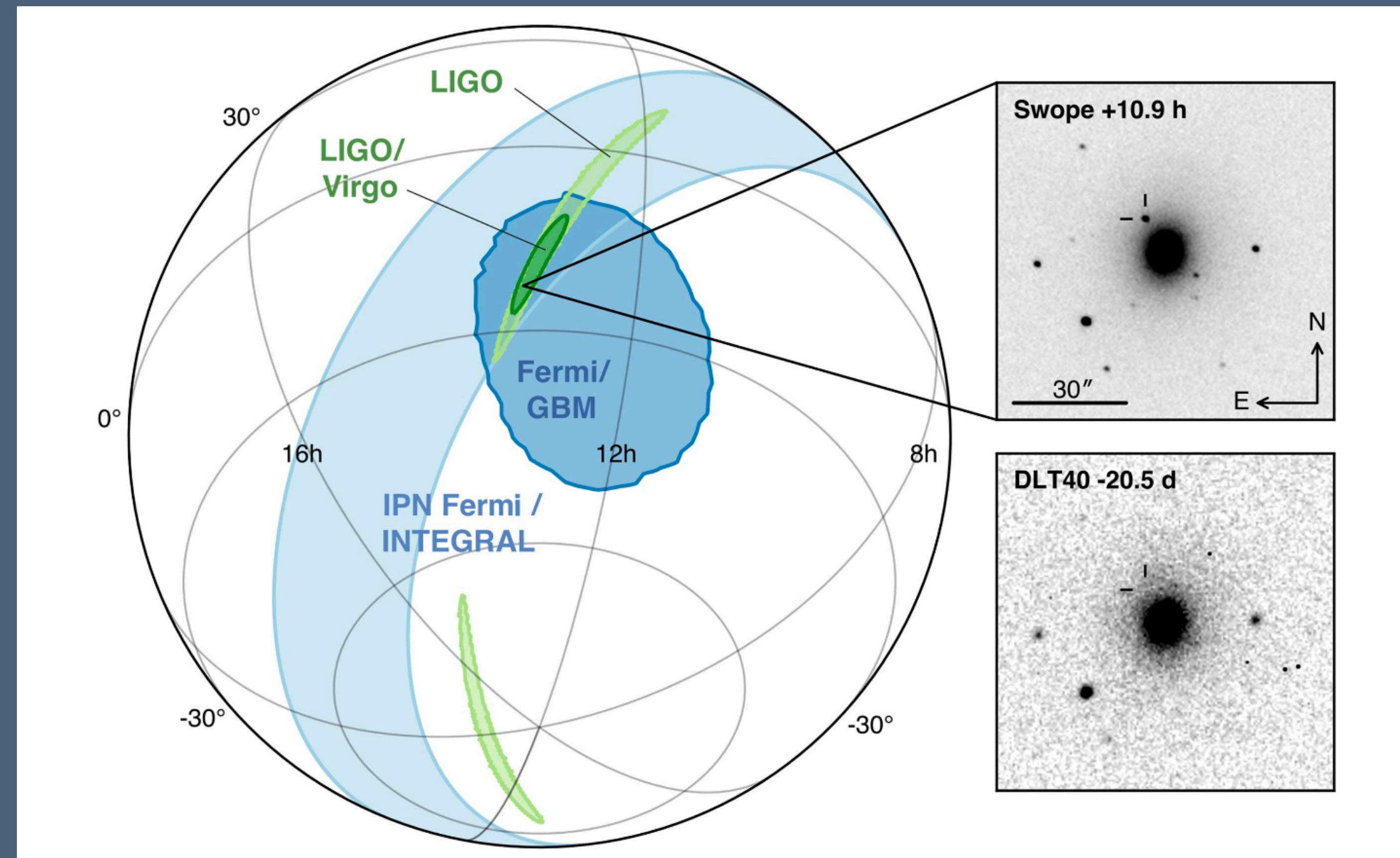
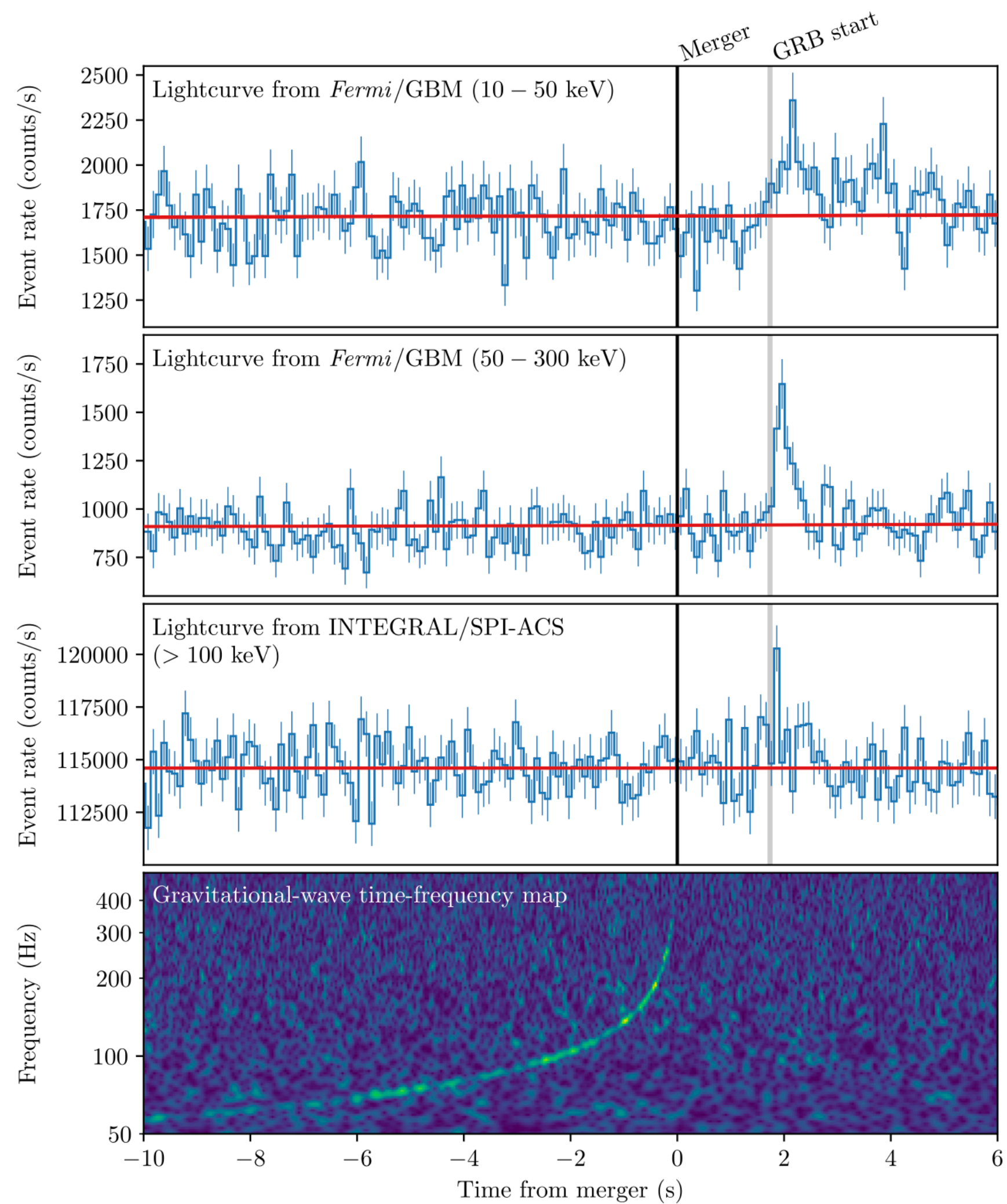


WEDGE: **W**ide-field
Explorer for **D**iscovering
Gravitational wave
Electromagnetic
counterparts

