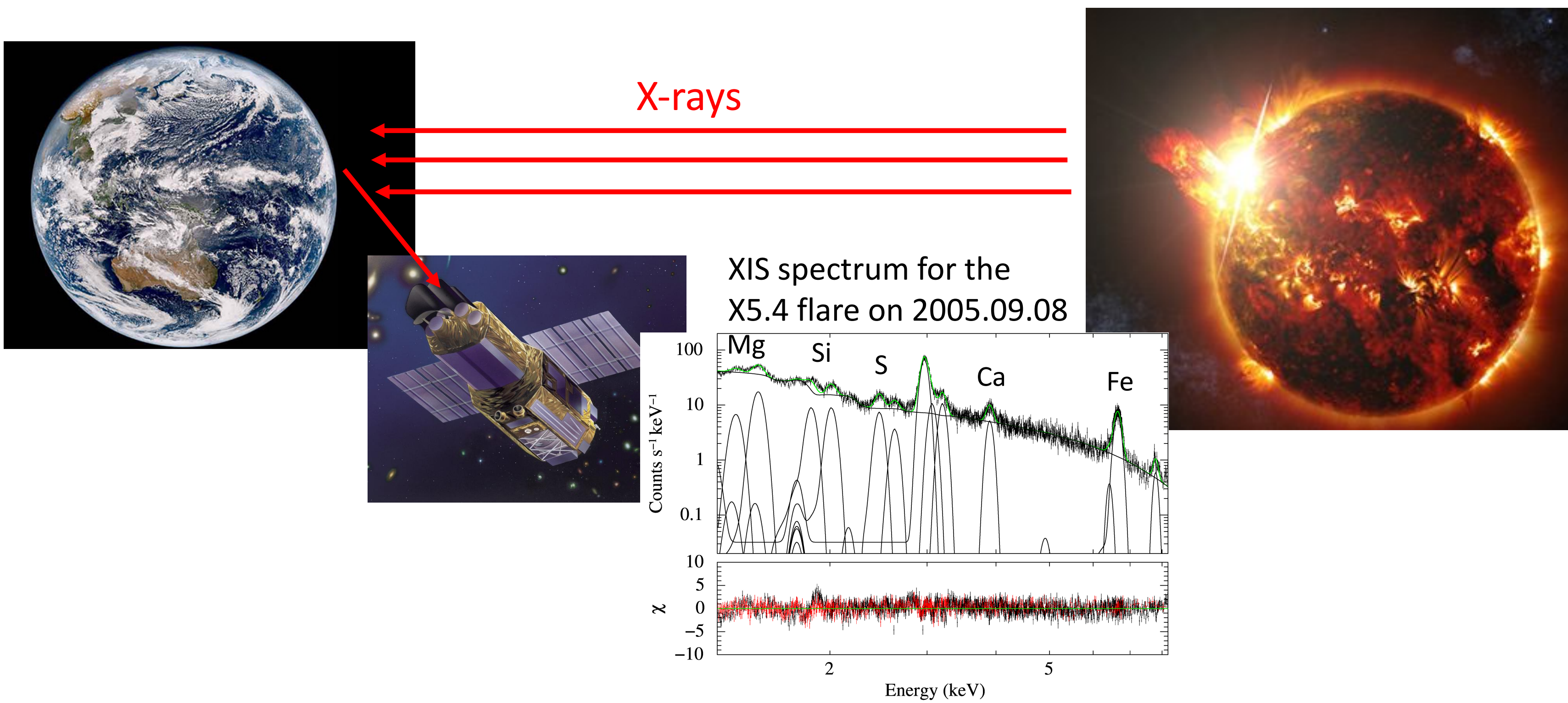
Elemental Abundances of Huge Solar Flares Measured with Suzaku's XIS

P01

S. Katsuda[1], M. Ohno[2], K. Mori[3], T. Beppu[3], Y. Kanemaru[3], M. S. Tashiro[1], Y. Terada[1], K. Sato[1], K. Morita[1], H. Sagara[1], H. Murakami[4], M. Nobukawa[5], H. Tsunemi[6], K. Hayashida[6], H. Matsumoto[6], H. Nakajima[7], Y. Ezoe[8], Y. Tsuboi[9], Y. Maeda[10], T. Yokoyama[11], and N. Narukage[12]
(1. Saitama U.; 2. Hiroshima U.; 3. U. Miyazaki; 4. Yohiku Gakuin U.; 5. Nara U. Edu.; 6. Osaka U.; 7. Kanto Gakuin U.; 8. TMU, 9. Chuo U.; 10. ISAS/JAXA; 11. U. Tokyo; 12. NAOJ)

The Earth albedo emission acquired with the XIS can be a unique clue to monitoring the solar activity between 2005 and 2015 with good energy resolution of E/ΔE ~ 20.



Elemental Abundances Measured

P01

We measured equivalent widths of various lines, from which we estimated their elemental abundances. For all flares, we found that
the Ca abundance is particularly enhanced!

Preliminary!

Date of flare	GOES class	S Heα / S Lyα (kT)	Si/H	S/H	Ca/H	Fe/H
2005.9.7	X17	0.43 (~1 keV)	0.42	0.27	1.5	0.74
2005.9.8	X5.4	0.45 (~1 keV)	0.35	0.32	1.9	0.76
2005.9.9	X6.2	0.51 (~1 keV)	0.28	0.33	1.4	0.43
2006.12.5	X9.0	0.74 (~1.2 keV)	0.50	0.19	2.2	1.1
2006.12.13	X3.4	0.72 (~1.2 keV)	0.54	0.21	1.6	1.0
2012.3.7	X5.4	0.10 (~0.6 keV)	1.4	0.31	2.6	1.1
2013.5.13	X2.8	0.38 (~1 keV)	0.39	0.22	1.3	0.9
2014.10.24	X3.1	0.61 (~1 keV)	0.74	0.21	1.4	1.8
Mean	---	---	0.50	0.27	1.8	0.84

Note: The elemental abundances are given relative to those of the solar photosphere.
The abundance of Fe/H was estimated based on the assumption that kT of the Fe-K emitting plasma is 3.5 keV, whereas other elements are estimated at the temperatures inferred from S Heα / S Lyα ratios.

Time-resolved hard X-ray spectra of the solar flares with the Suzaku HXD-WAM

Sota Murakami (M2, Saitama Univ.) *smurakami@heal.phy.saitama-u.ac.jp*

M. S. Tashiro, Y. Terada, K. Takahashi, D. Katsukura, K. Odaka (Saitama Univ.), K. Yamaoka (Nagoya Univ.), W. Iwakiri (Chuo Univ.), M. Yamauchi, N. Ohmori (Univ. of Miyazaki), S. Sugita (Aoyama Gakuin Univ.), M. Ohno (Hiroshima Univ.), Y. Urata (NCU), on behalf of the Suzaku/WAM team

Hard X-ray spectroscopy of the solar flares

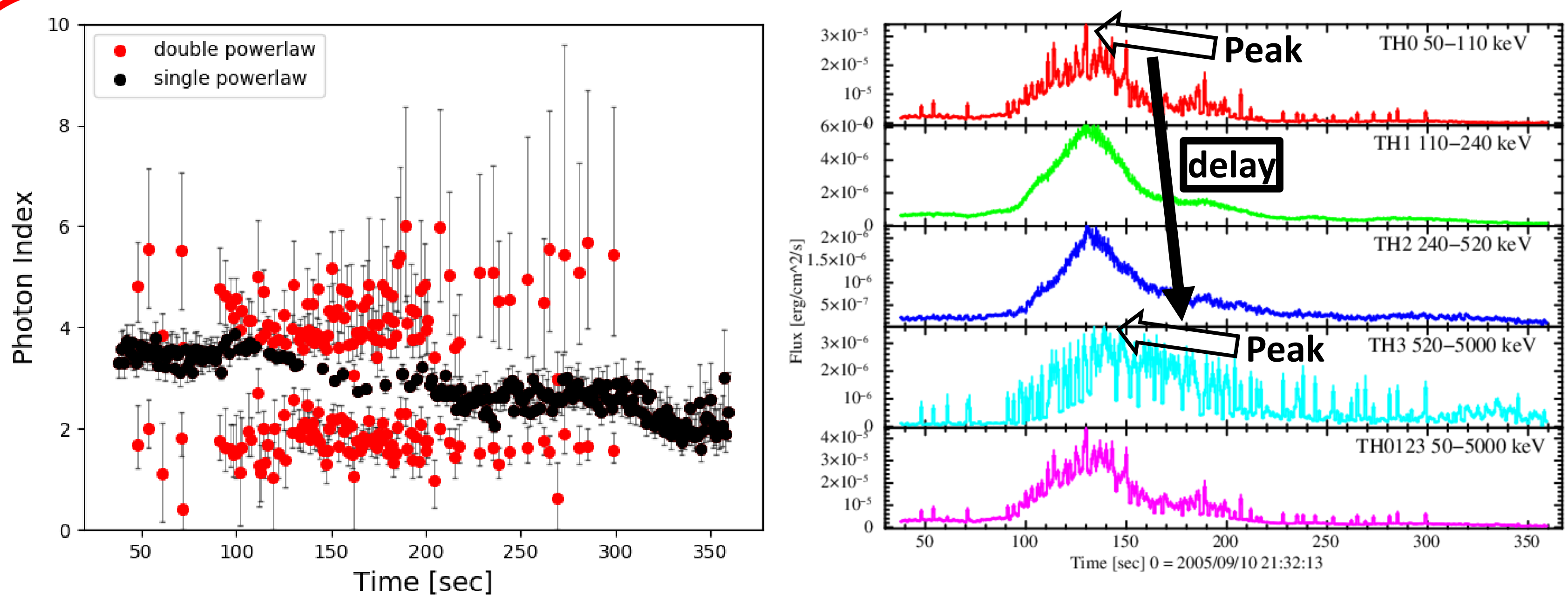


Fig. Example of the time evolution of photon indices (Left) and the flux (Right)

We present this in detail at P02.

Systematic studies of spectral break-up of solar flares in the hard X-ray band with the Suzaku HXD-WAM

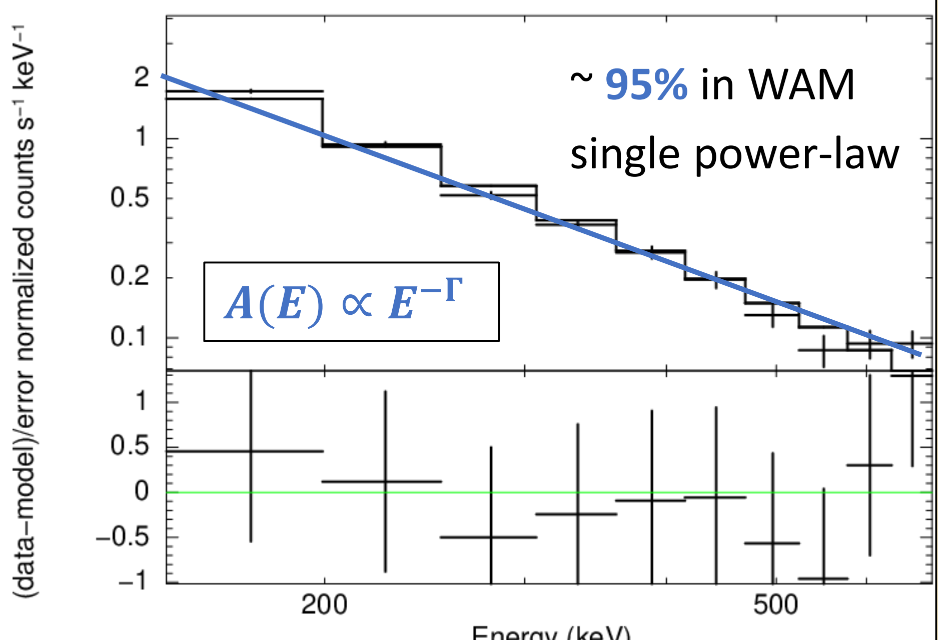
Kaito Takahashi
(M2, Saitama Univ.)

Saitama University
High Energy Astrophysics Laboratory

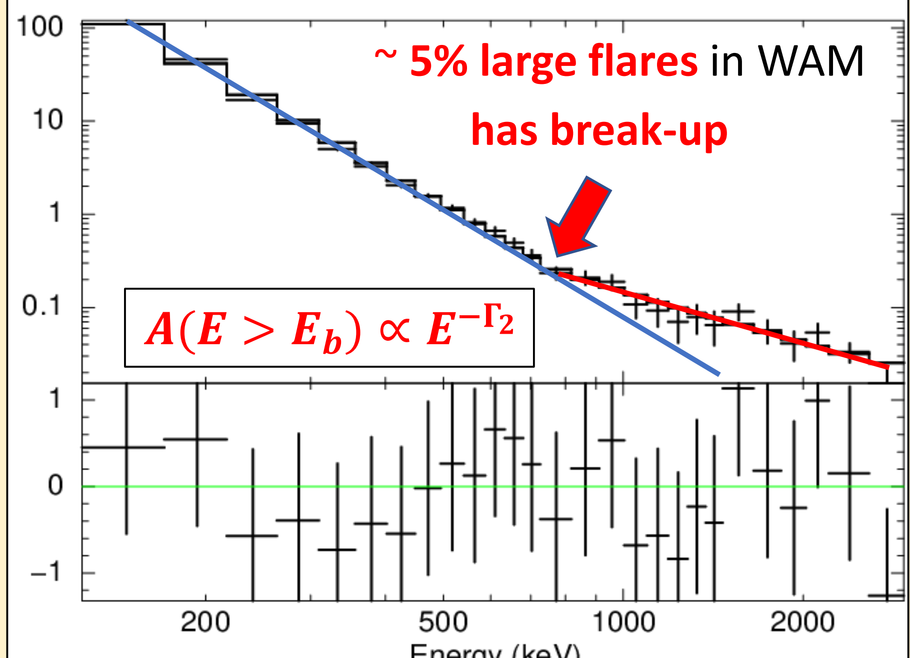
M. S. Tashiro, Y. Terada, S.murakami, D. Katsukura, K. Odaka (Saitama Univ.), K. Yamaoka (Nagoya Univ.), W. Iwakiri (Chuo Univ.), M. Yamauchi, N. Ohmori (Univ. of Miyazaki), S. Sugita (Aoyama Gakuin Univ), M. Ohno, (Hiroshima Univ.), Y. Urata (NCU), on behalf of the Suzaku/WAM team

Solar flare spectrum in hard X-ray band

usual spectrum with the Suzaku HXD-WAM



break-up spectrum with WAM



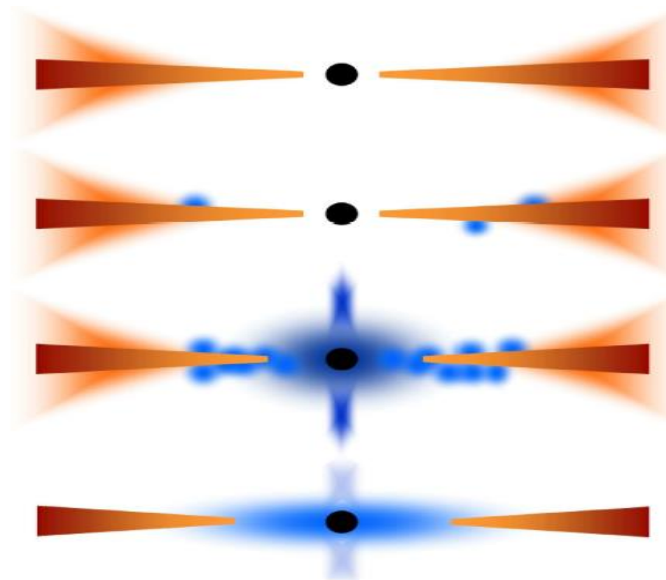
- **main components** :
  non-thermal bremsstrahlung by accelerated electrons
- **break-up** may be caused by:
  other components, e.g., γ-ray lines, proton bremss, … etc.
  or intrinsic break-up of source electron?

provide constraints on electron acceleration mechanism.

