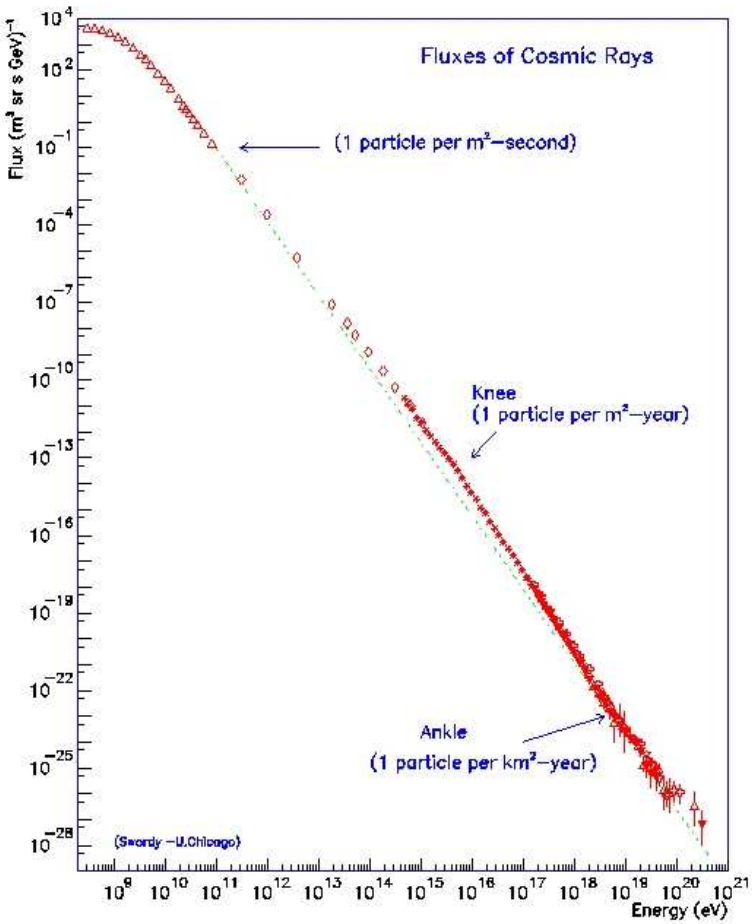
μQSO's search with the ANTARES neutrino telescope

Salvatore Galatà

2 June 2009

outline

high energy cosmic rays



cosmic rays up to energies of $\sim 10^{20}$eV

- where do they come from?
- what are the acceleration mechanisms?

candidate neutrino sources

neutrino production through pp or $p\gamma$ reactions

galactic:

- supernovae remnants
- microquasars

extragalactic:

- active galactic nuclei
- gamma ray bursters

other sources:

- dark matter annihilation
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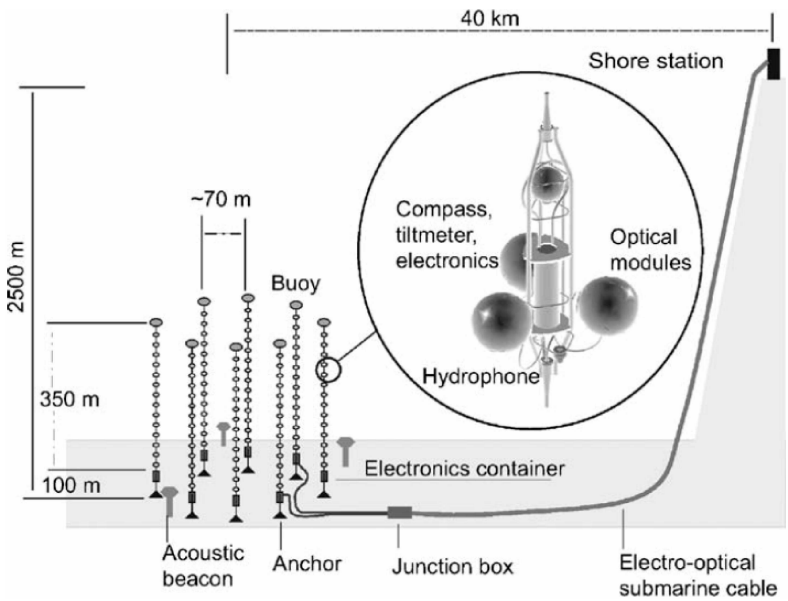
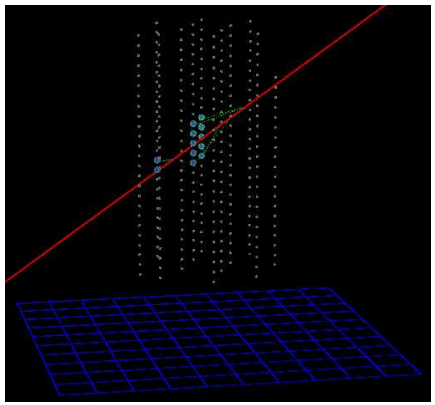
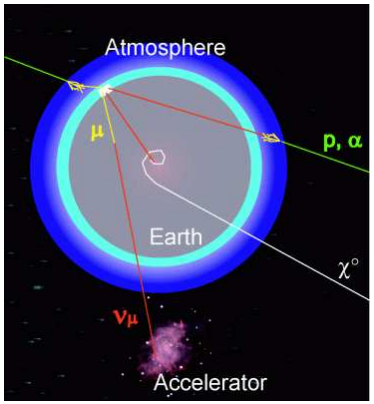
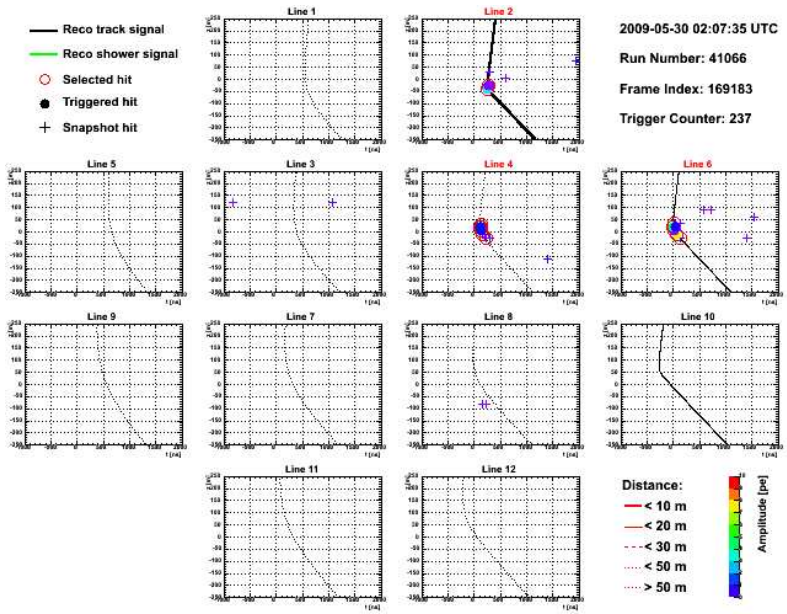
the ANTARES detector

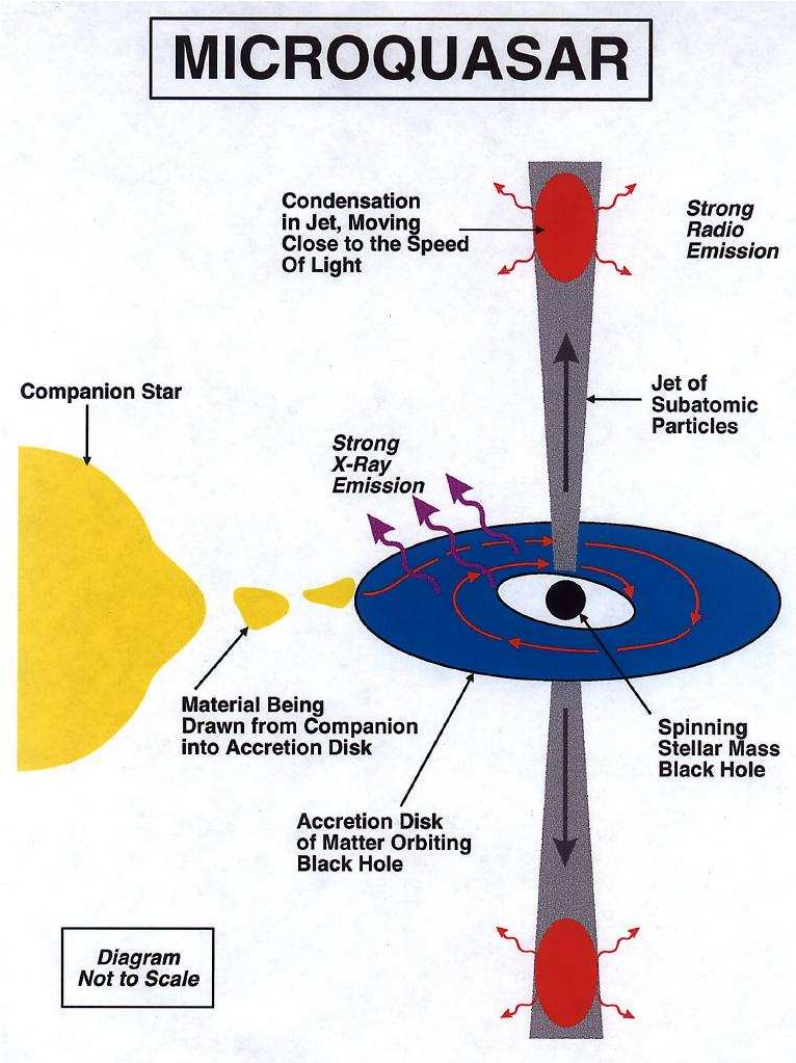








microquasars intro



search for μQSO's in the 2008 data (from MJD 54441 to MJD 54800)

which μQSO's show a radio activity (jet) during the data taking?