Sergio Campana
INAF - Osservatorio astronomico di Brera

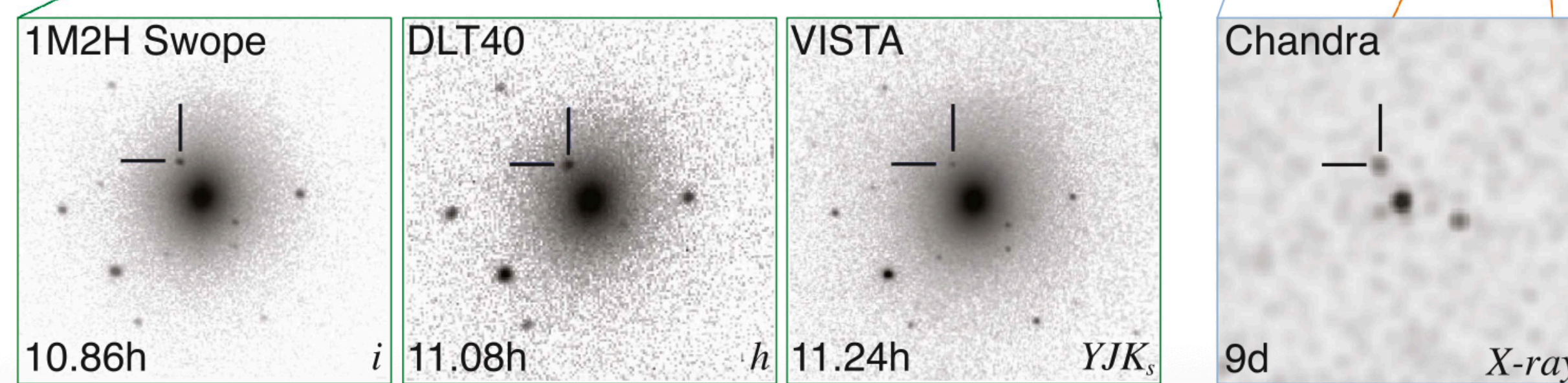
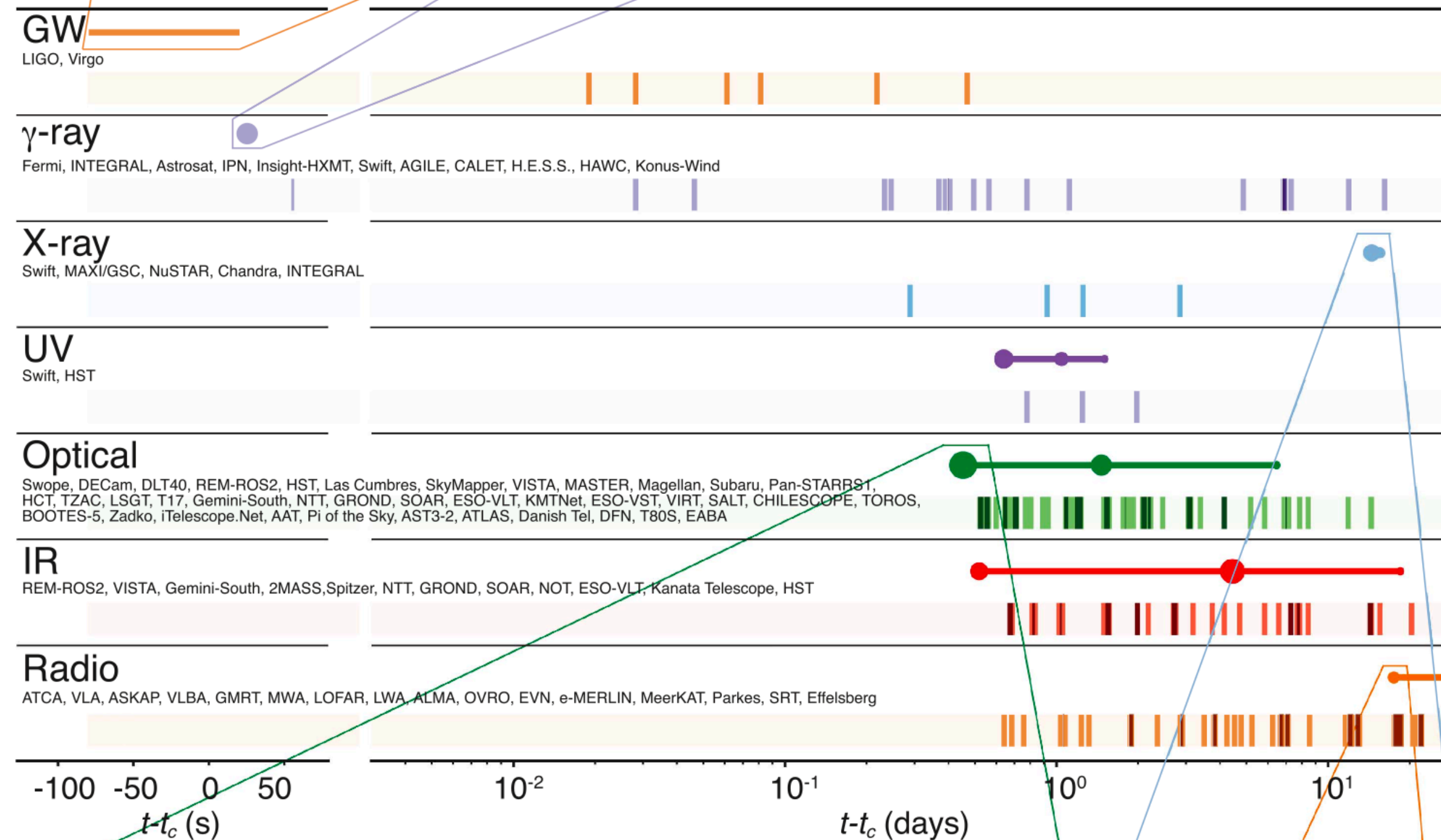
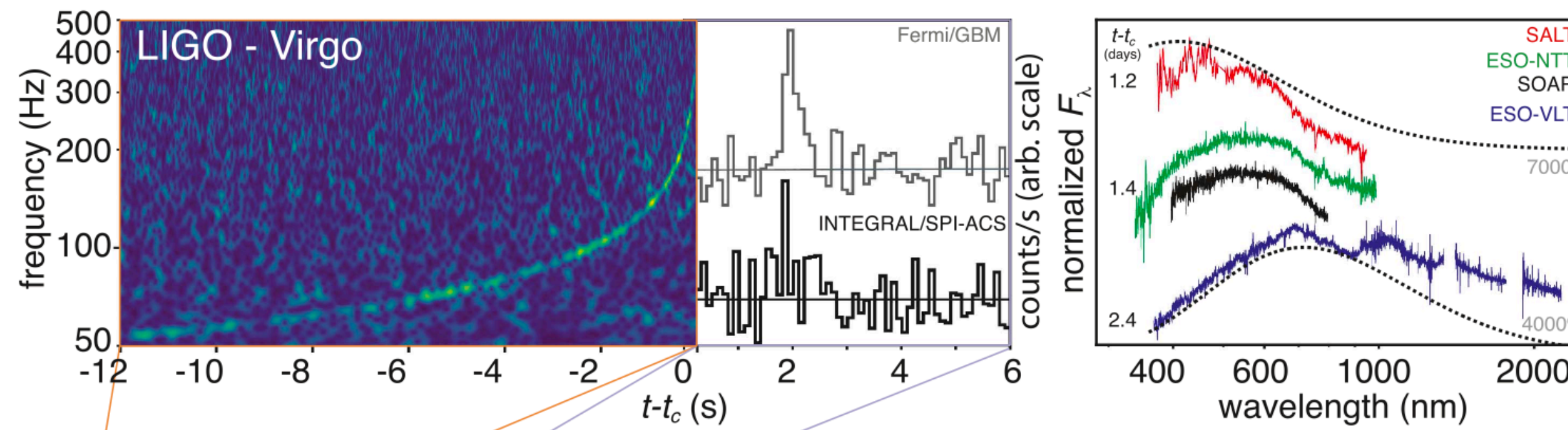


