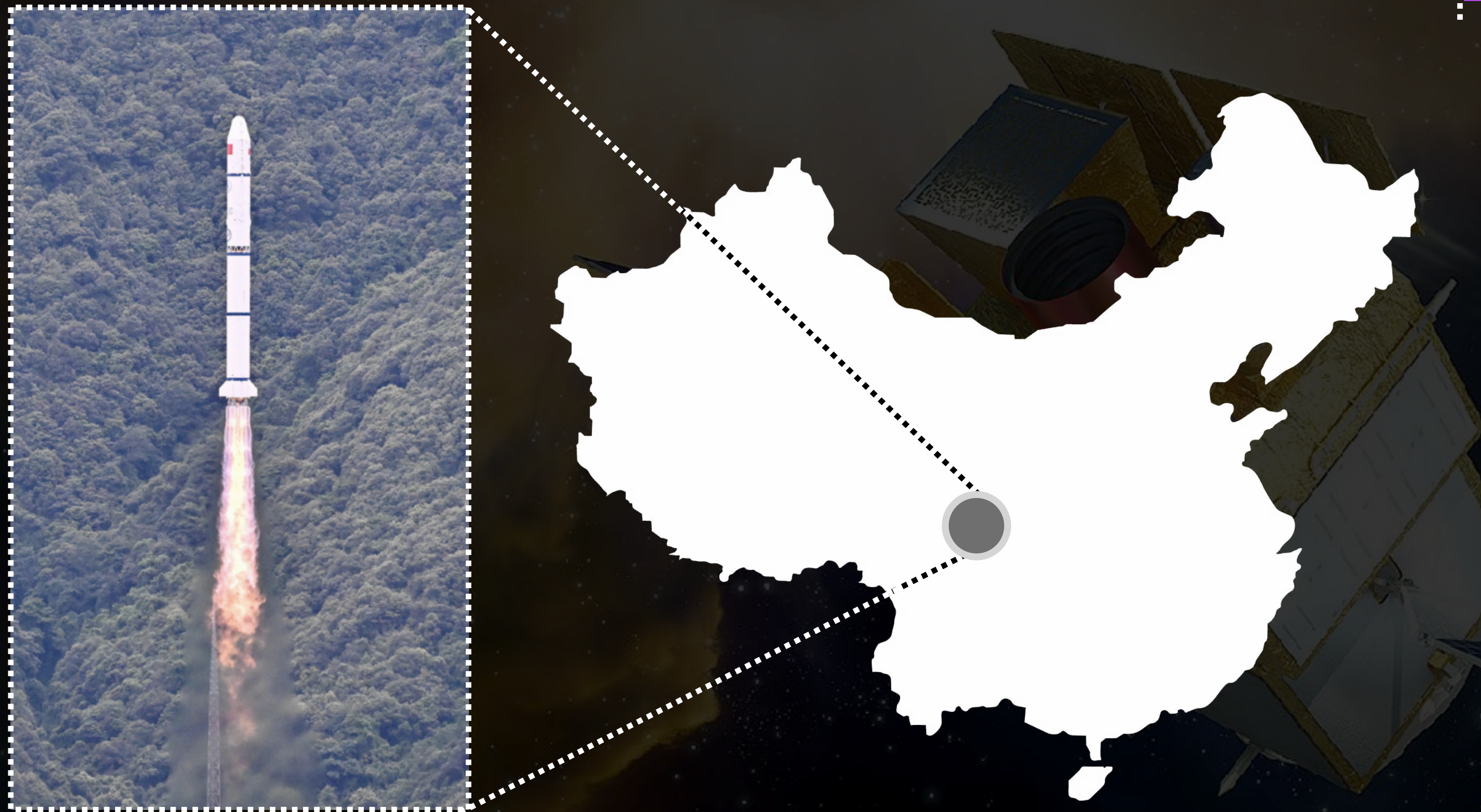


# SVOM launch

China/France collaboration

Launched on **June 22, 2024**

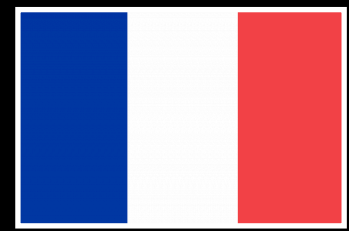
at 7:00 UT from the Xichang Space Center