14 events are found to "not single power-law" with the *Suzaku Wide-band All-sky Monitor(WAM)*

The properties of these flares are presented on P03

The corona puzzle



'*well known*' XRB corona:

WELL used in modelling, but *less KNOWN* in its nature

the formation mechanism?

Disk evaporation or magnetic re-connection

Intrinsic dynamic time scale?

Of hours or seconds

Proper probe: type-I burst

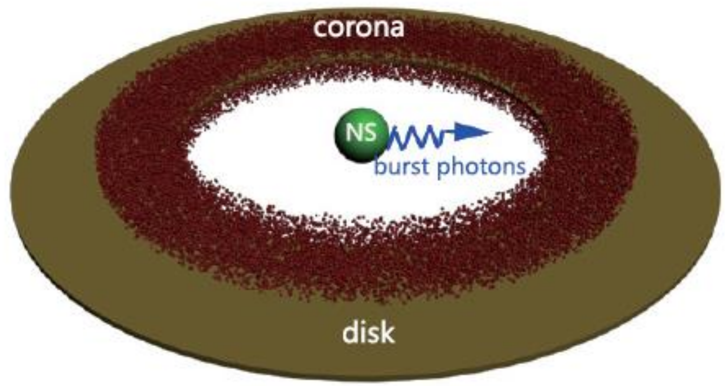
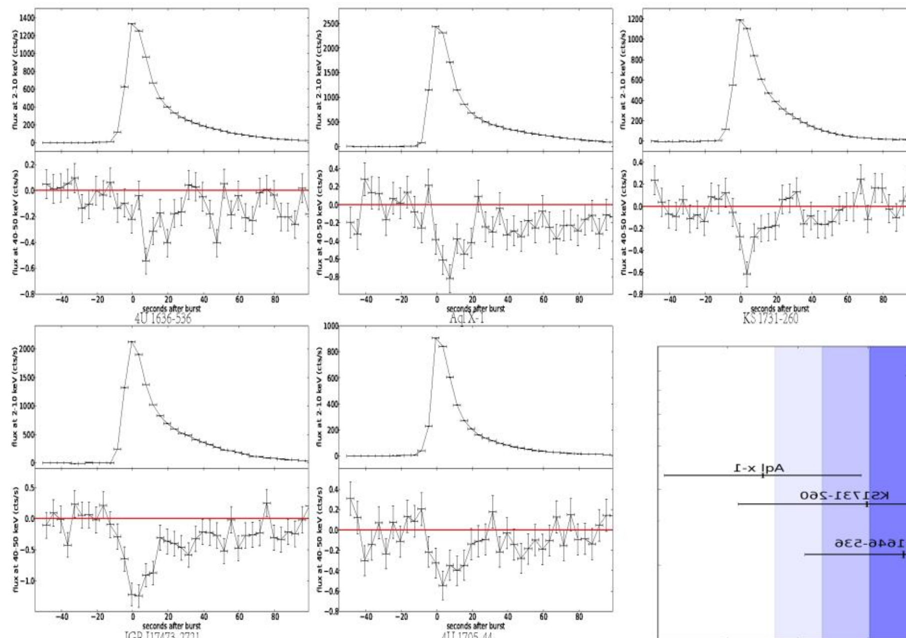
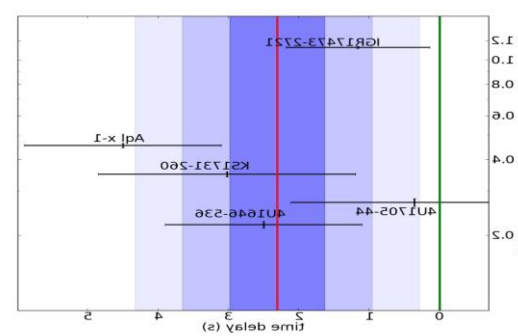
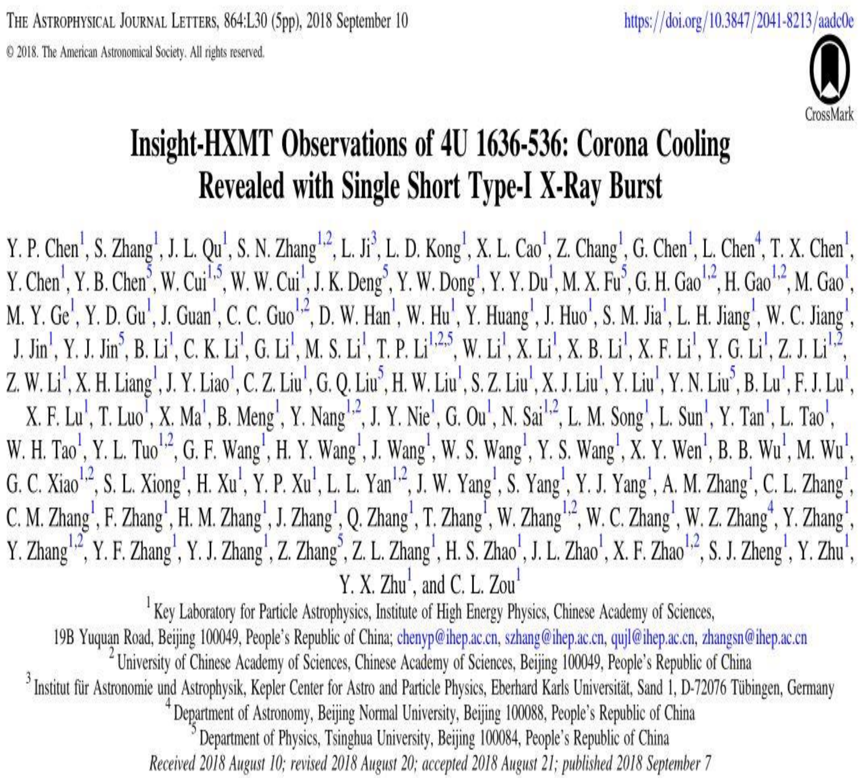


Figure 3. Illustration of the central region of an NS XRB, in which a corona is located around the disk and cooled by the soft X-rays from a type-I burst that occurred on surface of the NS.





The first refereed Insight-HXMT paper outside China


The Astrophysical Journal Letters, 864:L30 (5pp), 2018 September 10 https://doi.org/10.3847/2041-8213/aadc0e

CrossMark

Insight-HXMT Observations of 4U 1636-536: Corona Cooling Revealed with Single Short Type-I X-Ray Burst

Y. P. Chen[1], S. Zhang[1], J. L. Qu[1], S. N. Zhang[1,2], L. Ji[3], L. D. Kong[1], X. L. Cao[1], Z. Chang[1], G. Chen[1], L. Chen[4], T. X. Chen[1], Y. Chen[1], Y. B. Chen[5], W. Cui[1,5], W. W. Cui[1], J. K. Deng[5], Y. W. Dong[1], Y. Y. Du[1], M. X. Fu[5], G. H. Gao[1,2], H. Gao[1,2], M. Gao[1], M. Y. Ge[1], Y. D. Gu[1], J. Guan[1], C. C. Guo[1,2], D. W. Han[1], W. Hu[1], Y. Huang[1], J. Huo[1], S. M. Jia[1], L. H. Jiang[1], W. C. Jiang[1], J. Jin[1], Y. J. Jin[5], B. Li[1], C. K. Li[1], G. Li[1], M. S. Li[1], T. P. Li[1,2,5], W. Li[1], X. Li[1], X. B. Li[1], X. F. Li[1], Y. G. Li[1], Z. J. Li[1,2], Z. W. Li[1], X. H. Liang[1], J. Y. Liao[1], C. Z. Liu[1], G. Q. Liu[5], H. W. Liu[1], S. Z. Liu[1], X. J. Liu[1], Y. Liu[1], Y. N. Liu[5], B. Lu[1], F. J. Lu[1], X. F. Lu[1], T. Luo[1], X. Ma[1], B. Meng[1], Y. Nang[1,2], J. Y. Nie[1], G. Ou[1], N. Sai[1,2], L. M. Song[1], L. Sun[1], Y. Tan[1], L. Tao[1], W. H. Tao[1], Y. L. Tuo[1,2], G. F. Wang[1], H. Y. Wang[1], J. Wang[1], W. S. Wang[1], Y. S. Wang[1], X. Y. Wen[1], B. B. Wu[1], M. Wu[1], G. C. Xiao[1,2], S. L. Xiong[1], H. Xu[1], Y. P. Xu[1], L. L. Yan[1,2], J. W. Yang[1], S. Yang[1], Y. J. Yang[1], A. M. Zhang[1], C. L. Zhang[1], C. M. Zhang[1], F. Zhang[1], H. M. Zhang[1], J. Zhang[1], Q. Zhang[1], T. Zhang[1], W. Zhang[1,2], W. C. Zhang[1], W. Z. Zhang[4], Y. Zhang[1], Y. Zhang[1,2], Y. F. Zhang[1], Y. J. Zhang[1], Z. Zhang[5], Z. L. Zhang[1], H. S. Zhao[1], J. L. Zhao[1], X. F. Zhao[1,2], S. J. Zheng[1], Y. Zhu[1], Y. X. Zhu[1], and C. L. Zou[1]

[1] Key Laboratory for Particle Astrophysics, Institute of High Energy Physics, Chinese Academy of Sciences, 19B Yuquan Road, Beijing 100049, People's Republic of China; chenyp@ihep.ac.cn, szhang@ihep.ac.cn, qujl@ihep.ac.cn, zhangsn@ihep.ac.cn
[2] University of Chinese Academy of Sciences, Chinese Academy of Sciences, Beijing 100049, People's Republic of China
[3] Institut für Astronomie und Astrophysik, Kepler Center for Astro and Particle Physics, Eberhard Karls Universität, Sand 1, D-72076 Tübingen, Germany
[4] Department of Astronomy, Beijing Normal University, Beijing 100088, People's Republic of China
[5] Department of Physics, Tsinghua University, Beijing 100084, People's Republic of China
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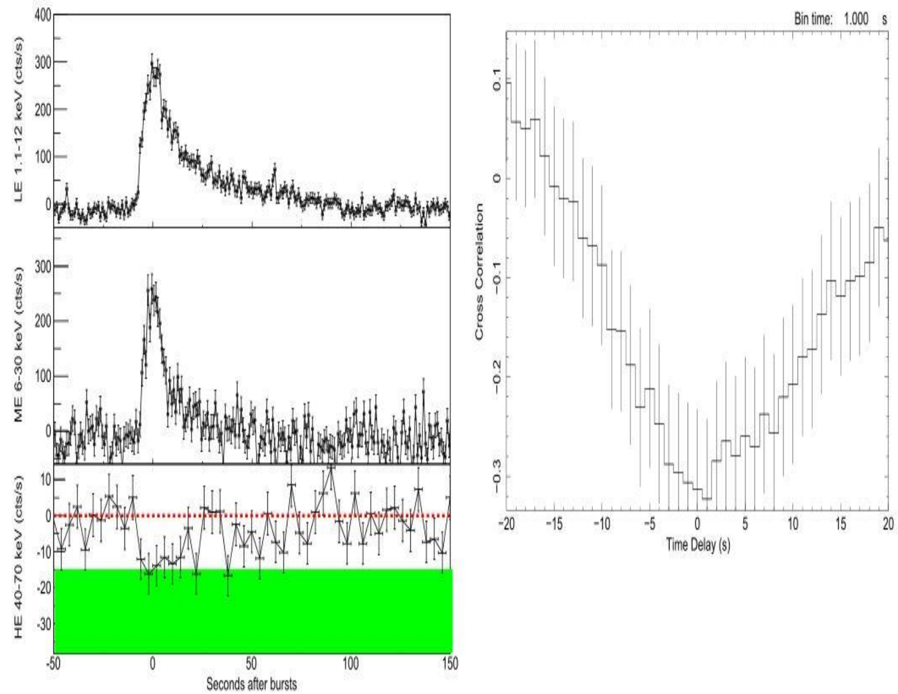
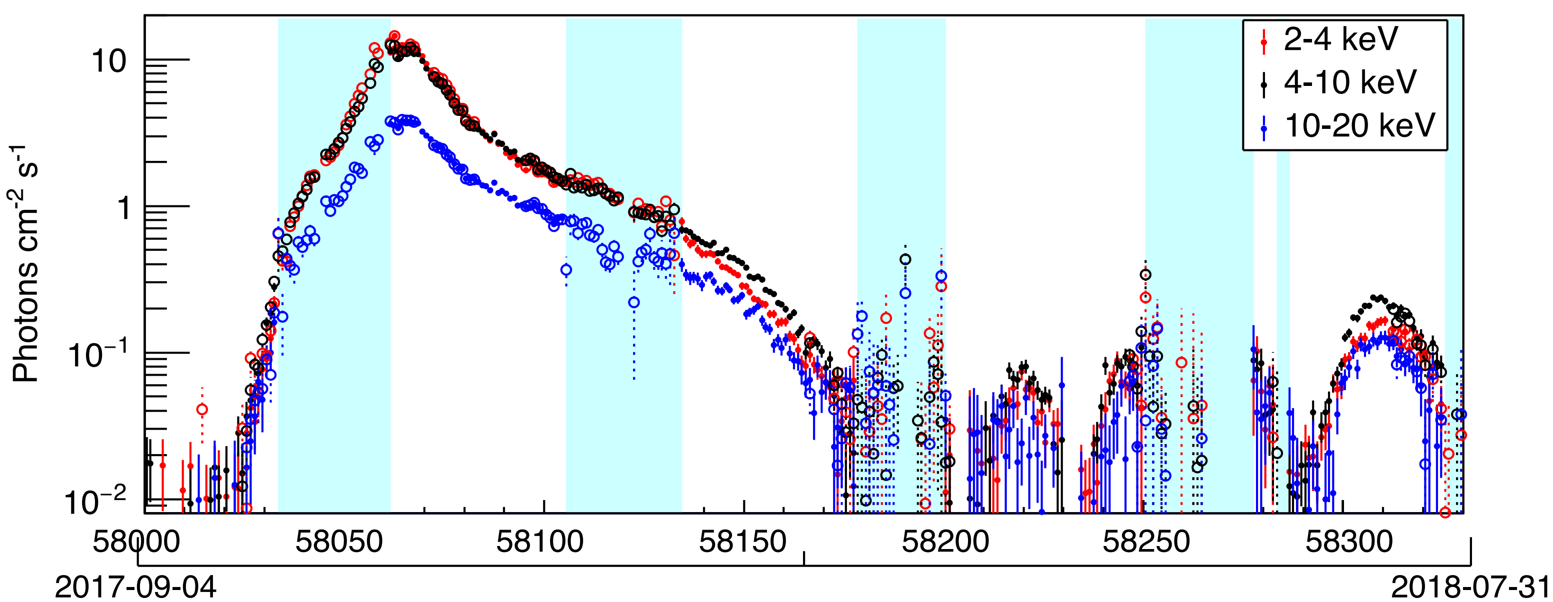