GW170817



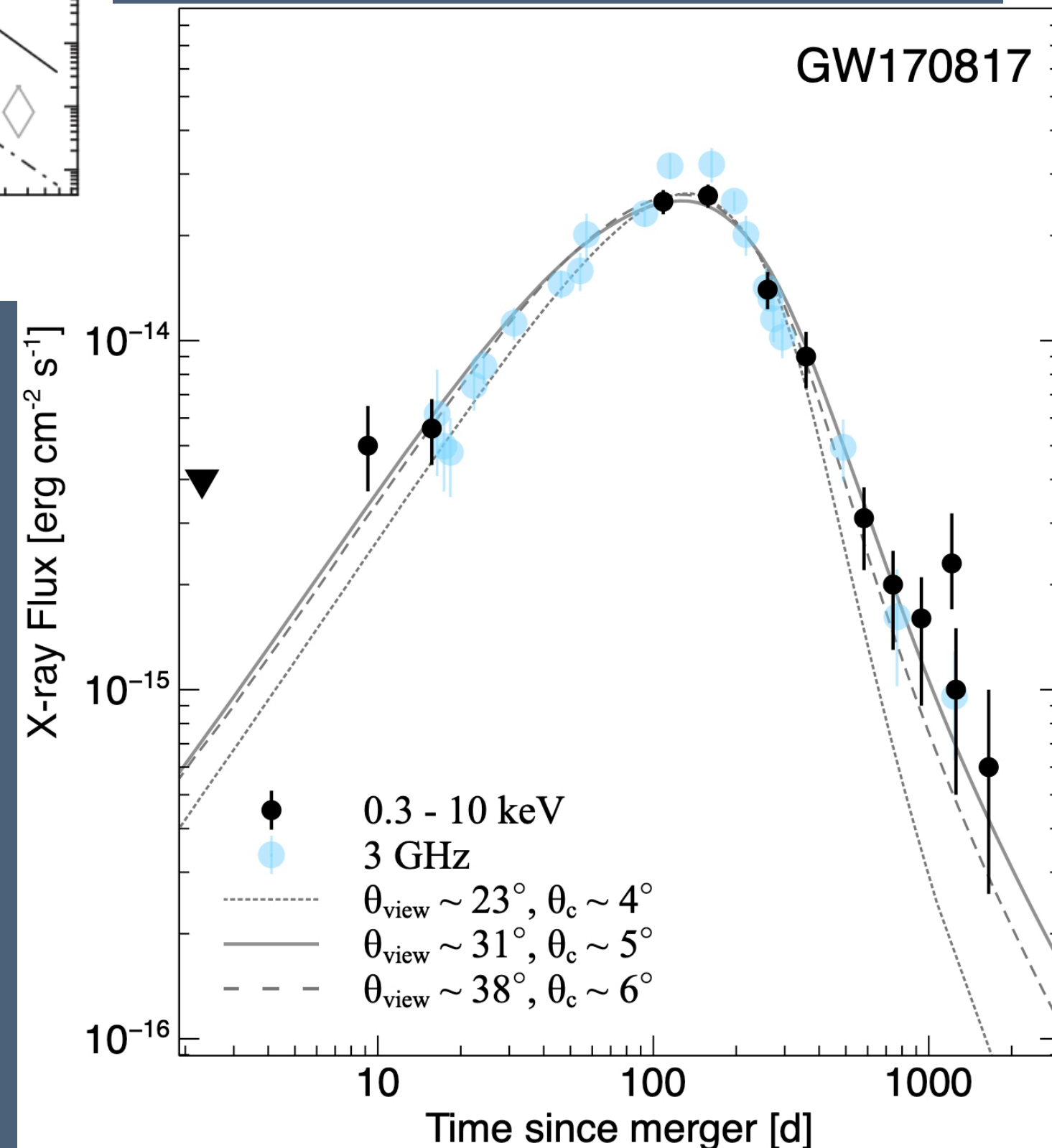
