Investigation of the Galactic Bulge Emission with Suzaku

M.Kokubun (ISAS/JAXA),
T.Yuasa[2], K.Tamura[1,2], S.Yamauchi[4], K.
K.Makishima[2,3], and T.Takahash

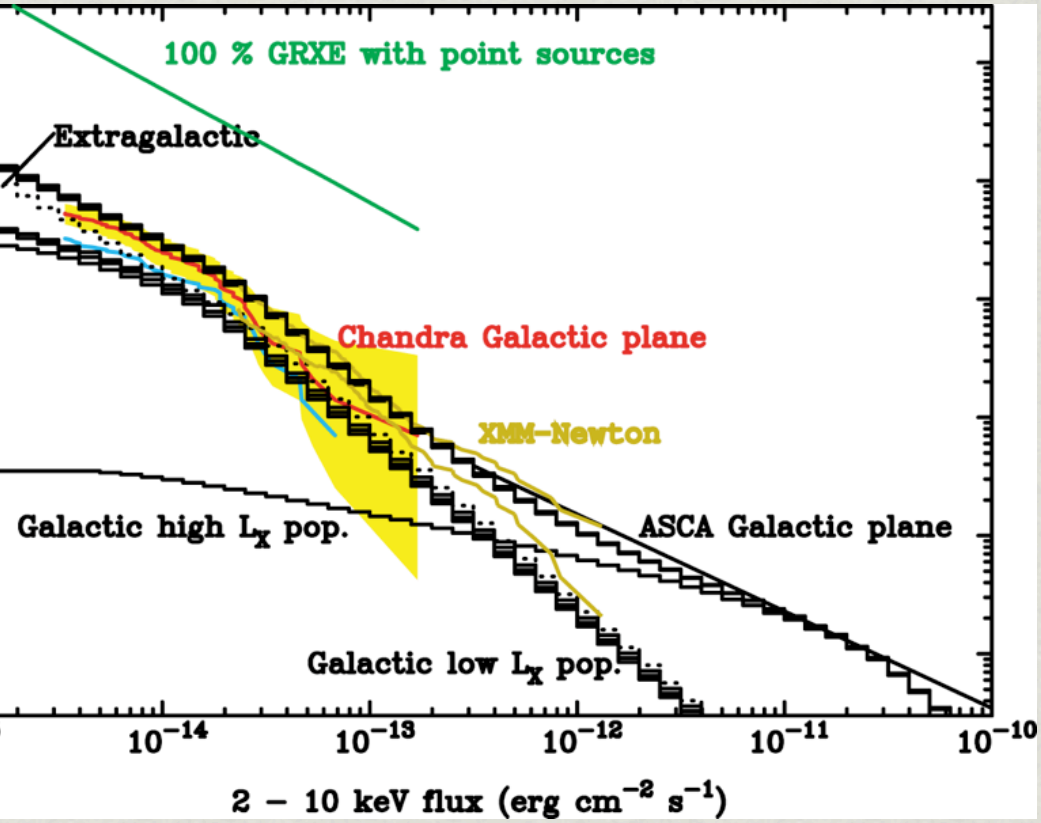
ISAS/JAXA[1], University of Tokyo[2], RIKEN[3]

Diffuse plasma

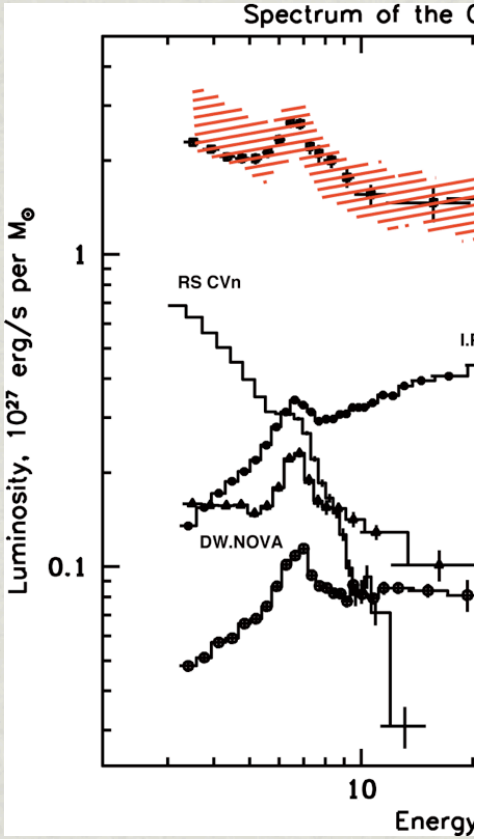
OR

Point sources

Ebisawa et al. (2005)



Revnivtsev et al. (2006)



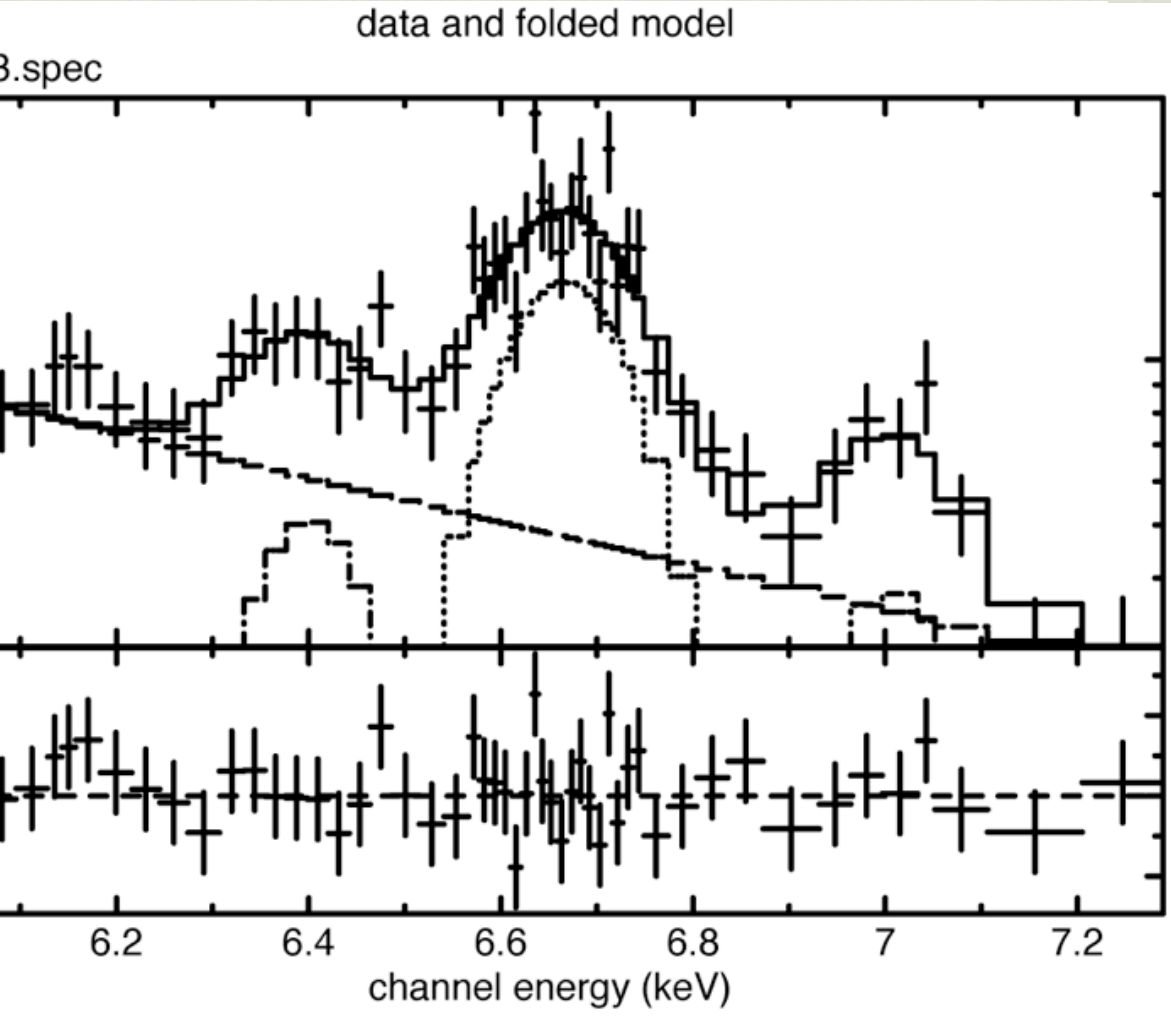
w to confine or supply such a
gh-temperature plasma ?

Do we know the actual populatio
and number density of CVs ?

e.g. Magnetic confinment
(Makishima *et al.* 1994)
In-situ acceleration

Is the Galactic Center is just an extreme enhancement of the GRXE ?