inputs:

- RXTE/ASM soft X-ray data
- multi-wavelength observations (literature)

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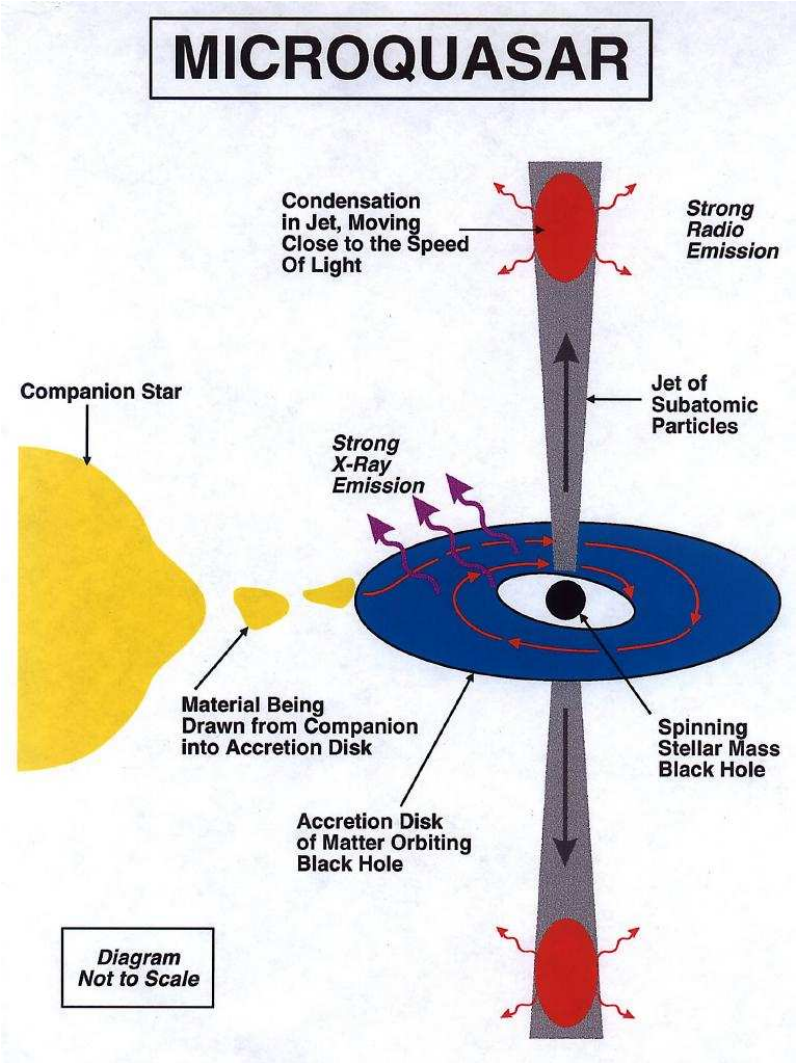

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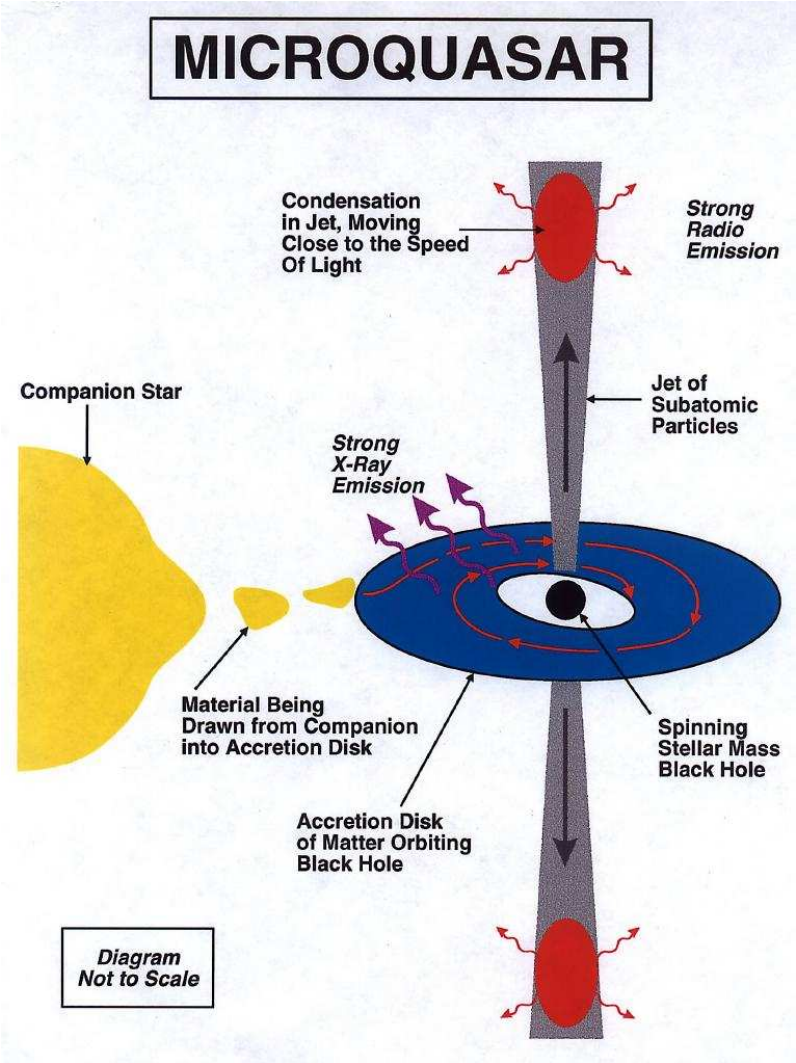