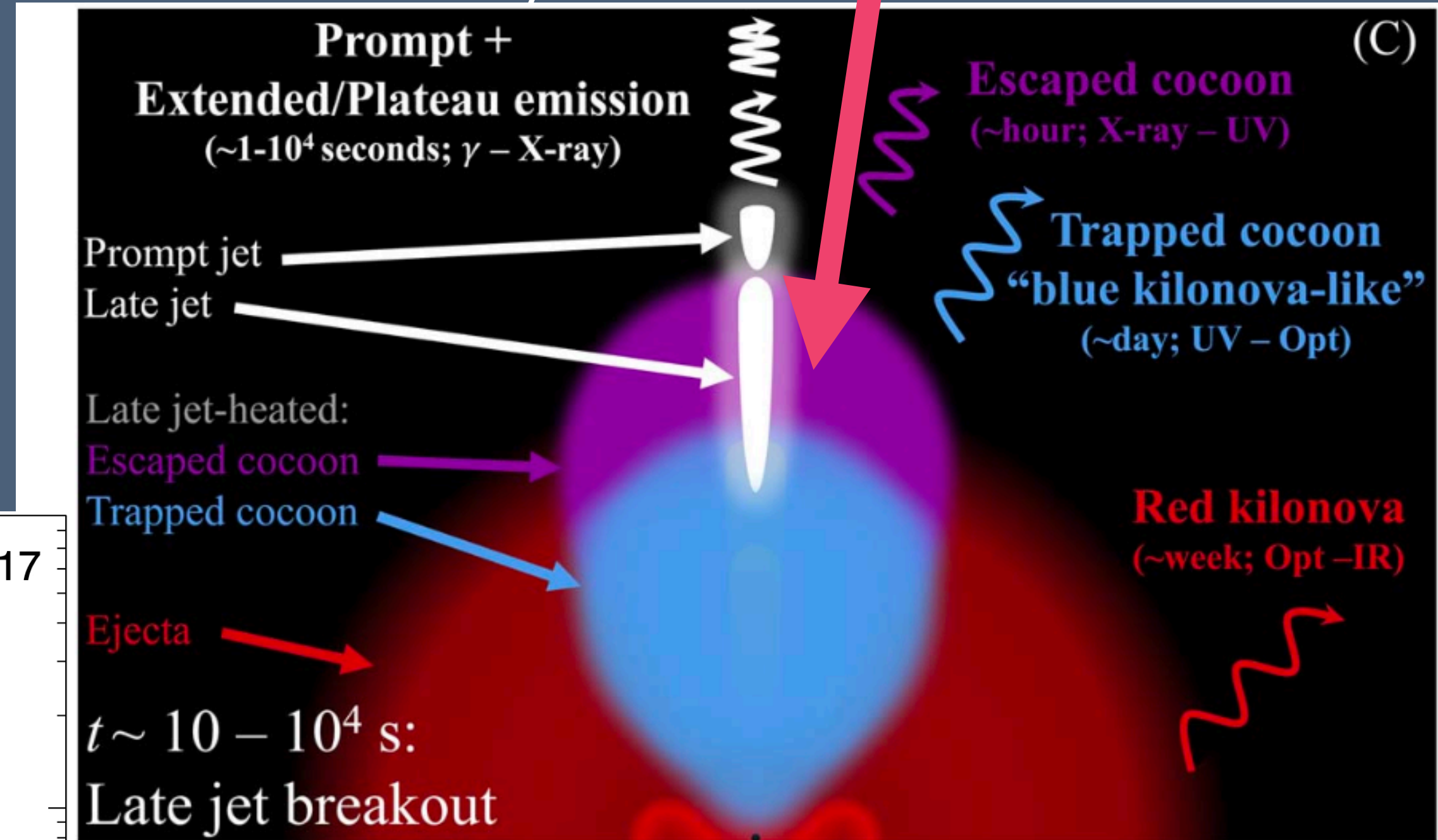
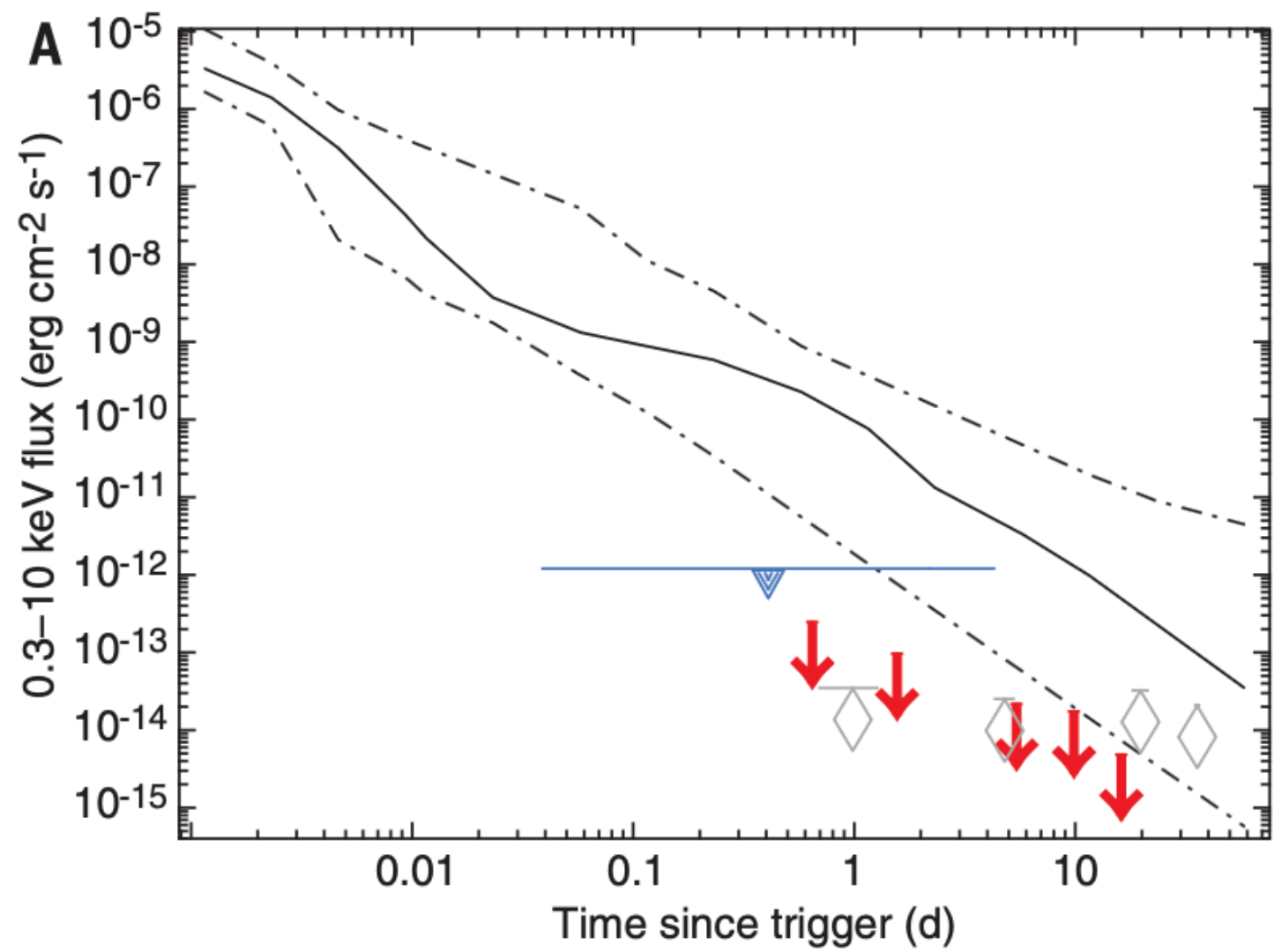
28 deg²