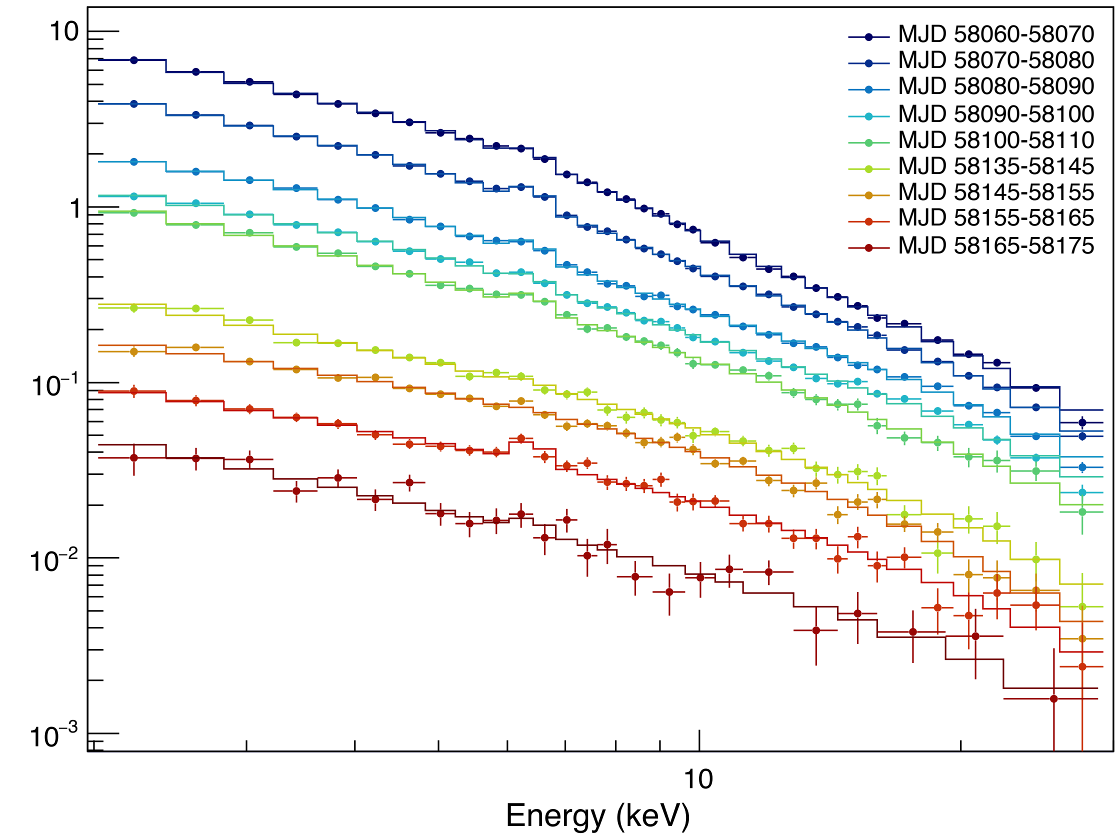
Figure 2. Left panel shows the LE, ME, and HE light curves of the burst in 1.1–12 keV, 5–30 keV, and 40–70 keV, respectively. The time bin for LE and ME is 1 s and HE is 4 s, the green zone in the bottom panel indicates the background level for HE detectors. The right panel shows the cross-correlation between the left panel's LE and HE re-extracted light curves with a time bin of 1 s.

Accepted 10 days after submission

MAXI results of the Galactic ultra-luminosity X-ray pulsar Swift J0243.6+6124

M. Oeda, M. Sugizaki, N. Kawai(Tokyo Tech), T. Mihara, K. Makishima(RIKEN.)
M. Nakajima(Nihon Univ.) and MAXI Team





$$F(E) = AE^{-\Gamma} \exp\left(-\frac{E}{E_C}\right) + BB + Gaus$$

BB:blackbody

$Gaus$:Fe-K line

- Flux at the peak: over 5 Crab
- Source distance: ~7 kpc (GAIA result)

↓

- X-ray luminosity:$10L_{\mathrm{EDD}}$

→Ultra-luminous X-ray pulsar (ULX pulsar)

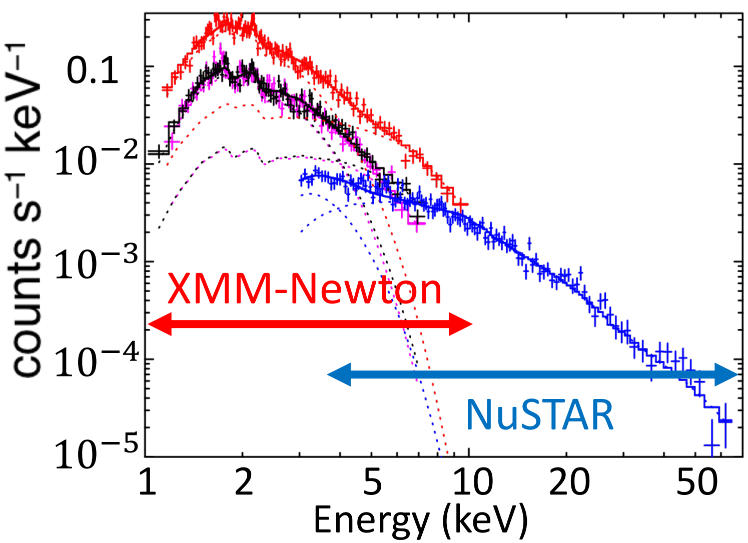
- Flux increase⇒spectral softening

X-ray Analysis of the Magnetar SGR 1900+14 with *NuSTAR* and *XMM-Newton* (P06)

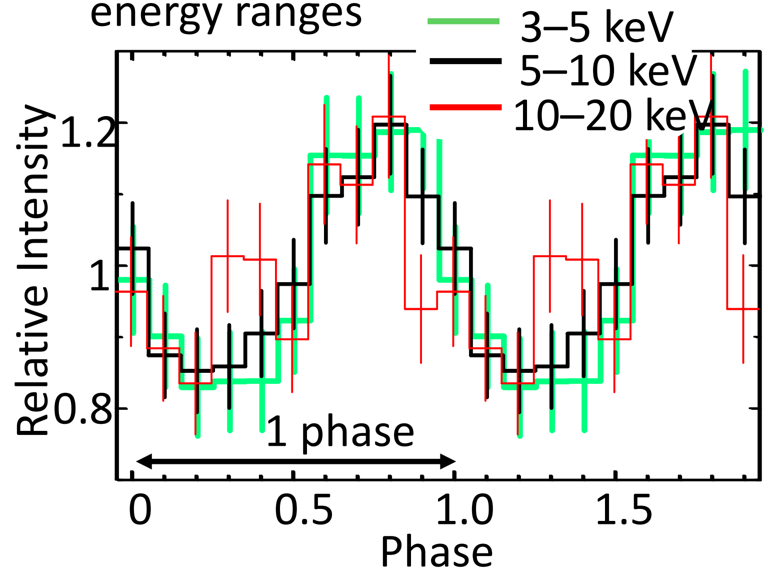
Tsubasa Tamba, Aya Bamba, Hirokazu Odaka, Teruaki Enoto

- **Magnetars**: Pulsars with extremely strong magnetic fields, 10^{13-14} G
- Target: SGR 1900+14, A young magnetar with huge magnetic fields, $\sim 6\times10^{14}$ G
- Observation: Observed with *NuSTAR* and *XMM-Newton* simultaneously
- Analysis:

Broad-band spectral analysis (1–70 keV)



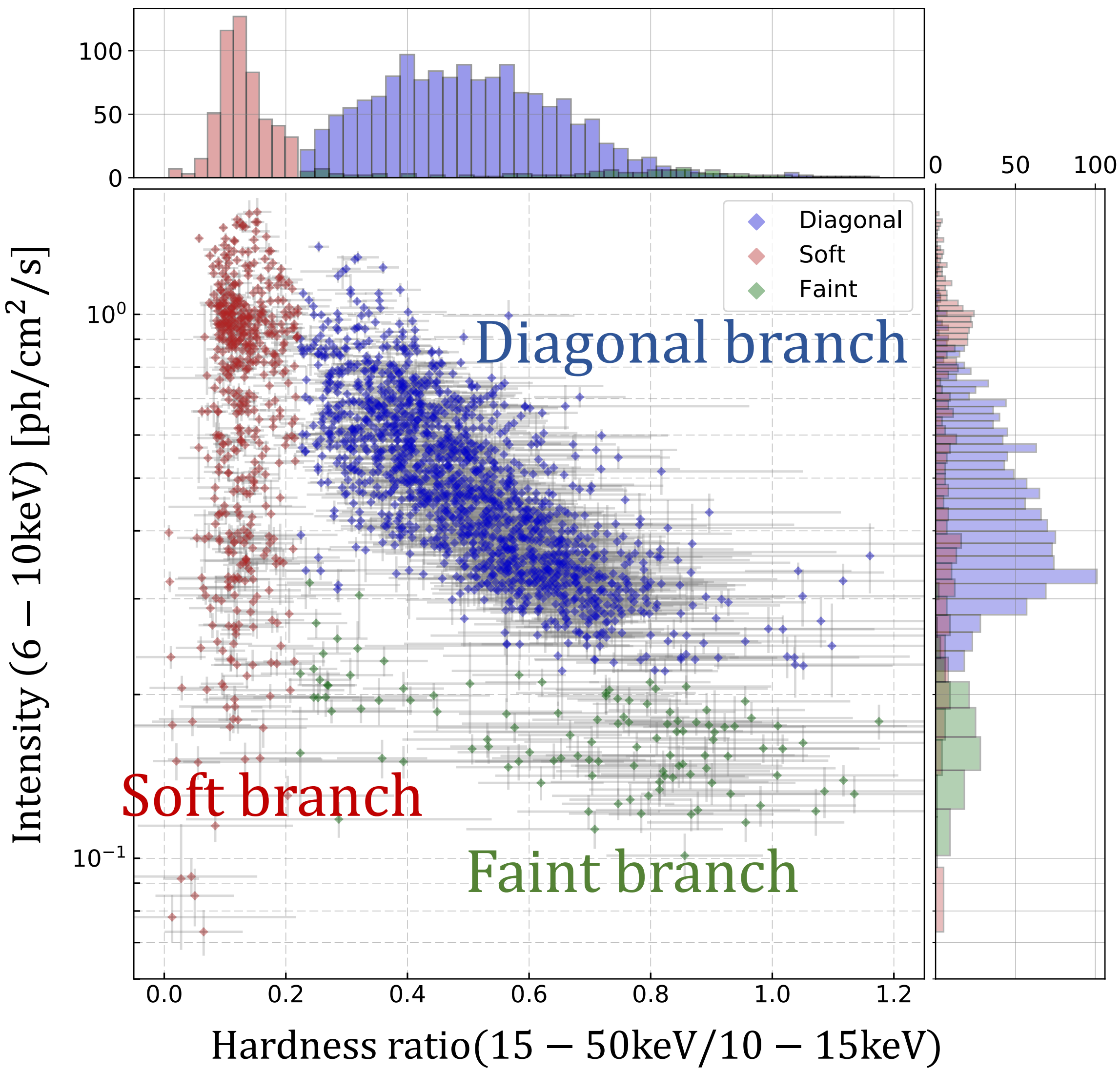
Detailed timing analysis of different energy ranges



- Discussion: Potentiality of *HXMT* to target SGR 1900+14

Variability study GRS 1915+105 with the 9-year monitoring of MAXI/GSC and Swift/BAT

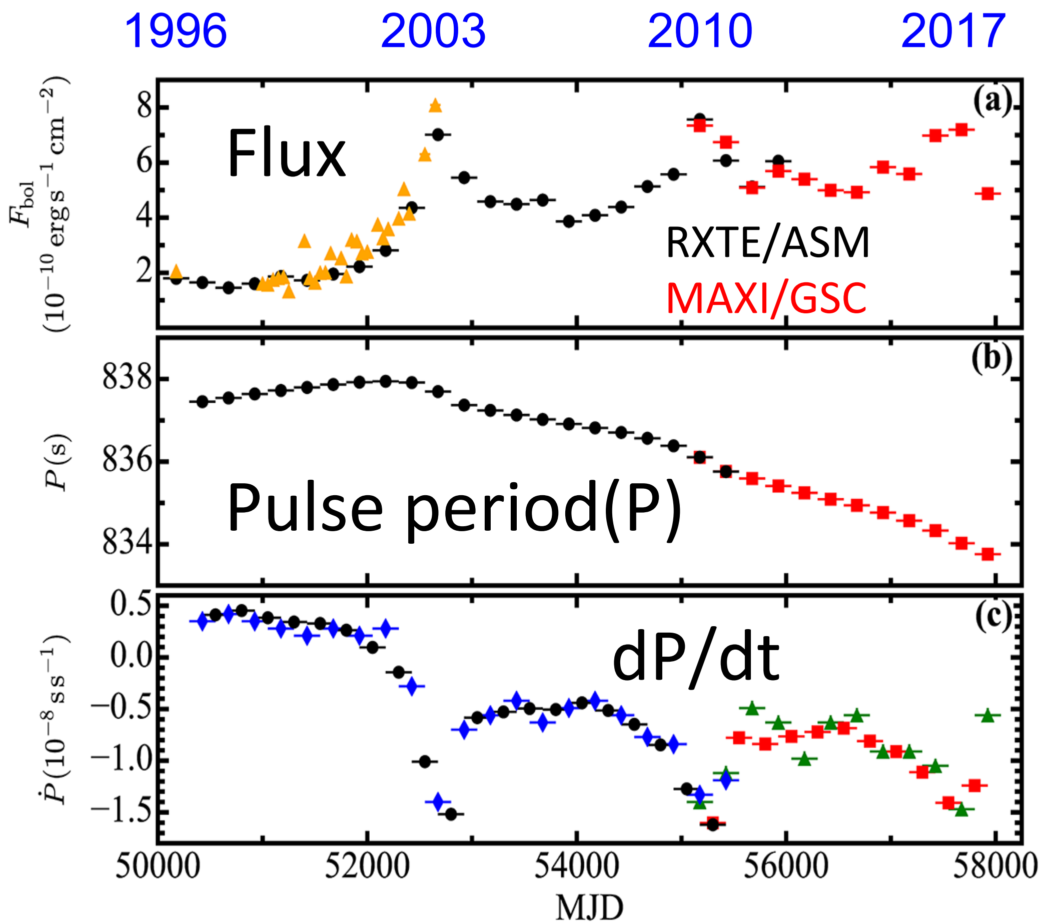
K. Shiraishi, Y. Tachibana and N. Kawai (Tokyo tech)