# The SVOM mission

## ECLAIRs



### « The trigger camera »

Wide-field X and  $\gamma$  rays telescope

4—150 keV

Loc. accuracy: < 12 arcmin

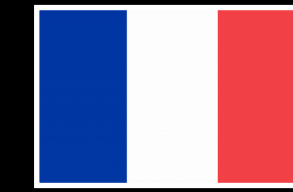
## The Visible Telescope



Narrow-field visible telescope

Loc accuracy: < 1 arcsec

## MXT



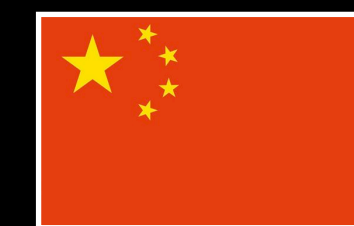
### Microchannel X-ray telescope

Narrow-field X-ray telescope

0.3—10 keV

Loc accuracy: < 1 arcmin

## GRM

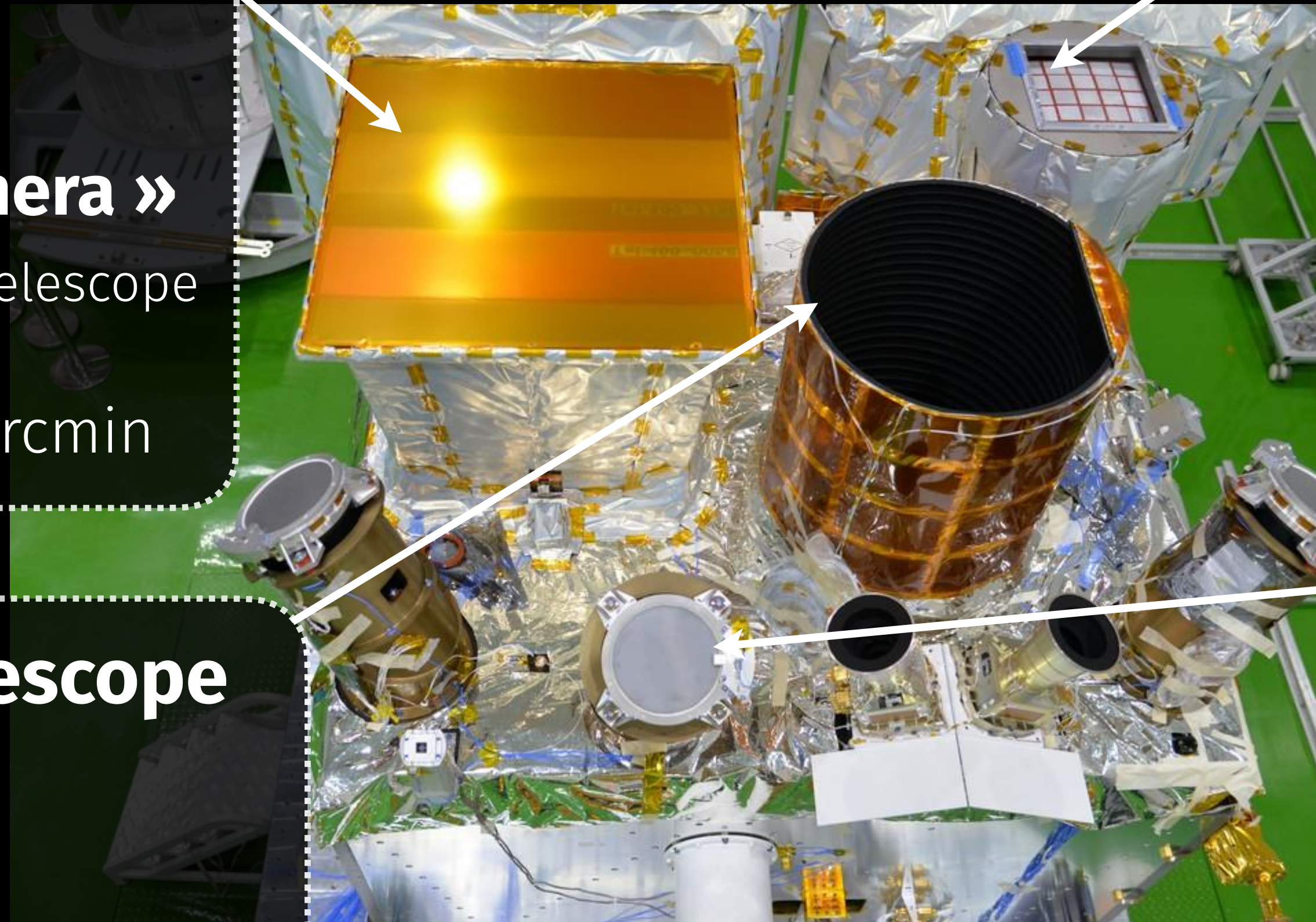


### Gamma-ray Burst Monitor

X and  $\gamma$  rays detectors

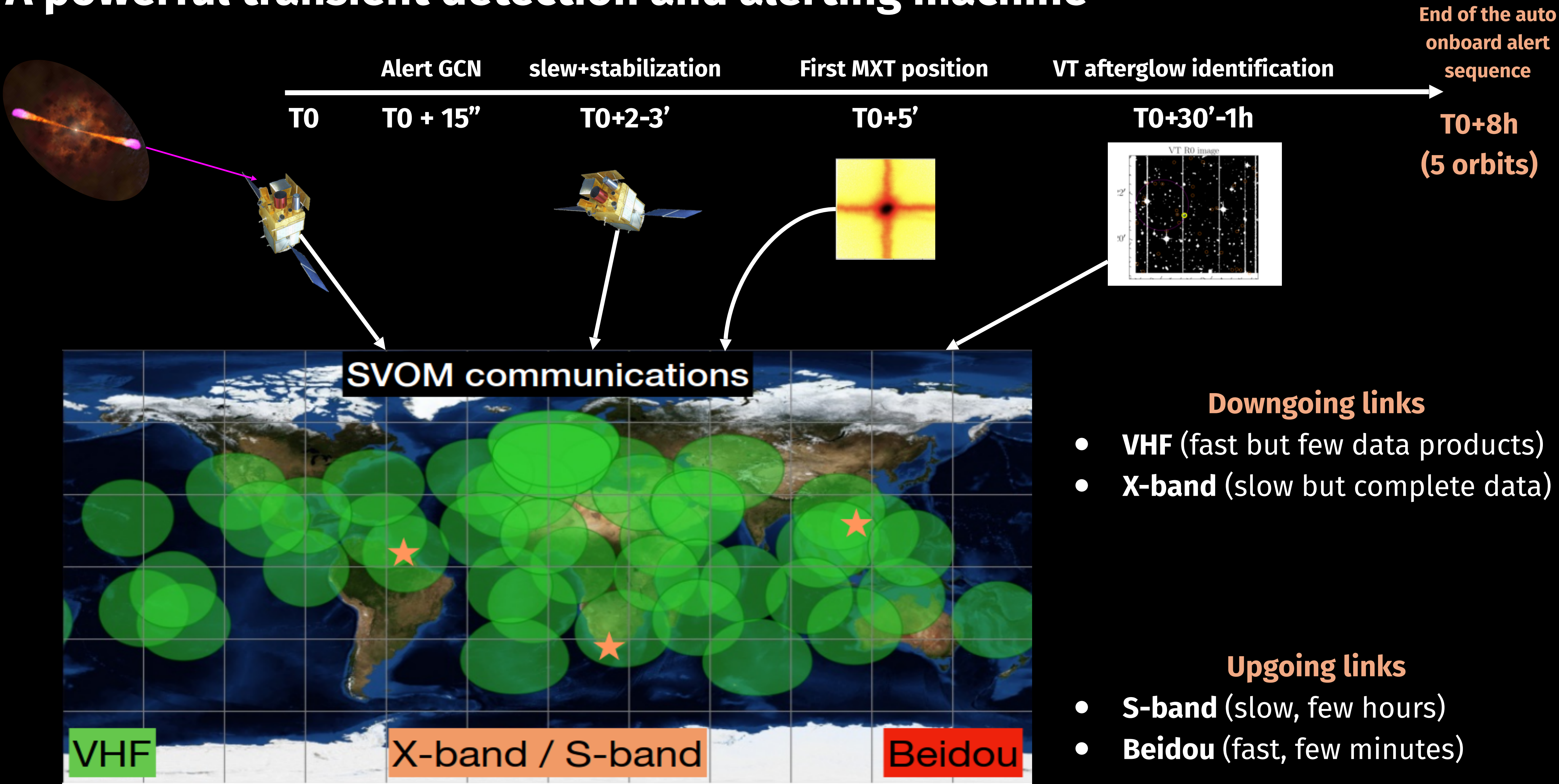
15 keV — 5 MeV

Loc accuracy: < 5°





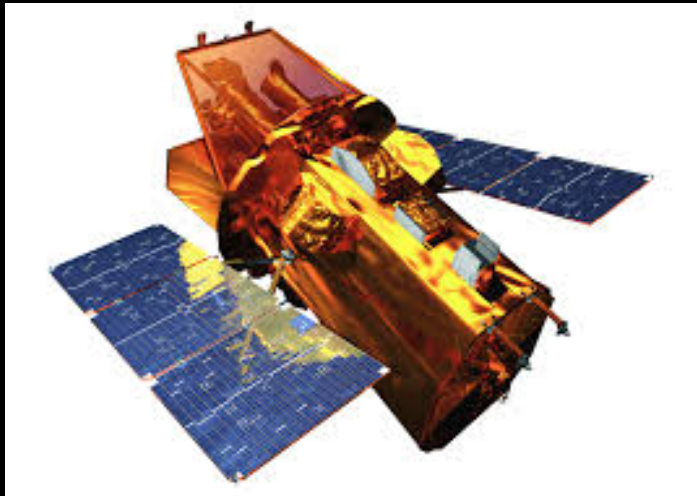
# A powerful transient detection and alerting machine





# Space and ground-based telescope synergies

Great synergies with  
Einstein Probe and  
Swift teams



Automatic ToO  
request to  
EP-FXT  
(since April 2025)  
and  
Swift-XRT  
(since Feb. 2025)

A dedicated ground-based follow-up segment  
from 25 cm to the 8m class telescopes



- Official Partners
- Associate Partners
- Purchase of time  
(LCOGT time  
coming 2025B)
- Close  
collaboration



# SVOM Scientific programs



Gamma-ray bursts

**The SVOM Core program**  
reserved to SVOM Co-Is

## The General & ToO programs

GP obs (known sources): Observation proposals awarded by a TAC (internal call for 2026).  
ToO obs (not anticipated flaring sources): requests to be submitted to the SVOM PIs (through the mission scientists)