GW170817 timeline



Early (non-)detections in X-rays

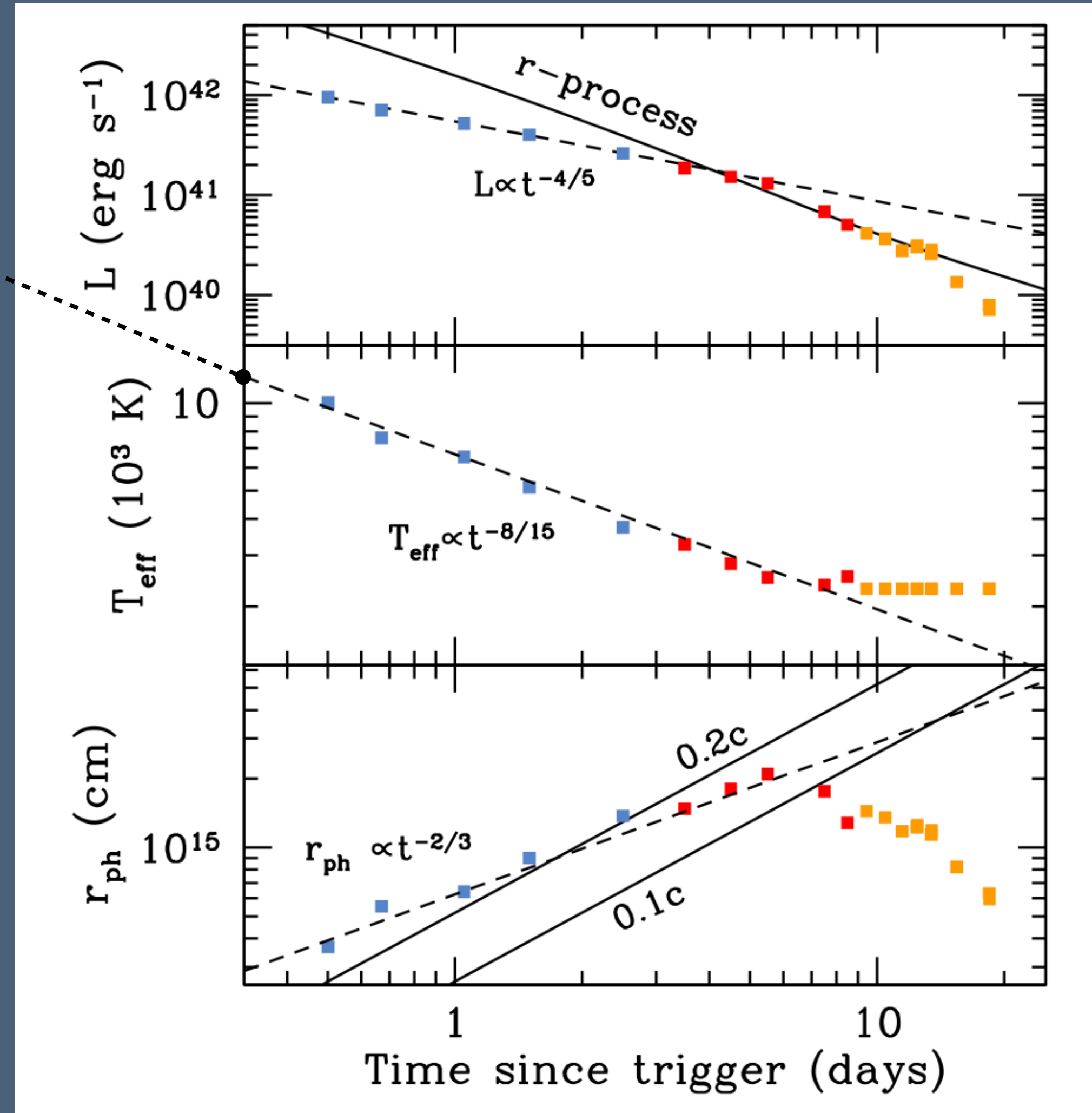
Our line of sight



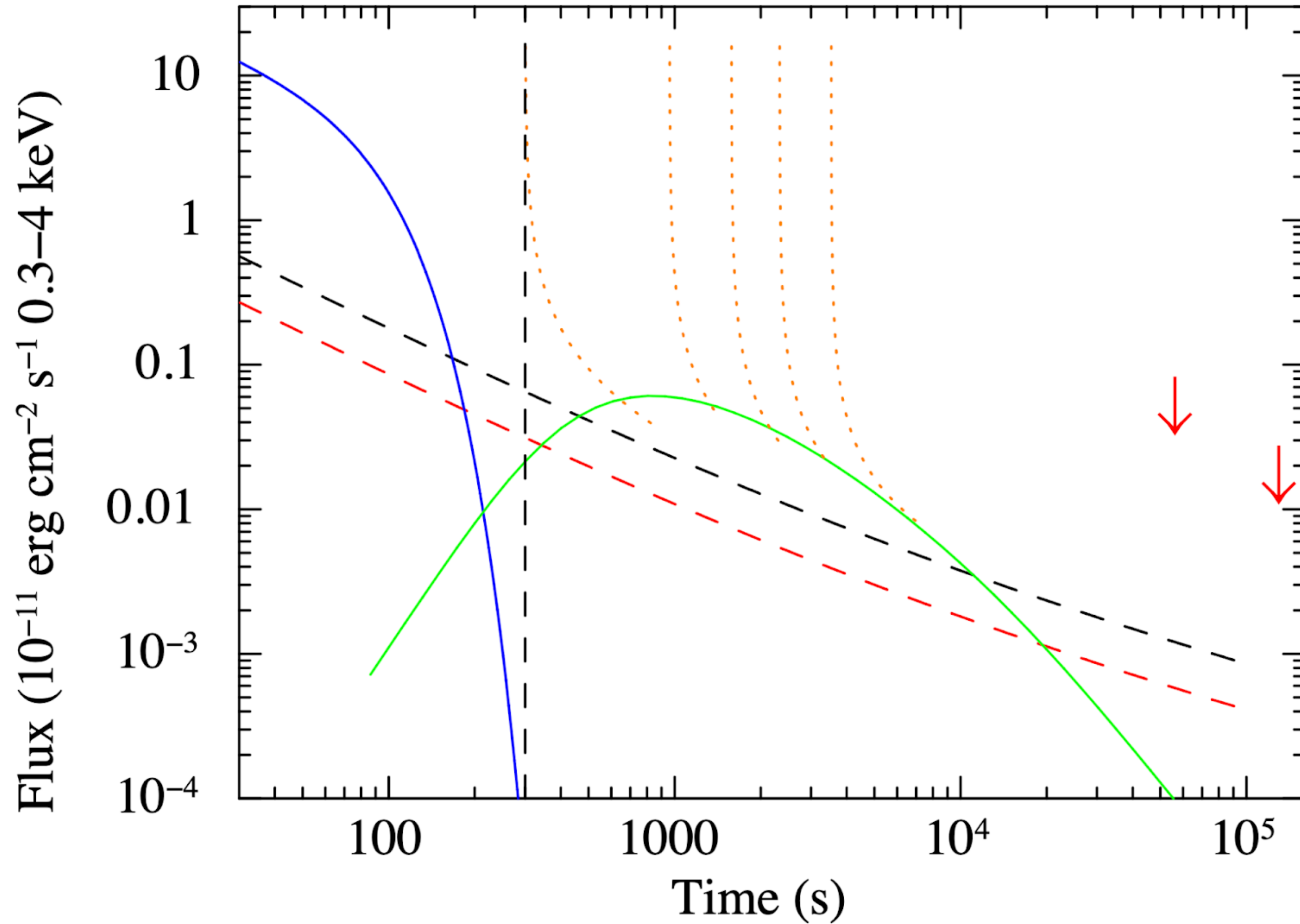
Swift & "normal" sGRB
afterglow

Cocoon emission

X-rays!