Suzaku : GRXE spectroscopy



Energy (keV)	Width (eV)	Flux (10^{-5})*	
6.41+/-0.02	<120	8+/-2	8(
6.670+/-0.006	<46	25+/-3	35
7.00+/-0.03	<52	5+/-2	7(

* (10^{-5} photon s^{-1} cm^{-2}

ku has for the first time resolved the Fe-K emission into three lir

- 6.7 and 6.9 keV : hot plasma at several keV
- 6.4 keV : interaction with the cold neutral matter (ISM)

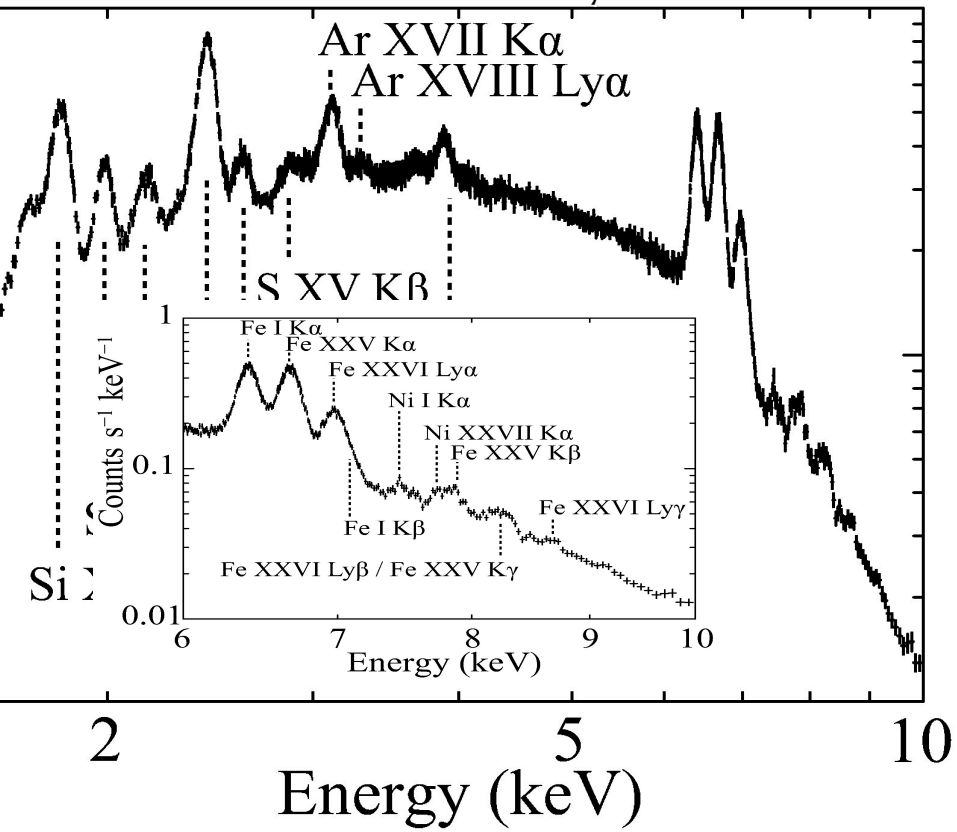
Possible Origin of 6.7 keV Lines?

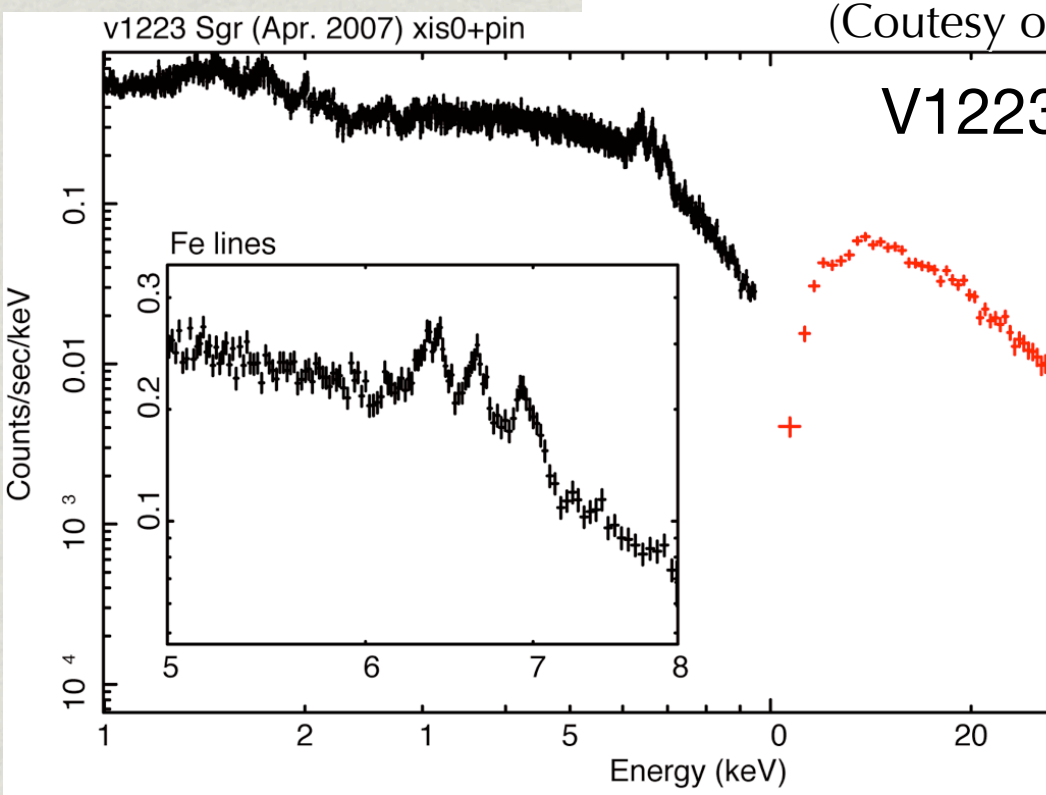
Diffuse plasma

OR

Point sources

(Koyama et al. 2007)



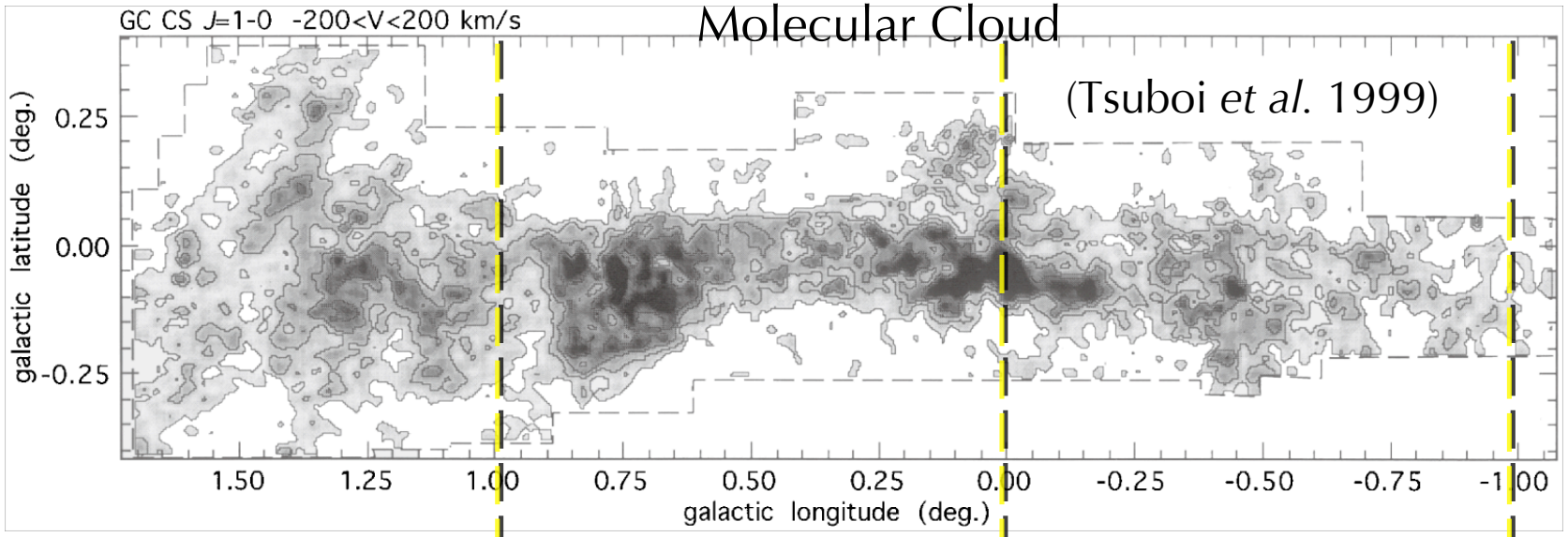


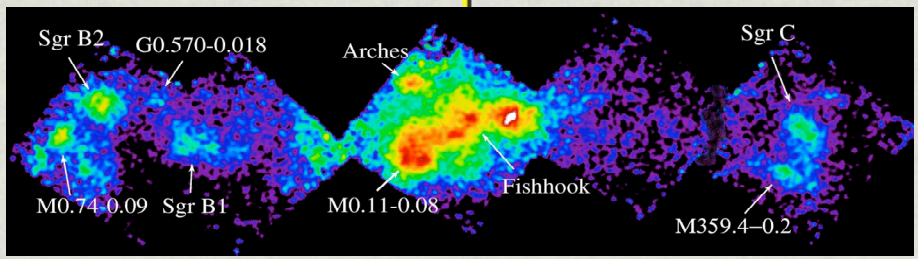
ction between the cold ISM and
/non-thermal electrons.