「An application of the Ghosh & Lamb model to the accretion-powered X-ray pulsar X Persei」 -Yatabe et al 2018-

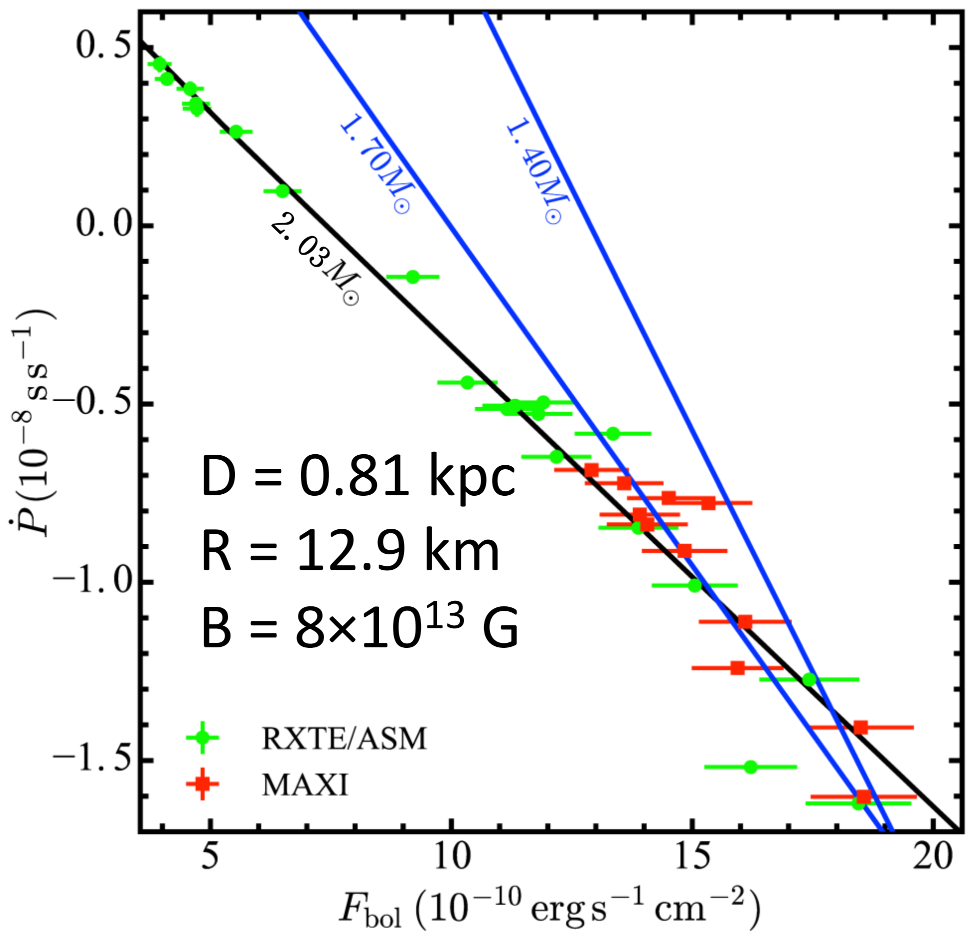
Fumiaki Yatabe (RIKEN / Rikkyo University)

- The X-ray fluxes and pulse-period changes of the Be/X-ray binary pulsar X Persei were investigated over a period of 1996 to 2017 by RXTE/ASM and MAXI/GSC.



- The history of X-ray fluxes suggest a 7-years super-orbital period.
- The pulsar was spinning down for 1996-2002, and has been spinning up since 2002.
- The spin up/down rate and the X-ray flux showed a clear negative correlation.

▪dP/dt vs F_{bol} showed a clear negative correlation
→fitted with Ghosh & Lamb (1979) relation



▪We assumed that the ranges of radius(R) and distance(D) of the neutron star are

R = 9.5−15 km (realistic range)

D = 0.77−0.85 kpc (GAIA DR2).

↓

The magnetic field strength(B) and mass(M) of X Per are estimated as

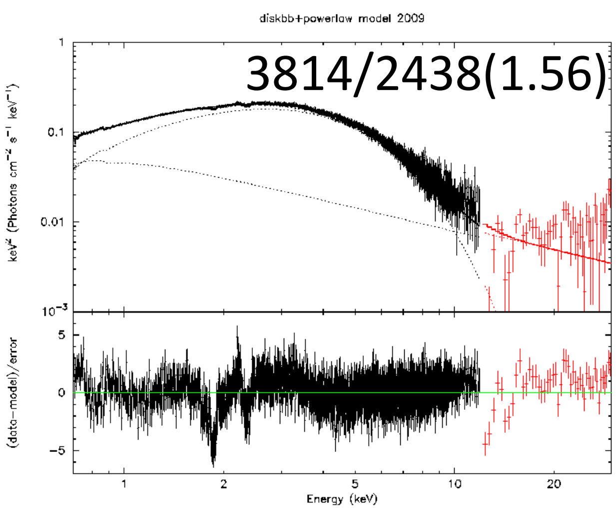
$B = (5\text{–}23) \times 10^{13}$ G

$M = 2.03 \pm 0.17 M_\odot$

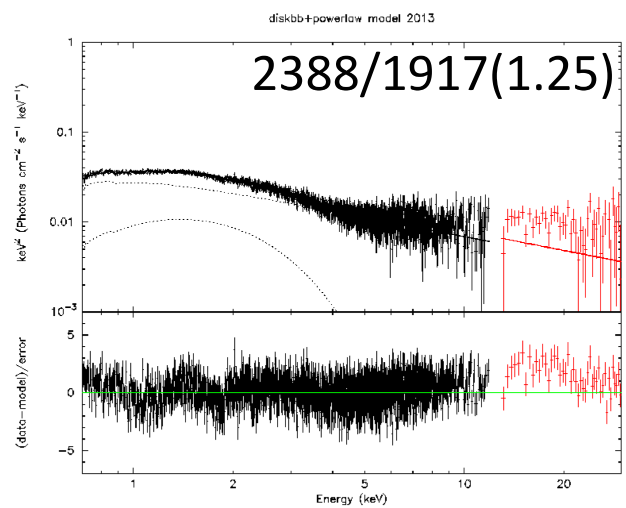
Detail studies of the accretion disk of the black-hole binary LMC X-3 with “Suzaku”

Iwao Yuki (Hiroshima University)

- Using 3 Suzaku observations of LMC X-3, 0.7-30 keV energy spectra are analyzed.
- The obtained physical parameters of the accretion disk (luminosity, inner radius and temperature) show variabilities.



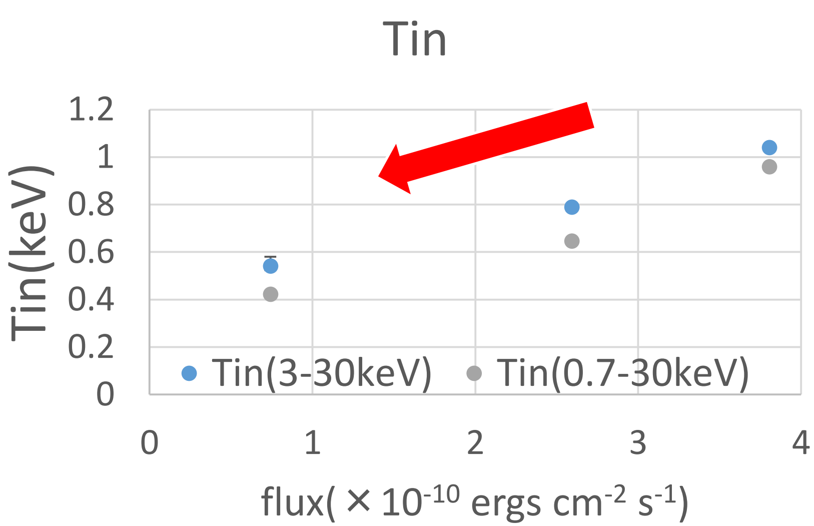
disk emission > powerlaw
→high/soft state

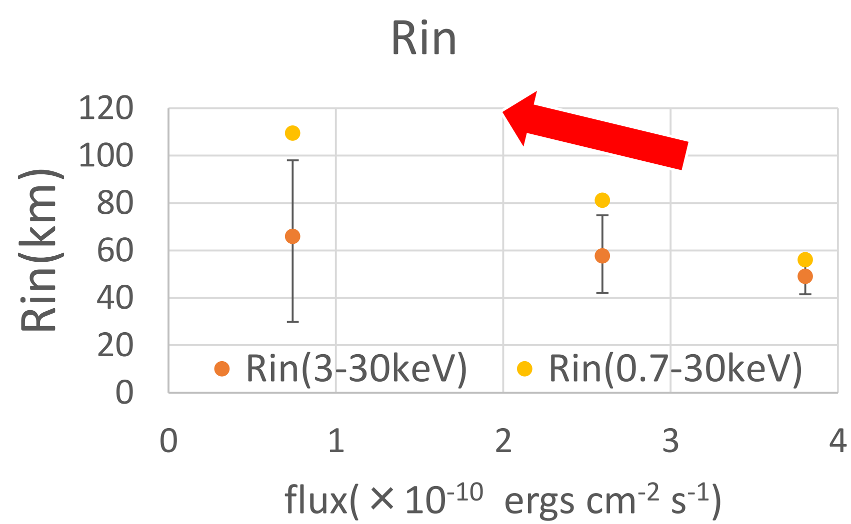


disk emission < powerlaw
→different from high/soft state

Temperature (Tin) and inner radius (Rin) variabilities

Model:diskbb*simpl (considering the disk radiation powerlaw model)





When the luminosity decreases, Tin decreases while Rin increases.

Please see the poster for more details.

No oral short presentation

P10
Suzaku Study on the Galactic Diffuse X-ray Emission

Dr. Masayoshi Nobukawa

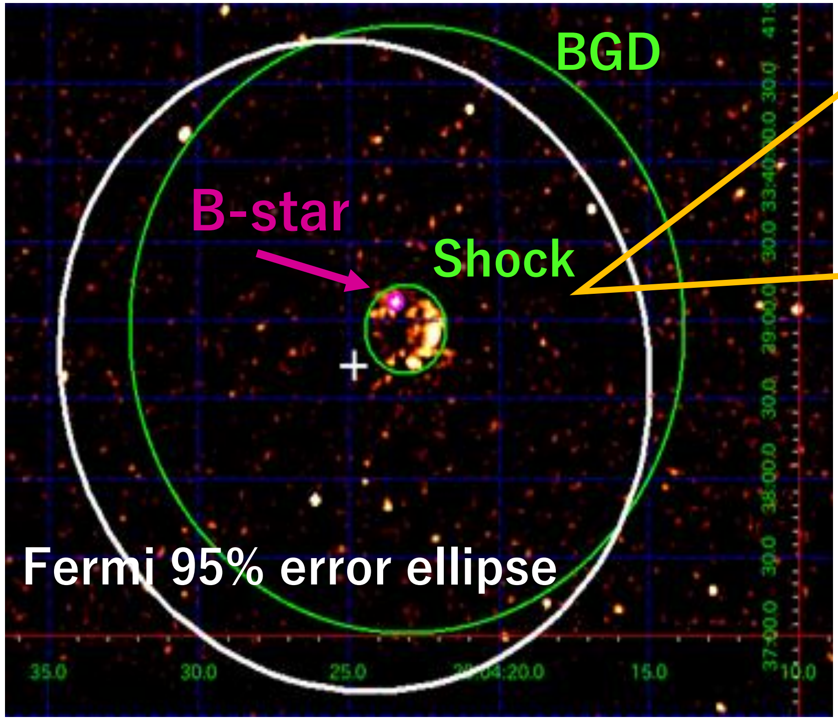
X-ray study of new particle acceleration candidate, the bow-shock region in G70.7+1.2

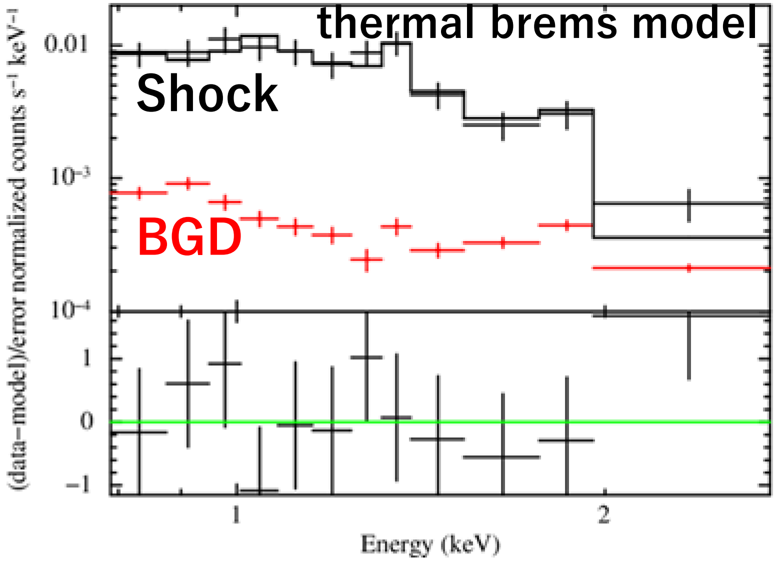
Yuuki Imai (M2, Saitama Univ) imai@heal.phy.saitama-u.ac.jp
Y. Terada (Saitama Univ.), A. Bamba, Y. Ohira (U.Tokyo), R. Yamazaki (Aoyama Gakuin)

Question: New candidates of galactic cosmic-rays origins?
→ Shock regions of Runaway stars

- Fast moving OB-stars
- Similar to SNR's system

G70.7+1.2
- Unidentified source with Fermi-LAT
- A shell-like morphology with VLA
- it is not a SNR
- B-star ~Runaway star?