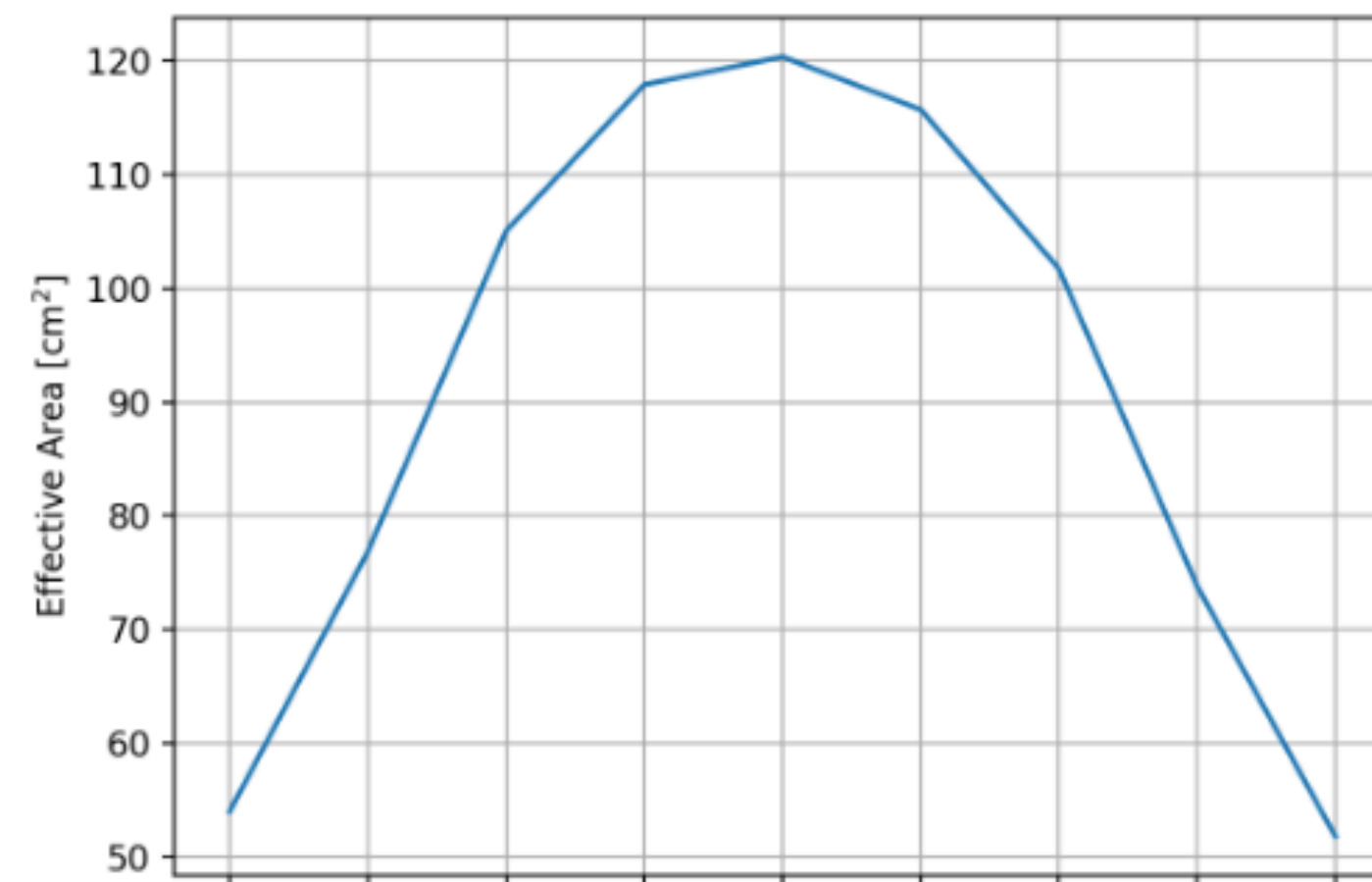


WEDGE prediction

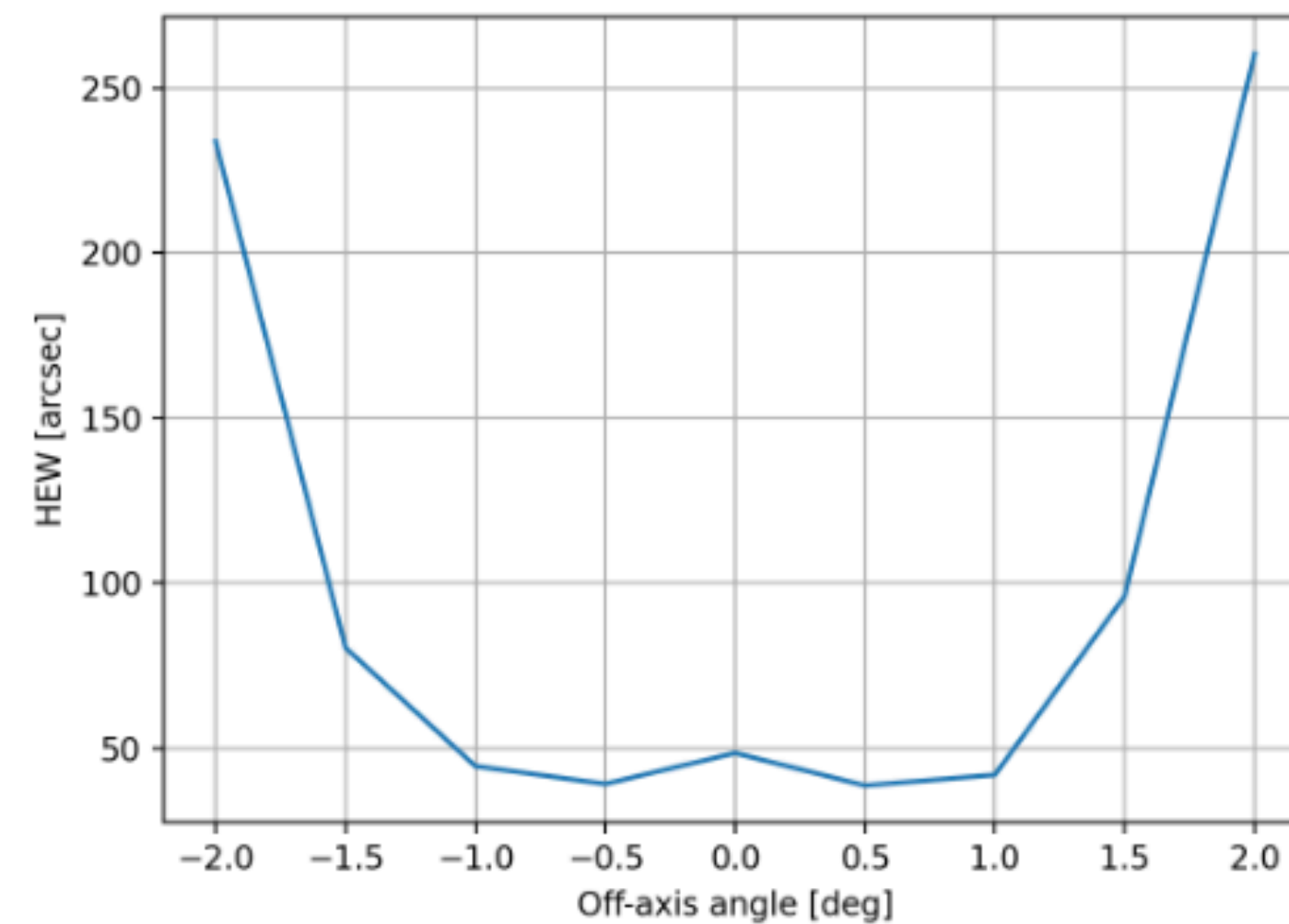
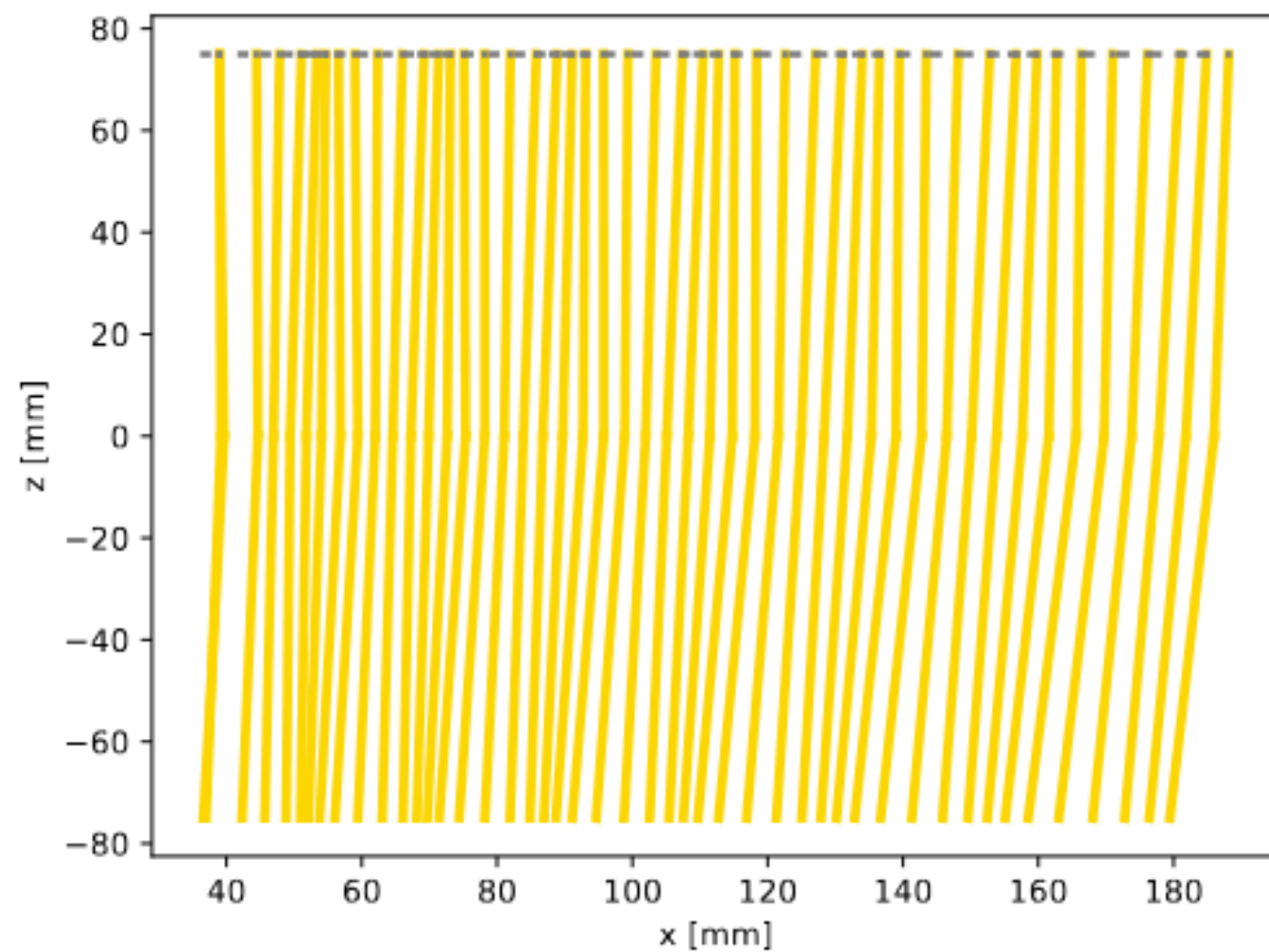