Magnetar Giant flares



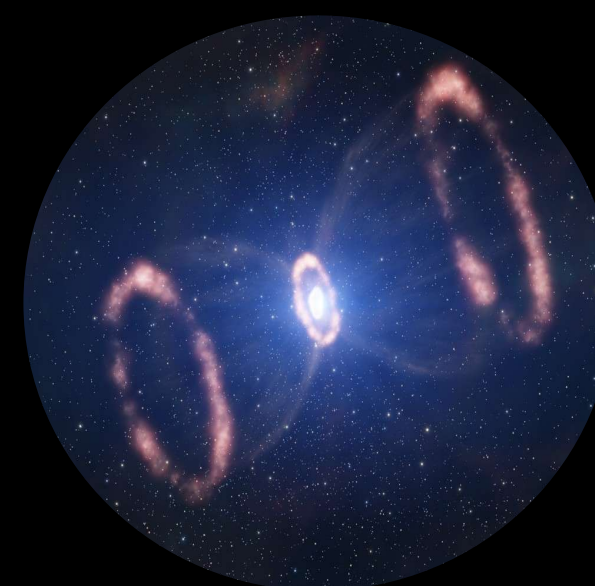
CVs, x-ray  
binaries



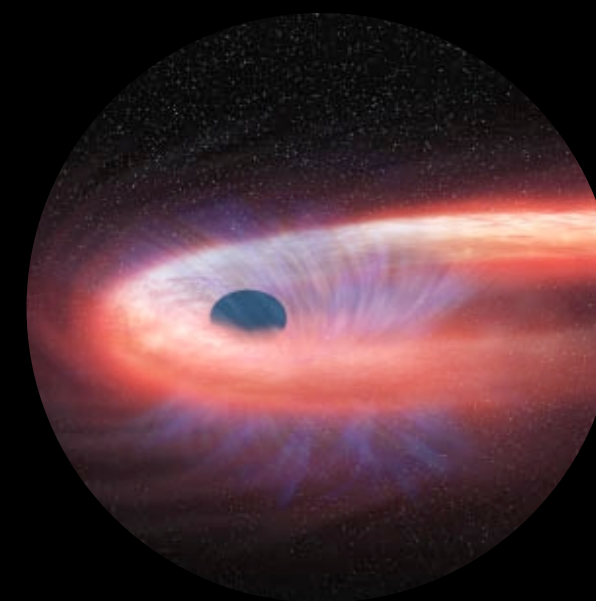
Flaring stars



AGNs/Blazars



Supernovae

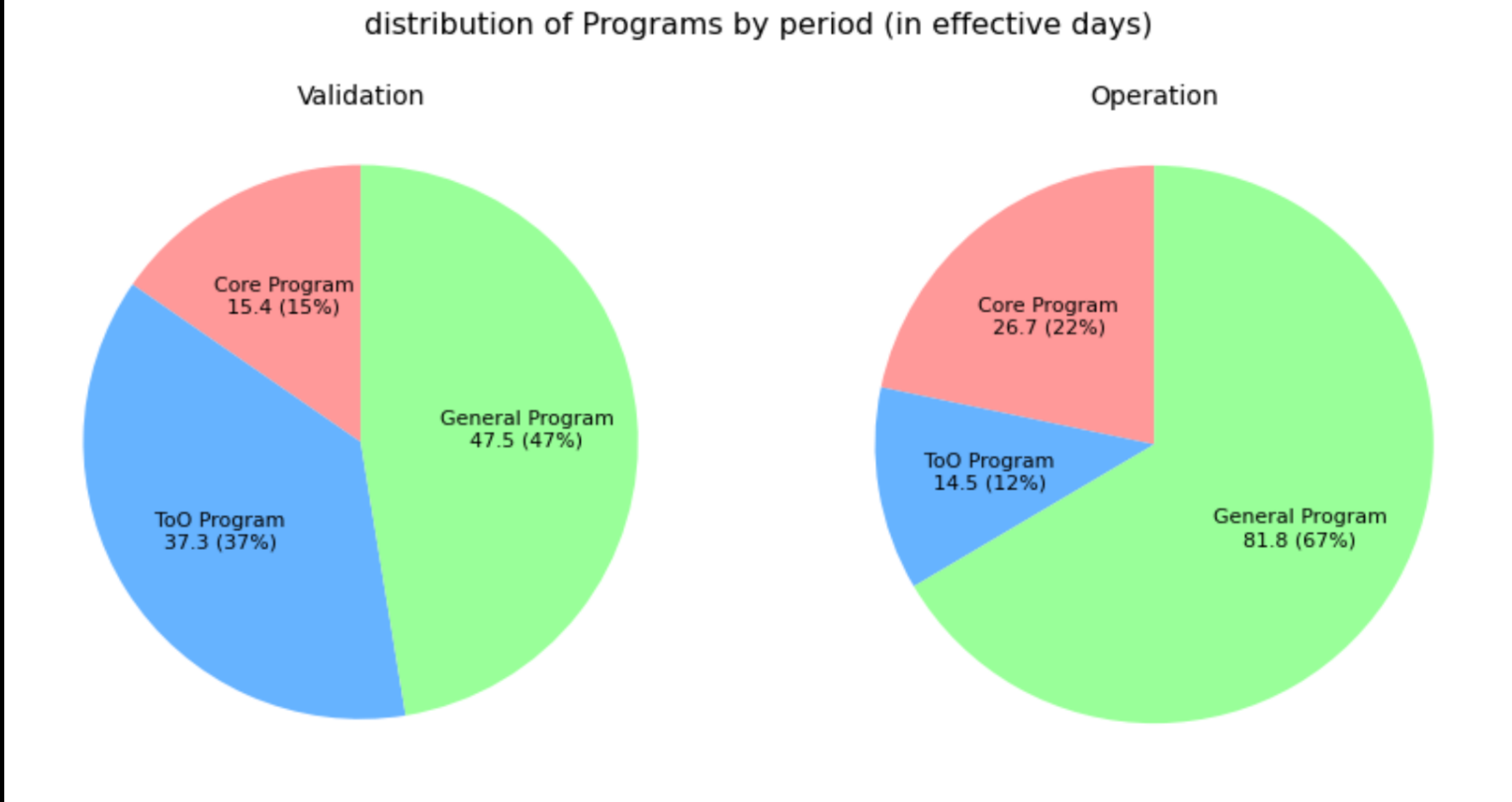
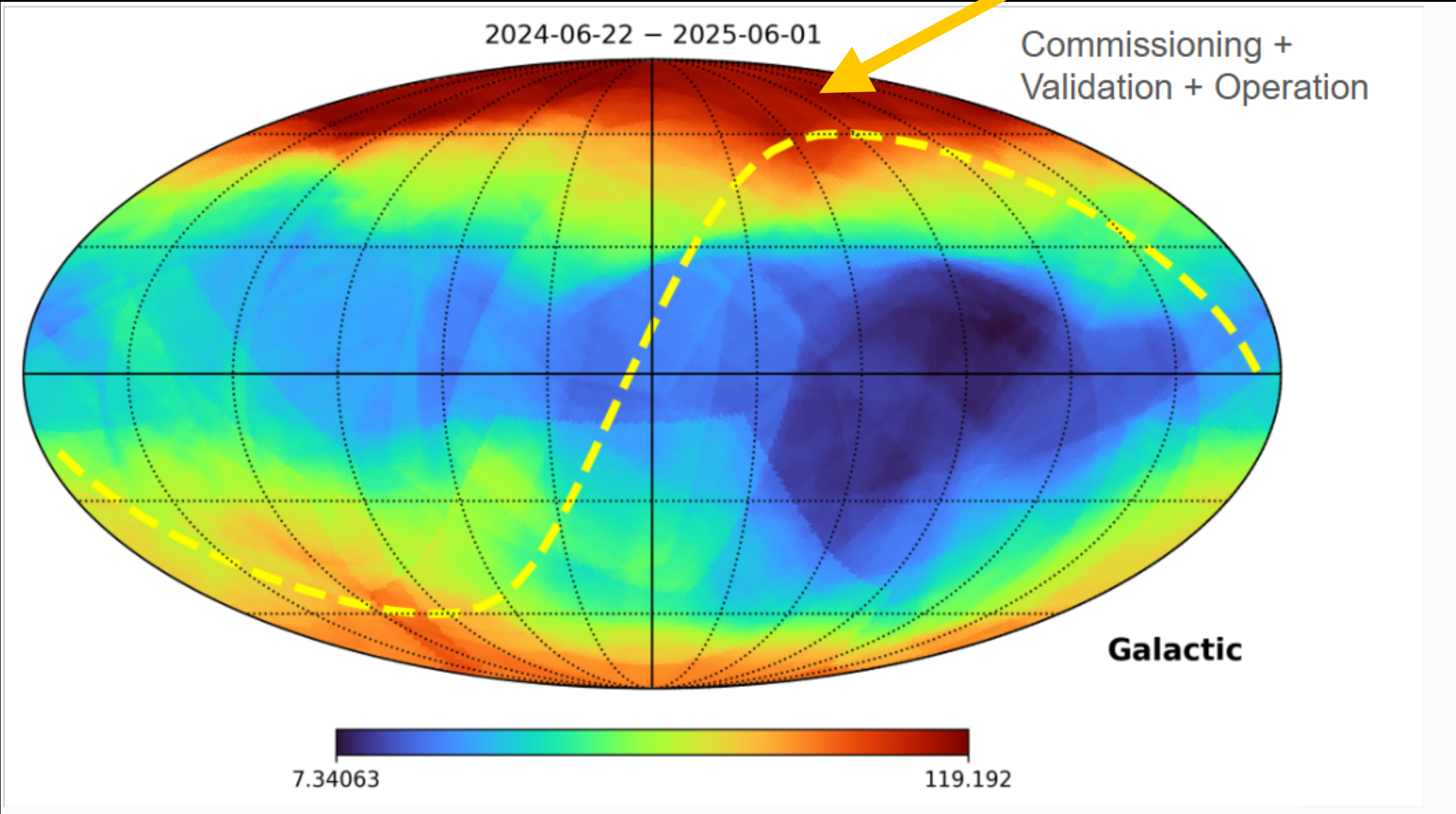


TDE, FRB, etc.



# A year of SVOM observations

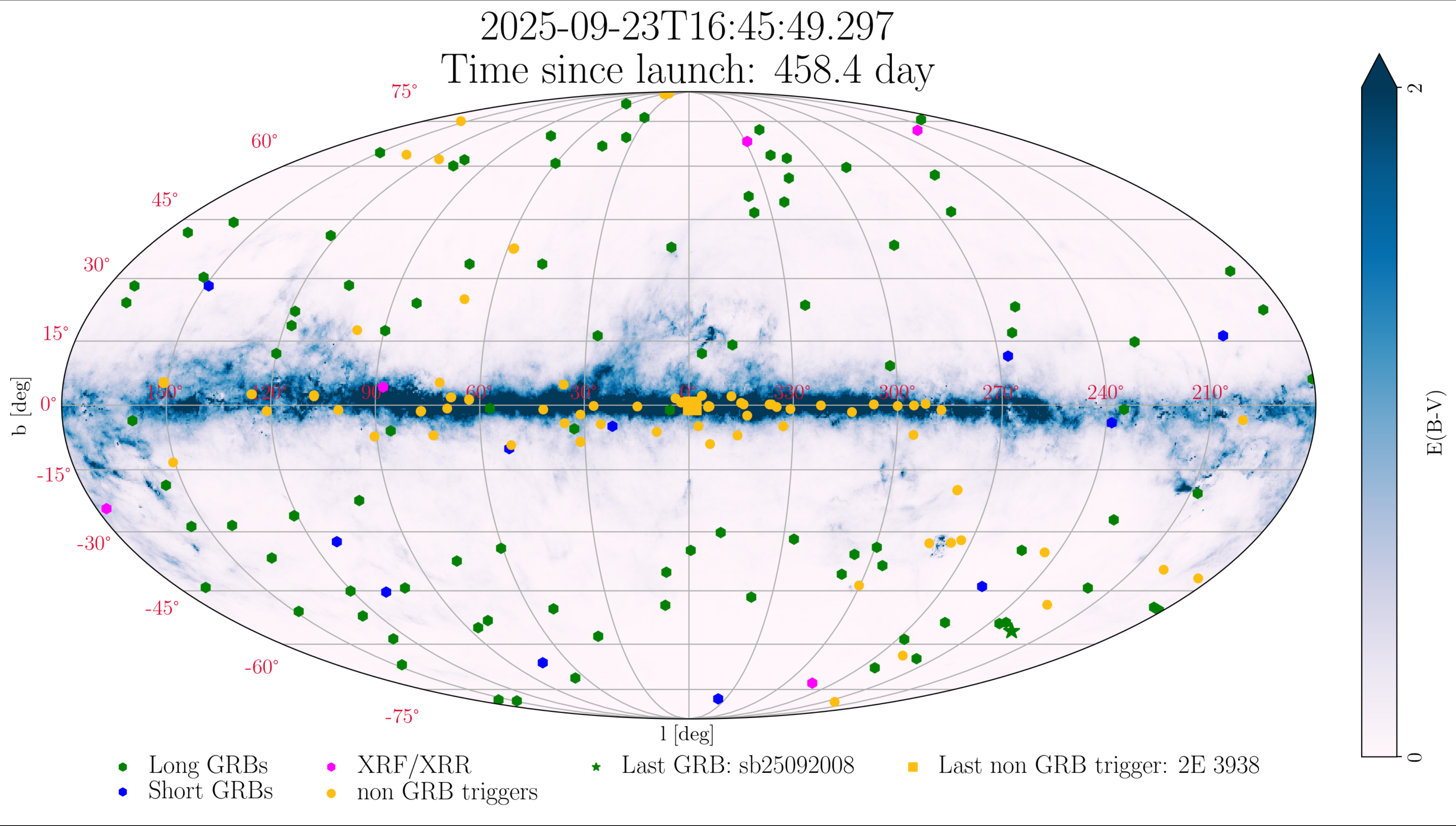
Long exposure around the Galactic poles to maximize GRB detection: avoidance of the Galactic plane + anti solar pointing strategy



Commissioning :	22/06/2024 - 01/10/2024
Validation :	10/01/2024 - 15/01/2025
Scientific exploitation :	since 15/01/2025



# A year of SVOM observations





# Gamma-ray burst science

## Gamma-ray Burst general statistics (on 1 October 2025)

GRM detection	ECLAIRs detection	Total ECLAIRs+GRM	Joint detection by other missions	# redshift
144	62	169 129 Long (76%), 25 Short (15%), 15 XRF (9%)	115 (68%)	35 (21%) 40% of ECLAIRs detected bursts

ECLAIRs median localization	MXT median localization	X-ray afterglows	Optical afterglows	Radio afterglows	z>4
~7'	~40 ''	67	49	5	4/35 (12%)