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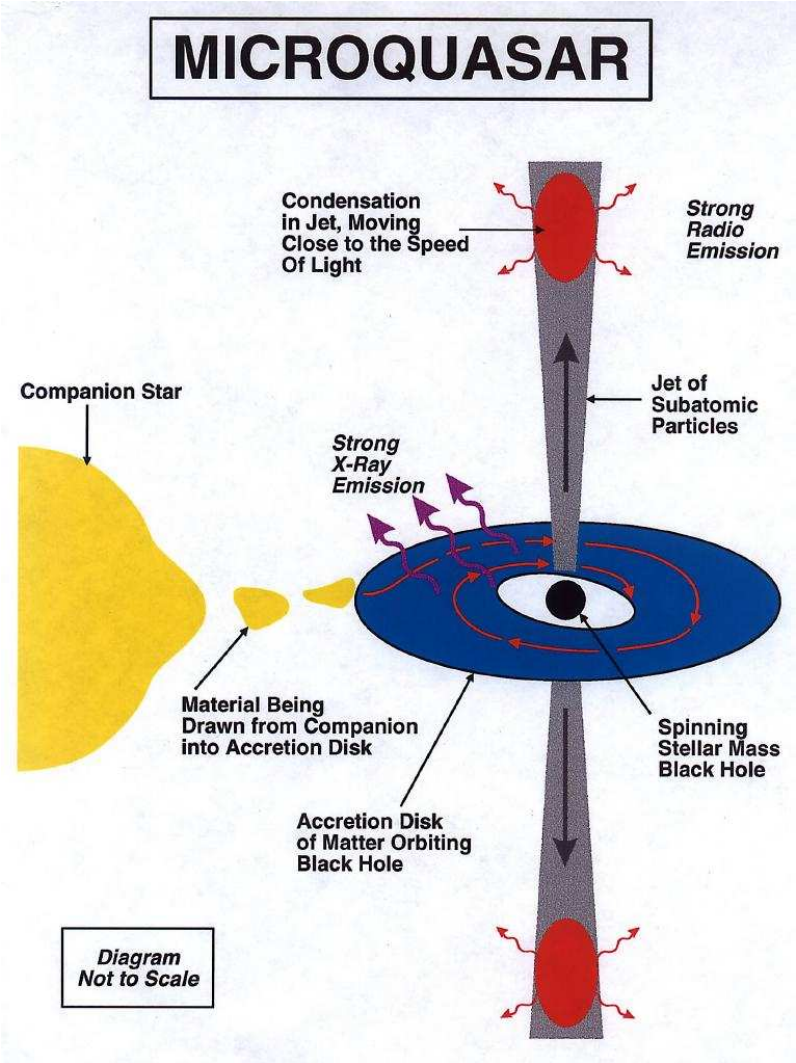

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disk-jet coupling in μQSO's

most μQSO's are BHB's or BHC's (just 2 presumed NS)

BHB's X-ray states:
Off, Low/Hard, High/Soft, Very High (or intermediate)

- Low/Hard $\rightarrow$ steady radio jet
- Very High $\rightarrow$ optically thin radio flare
- Off and High/Soft $\rightarrow$ radio quenching

Low/Hard state: fitted relation between radio and X-ray intensity (astro-ph/0305231)

$$L_{radio} \propto L_X^{0.7}$$

RXTE/ASM data

3 Scanning Shadow Cameras (SSC) (proportional counters)

- sensitive to 1.3-12.1 keV X-rays
- 3 energy bands available:

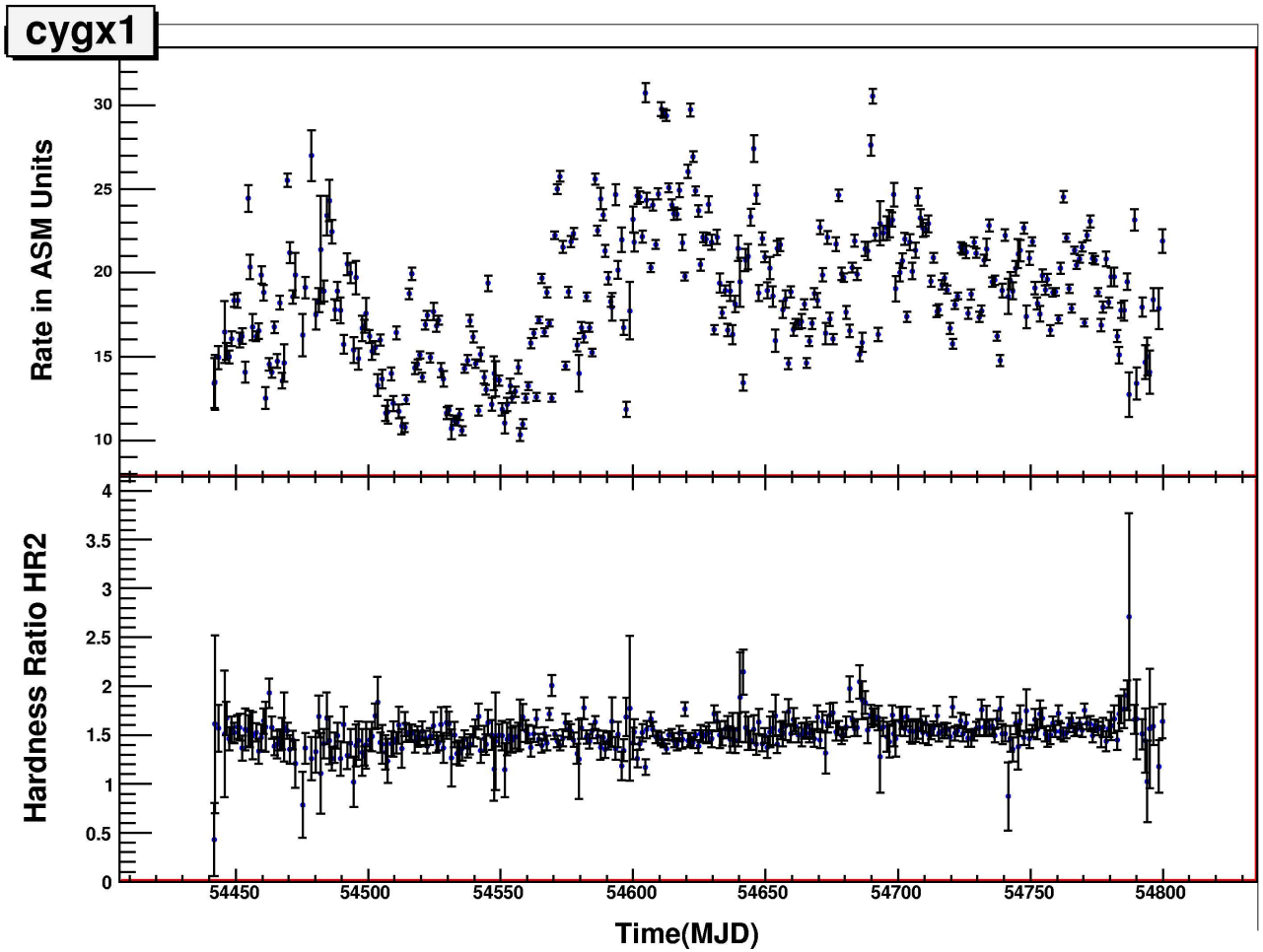
  (1.3-3.0) ; (3.0-5.0) ; (5.0-12.1) keV

- hardness ratio defined as:

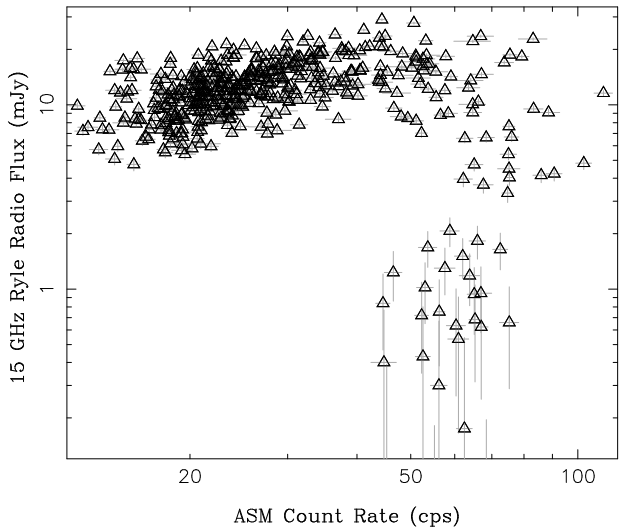
  HR1=(3.0-5.0 keV)/(1.3-3.0 keV)
  HR2=(5.0-12.1 keV)/(3.0-5.0 keV)

- Data available in ASCII format: "quick-look results provided by the ASM/RXTE team".