WEDGE mirrors (baseline): 47 shells

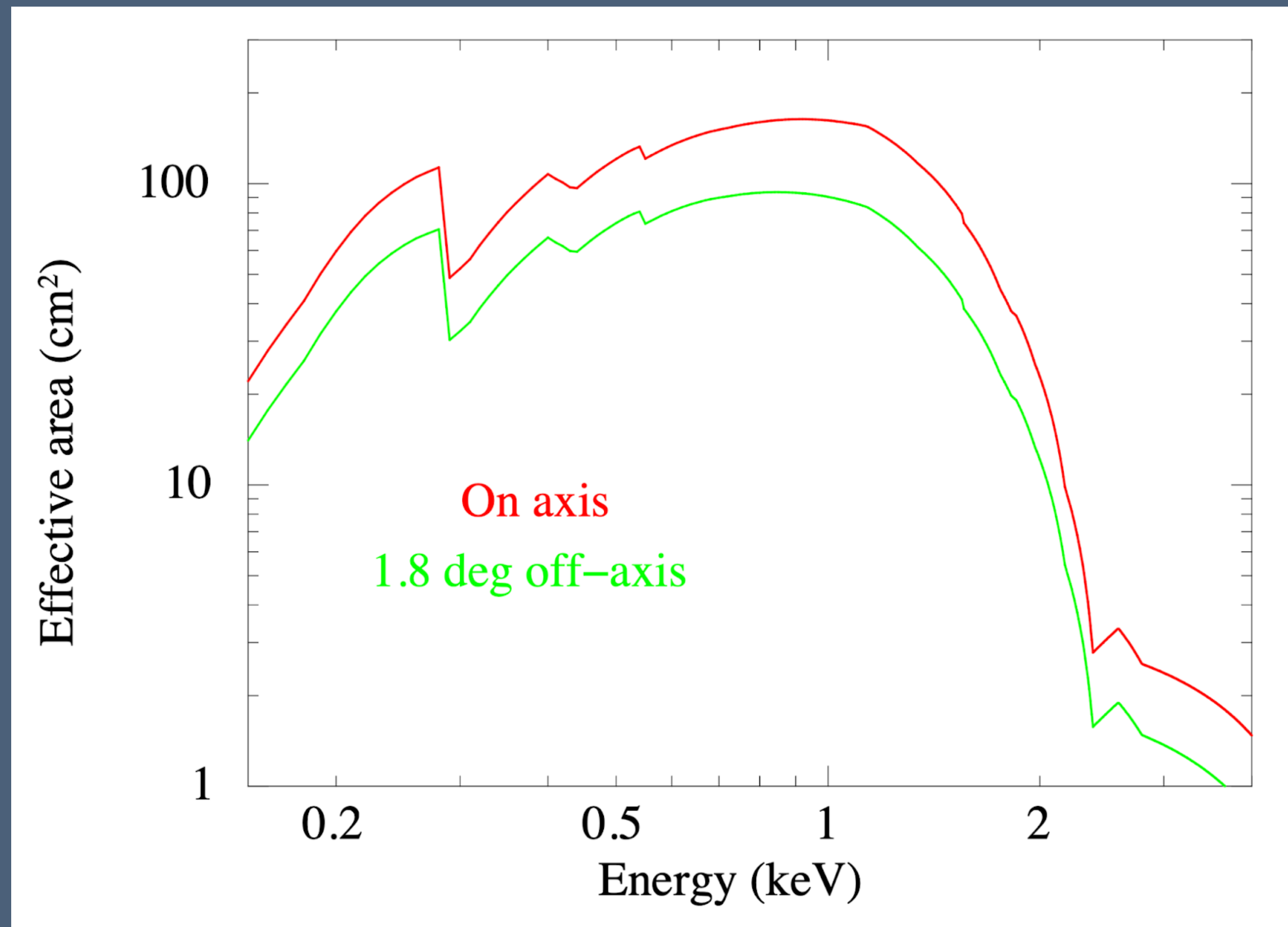
Made by John Rankin



eROSITA shells (1 out of ~3)
Mirror weight 10 kg
Focal length 1600mm
Mirror length 75+75 mm

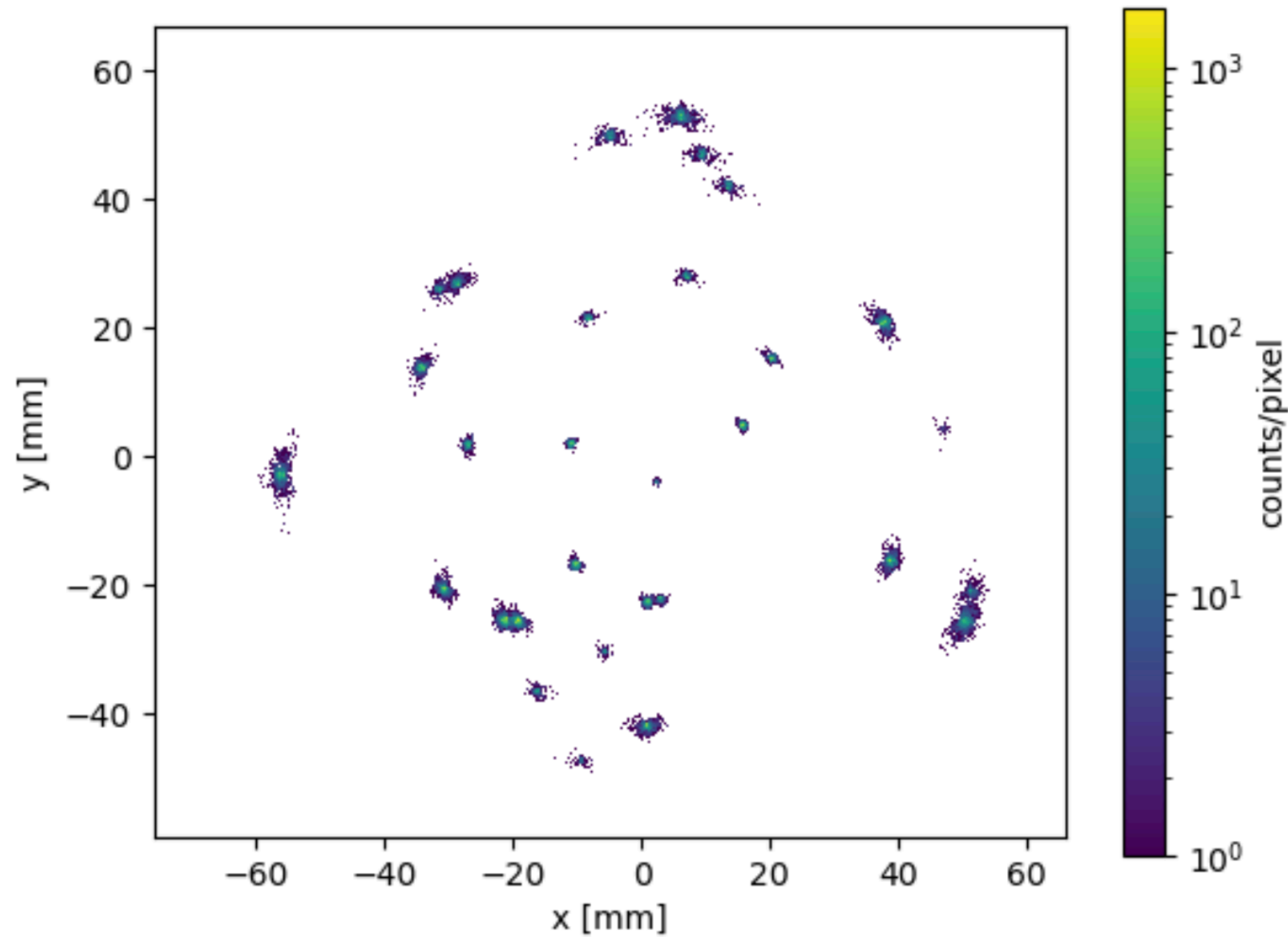


WEDGE mirrors (baseline): 47 shells



Increase >2 keV response with dopamine coating

WEDGE mirrors (baseline): localisation



Position error (1sigma) \sim HEW/sqrt(counts)