Further discussion about this object at P-11

X-ray image and spectrum of G70.7+1.2 with Chandra

Discovery of Recombining Plasma from A Magnetic Cataclysmic Valiable, EX Hya with Suzaku

Takashi Sako ,Masayoshi Nobukawa(Nara Uni.of Education)

- Trying 3CIE model fitting (HP,MP,LP)
- We found large residuals at 9-10 keV , which is consistent with a radiative recombination continuum (Fe XXVI RRC).
- Adding Fe XXVI RRC model ,we resolved 9-10 keV residual.
  - the plasma of EX Hya has larger fraction of Fe XXVII ions than that of CIE.
  - We suggest the plasma is recombining plasma (RP).
  - This is the first discovery of the from mCVs

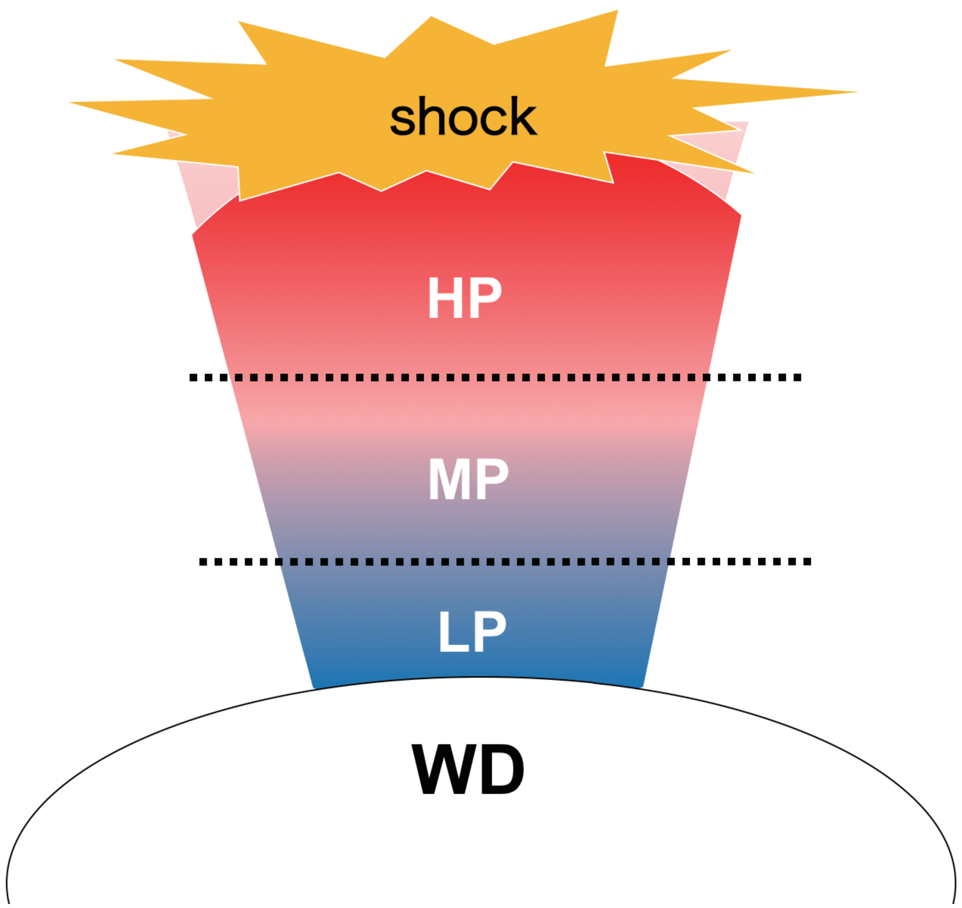


Fig1. acreation column plasma

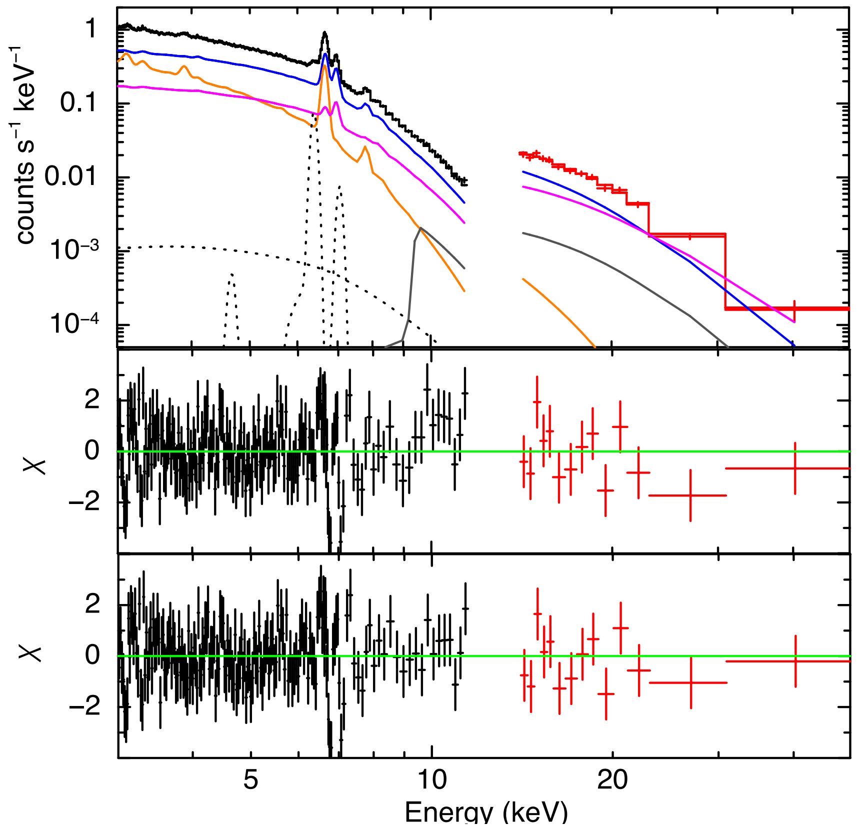
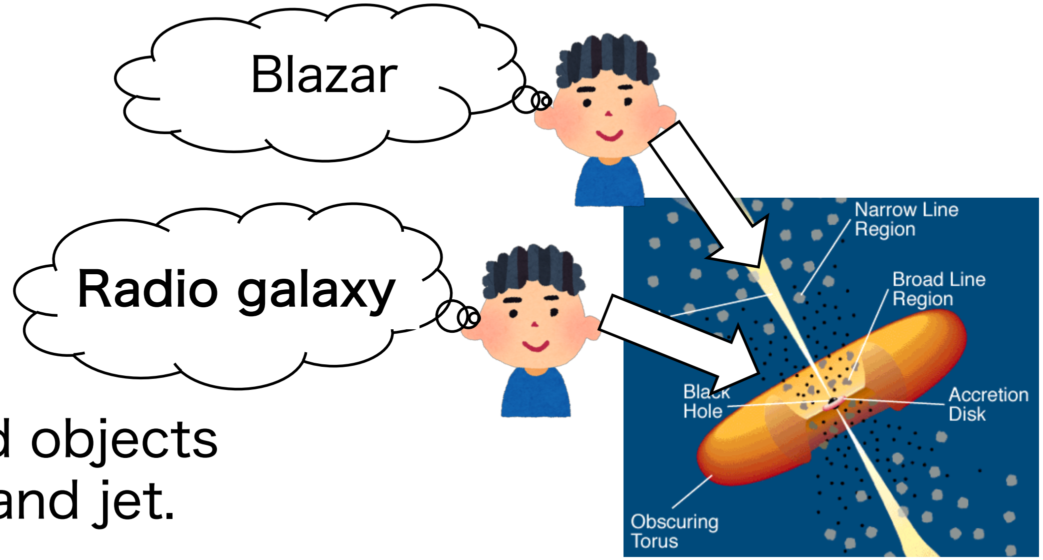


Fig 2.Fitiing model
3CIE(HP+MP+LP)+redge

13 Study of the Opt/UV and X-ray variability of NGC1275 with Swift

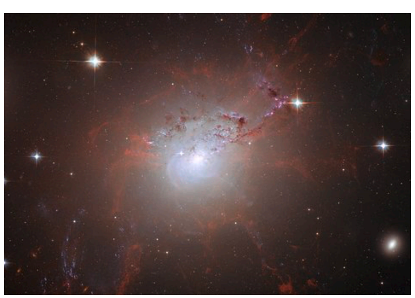
Fumiya Imazato, Yasushi Fukazawa (Hiroshima University)



Radio galaxies are good objects for studying both disk and jet.

The origin of Opt/UV - X-ray emission is unclear. Jet? disk/corona?

⇨ **We compared Opt/UV - X-ray data with Gamma-ray data(jet)**



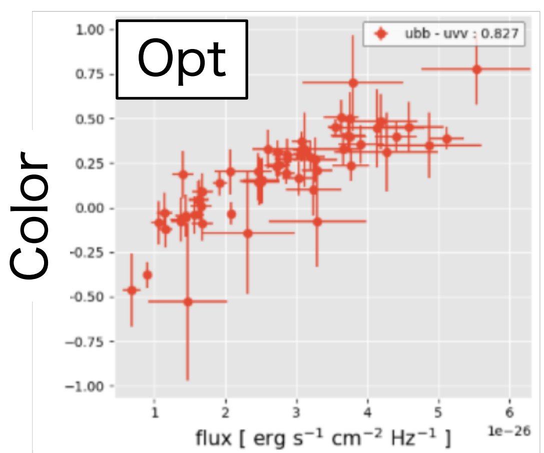
NGC 1275

- cD galaxy(z ~ 0.00176)
- $6 - 15 \times 10^{8}\ M$ (scharwaohter+13)
- Brightest gamma-ray emitting radio galaxy
- The origin of gamma-ray and radio is jet

13 Study of the Opt/UV and X-ray variability of NGC1275 with Swift

Lightcurves

Opt/UV – X-ray flux have gradually increased



Redder-when-brighter

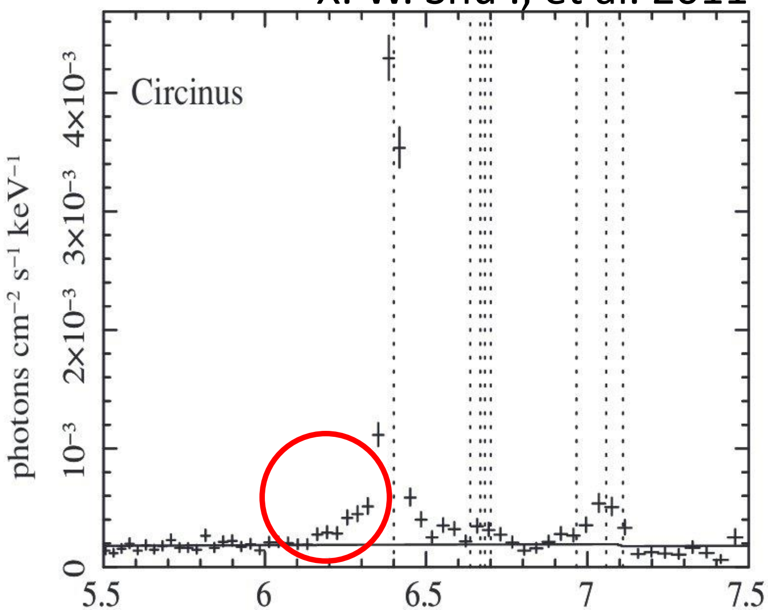
Flux

Estimation of the physical condition of the torus in active galactic nuclei by a modeling of the Compton shoulder in the reflected X-ray spectrum

Masaya Hikitani,[1] Masanori Ohno,[1] Yasushi Fukazawa,[1] Toshihiro Kawaguchi,[2] Hirokazu Odaka[3]
[1] Hiroshima Univ. [2] Onomichi City Univ. [3] The University of Tokyo

Compton shoulder

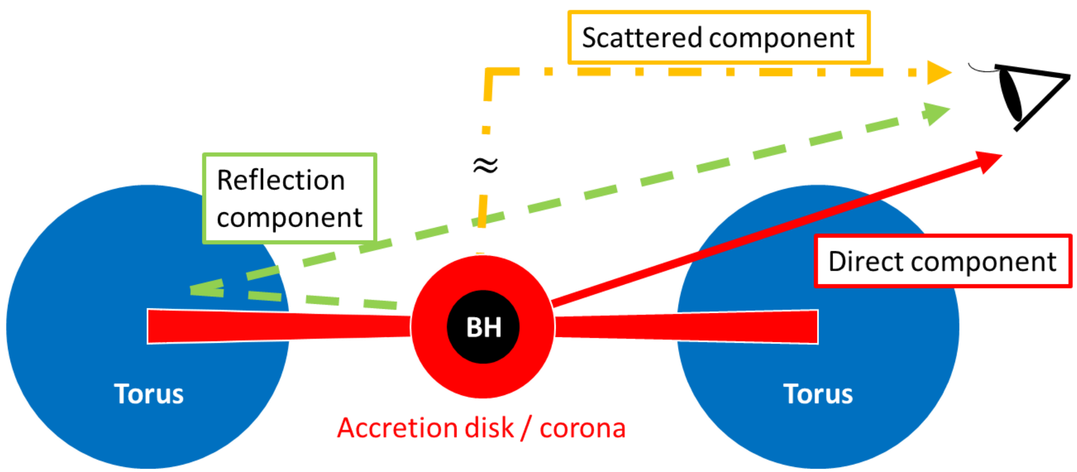
X. W. Shu ., et al. 2011



Chandra/HEG

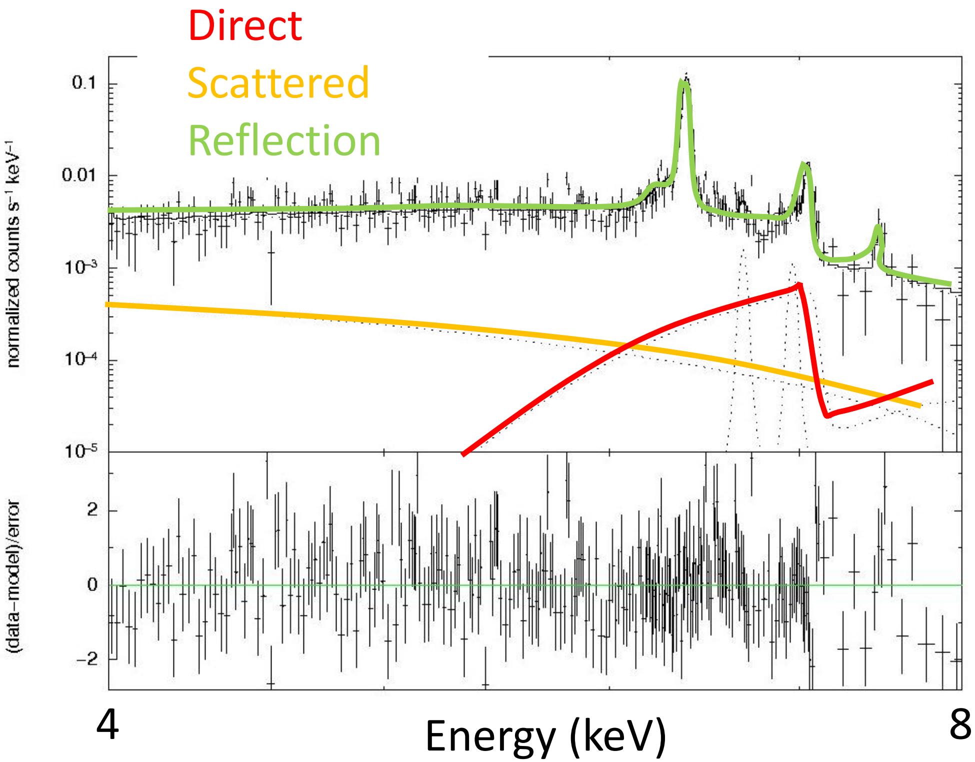
Characteristics of the Compton shoulder is a powerful tool to investigate the structure of the torus

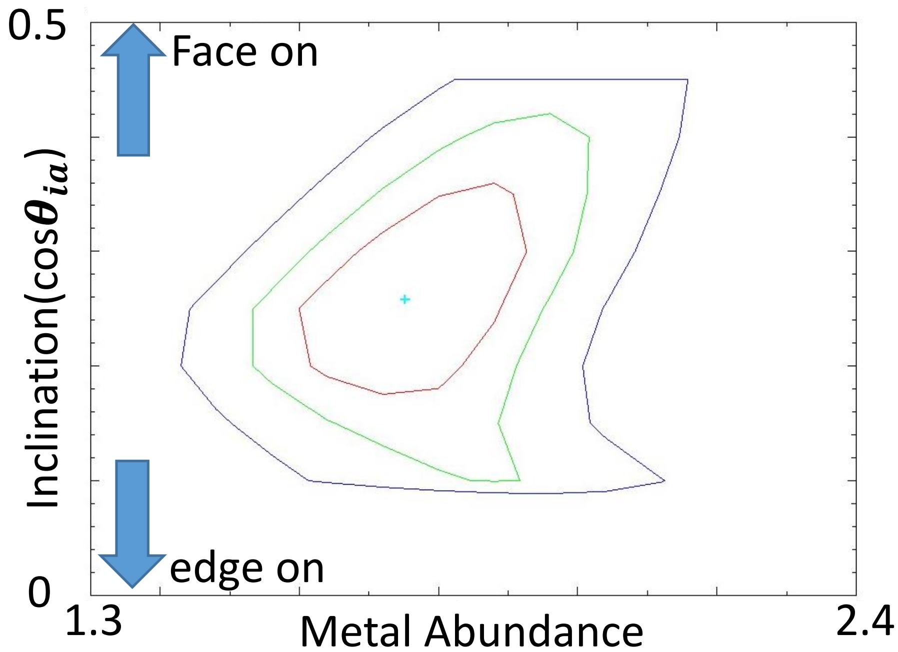
X-ray components from type Ⅱ Seyfert



We developed a Monte-Calro based X-ray reflection spectral model (Our model) to reproduce the structure of the Compton shoulder and applied Our model to the Chandra High Energy Transmission Grating data with an enough high spectral resolution.

