

Resolving the hard X-ray emission of GX 5- with INTEGRAL

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The *LMXRB* monitoring programme

Description and first results: Proc. 5th INTEGRAL Workshop

(Paizis et al., 2004)

Core Programme data

Neutron Star LMXRB:

X 5-1 (this talk)

co X-1 (P. Goldoni)

X 3+1 (R. Farinelli)

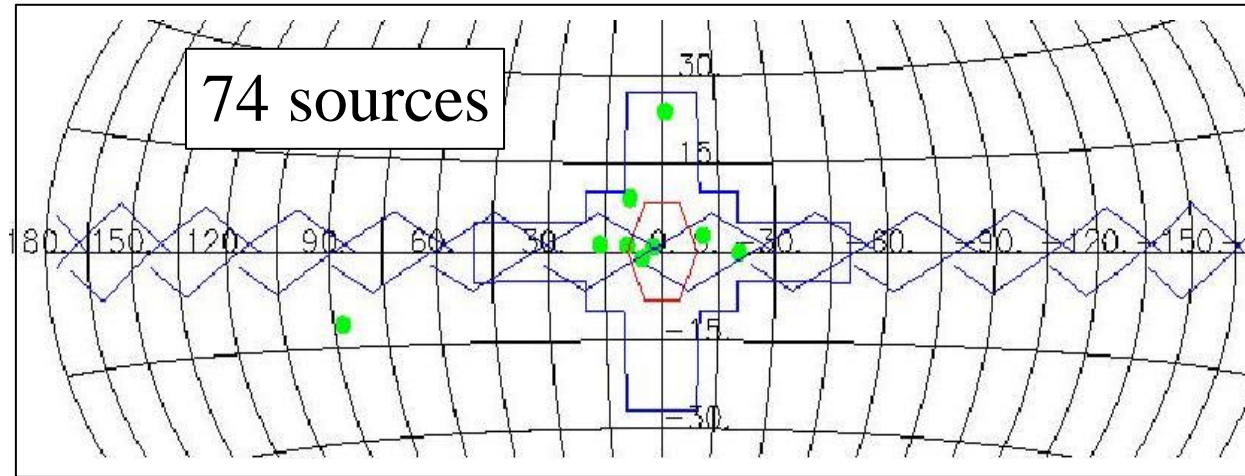
X 17+2

yg X-2

X 9+9

X 9+1

U 1822-371



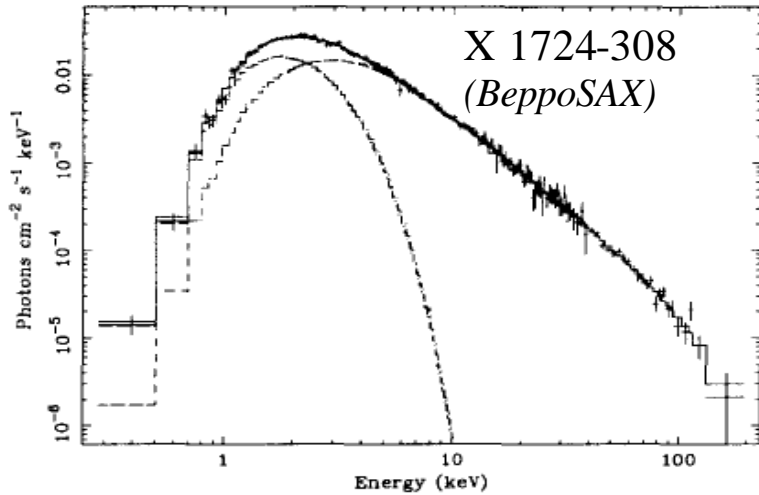
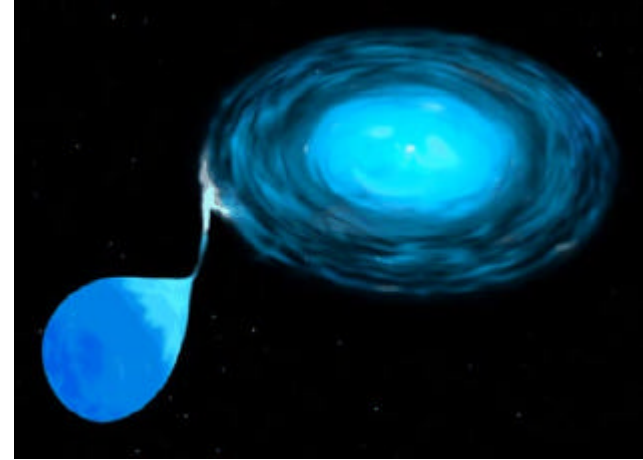
INTEGRAL Acc. Pulsar monitoring web pages (described by J. Wilms) We will

include our LMXRBs:

starting with the above sources, GRS 1758-258, GRS 1915+105...