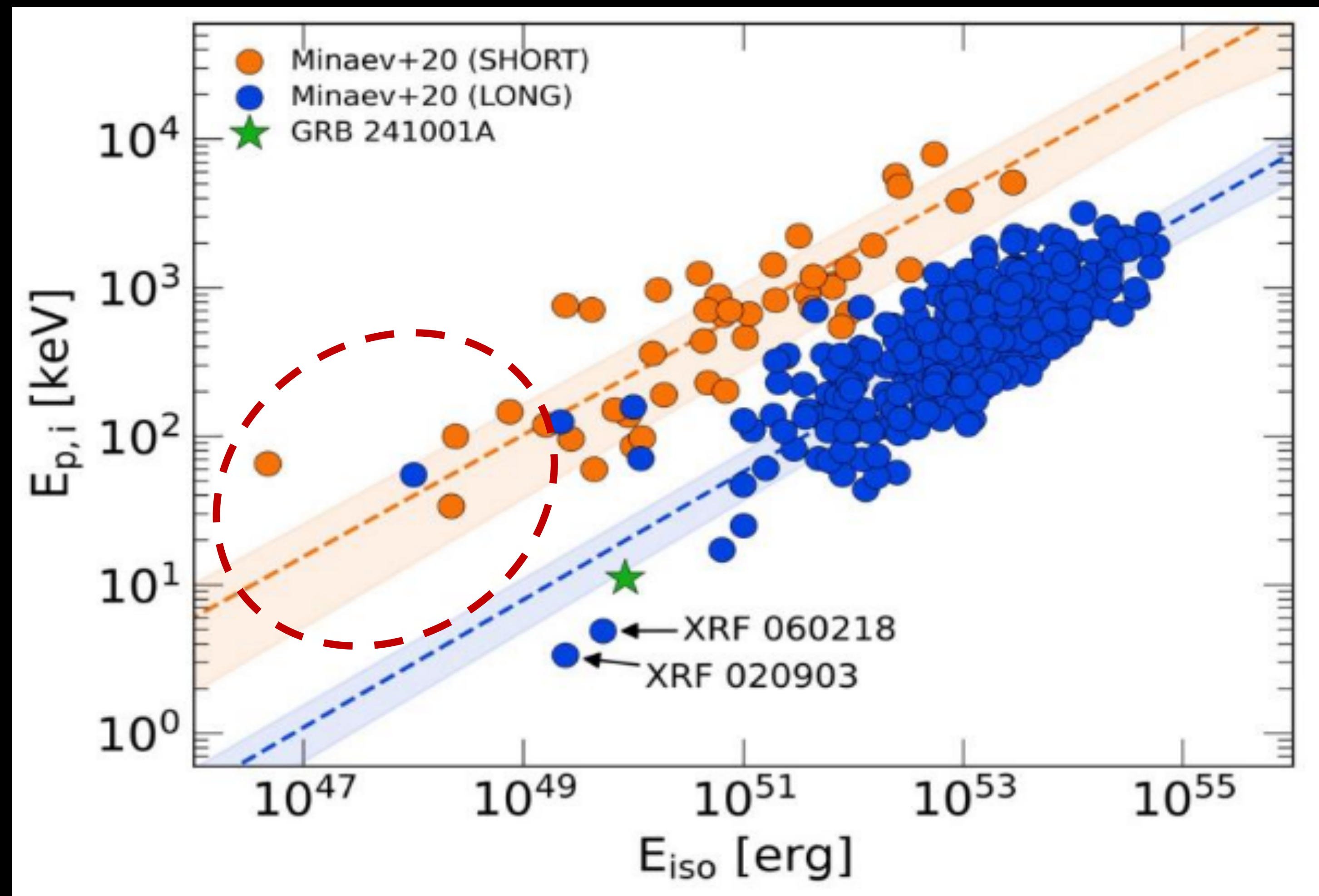


# Gamma-ray burst science

## Unveiling the poorly known XRR/XRF burst population

**SVOM goal:** bring a complete physical interpretation of the poorly known population of **very soft X-ray burts**

- connection with classical collapsar GRBs?
- Shock breakout emission?
- geometry effect  $\rightarrow$  off-axis jet?
- Low  $\Gamma$  jets?
- High redshift effect?

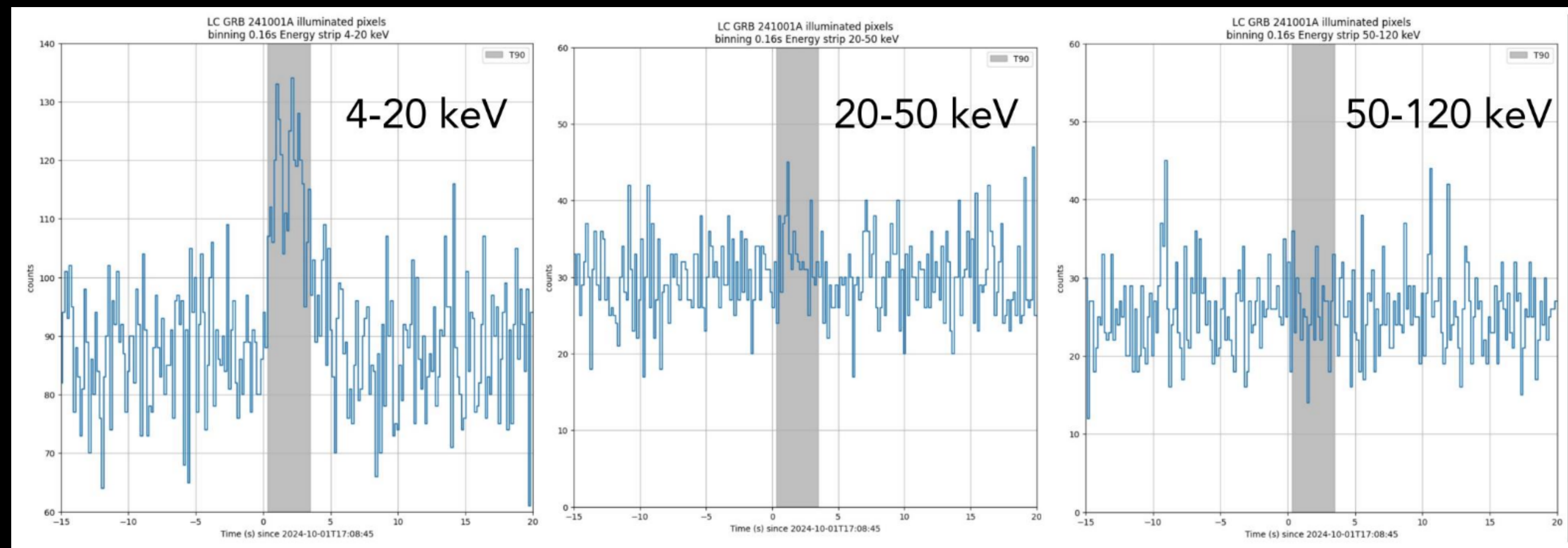




# Gamma-ray burst science

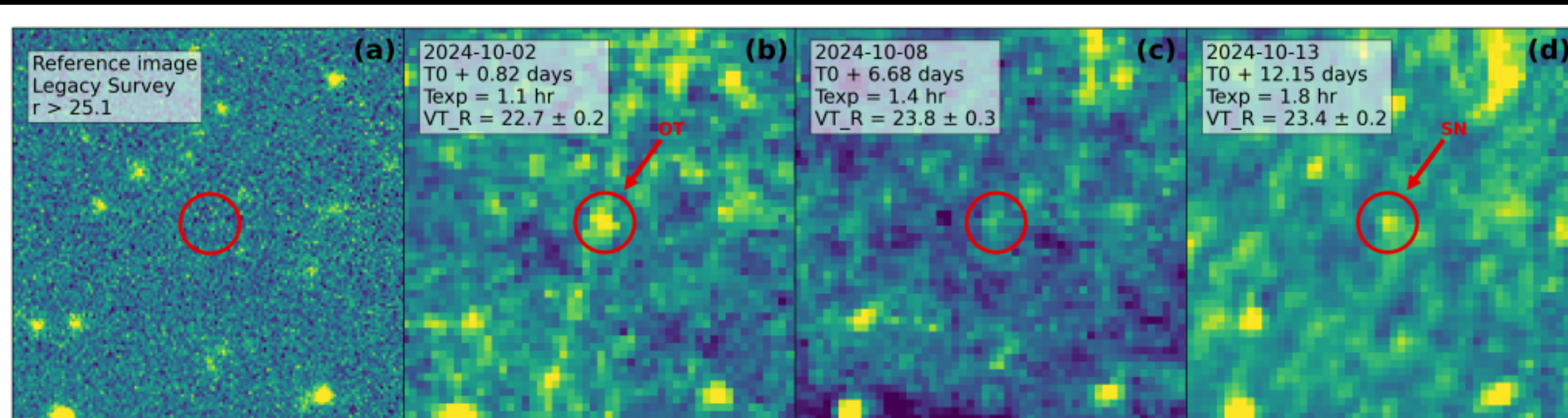
## Unveiling the poorly known XRR/XRF burst population

**GRB 241001A (SVOM) : a very soft X-ray burst associated with a type Ic supernova (seen by JWST) - Schneider et al. (in prep)**



**ECLAIRs light curve in different energy bands**

Credits: collaboration SVOM/IRAP, Marius Brunet



**Time series of VT obs.**

From  $T_{\text{GRB}} + 0.82$ d (afterglow) -  
 $T_{\text{GRB}} + 12.15$ d (Supernova rise)