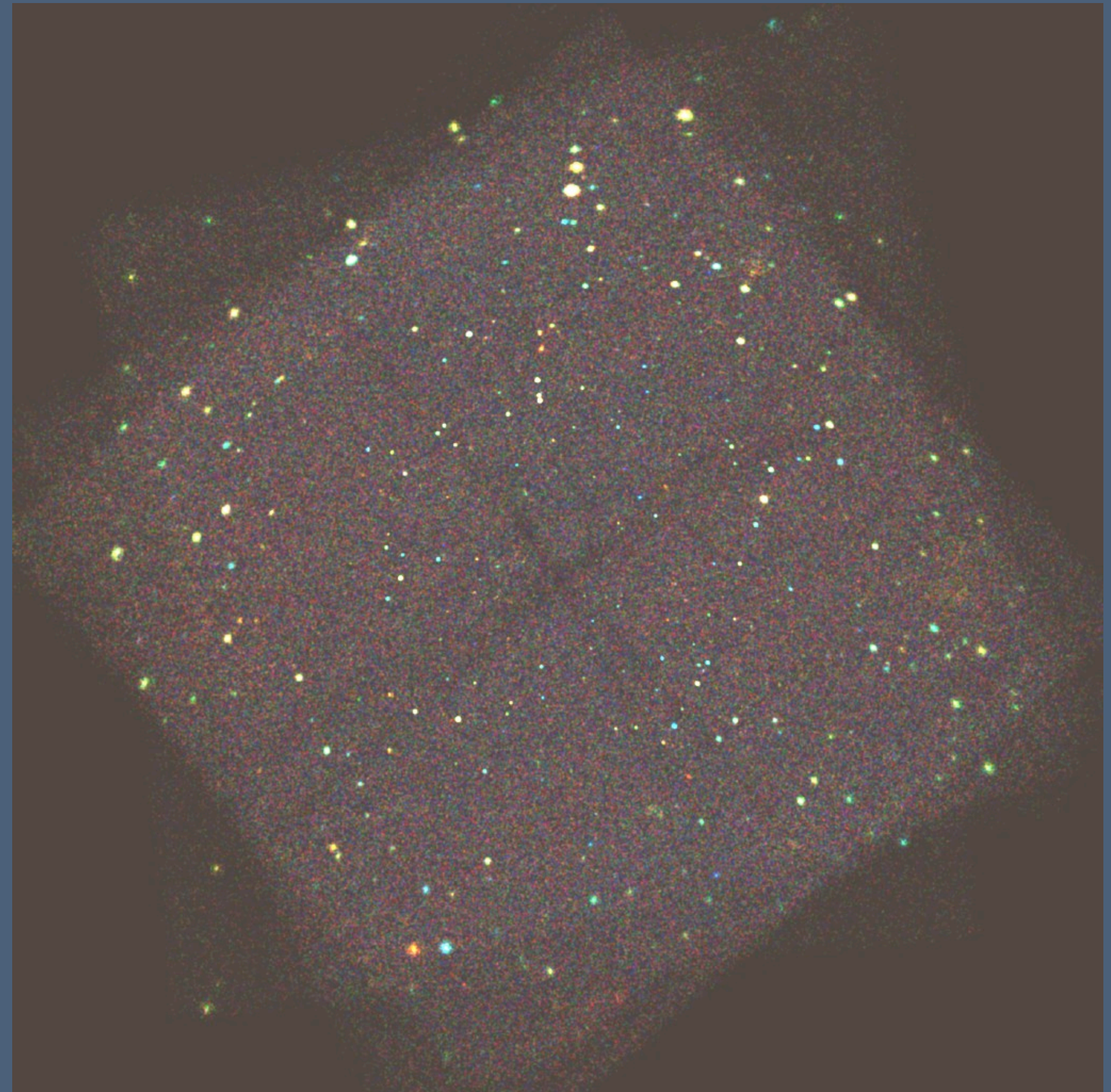
so for a 100 counts source

Pos.err. \sim 12arcsec (95% c.l.)

Detectors: CMOS

Specifications	value
Imaging area	6 cm × 6 cm
Pixel size	15 μm × 15 μm
Epitaxial thickness	10 μm
Number of pixels	4096 × 4096
Frame rate	20 fps (max. 100 fps)
Readout noise	< 5.0 e ⁻ at high gain
Dark current	< 0.02 e ⁻ pixel ⁻¹ s ⁻¹ @ -30°C < 10 e ⁻ pixel ⁻¹ s ⁻¹ @ 20°C
Energy resolution	210 eV@5.9 keV 150 eV@1.5 keV
Full well capacity	120,000 e ⁻
Power	1.6 W
Al coating layer thickness	200 nm

9.6x8 cm one unique CMOS
80 um pixel size - 10"/pixel
(loose 5% of the Rubin footprint)



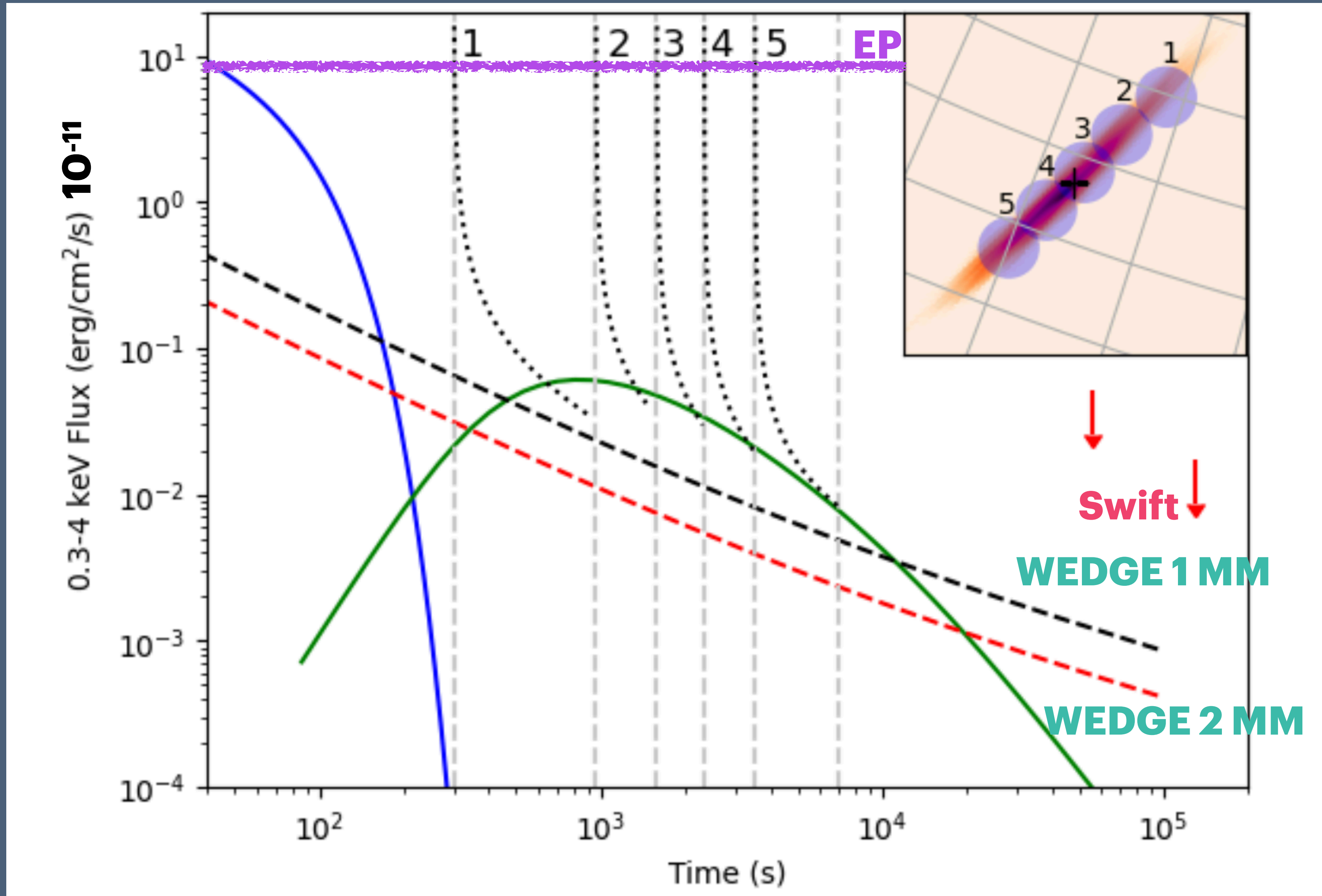
Primary goal + others TBD

Find the electromagnetic counterparts of GW triggers in the X-ray band
(where no one can look for)

- Launch date ~2034
- GW trigger from Advanced Interferometers
- GW trigger from Einstein Telescope (a few years later)
- GW triggers from LISA (later on)
- multi-messenger triggers from neutrino sources

All GW experiments call for a large field of view (tens of deg²)
and a sensitivity of at least *Swift*/XRT

WEDGE prediction



Secondary (?) science

- **Fast repointing or co-pointing:** Follow-up of fast transients: ULTRASAT/Rubin shock breakout, GRBs, magnetar flares, X-ray binary superbursts, FRBs (?)
- **Large field of view:** follow-up of Fermi GRBs
- **Low background:** clusters and groups of galaxies (CGM), Fermi/eROSITA bubbles, LHAASO sources
- **Monitoring:** Galactic Centre & bulge, LMC, SMC, Andromeda, Virgo cluster

WG

- **Galactic science** :(transient and persistent)
- **Extragalactic science** (AGN, blazars)
- **Multi-messenger astronomy**: GW, neutrinos
- **Transients**: extragalactic transients (GRB, SN, TDE, etc.)
- **Diffuse emission**: (Clusters, CGM, M31-LMC-SMC, bubbles, LHAASO sources)

NIR telescope?

- possibility to change one X-ray mirror module with a 30cm NIR telescope with a $\sim 10\text{deg}^2$ field of view, 2-3 arcsec pixel size (it does not exist!)
- difficult but intriguing - H ~ 19 in 30s of K ~ 19 in 30s
- shadowing Rubin (25% of the time): find high-redshift GRBs and provide NIR extension to Rubin
- kilonova serendipitous searches

Open discussion