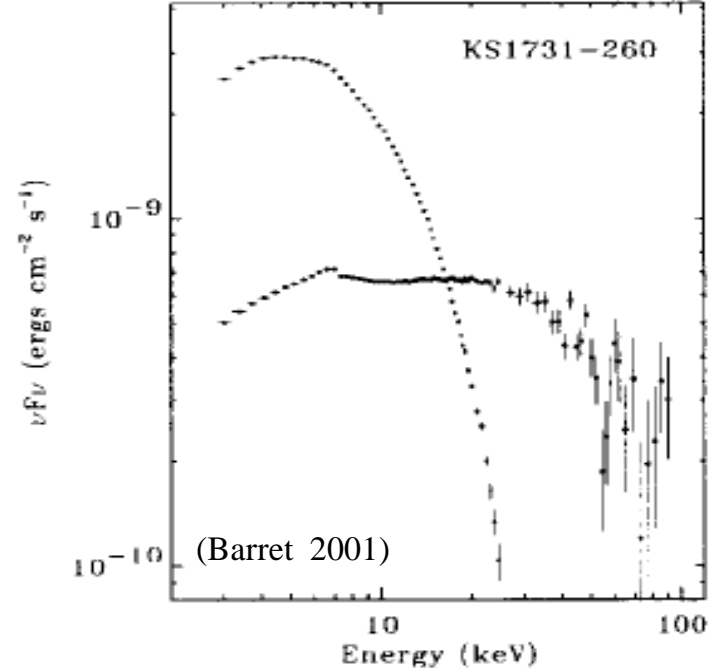
Low Mass X-ray Binaries

Low mass star: $M < 1 M_{\odot}$ (spectral type K, M)
 Black Hole (Candidate) or Neutron Star



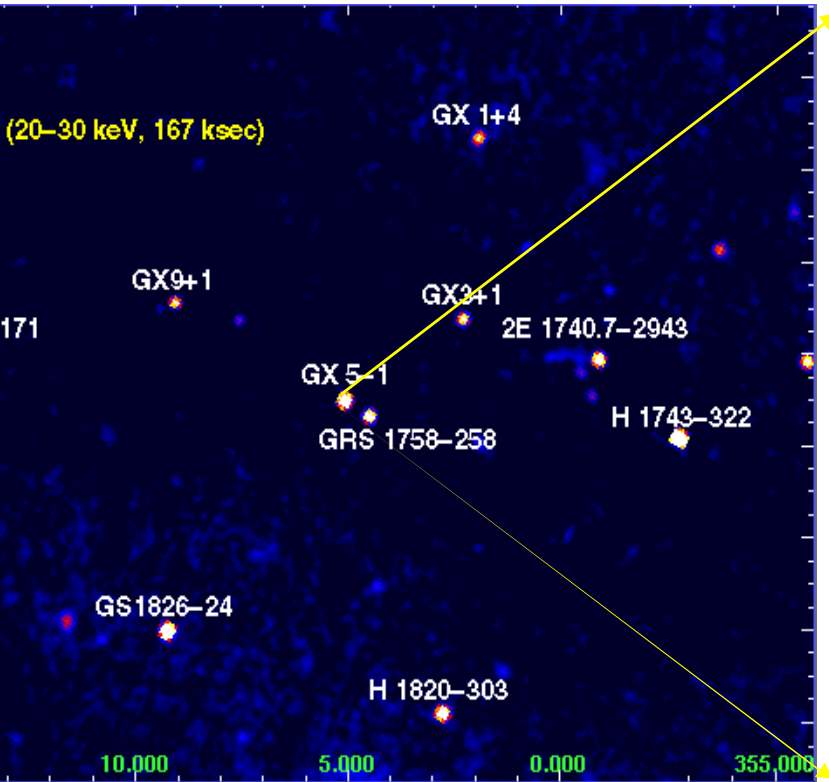
(Guainazzi et al., 1998)

atmosphere of hot electrons ($\sim 1-100 \text{ keV}$)
 Comptonise the photons:
 "Corona"
 Hot flow
 Jet
 Boundary layer