RXTE/ASM lightcurves: Cygnus X-1

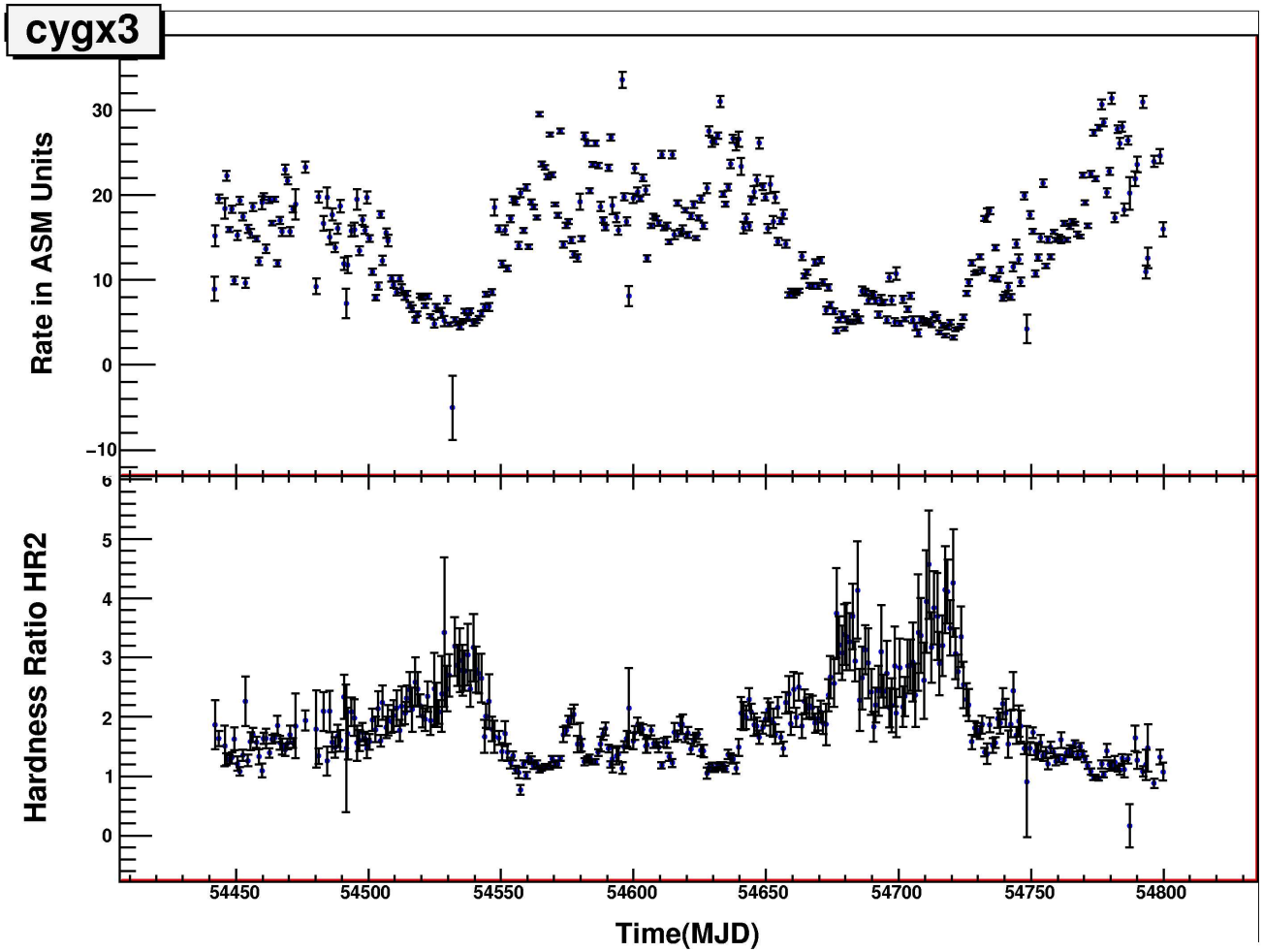


radio emission of
$\sim$10 mJy expected below
30 ASM counts s^{-1}

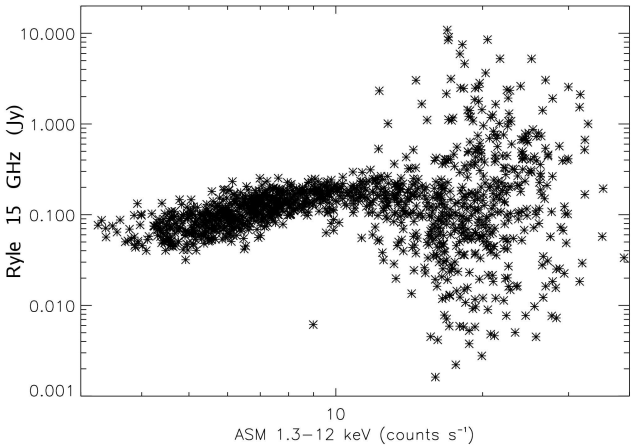


(astro-ph 0412006)