(Yamasaki et al. 1997,
Valinia et al. 2000)

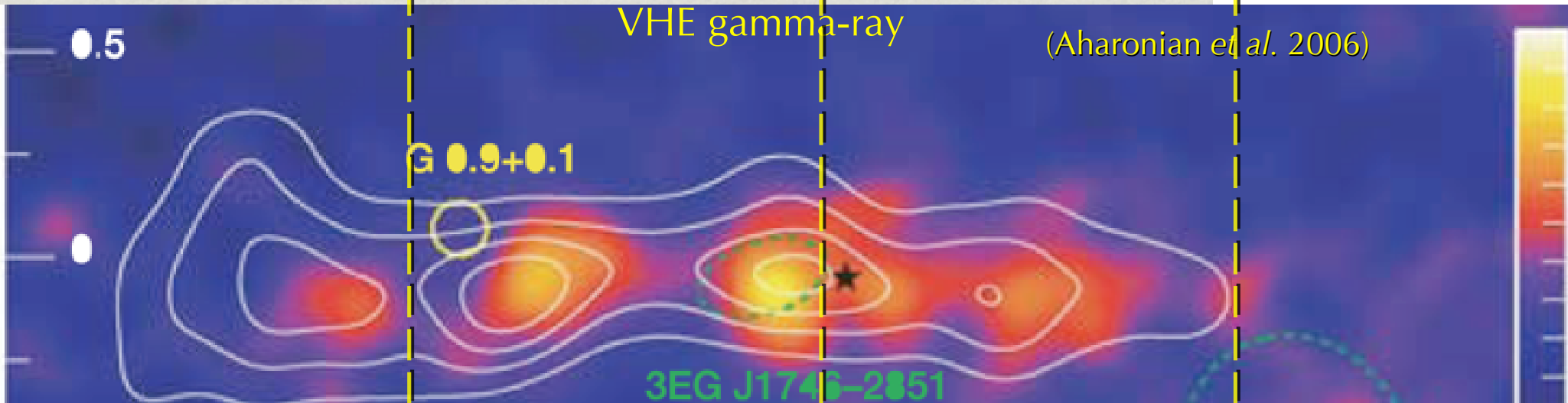
Superposition of numerous dim sour
like quiescent cataclysmic variables

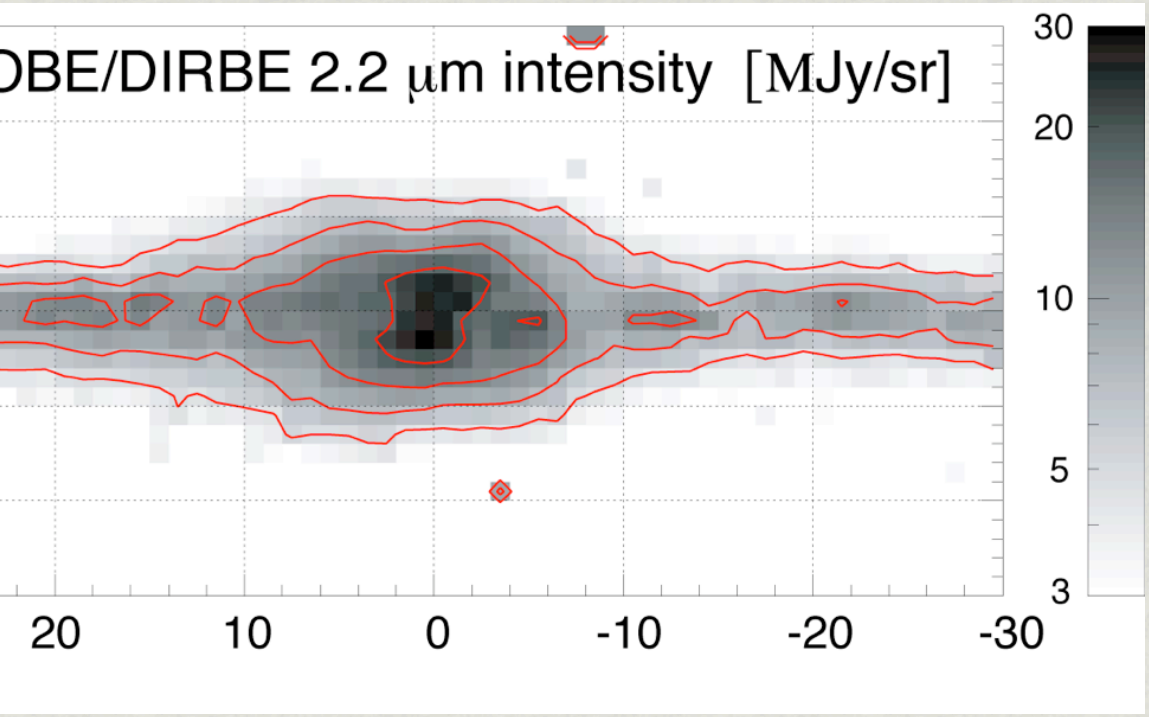
(Ezuka & Ishida

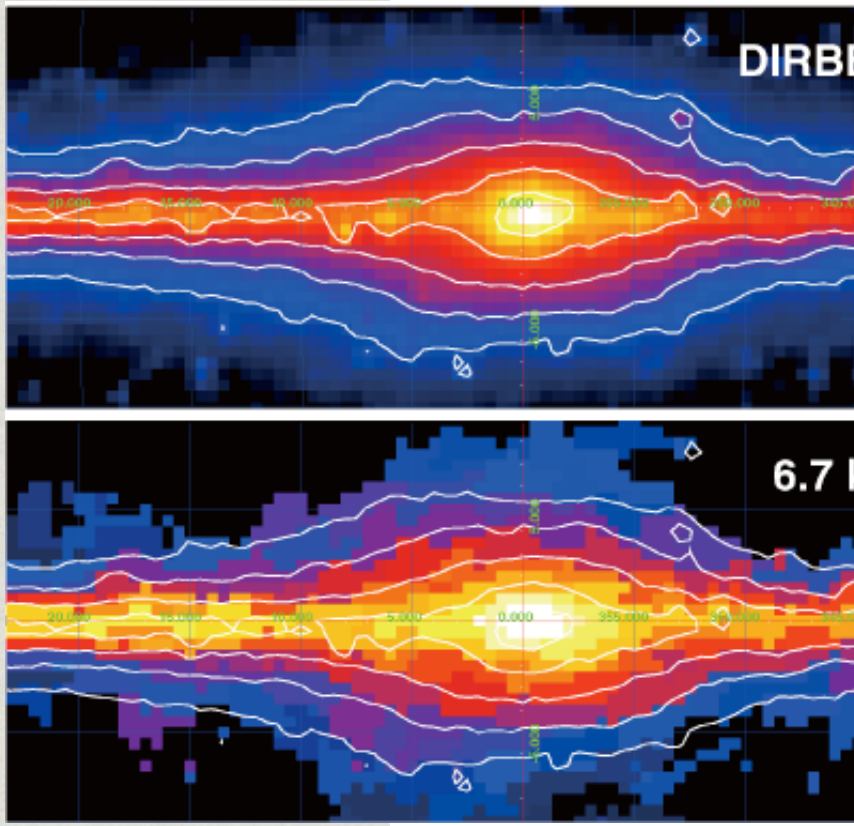




6.4 keV narro
image obtaine
Suzaku







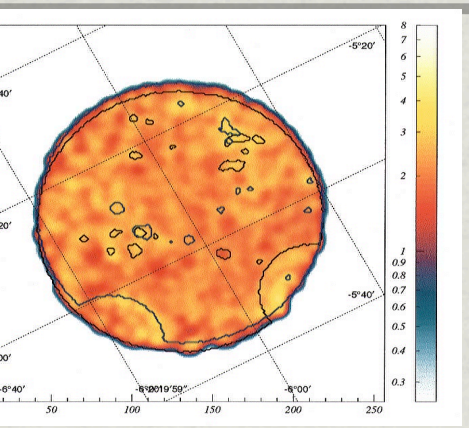
(Revnivtsev et

alaxy consists of the Galactic disk and
Their stellar populations and star
tion activities are completely different.
is no on-going star formation activity.