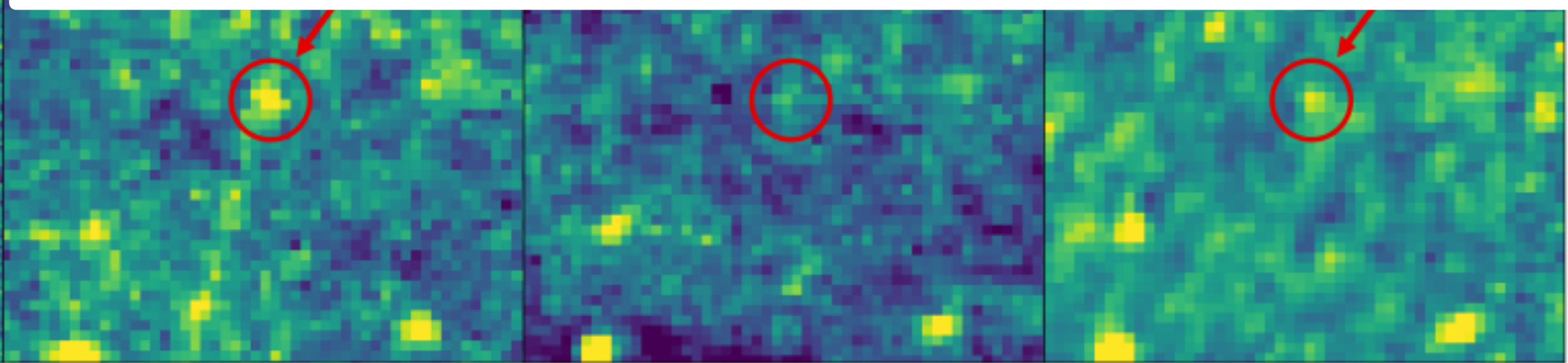
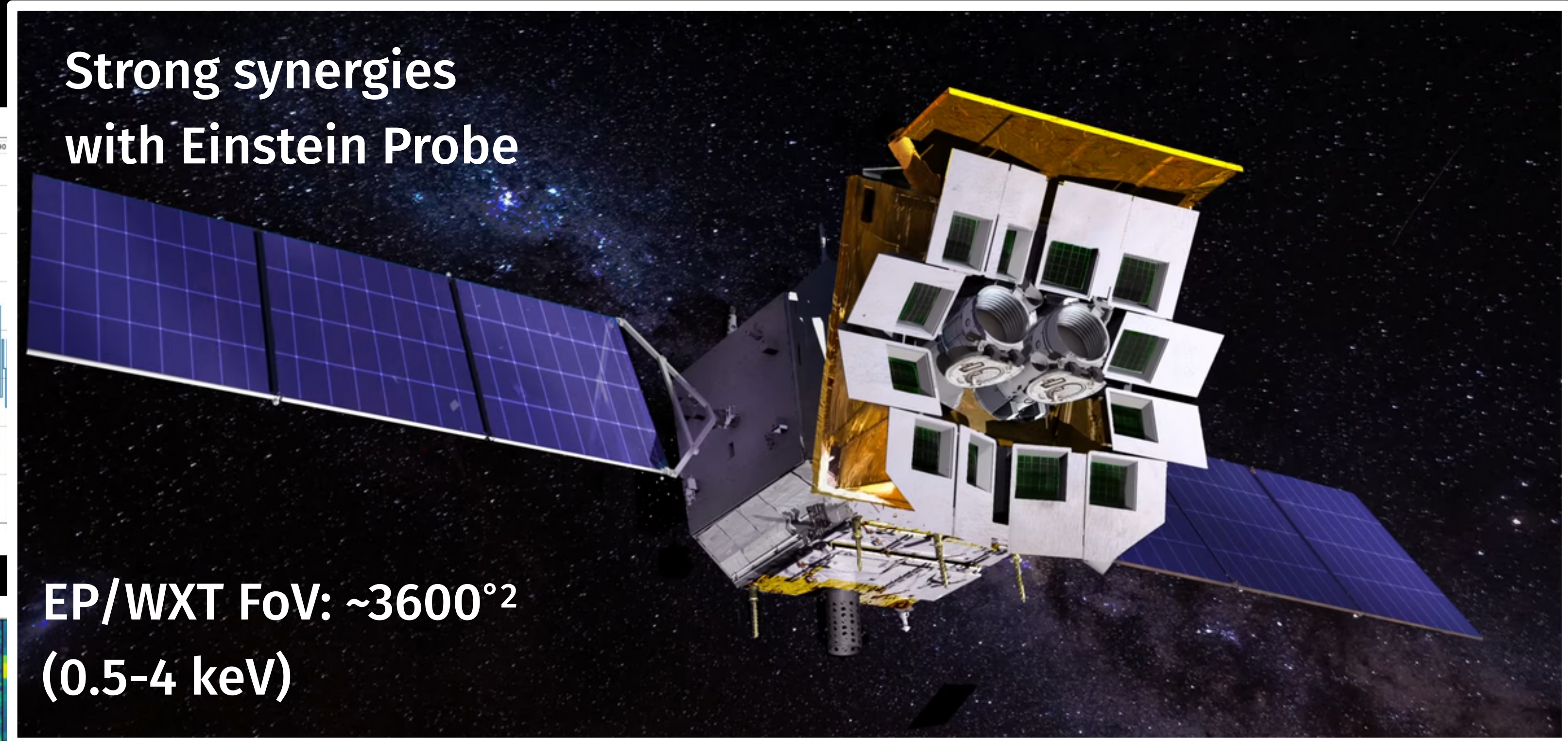
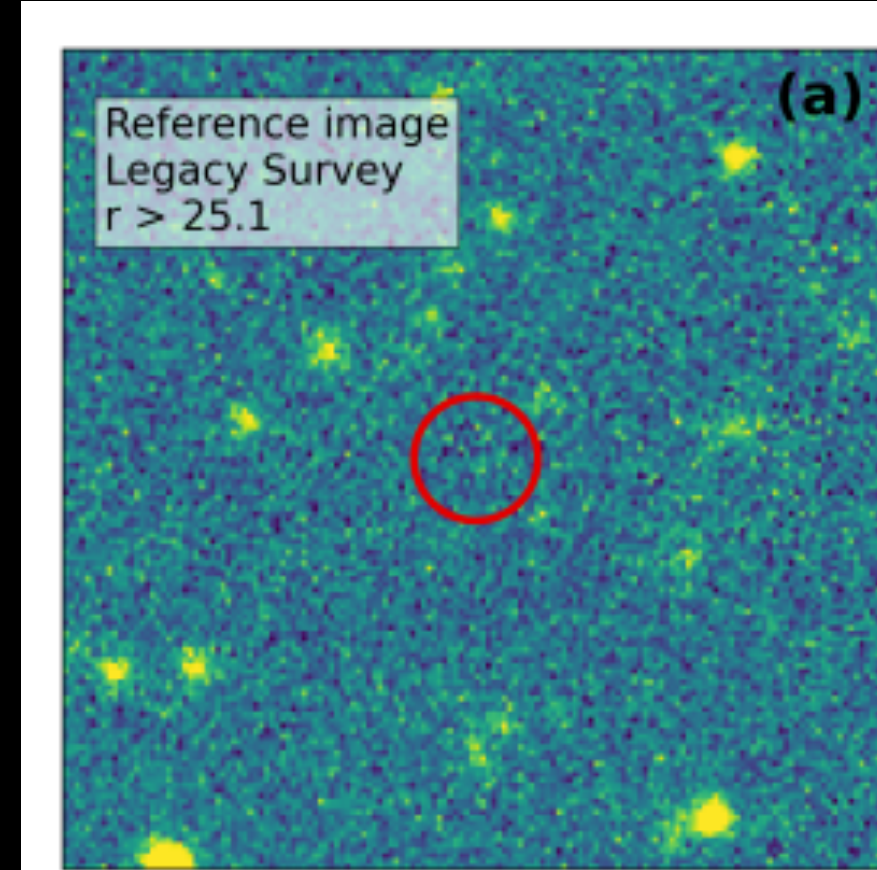
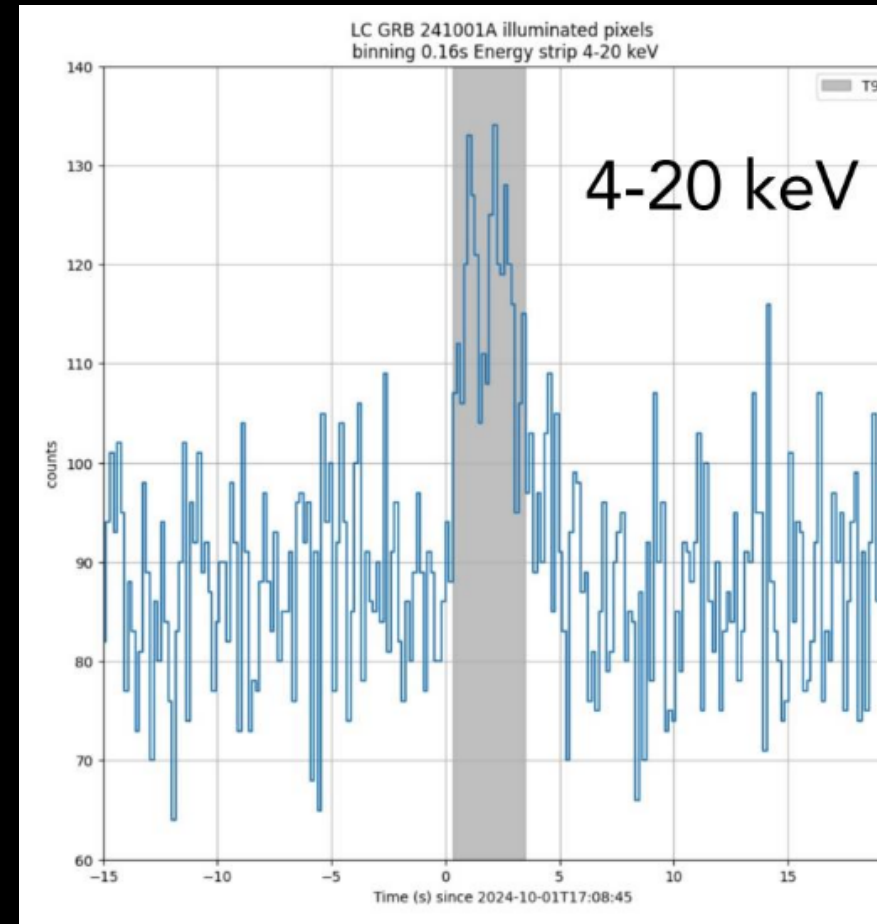
Credits:SVOM/VT, Huali li &  
Benjamin Schneider



# Gamma-ray burst science

Unveiling the poorly known XRR/XRF burst population

GRB 241001A (SVOM) :



Schneider et al. (in prep)

at energy bands

RAP, Marius

f VT obs.