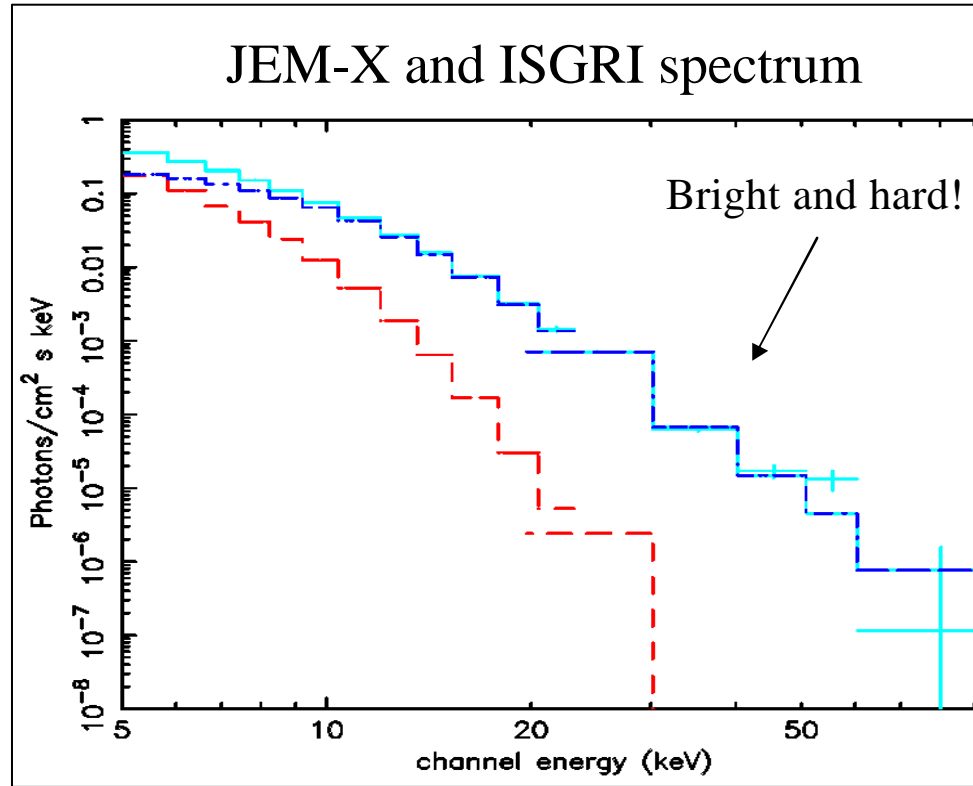


(Barret 2001)

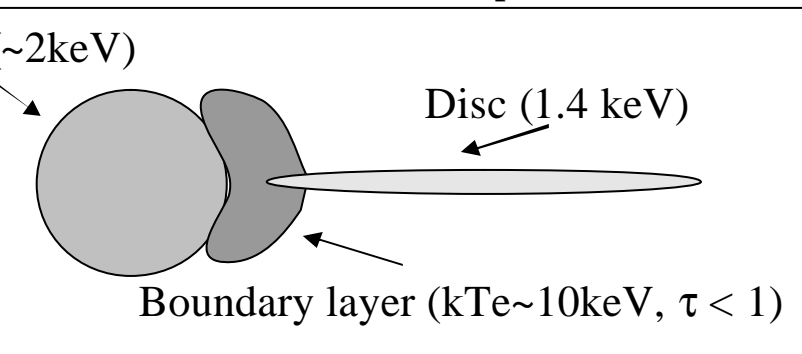
GX 5-1: a bright NS LMXRB



(April / October 2003)