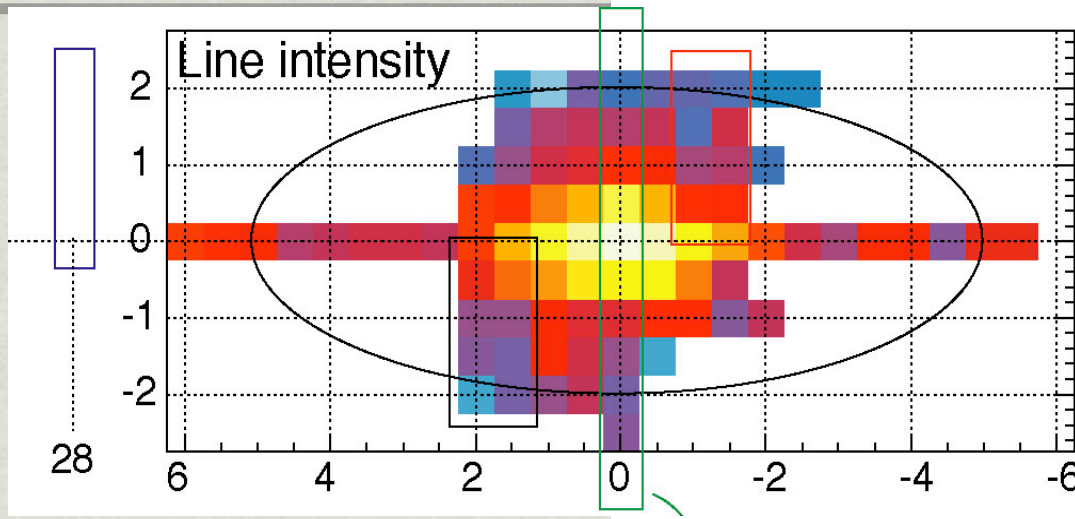
There is a strong correlation bet
the stellar mass distribution and
intensity of 6.7 keV line. Then, if
apply the point source scenario
keV line would be naturally expe
from the bulge

igation with Suzaku will
s crucial information.

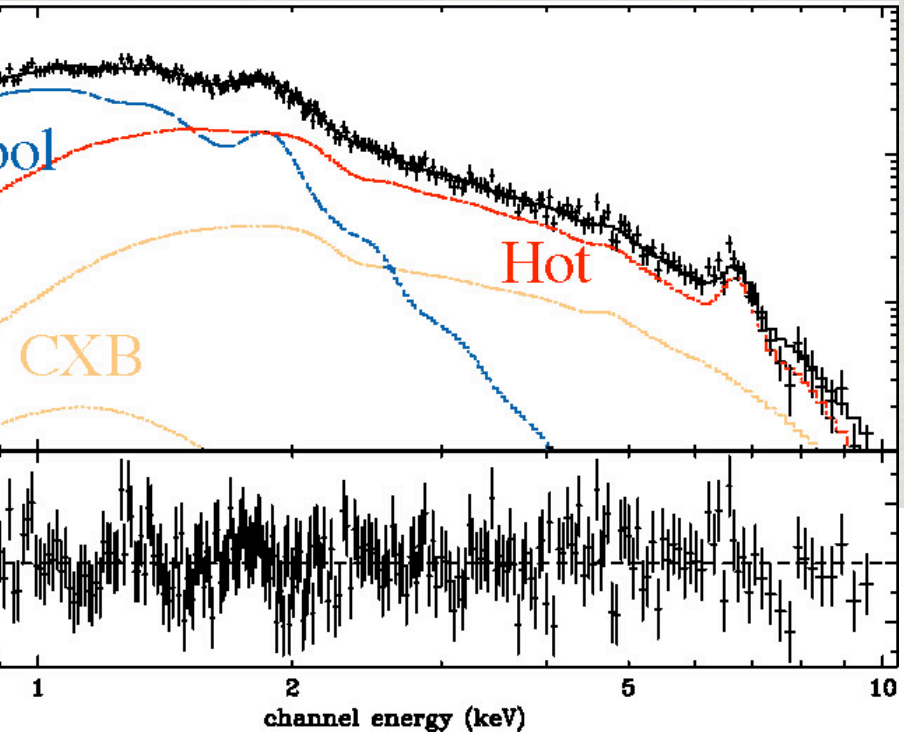
Galactic Bulge X-ray Emission



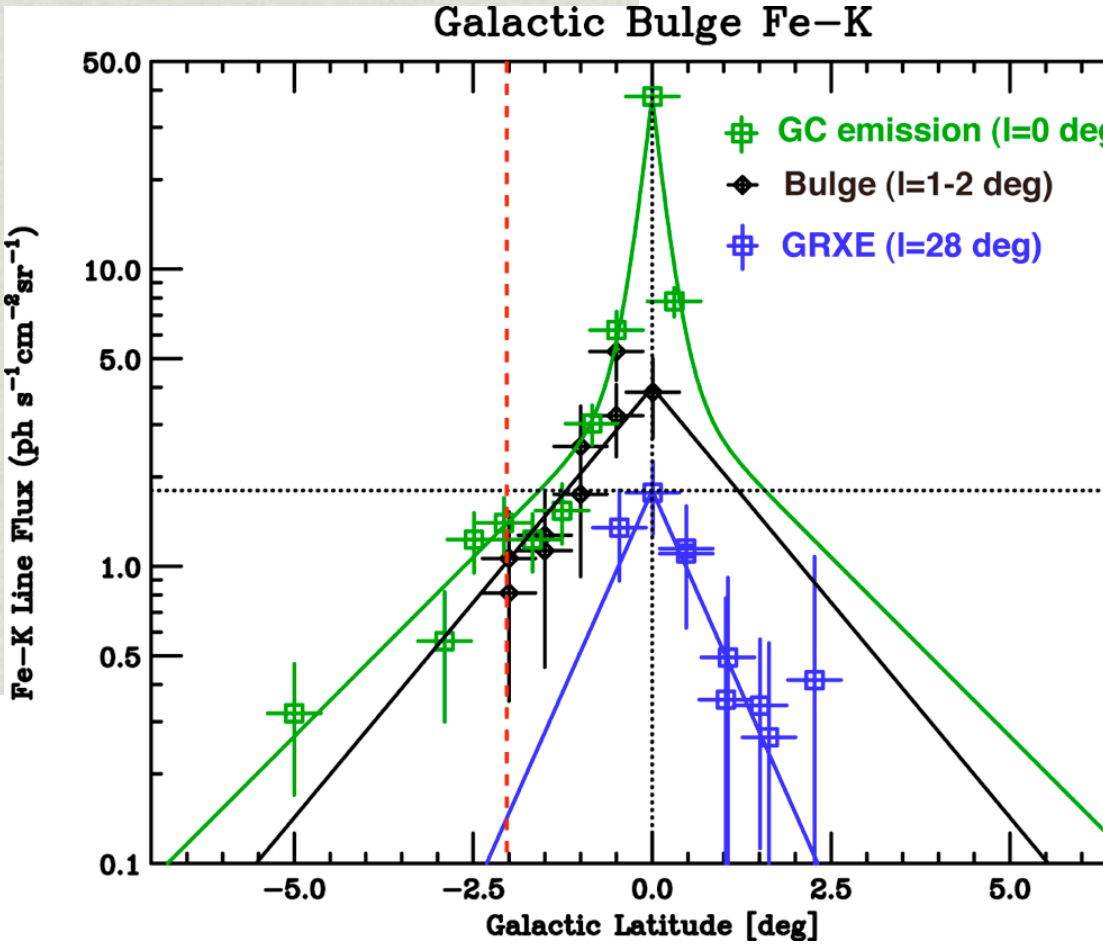
ASCA-GIS
(Kokubun 2001)



X-ray emission widely spreading
whole FOV. The surface
ess is several times than CXB.