From  $T_{\text{GRB}}+0.82\text{d}$  (afterglow) -  
 $T_{\text{GRB}}+12.15\text{d}$  (Supernova rise)

credits:SVOM/VT, Huali li &  
Benjamin Schneider



# Gamma-ray burst science

## Exploring the high-redshift GRB population

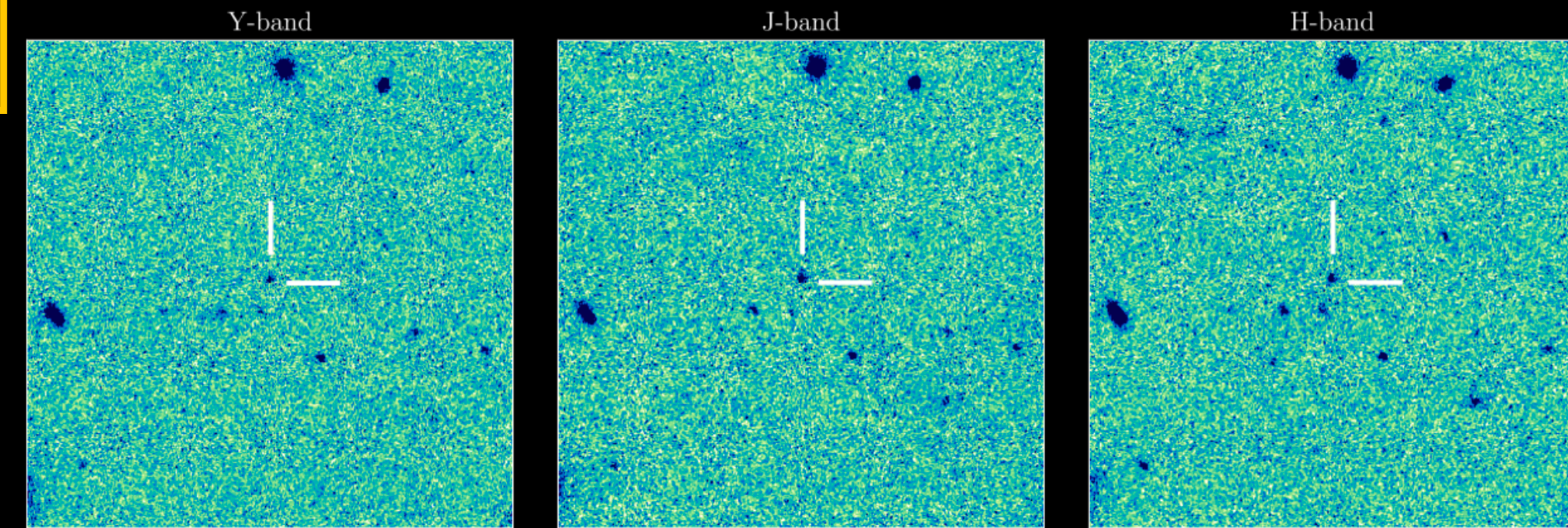
**GRB 250314A at  $z \sim 7.3$ ! : 5th most distant burst, 3rd with a spectro measurement**

12:56pm UTC — ECLAIRs sent the alert

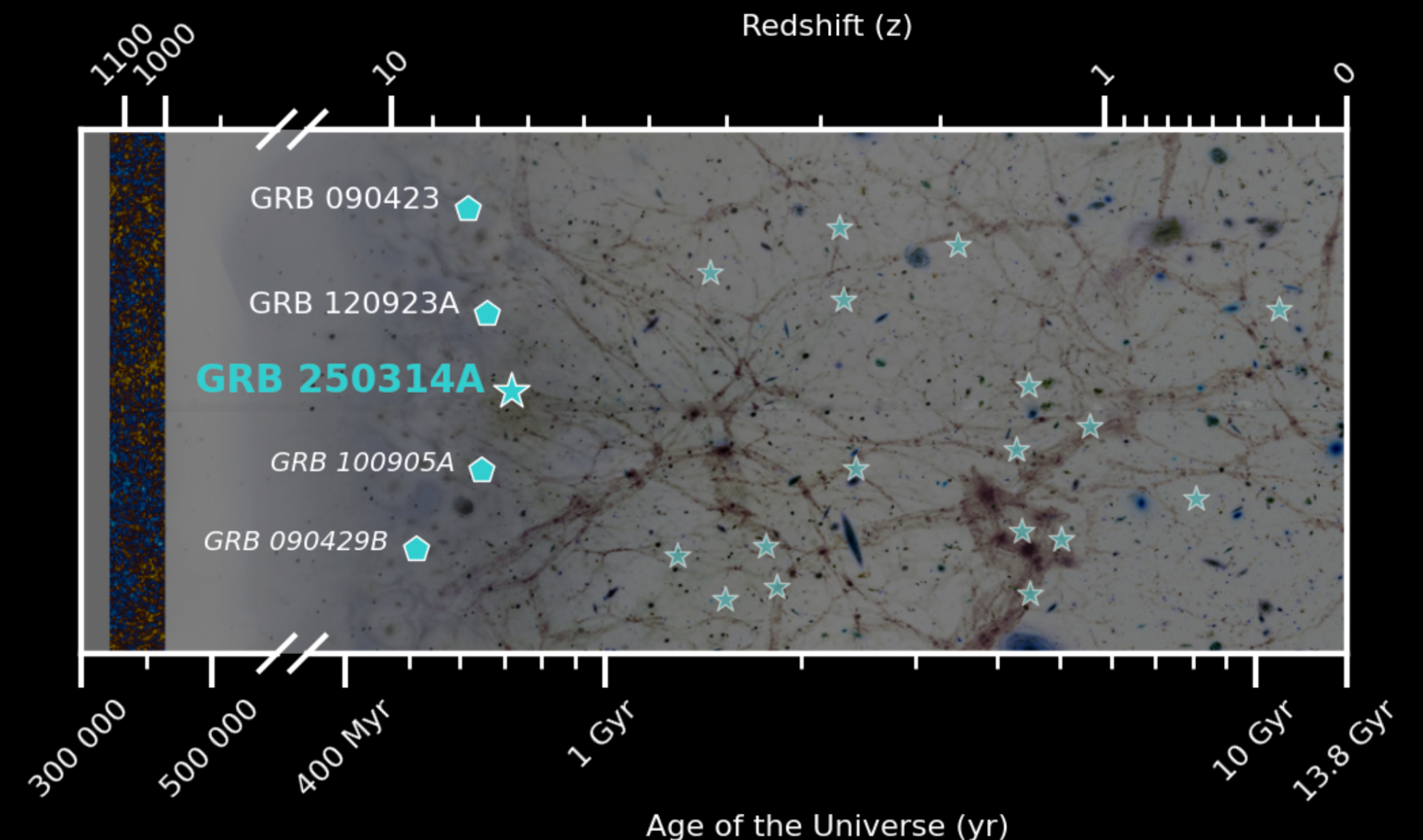
- 40134. [GRB 250314A: e-MERLIN observations](#)
- 40012. [GRB 250314A: ALMA detection](#)
- 39954. [GRB 250314A: VLA detection](#)
- 39797. [GRB 250314A: Keck/NIRC2 J-band upper limit](#)
- 39779. [GRB 250314A: ATCA radio upper limits](#)
- 39761. [GRB 250314A: REM optical/NIR upper limits](#)
- 39746. [GRB 250314A: SVOM/GRM analysis](#)
- 39743. [GRB 250314A: GTC z-band upper limit and updated photo- \$z \sim 7.27\$](#)
- 39739. [GRB 250314A: EP-FXT afterglow detection](#)
- 39737. [GRB 250314A: Swift/UVOT Upper Limits](#)
- 39734. [GRB 250314A: Swift XRT Detection](#)
- 39732. [GRB 250314A: VLT/X-shooter dropout, redshift  \$z \sim 7.3\$](#)
- 39729. [SVOM/MXT upper limit on GRB 250314A](#)
- 39728. [GRB 250314A: SVOM/VT upper limit](#)
- 39727. [GRB 250314A: NOT near-infrared candidate counterpart](#)
- 39719. [GRB 250314A: SVOM detection of a burst](#)

## Multi-wavelength follow-up

### VT optical afterglow



### Redshift measurements at $z = 7.27$ (VLT/X-Shooter)

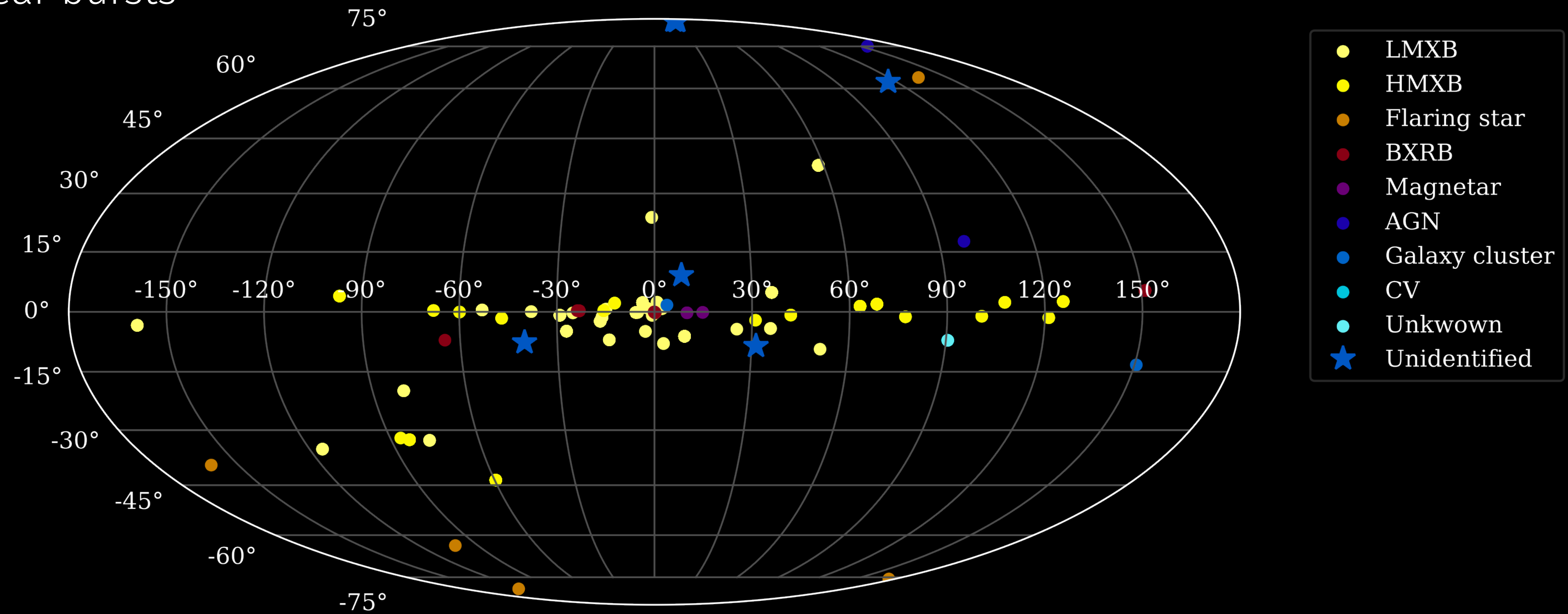




# Non-GRBs triggers

354 non-GRB triggers (mostly galactic X-ray binaries) → 24 ATels

- LMXB Type I thermonuclear bursts
- Blazar outbursts
- X-ray a outbursts
- Flaring stars
- Magnetar flares
- ULXs ?, TDEs ?, ...



