

Microquasars in the Cygnus region: perspectives with e-ASTROGAM



G. Piano¹, P. Munar-Adrover¹, F. Verrecchia², M. Tavani¹, S. Trushkin³

¹ INAF-IAPS, Via del Fosso del Cavaliere 100, I-00133 Roma, Italy

² ASI Data Center (ASDC), Via del Politecnico snc, I-00133 Roma, Italy

³ Special Astrophysical Observatory RAS, Karachaevo-Cherkassian Republic, Nizhny Arkhyz 36916, Russian Federation
contact: giovanni.piano@iaps.inaf.it

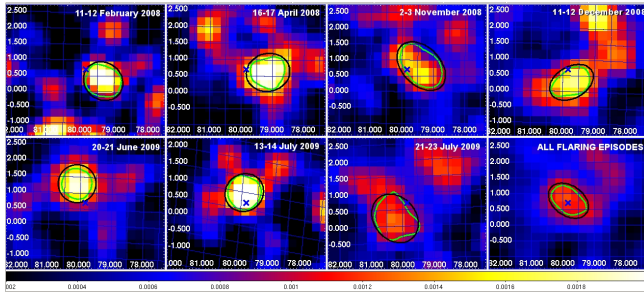


Abstract

Cygnus X-3 and V404 Cygni are gamma-ray emitting microquasars located in the Cygnus region. Transient gamma-ray emission was observed by AGILE and Fermi in coincidence with bright flares at radio wavelengths, revealing non-thermal activity from plasmoids in a relativistic jet.

Observations at 1-100 MeV by e-ASTROGAM will crucially contribute in determining the spectrum and the process of jet formation. The transition region between the disk-corona and the jet emission range can be studied in the jet launching phase.

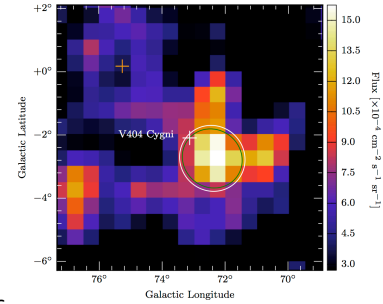
Cygnus X-3



November 2007 – July 2009:

7 γ -ray flares above 100 MeV with $\sqrt{TS} > 3$ and $F_\gamma \sim 200 \times 10^{-8}$ photons $\text{cm}^{-2} \text{s}^{-1}$

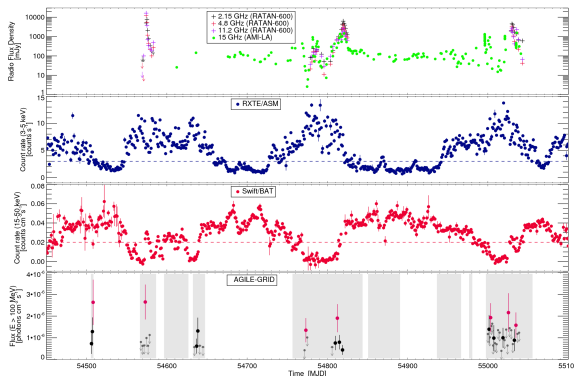
V404 Cygni



June 24-26, 2016:

γ -ray flare detected at 50-400 MeV with $\sqrt{TS} = 4.3$
and $F_\gamma = (4.6 \pm 1.5) \times 10^{-6}$ photons $\text{cm}^{-2} \text{s}^{-1}$

Multi-frequency behavior

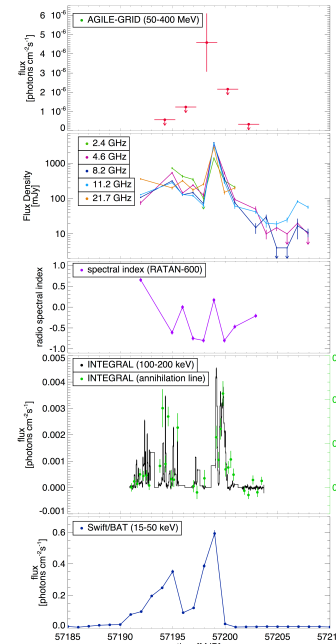


γ -ray flares occur:

- During X-ray soft spectral states (bright soft X-ray emission)
- During local minima of the hard X-ray light curve
- During soft-to-hard or hard-to-soft spectral transitions
- When the system is moving into or out of a “quenched” radio state
- Before giant radio flares



Transient jet responsible for γ -ray and radio flares,
launched during “hypersoft” X-ray spectral states



γ -ray flare coincident
with outbursts detected at:

- Radio wavelengths
- 511 keV (annihilation line)
- 100-200 keV (continuum)
- 15-50 keV



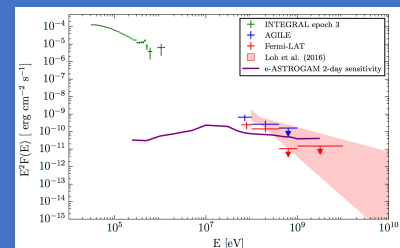
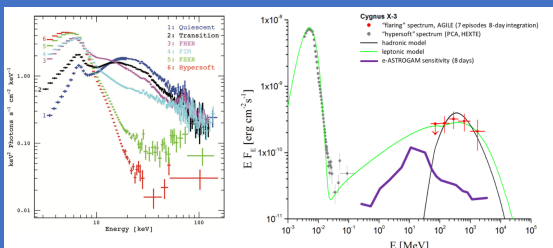
Transient jet responsible for γ -ray,
radio outbursts, and 511 keV line (?)



γ -ray emission mechanism:
• Leptonic (IC)?
• Hadronic ($pp \rightarrow \pi^0$ decay)?

Perspectives with e-ASTROGAM

Exploring the spectral link between the disk-corona system and the jet, during the jet launching phase



References:

Piano et al., A&A, 545, A110 (2012)
Piano et al., submitted to ApJ (2017)