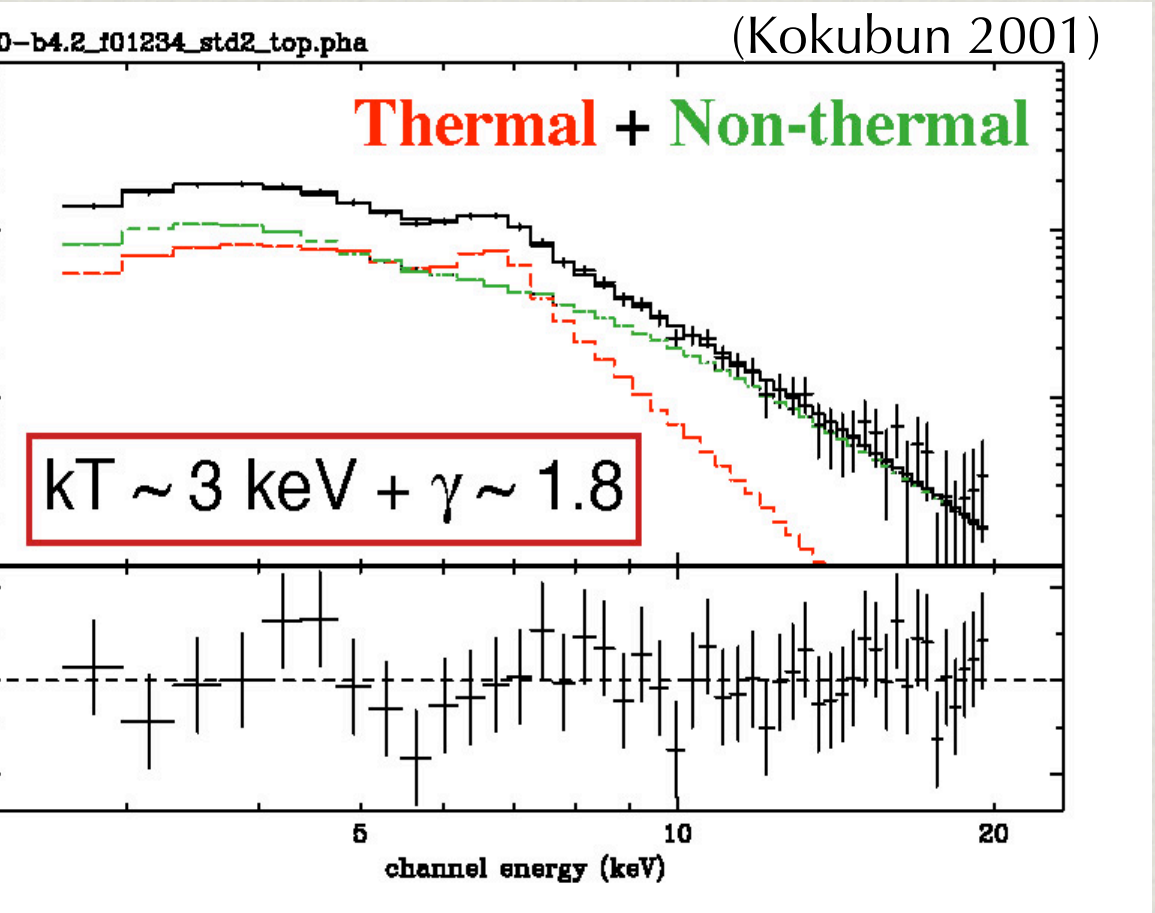


emperature plasma

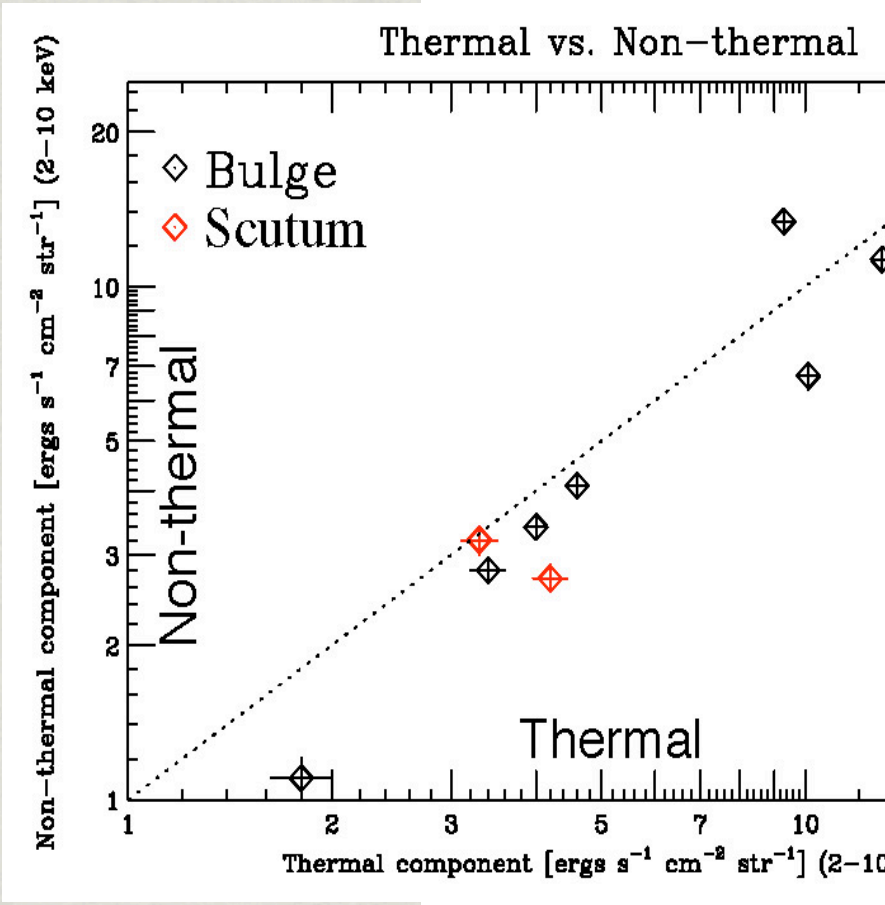


The latitudinal scale of the bulge emission is ~2 d

(0, -4.2)



(Kokubun 2001)

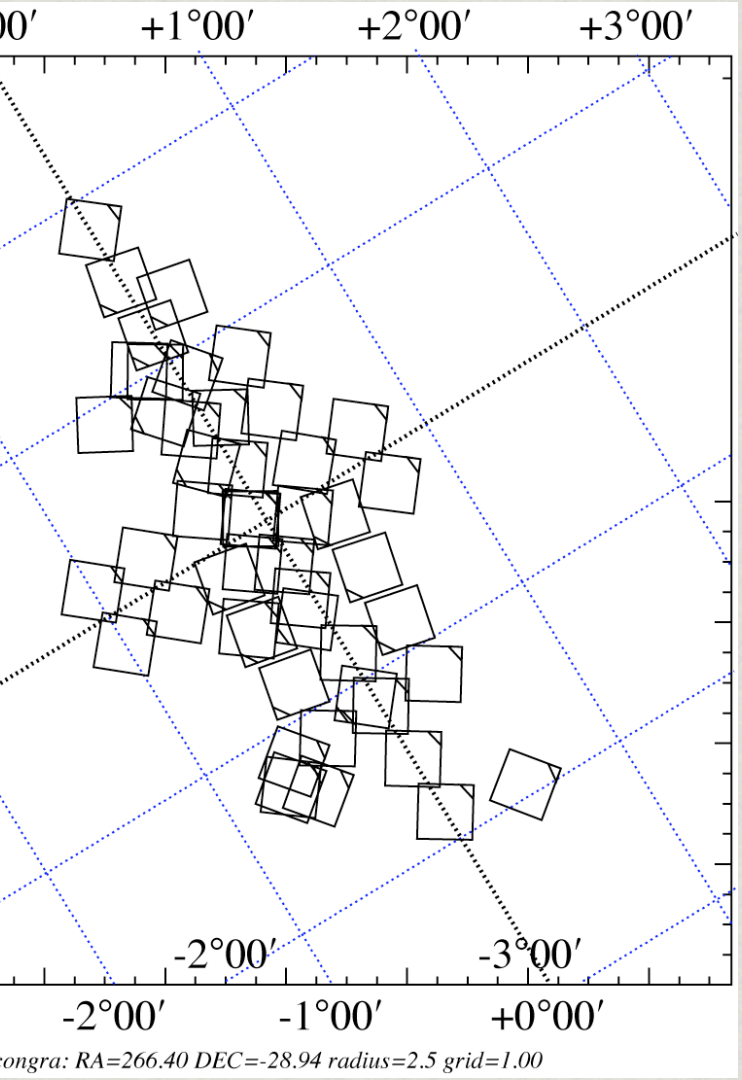


ulge X-ray emission consists of thermal
on-thermal components. These spectral
es (~3 keV + PL) are almost the same
where in the Galactic plane and bulge.

A strong correlation between
thermal and non-thermal brigh
Coexistence of two componer