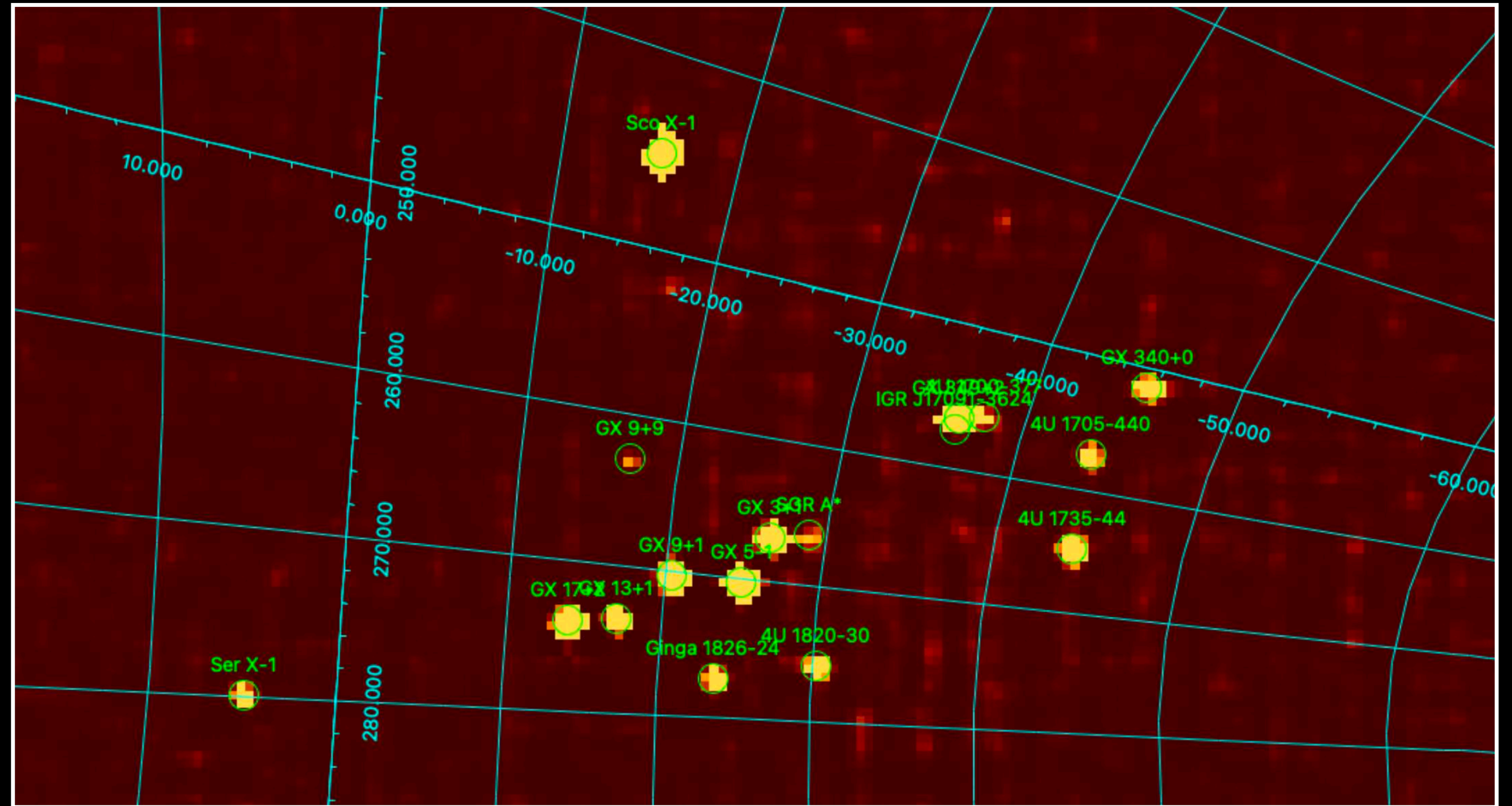


# Non-GRBs triggers

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**ECLAIRs 4-150 keV view of the Galactic plane**

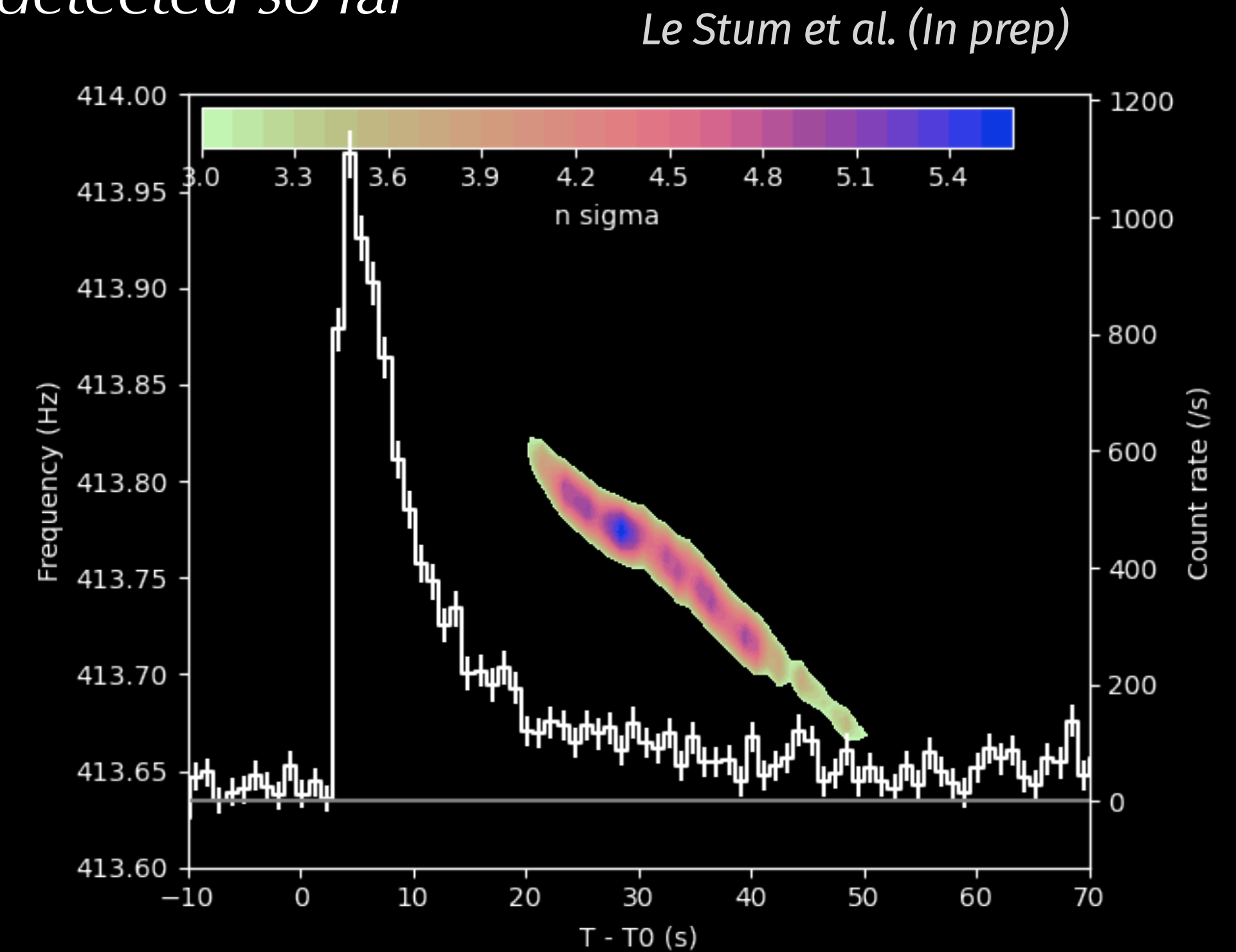
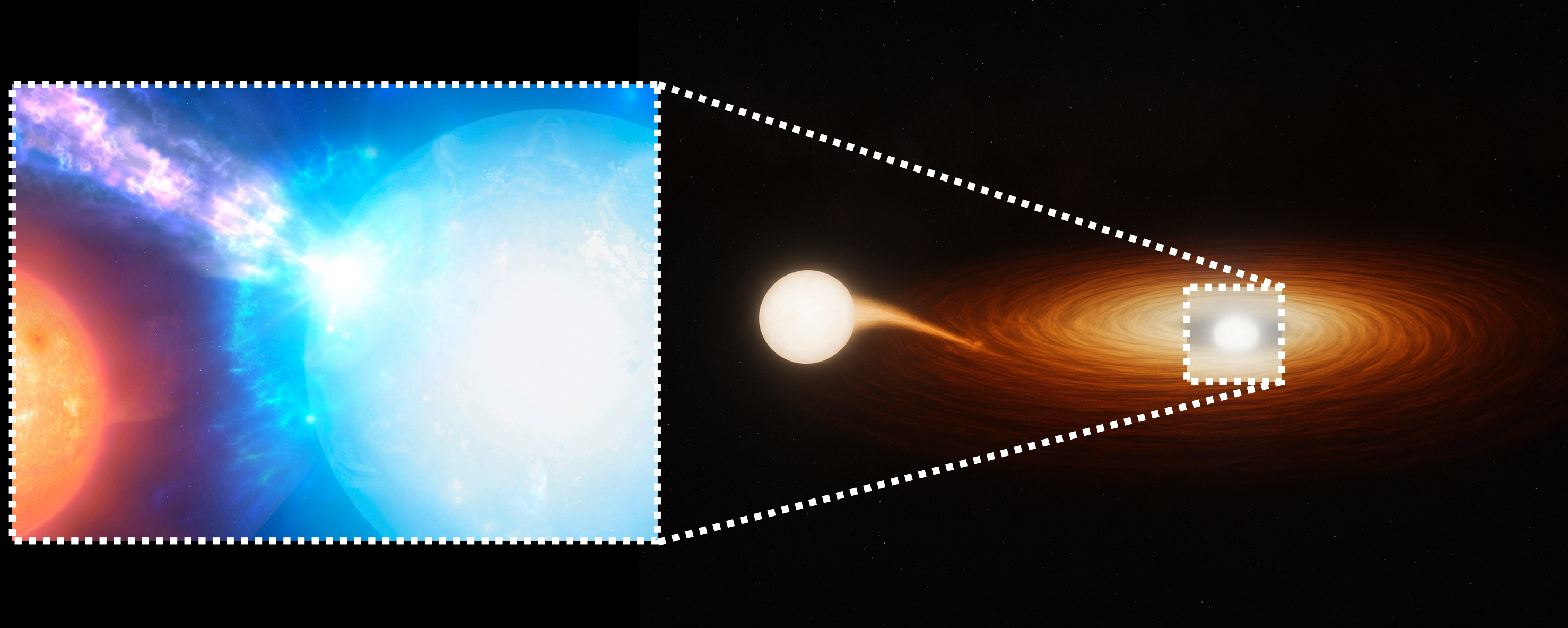