RXTE/ASM lightcurves: Cygnus X-3

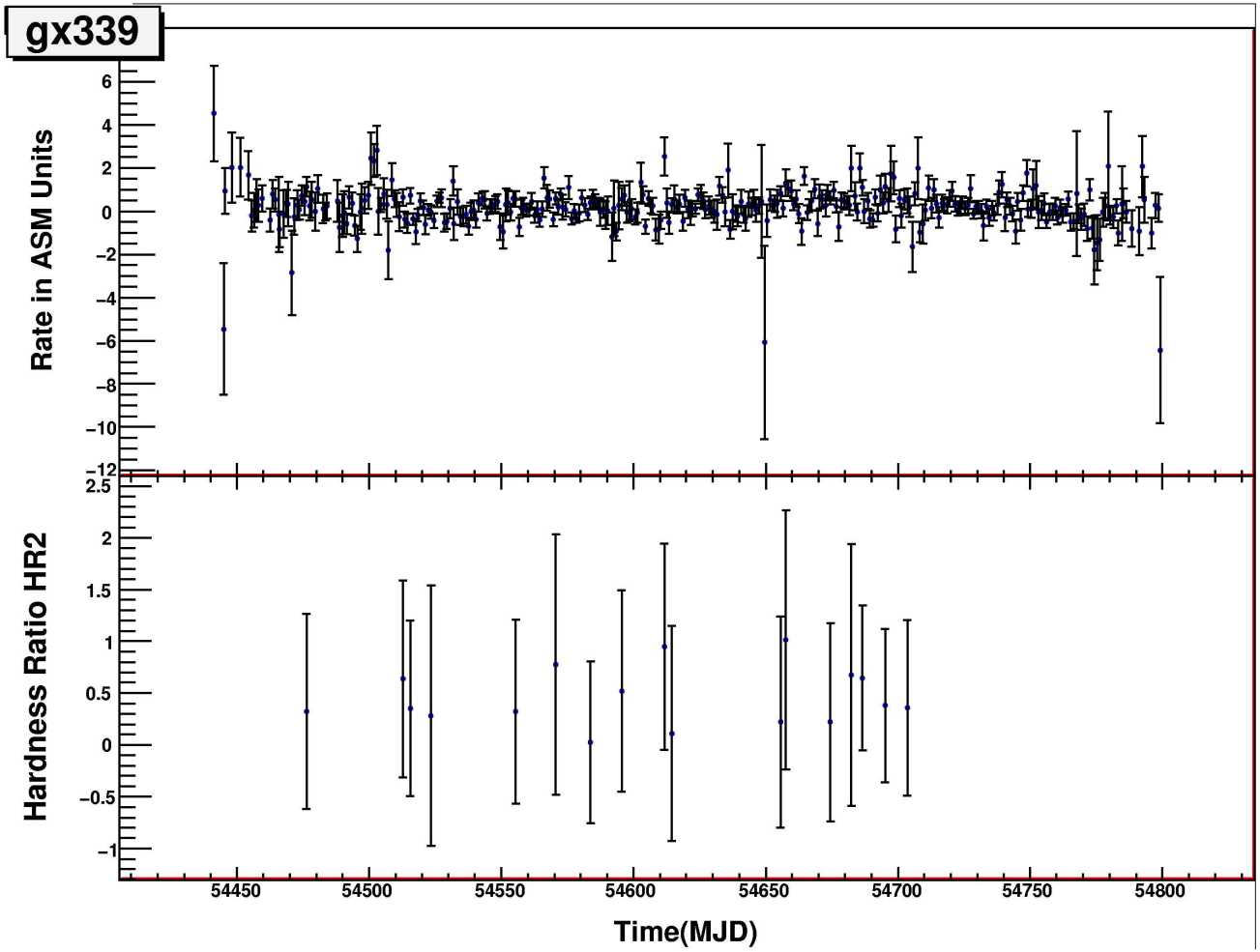


radio emission of
$\sim$100 mJy expected below
15 ASM counts s^{-1}



(astro-ph 0707.2032)