Inferring the supra-th
electrons ? (Masai 20

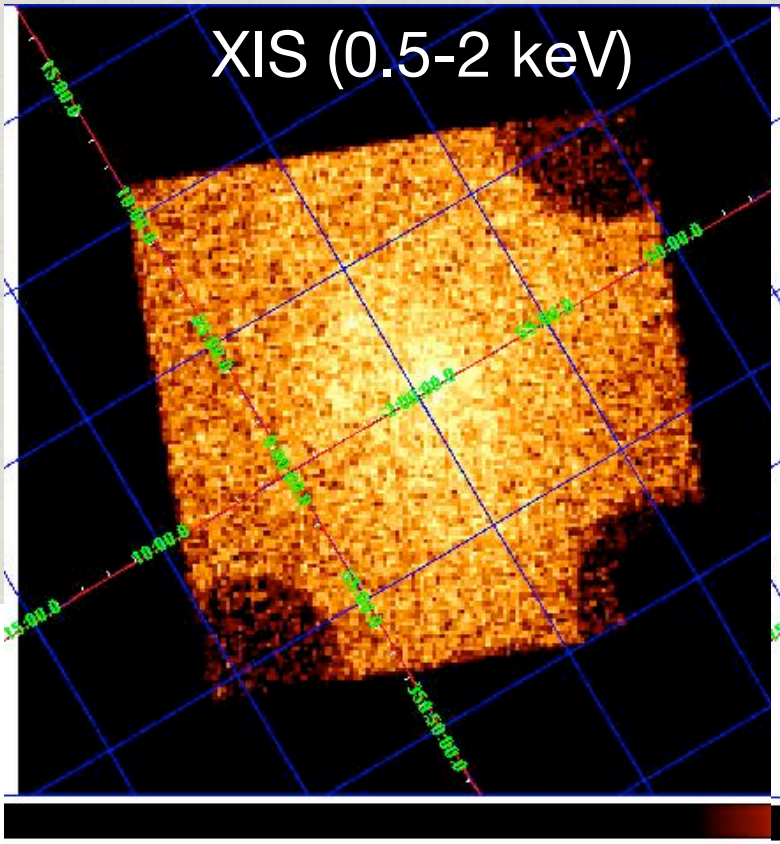
Hard X-ray investigation with HXD-PIN

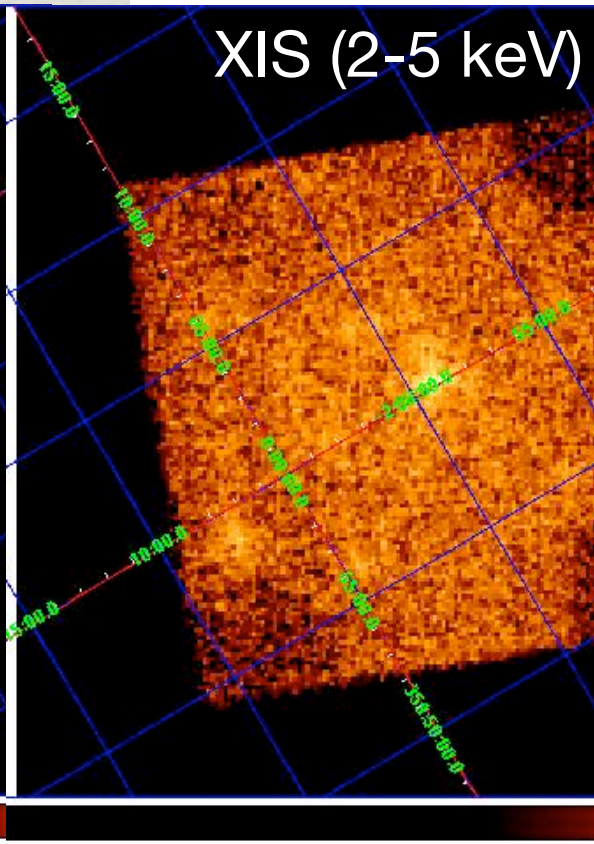


apping observations of
overs b~-1deg.

Observational parameters

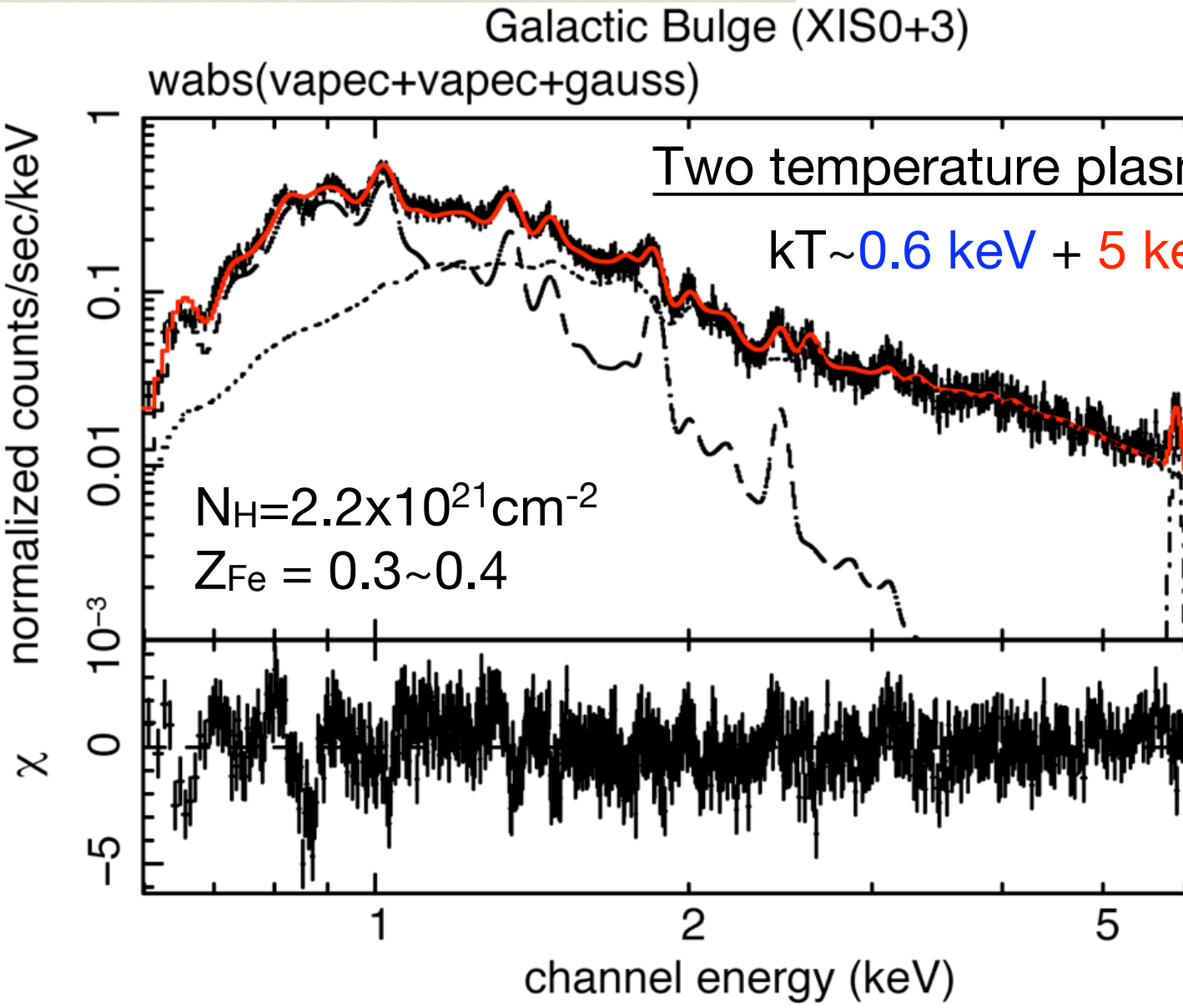
(L,B) = (0, -2)
Obs. Date: 2007-09-29 to 2007-10-02
Exposure = 136 ks
XIS: No window/burst mode