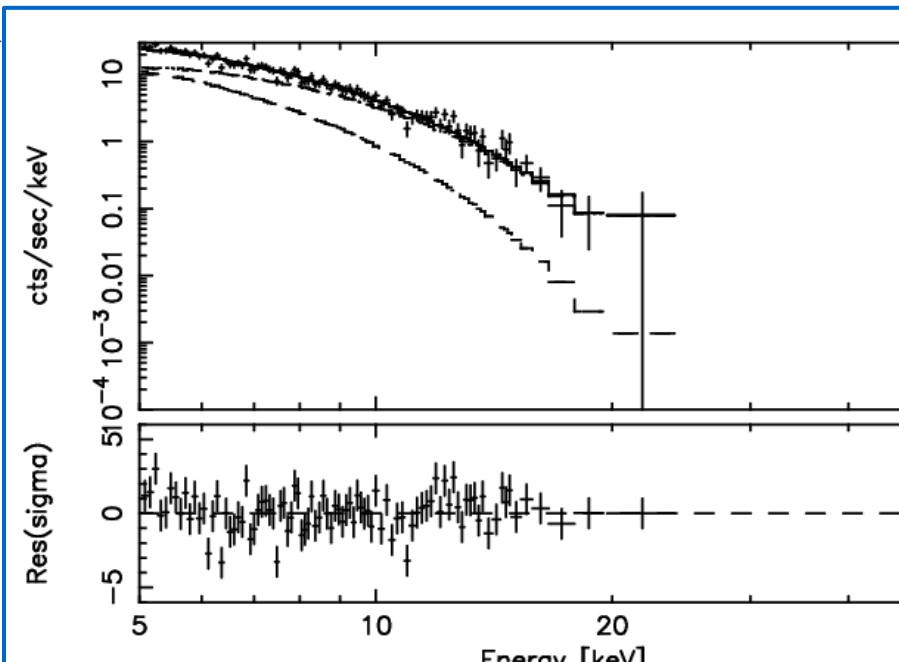
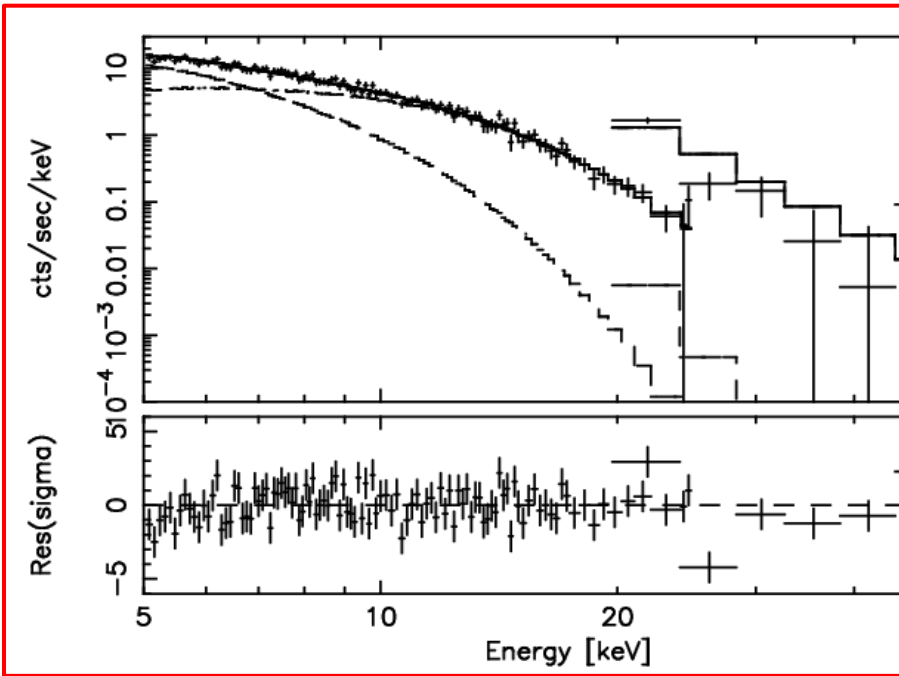
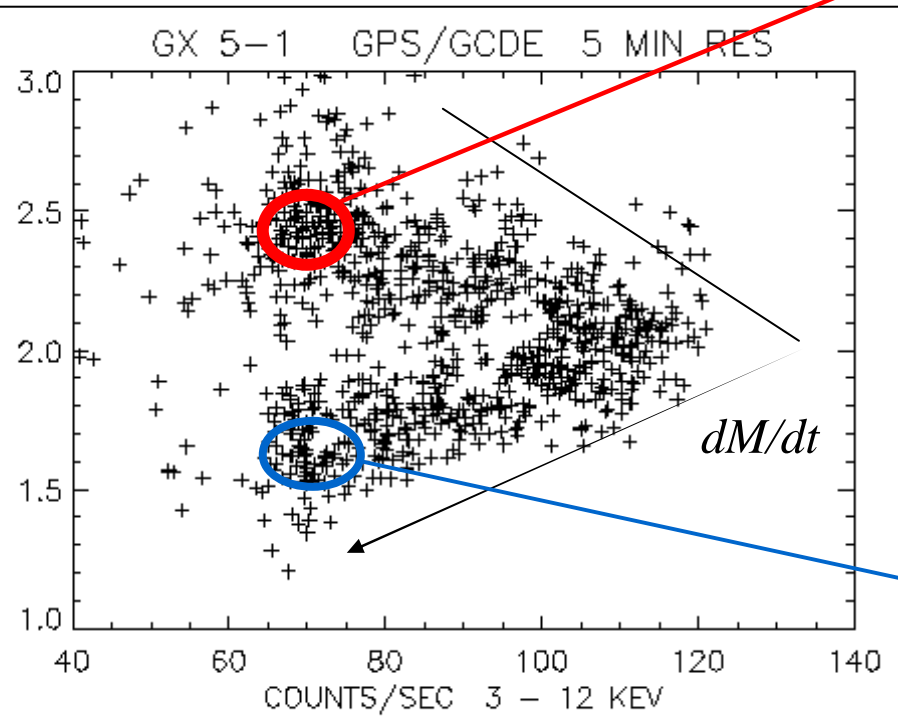