RXTE/ASM lightcurves: GX 339-4

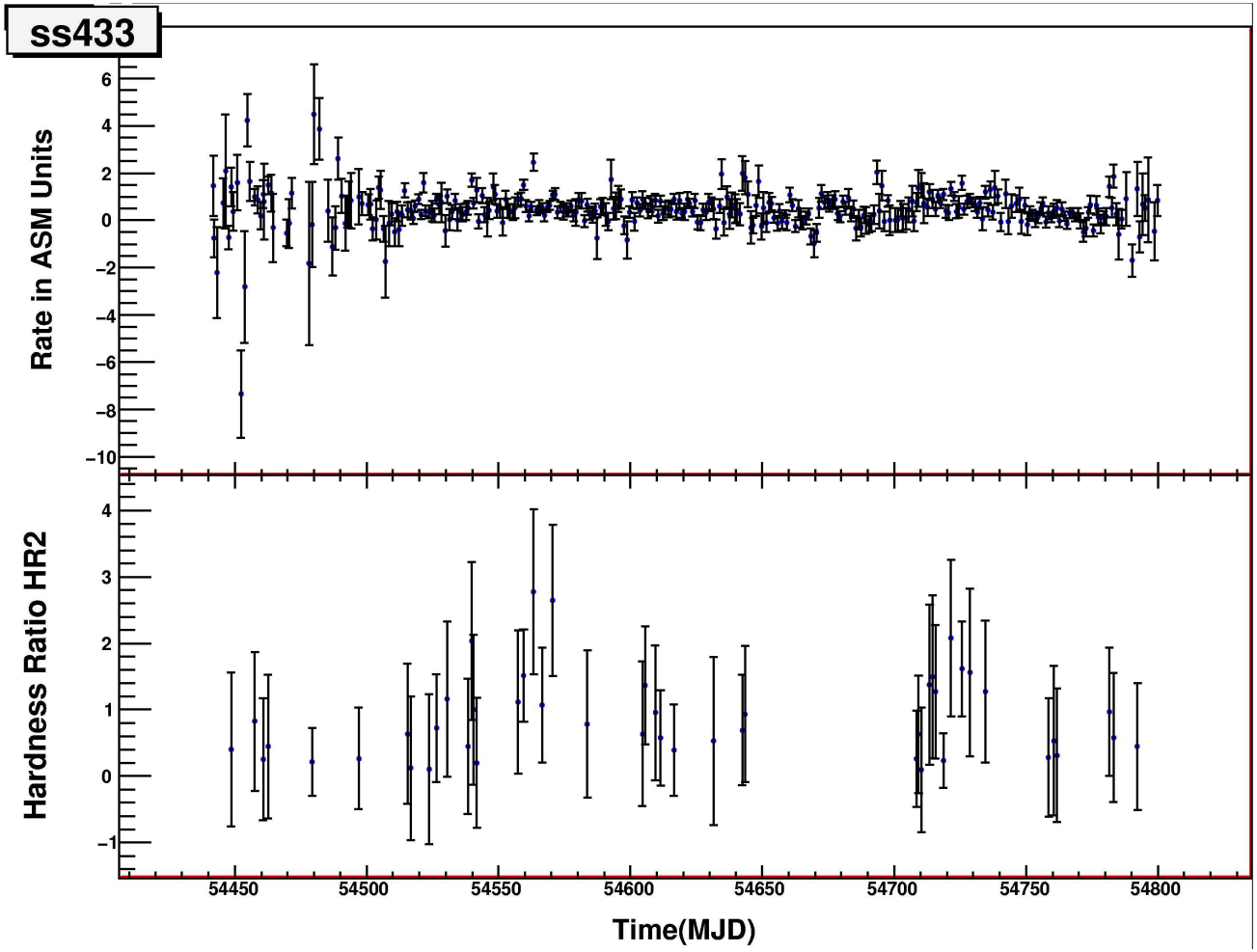


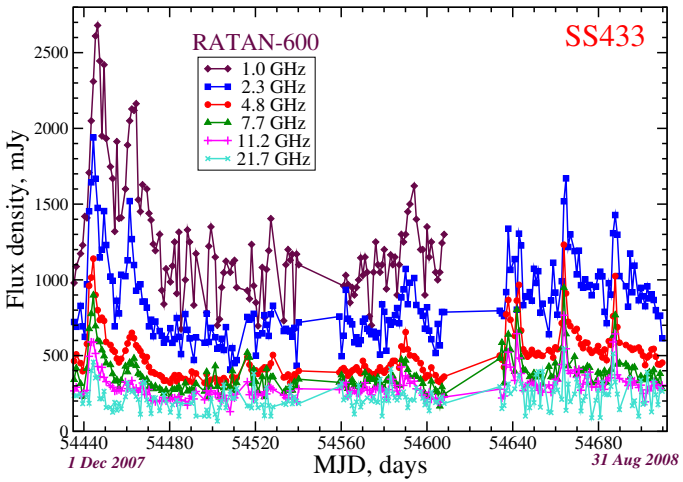
compatible to an Off state: no radio emission likely to be observed in 2008 with a mJy sensitivity

March 2009, possible Hard state, likely a 6 mJy radio emission

(astro-ph 0003460)

RXTE/ASM lightcurves: SS 433





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