# Observatory science

## ECLAIRs: a Type I X-ray burst hunter !

*~150 bursts from 37 different sources detected so far*



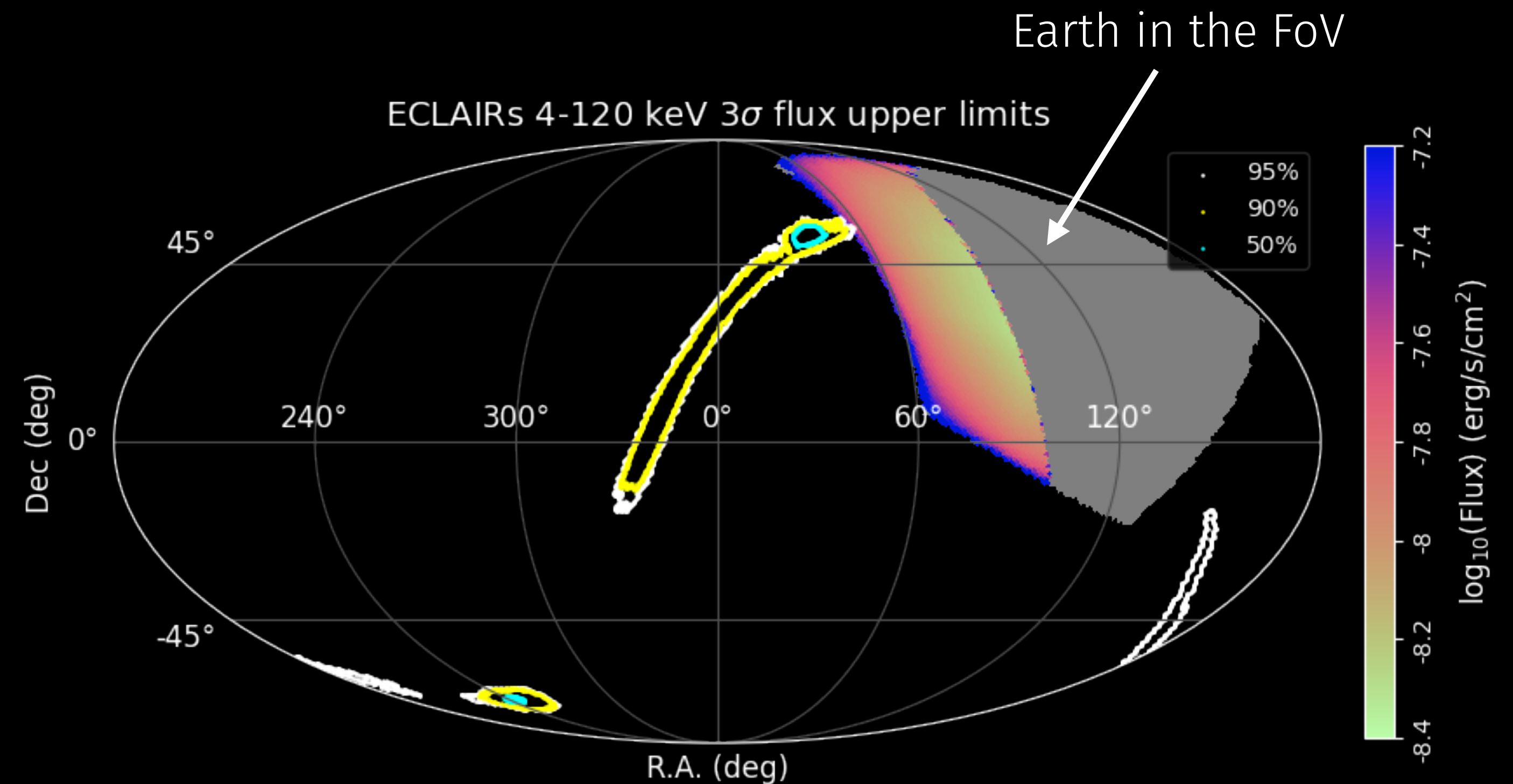
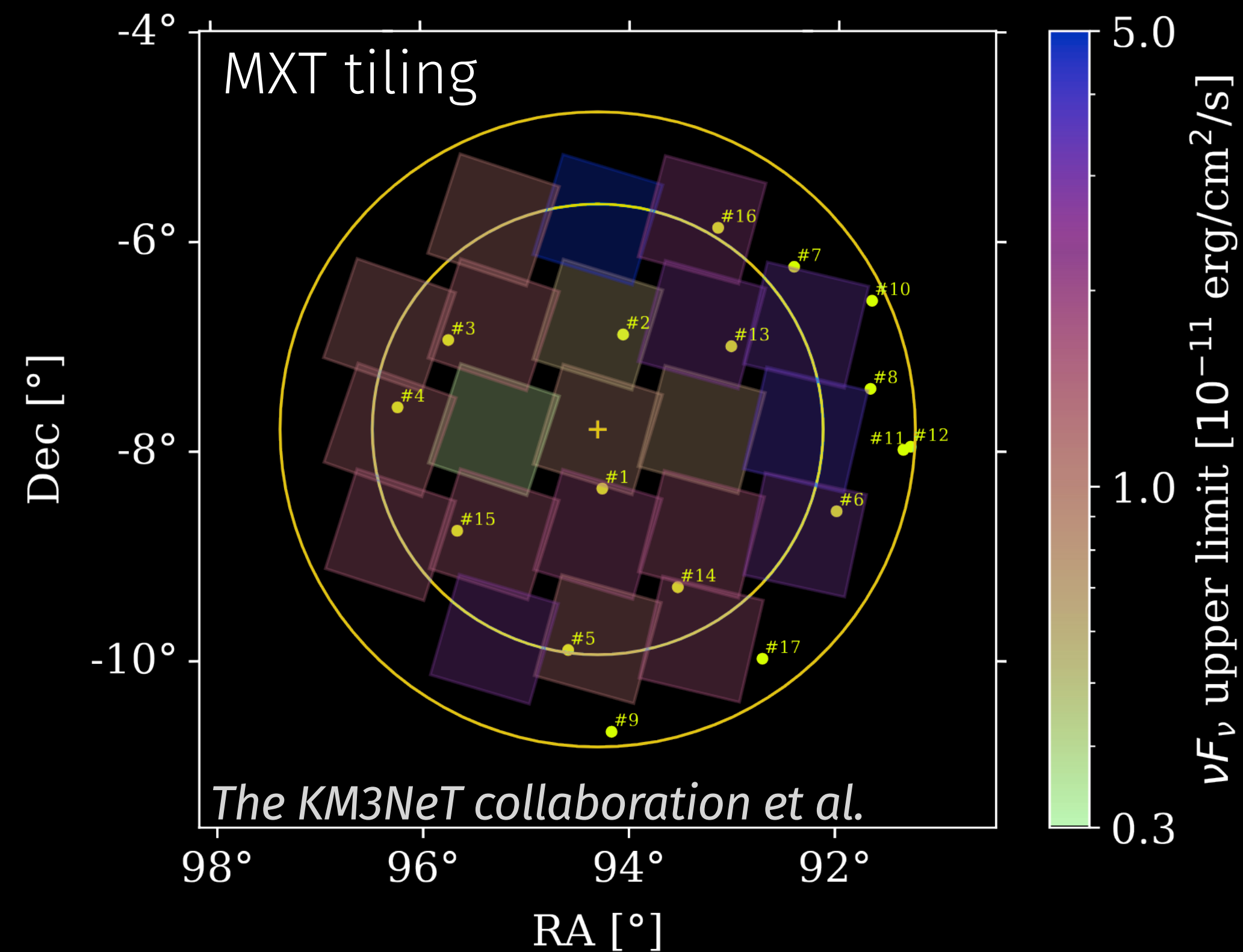
ECLAIRs detection of a **type I burst** of 4U 0614+014 on **January 10 at 15:58:02 (UTC)** - *Cangemi et al. (2025)*

- Detection of the neutron star pulsation at **413.69 Hz**
- Decrease of the oscillation frequency observed during the burst (rare behavior).
- If orbital Doppler effect → orbital period < 20 min (verification binary for LISA ?)



# Multi-messenger ToO program

- Follow-up of KM3Net UHE event KM-230213A / first SVOM ToO-MM to test the tiling strategy
- Search for a counterpart to S250206dm (NSBH/BNS event) - no triggered ToO - UL over 10 sec time window for  $E^{-2}$  spectrum
- Preliminary work to be improved





# SVOM first results in a nutshell

- **SVOM 4 keV low energy threshold: a clear impact to better explore the**
  - Soft GRBs
  - High-z GRB
  - Type I thermonuclear X-ray bursts from X-ray binaries
- **A full spectral coverage of the burst's emission from 4 keV - 5 MeV**
  - Characterization of the soft  $\gamma$ -ray spectrum by ECLAIRs+GRM
  - Detection non-GRB sources (jetted TDEs, ...)
- **A large FoV ( $1^\circ \times 1^\circ$ ) MXT x-ray telescope & a sensitive 40 cm VT telescope**
  - Several cases of well characterized events
  - Already one high-z GRB identified
  - Multi-wavelength follow-up of AGN and X-ray binary outbursts
- **General Program & ToO**
  - Pointed observations with yearly call for proposals
  - Multi-messenger ToO programs
- **Already fruitful Collaboration with other missions and groups**
  - Efficient partnership with Einstein Probe & Swift to systematically catch X-ray and optical counterparts of respective triggers
  - Collaboration with the Stargate, NOT/GTC/GEMINI-GRB - optical/nIR spectroscopy of GRB afterglows

3 first Obs-SWG articles  
to be submitted in  
October

25 single GRB papers  
under review

A SVOM special issue  
under preparation