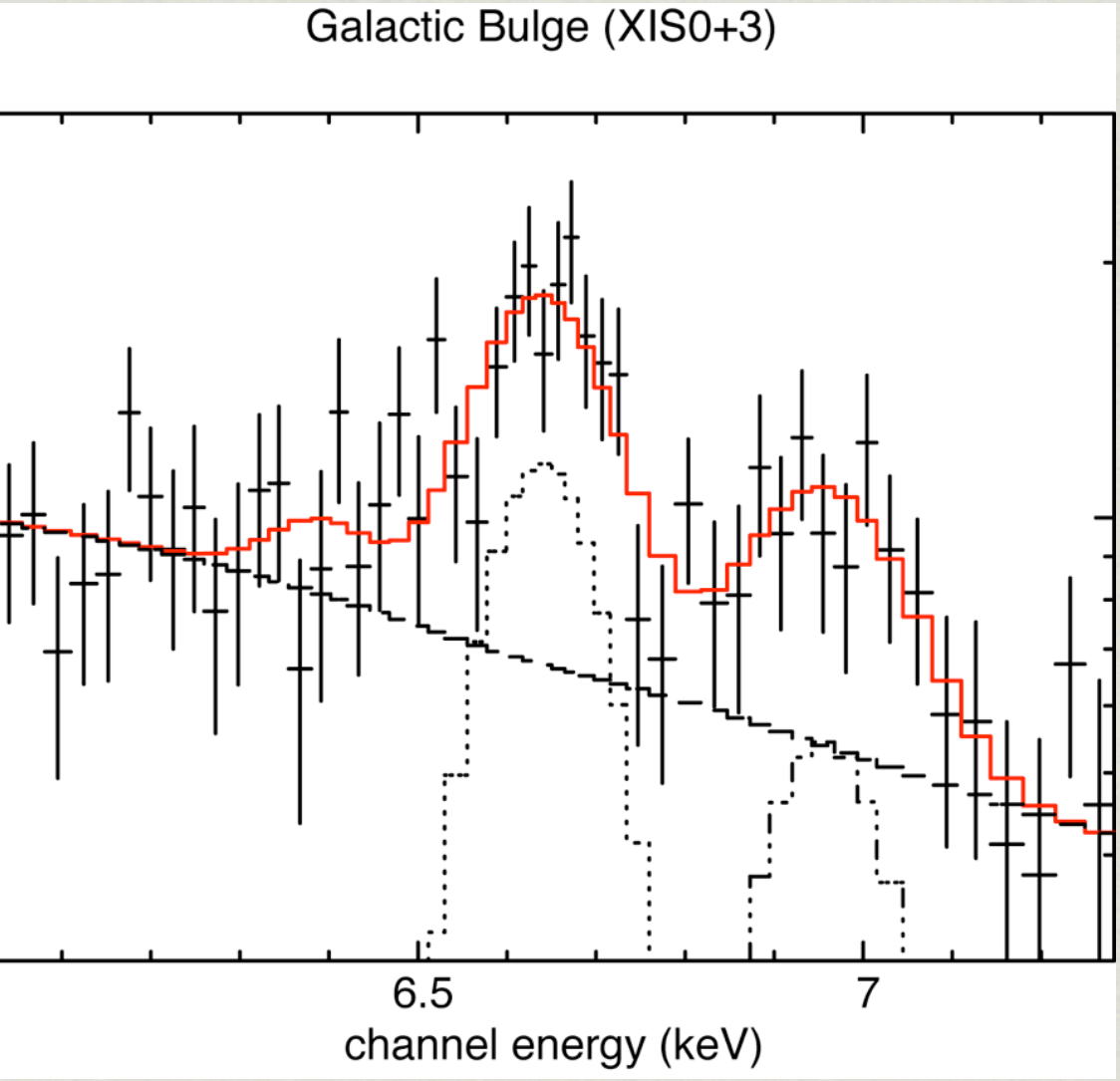


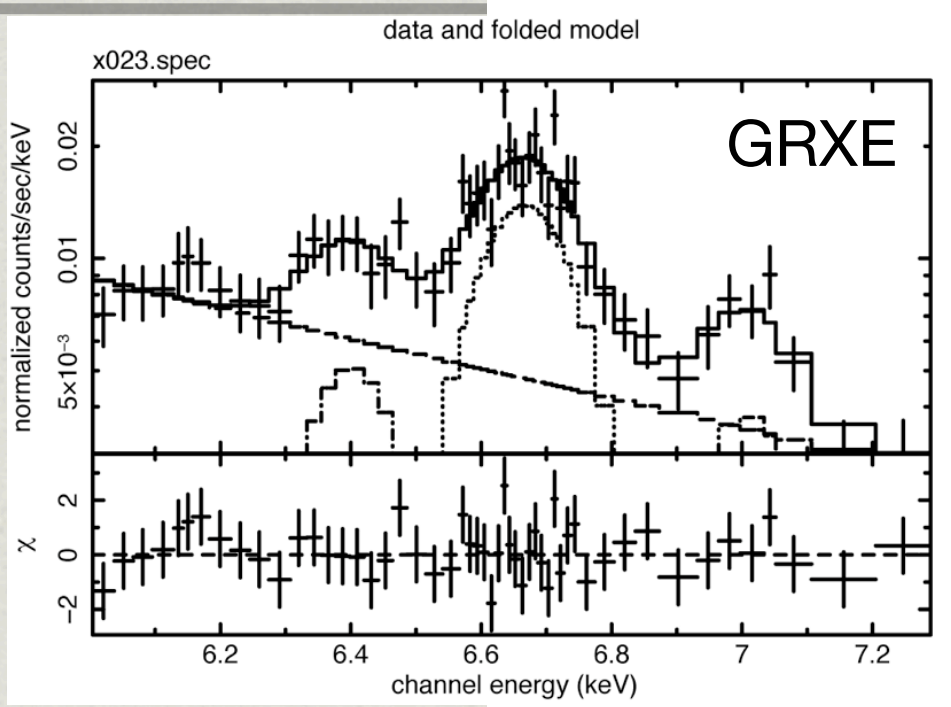
Data analysis

e detector region
ot the cal. source.
+XIS3 summed.
was subtracted by
f the latest database.
file for diffuse source.



host same results as ASCA, but it is possible to perform much finer plasma
gnostics thanks to the better energy resolution, using the low energy lines.
e absorption column density is factor 2 smaller than the Galactic value (5x1

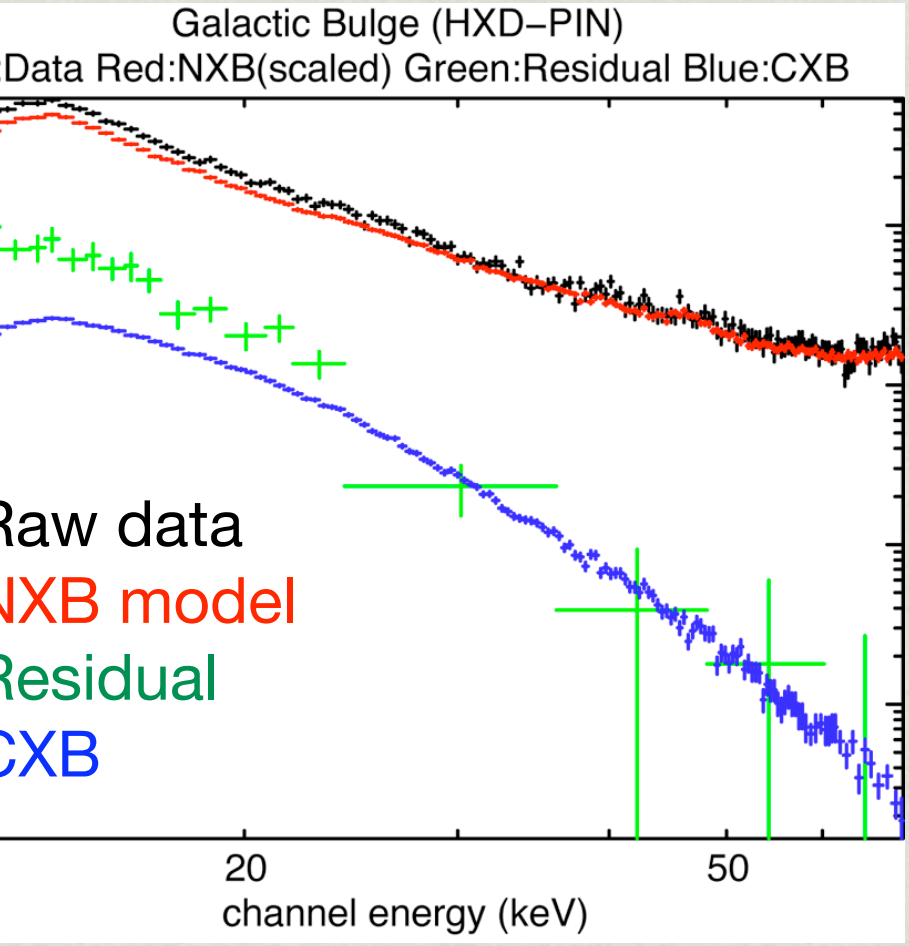


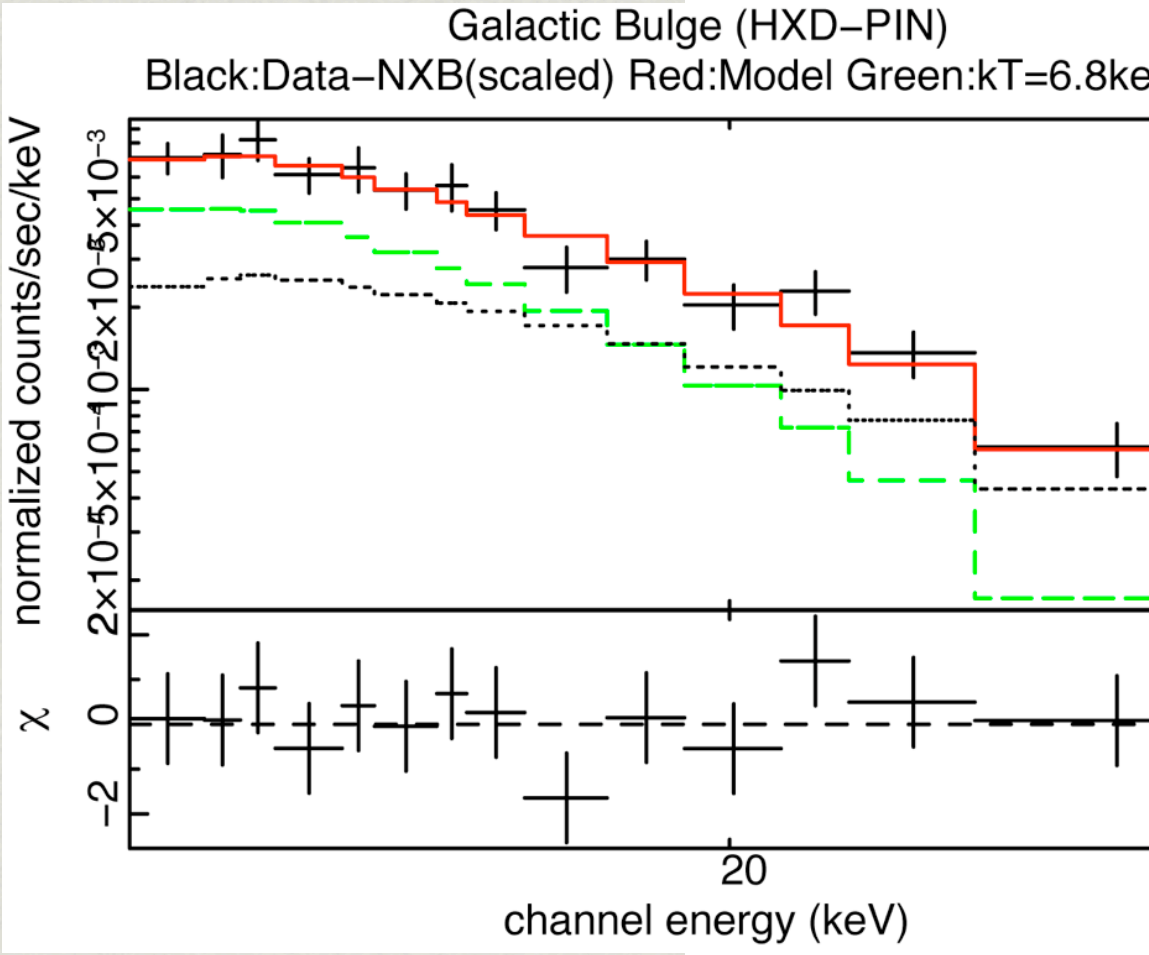


Energy (keV)	Width (eV)	Flux (10^{-5})*	GR Flu
6.40 (fix)	0(fix)	2+/-4	8+/
6.645+/-0.016	<76	20+/-3	25+
6.96+/-			

flux of 6.4 keV is smaller than the
ter of the GRXE, while that of 6.7 keV
most comparable.