(Paizis et al., 2005)



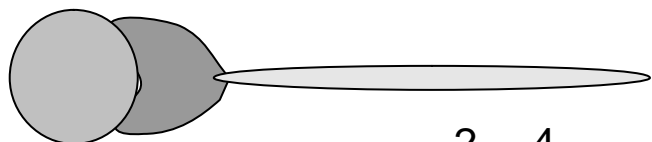
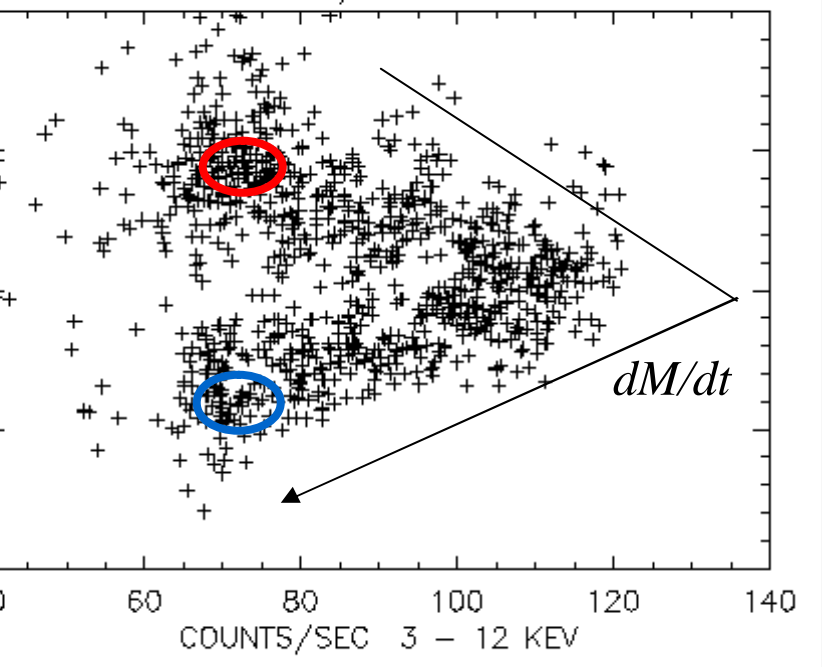
- ? **Soft** component: emission from the **disc**;
- ? **Hard** component: **Comptonisation** of the NS emission by the boundary layer plasma;
- ? **Total spectrum**: shows a flattening above 30 keV.

GX 5-1: a Z source



The spectra are different along the “Z”:
How can we quantify this difference?