Our analysis of the Circinus galaxy(Seyfert Ⅱ galaxy)





・We successfully reproduced the structure of the Compton shoulder and constrained the absorption column density(N_H), inclination angle($\cos\theta_{ia}$), and metal abundance, using the spectral data only around Fe-Kα emission line(4-8keV).

・N_H and $\cos\theta_{ia}$ are consistent with edge-on geometry.

・Metal abundance is $1.75^{+019}_{-0.17}$, which is slightly higher than the solar. This gives a hint for the star formation history around the torus in the AGN.

No.15
Markov chain Monte-Carlo modeling of FSRQ SED

Naoyoshi Hirade (Hiroshima Univ.)
Yasushi Fukazawa, Makoto Uemura, Yurika Yamada(Hiroshima Univ.)

FSRQ
The particularly bright blazars.

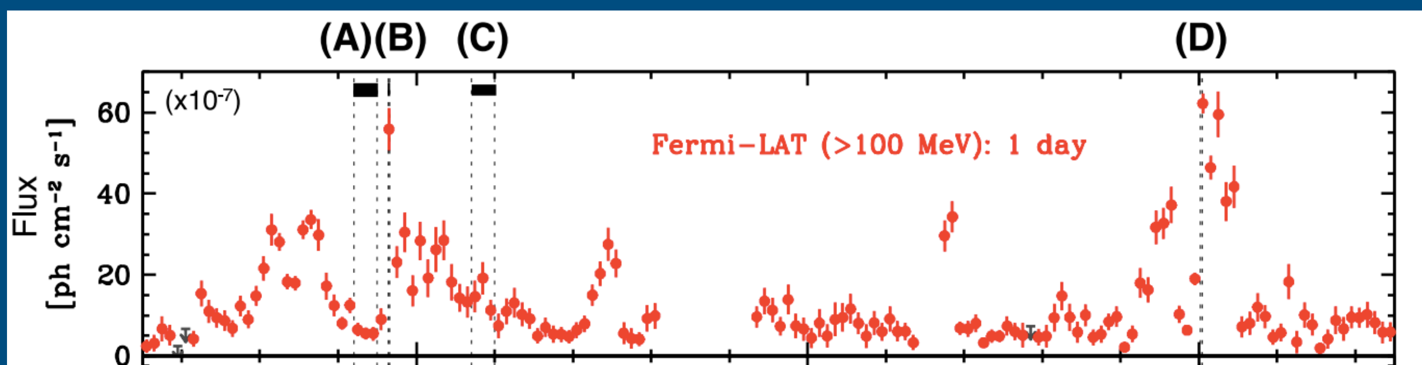
Purpose..

By modeling SEDs of FSRQ, physical parameters of relativistic jets can be estimated to the mechanism of jet ejection.

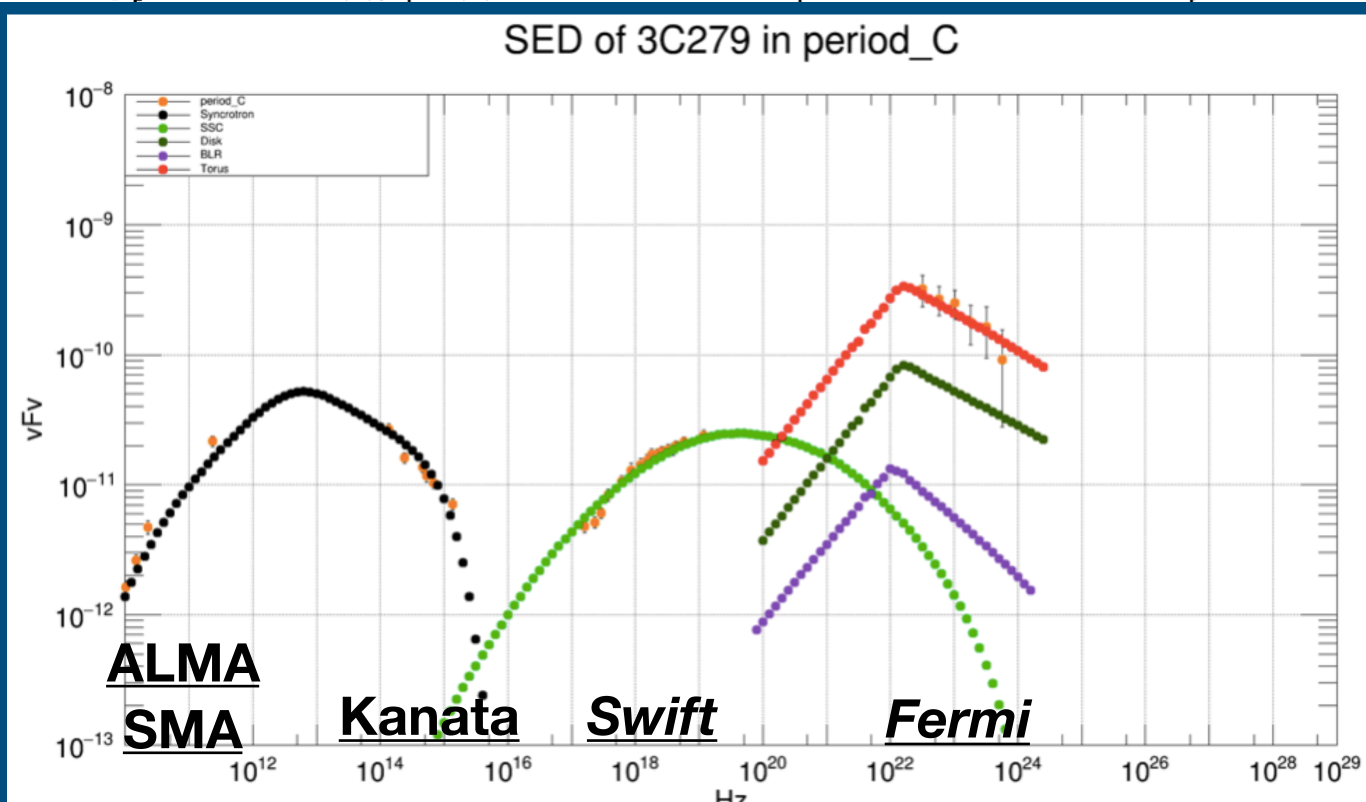
Problem of conventional method

The model calculation takes much time and not estimate uncertainty.

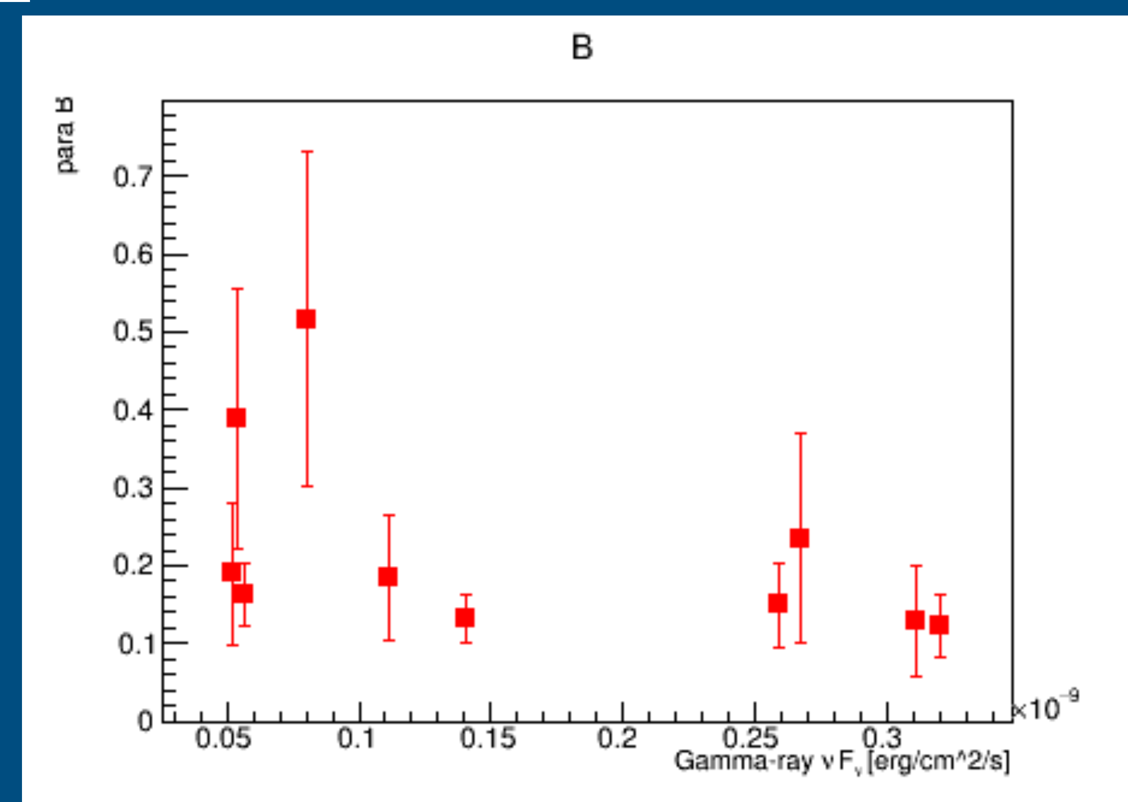
Approximation formula of Finke et. al. 2016 and use Markov Chain Monte-Carlo method.



Light curve of 3C279 from Fermi-LAT(2013-2014). Hayashida.et.al.(2015)



SED of 3C279 using MCMC



Parameters include uncertainty

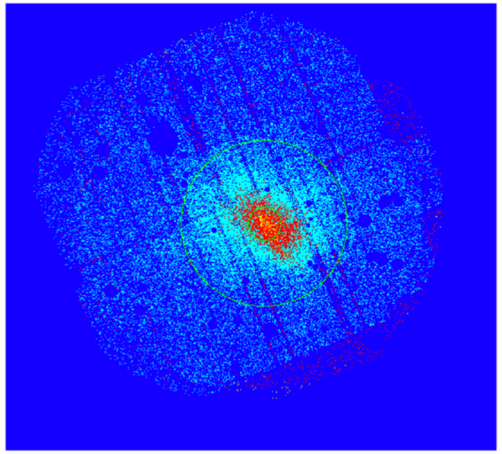
We can estimate SED including uncertainty !!

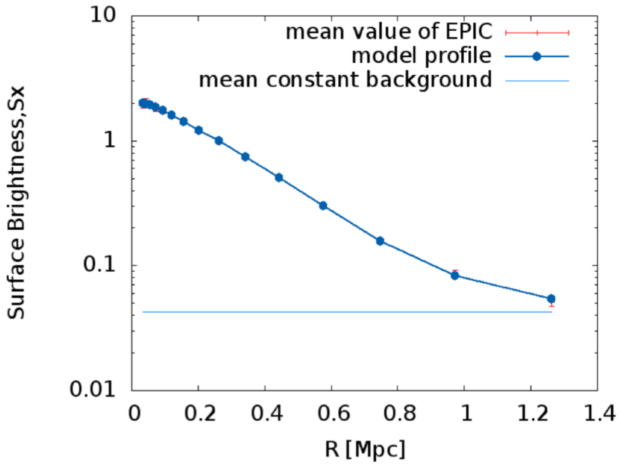
XMM-Newton Observations of the Cool Core Cluster MCXC J1200.4+0320

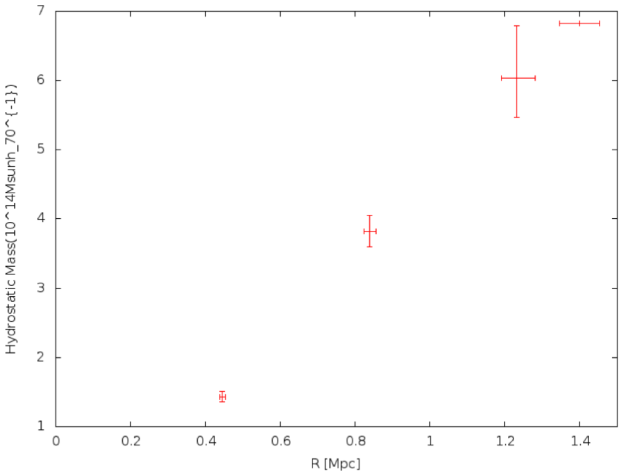
POON, Helen (Hiroshima University)

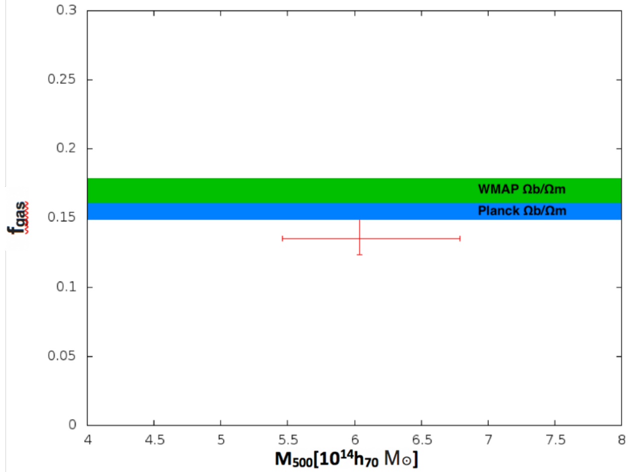
- Assuming hydrostatic equilibrium and spherical symmetry, XMM-Newton results (surface brightness, H.E. mass and f_{gas}) of cool core cluster MCXC J1200.4+0320 are presented

- Preliminary results consistent with our previous studies ($f_{gas} = 0.135^{+0.014}_{-0.011}$)









- Altogether 22 clusters in our sample (all from MCXC catalogue), in the region observed by Hyper Supreme-Cam Subaru Strategic Program (HSC – SSP)