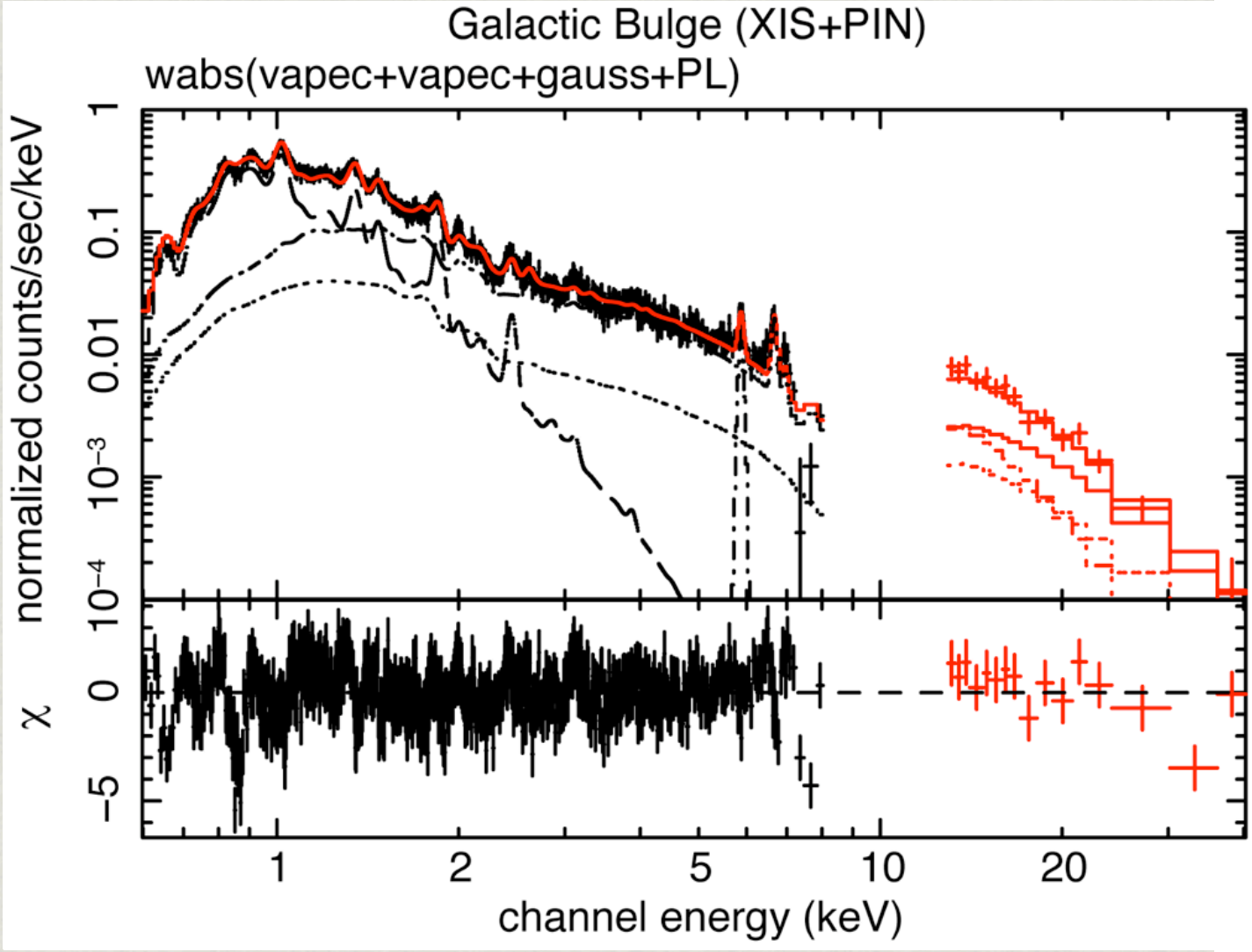
sible extinction of 6.4 keV line





-ray spectrum of the Galactic
s successfully obtained up to
. Lower energy side than ~13
suffered from the noise event.

The spectrum can be fit with either c
power-law with an index of ~3.7, or a
thermal bremsstrahlung of ~7 keV,
together with the fixed CXB model.



f the best-fit model of XIS is simply overlaid on the HXD-PIN spectrum with only a correction of different FOV size, the thermal emission fails to explain the PIN flux. If an additional power-law besides CXB is introduced, a photon index of ~2.1 is obtained. Further investigation is needed.

ith Suzaku, we have observed 133 ks on the Galactic Bulge.

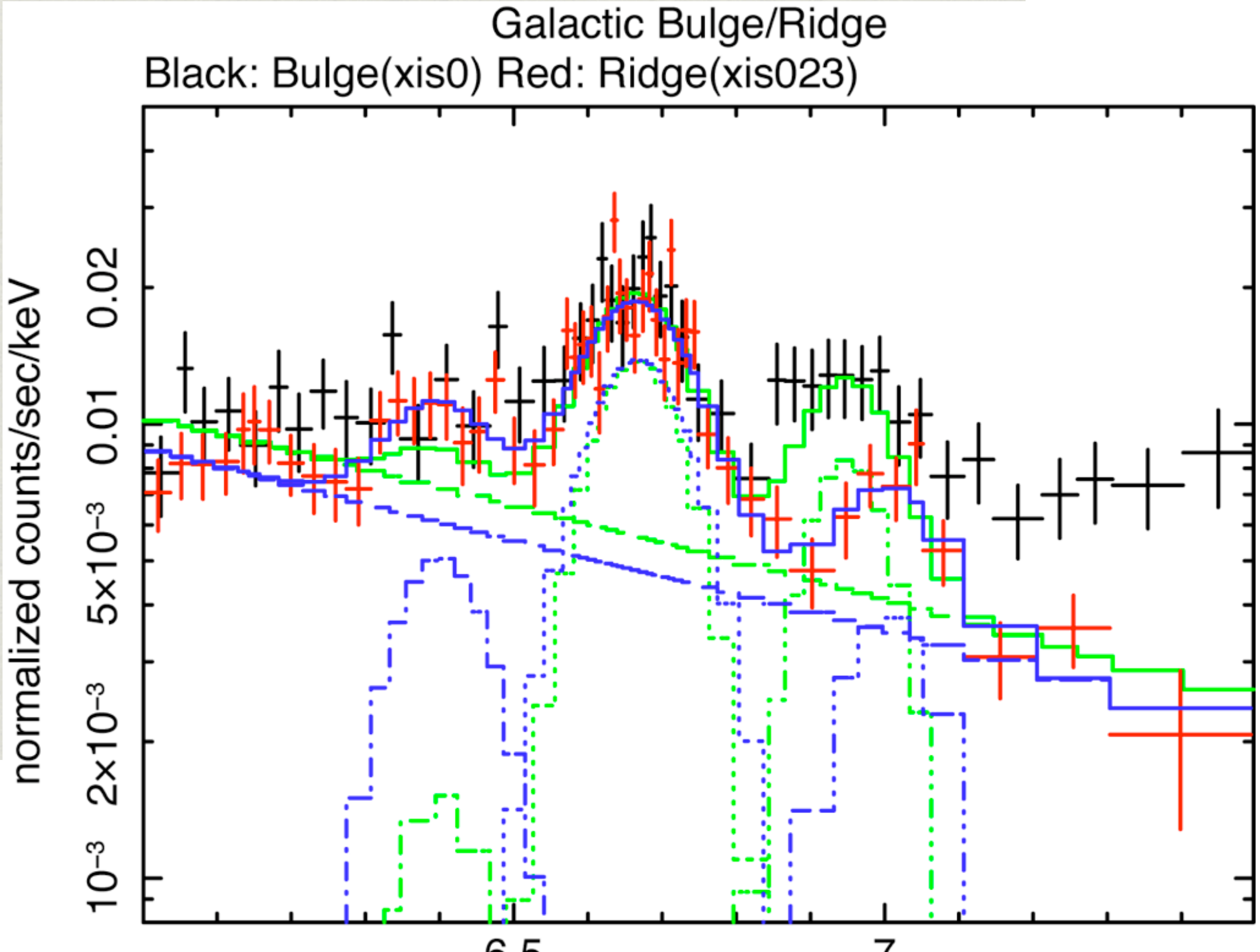
om the first-stage analysis, we found:

- The Bulge X-ray emission consists of at least two temperature componen whose temperature is 0.6 and ~5 keV.
- The line flux of 6.4 keV is smaller than the scaled value from the result of
- There is a hard X-ray emission up to 20 keV besides the thermal emission It is roughly explained with a power-law of index of 2.1.

s a next step,

- Further analysis of XIS data, especially the NXB subtraction in 6-7 keV ra
- Study on the latitudinal change of 6.4 keV intensity by use of the GC map
- More detailed XIS-PIN combined analysis.

Comparison with the SNR



All spectrum