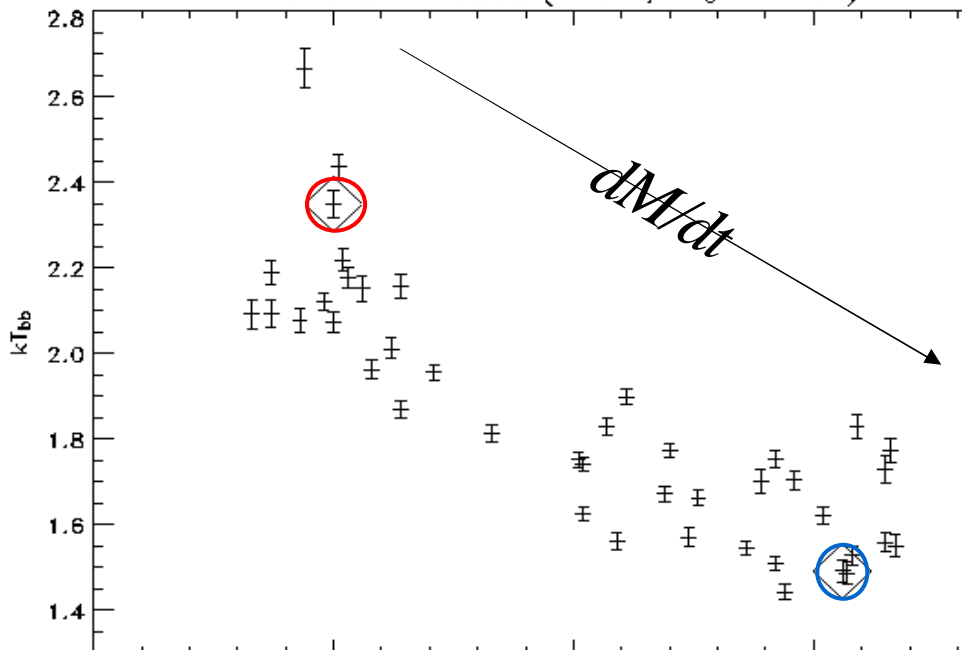
GX 5-1 GPS/GCDE 5 MIN RES



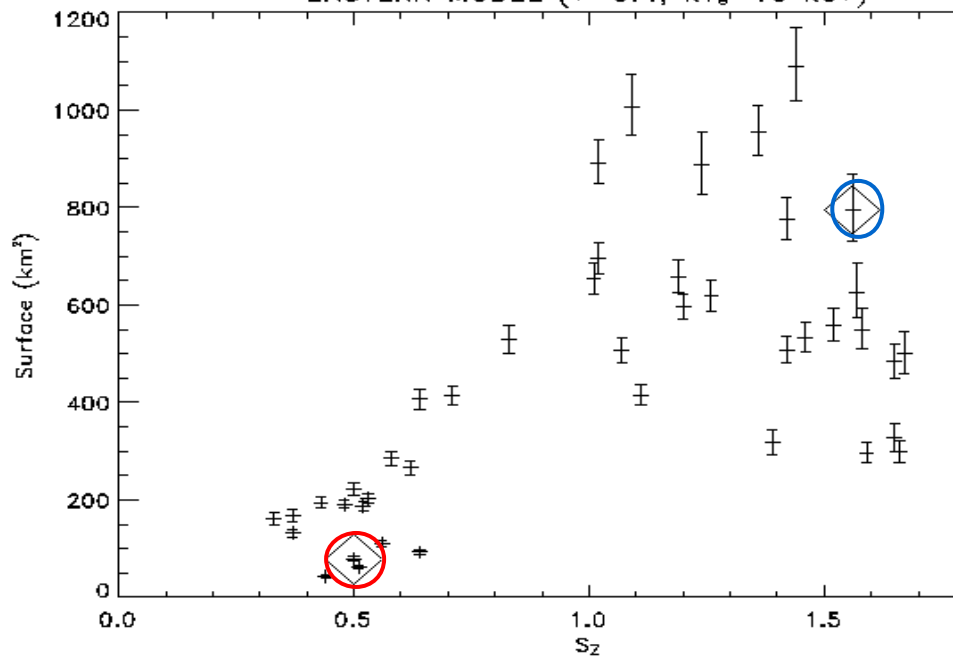
$$L \propto R^2 T^4$$

agreement with Popham & Sunyaev (2001): expansion of boundary layer with increasing dM/dt .

EASTERN MODEL ($\tau=0.4, kT_e=10$ keV)



EASTERN MODEL ($\tau=0.4, kT_e=10$ keV)



Summary and future work

We have studied GX 5-1 using INTEGRAL Core Programme data (ISGRI and JEM-X):

1. We detect for the first time a clear emission above 20 keV:
→ Comptonising opt. thin plasma of $kT_e \sim 10$ keV;

2. We can study the spectral variation of GX 5-1 along the “Z” pattern:
→ changes in the properties of the boundary layer

We intend to:

1. Extend the study to all the available data (with latest software)
2. Include RXTE simultaneous data