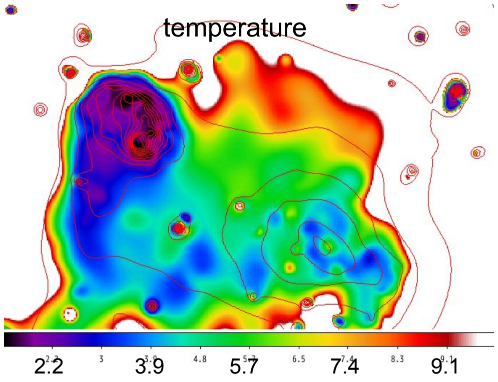
- Next step:

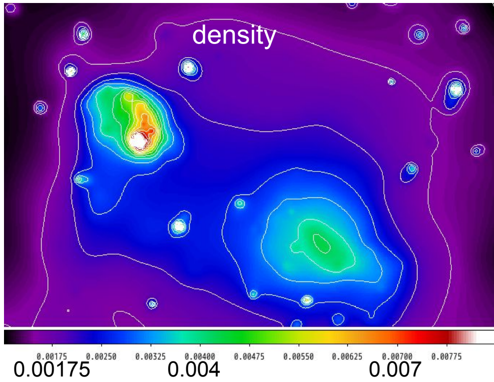
  work out the rest of the samples to compare the mean baryon fraction estimated from X-ray and HSC-SSP optical data (H.E. mass vs weak lensing mass) → complementary to the forthcoming X-ray survey from eROSITA

Analysis of 2D temperature and density structure of the merging cluster MCXC J0157.4-0550 using XMM-Newton data

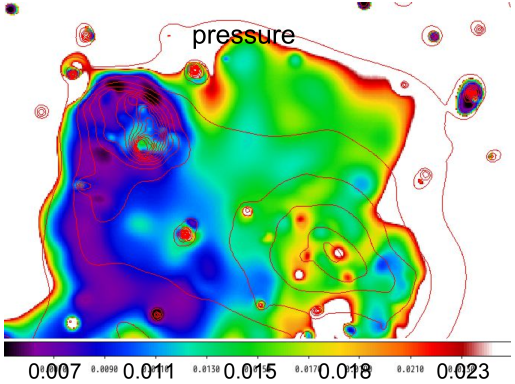
Yang,Chong (Hiroshima University)

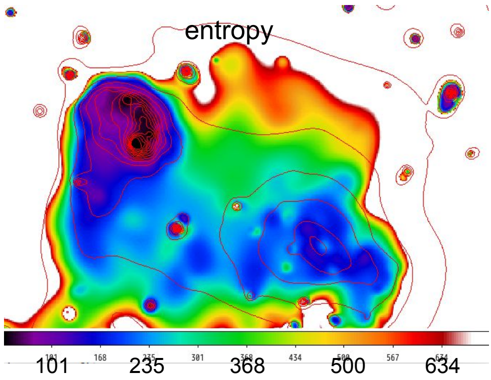
We analyze XMM-Newton data of the merging cluster MCXC J0157.4-0550 and derive the 2-dimensional temperature, density, pressure and entropy maps from the hardness ratio map.

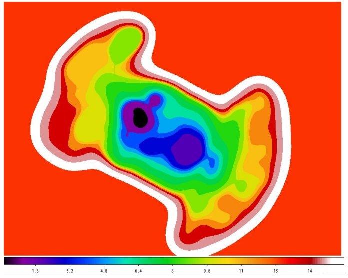




From the 2D maps, we find this galaxy cluster's merging process.







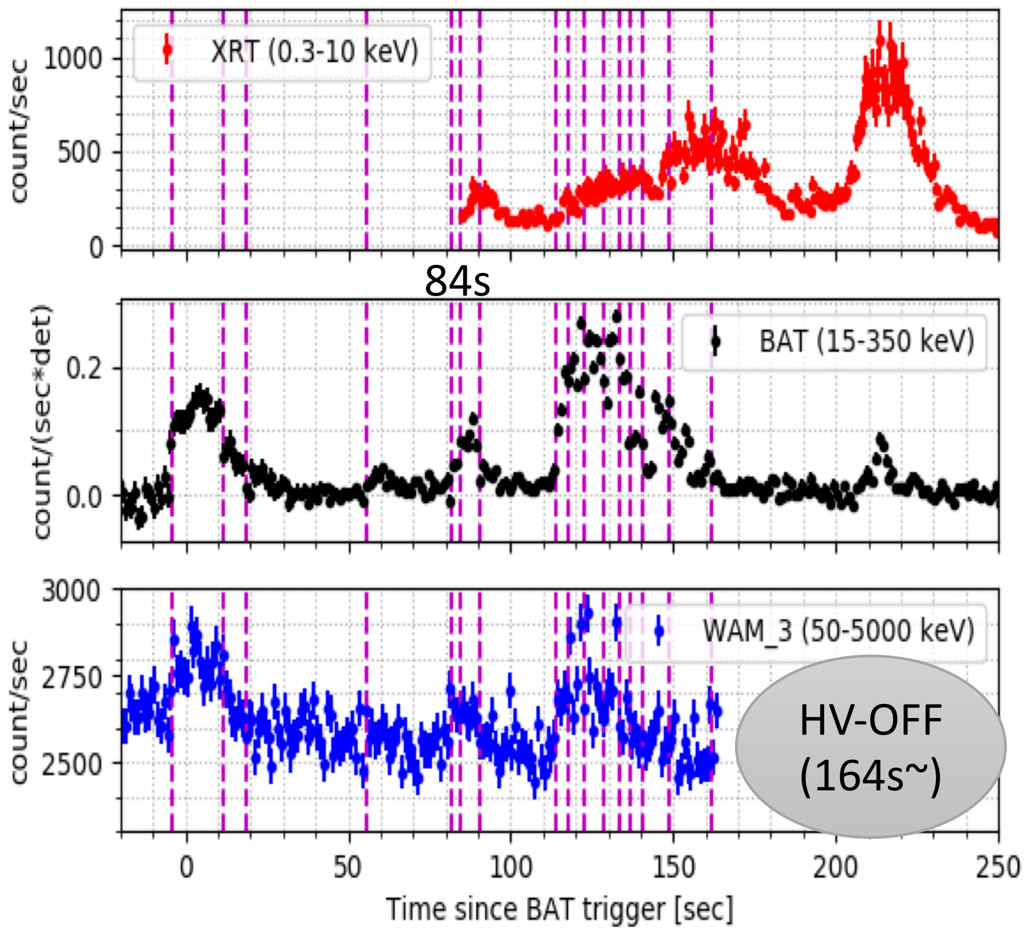
Next:we use contour binning algorithm to analyze the structure of this merging cluster and derive the temperature from the spectrum.Finally, we compare both results.

Search for the possible thermal emission from GRB100725B with *Swift* and *Suzaku* (P18)

Daisuke Katsukura(Saitama Univ.)

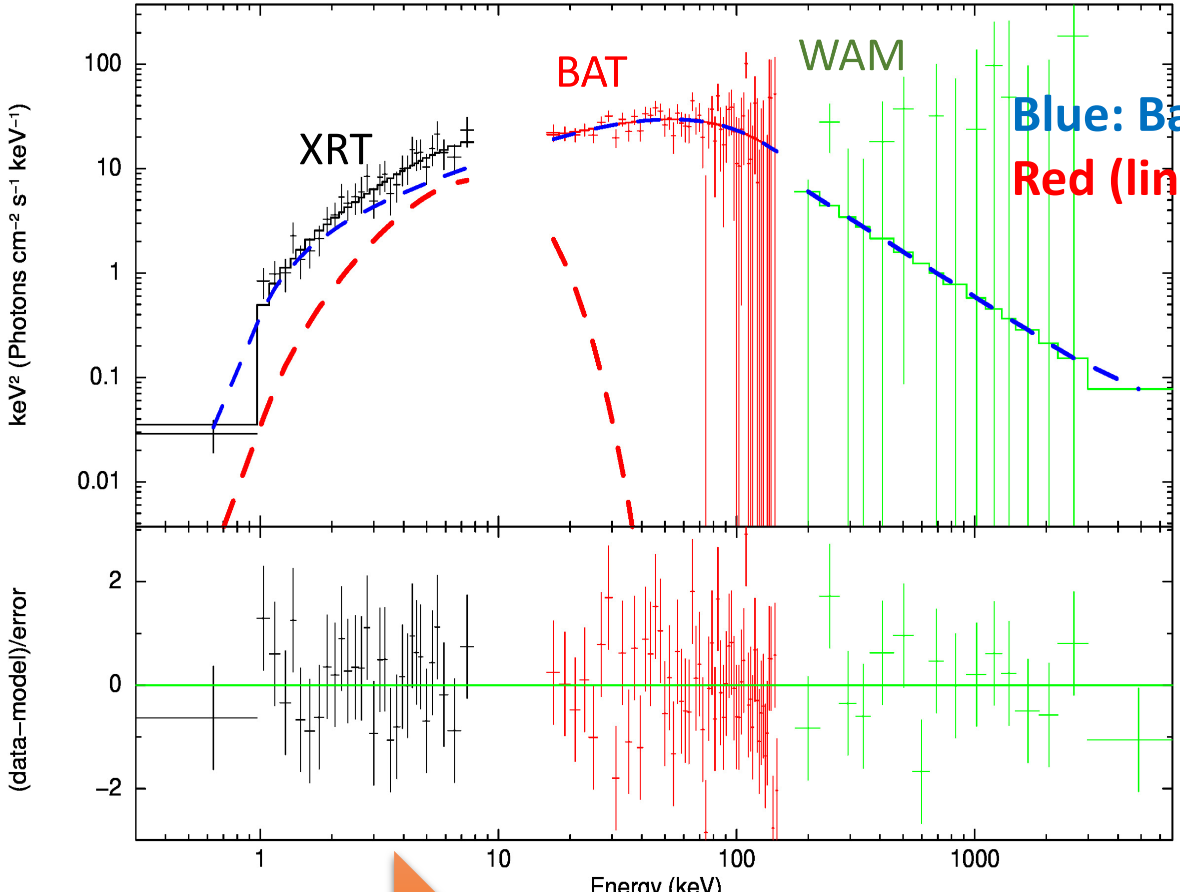
- Duration (BAT): $T_{100}^{BAT} = 231$ s
- Differences among light curves:
  - ✓XRT $\neq$ BAT & WAM
- Spectral evolution study:
  - ✓Until WAM HV-OFF
  - ✓Divided it into 15 intervals
  - ✓BAT & WAM (< 84s)
  - ✓XRT & BAT & WAM (>84s)

3-band light curves of GRB100725B



The methods to search for the thermal component:

1. Fitting the joint spectra by the non-thermal model of GRBs (c.f. Single Power-Law, Band function)
2. Adding the black body model to the non-thermal model.



Blue: Band function

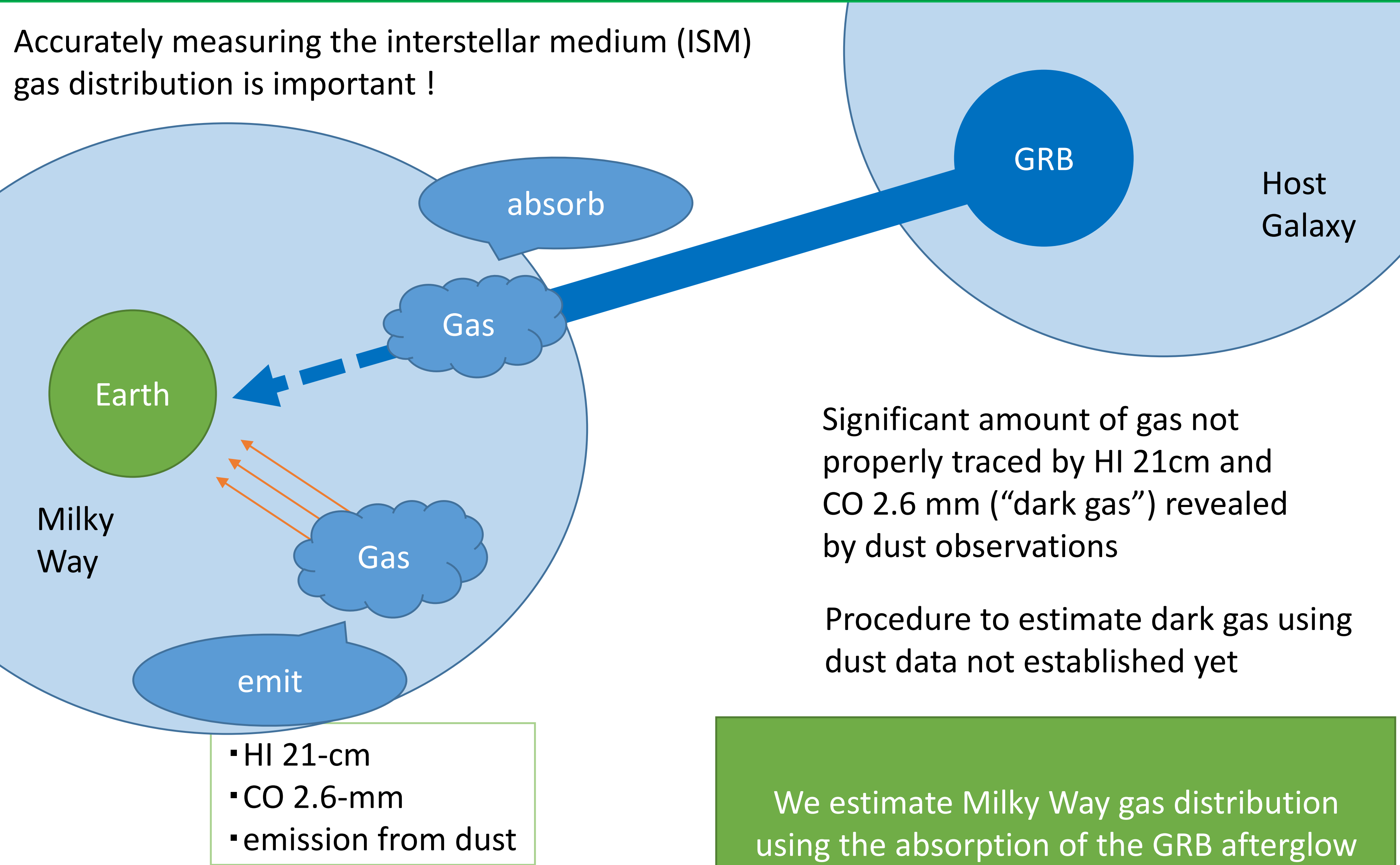
Red (line): thermal component?

If you want to get more details...

See how the components varied and discuss at P18

Study of the Interstellar Gas Distribution of Milky Way Using Gamma-Ray Burst Afterglow

Accurately measuring the interstellar medium (ISM) gas distribution is important !



Significant amount of gas not properly traced by HI 21cm and CO 2.6 mm ("dark gas") revealed by dust observations

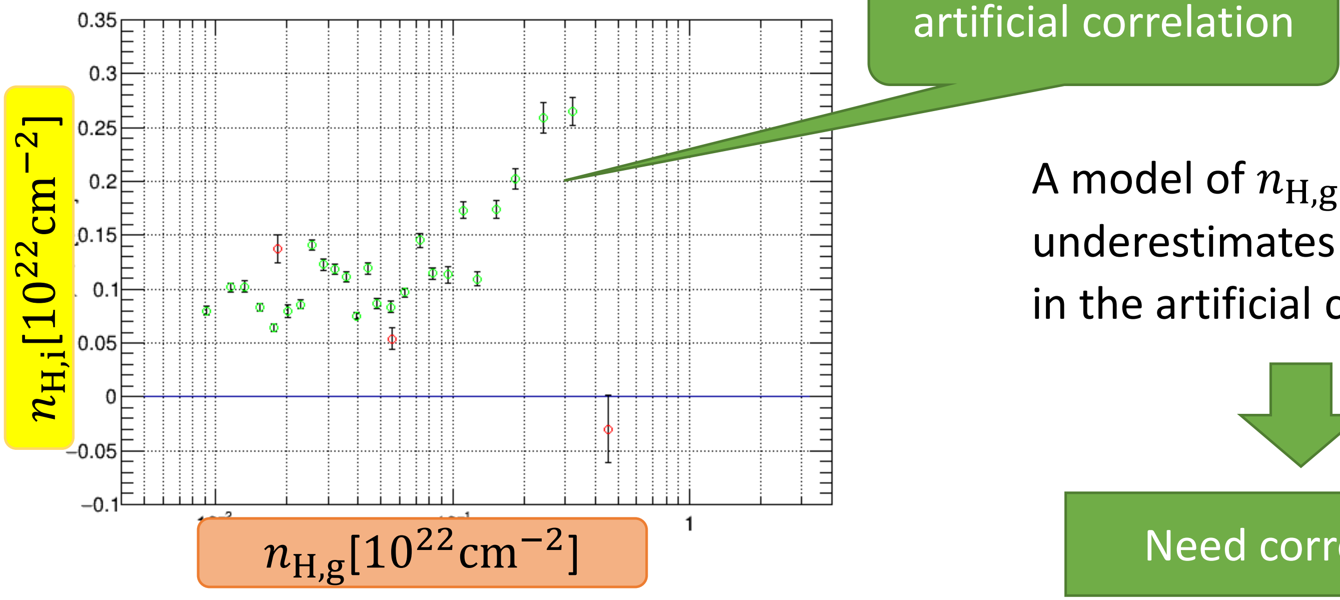
Procedure to estimate dark gas using dust data not established yet

We estimate Milky Way gas distribution using the absorption of the GRB afterglow

Study of the Interstellar Gas Distribution of Milky Way Using Gamma-Ray Burst Afterglow

Example

Radiance (no Correction)



※ $n_{\mathrm{H,tot}} = n_{\mathrm{H,i}}(\text{host galaxy}) + n_{\mathrm{H,g}}(\text{MW})$

A model of $n_{\mathrm{H,g}} \propto$ Radiance underestimates $n_{\mathrm{H,g}}$, resulting in the artificial correlation

Need correction

We report details of the analysis and obtained results in our POSTER(P19)

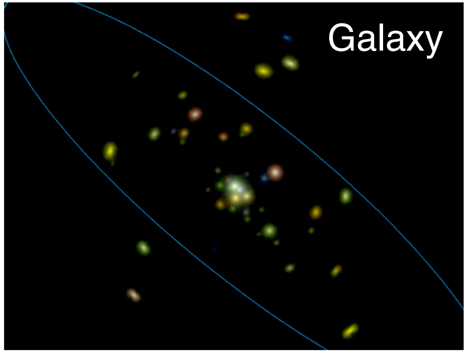
The FORCE mission : broadband x-ray imaging spectroscopy with good angular resolution

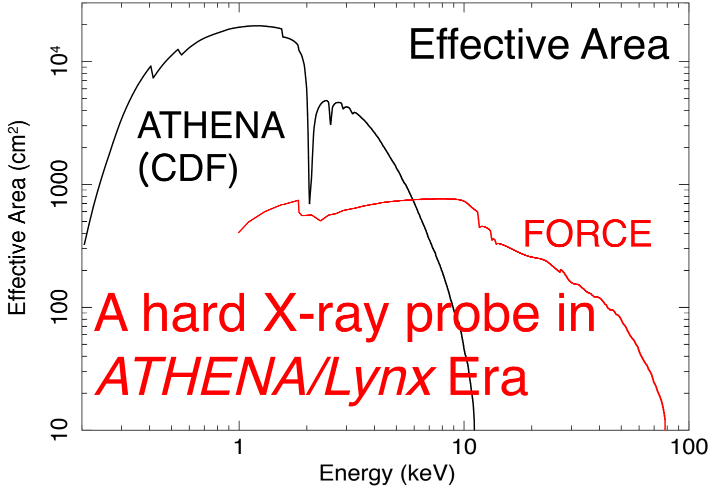
Kazuhiro Nakazawa (Nagoya University), Koji Mori (University of Miyazaki), T. G. Tsuru (Kyoto), Y. Ueda (Kyoto), T. Okajima (GSFC/NASA), H. Murakami (Tohoku Gakuin), H. Awaki (Ehime), H. Matsumoto (Osaka), Y. Fukazawa (Hiroshima), M. Ishida (ISAS/JAXA), H. Tsunemi (Osaka), T. Takahashi (U. Tokyo/IPMU), W.W. Zhang (GSFC/NASA), and the FORCE WG

- ✓ 11 m long, 1.2 t mission, proposed for mid-2020s launch.
- ✓ Wide-band (1-80 keV) & good angular-reso. (~10" HPD)

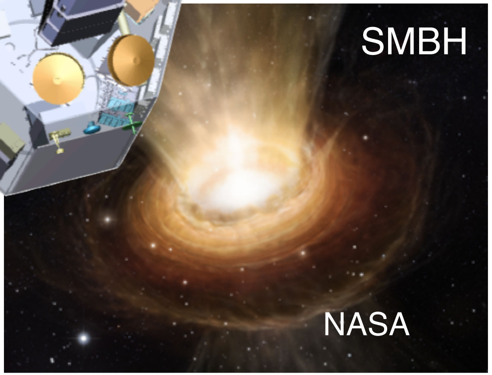
→ sensitivity < 3×10^{-15} erg/s/cm^2 (10-40 keV) @ 1 Ms

Technical heritage of Hitomi HXI/HXT





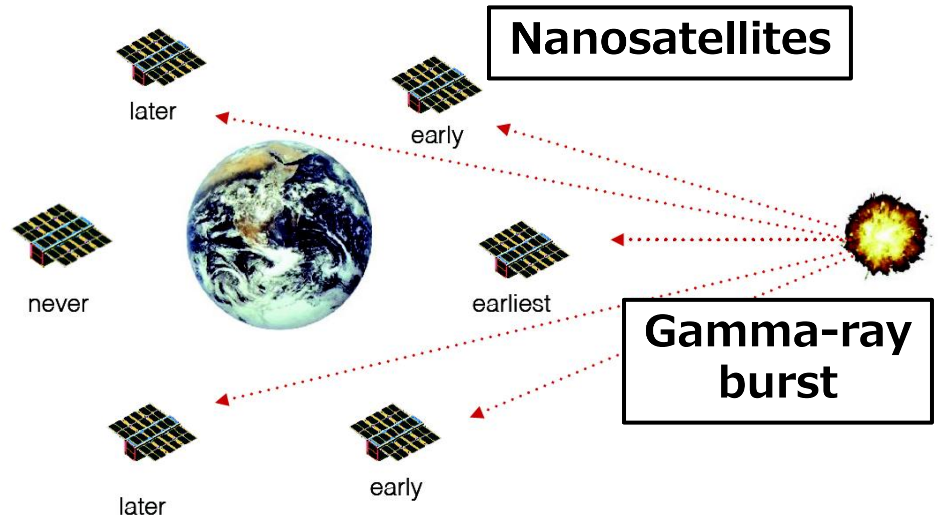
A hard X-ray probe in *ATHENA/Lynx* Era



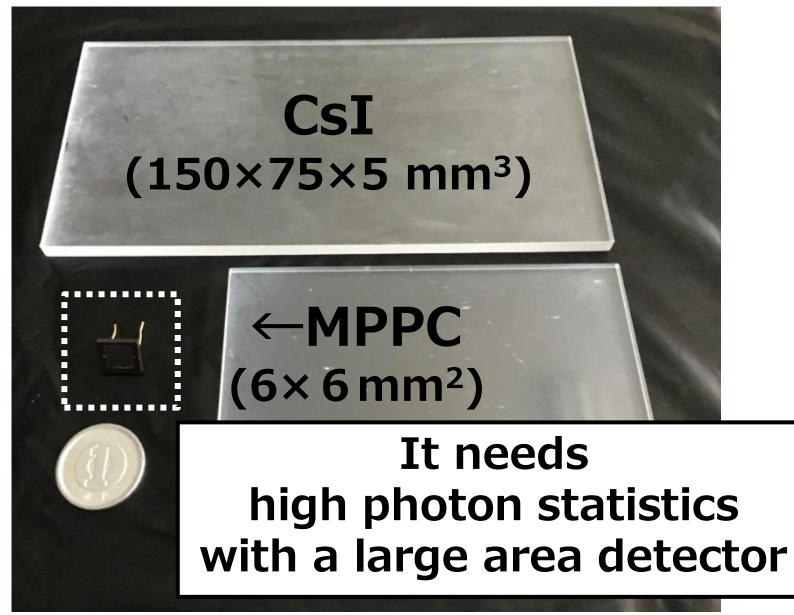
Aims: "missing black holes" (highly obscured SMBHs, and isolated stellar/IM-mass BH) and "hard X-ray diffuse science"

Performance Study of a Large CsI (Tl) Scintillator with an MPPC Readout for Nanosatellites Used to Localize Gamma-Ray Bursts

Kento Torigoe, Japanese-Hungarian collaboration
PI: Norbert Werner



Localization by measuring arrival time differences



CAMELOT

CubeSats Applied for MEasuring and LOcalizing Transients

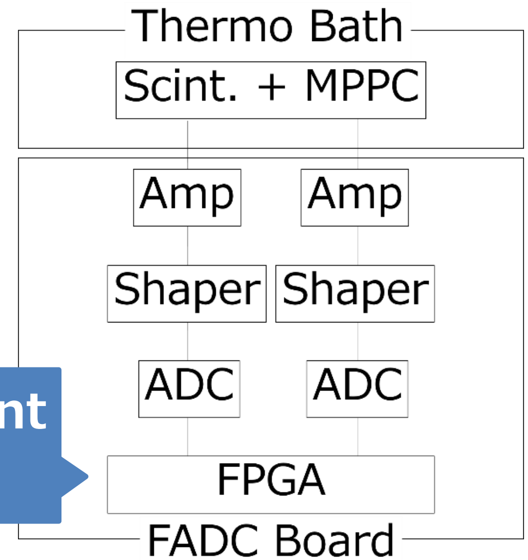
Detector:

- Large CsI (high light output)
- MPPC (low power consumption)

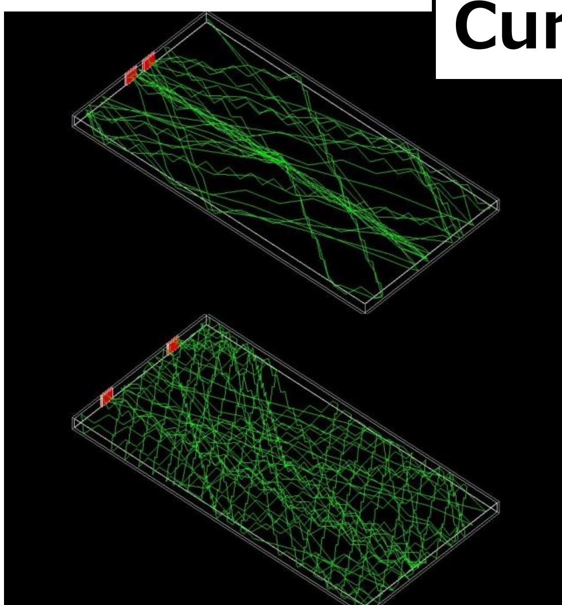
In order to improve the light yield, we developed multiple readout system with MPPCs

→ Light yield and uniformity was improved

→ Energy threshold is ~10 keV at 25 ℃



Current study



Optimum position of two MPPCs based on Geant4 simulation

Effect of radiation damage to MPPCs in orbit by the proton beam test

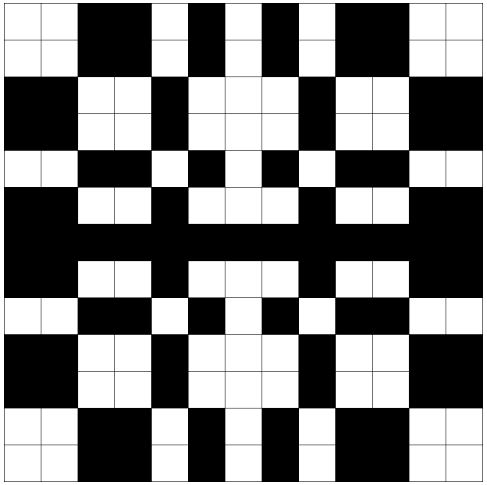
No. 22
Development of a Compact X-ray Imaging System with Coded Aperture

Tomoaki KASUGA, Yuki AIZAWA, Hirokazu ODAKA, Aya BAMBA
(The University of Tokyo)

Coded Aperture is necessary for imaging in hard X-ray and γ-ray band, due to the difficulty of using mirrors.

Our Poster includes …

- **Theory of Coded Aperture**
- **Numerical simulation**
- **Demonstration with visible light**
- **Application for a compact X-ray imaging system**



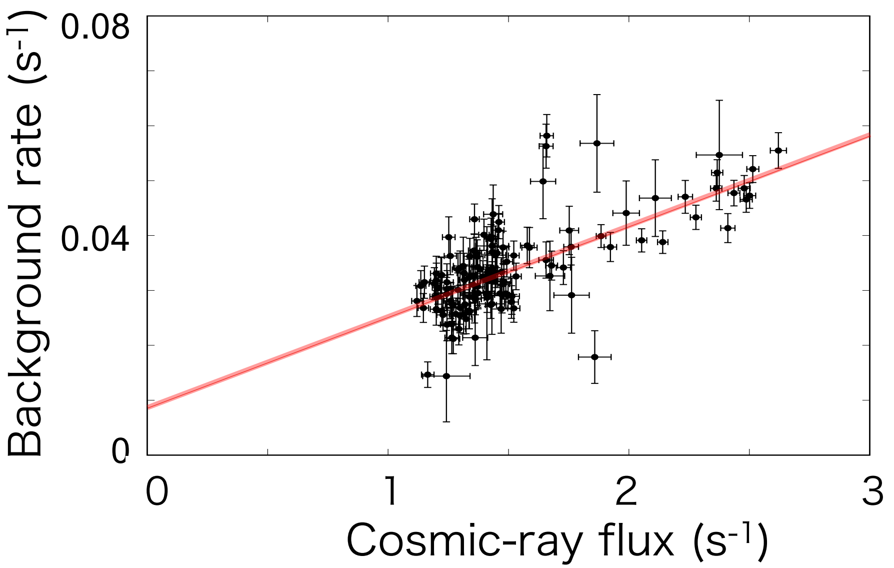
Poster No. 23:
In-orbit Neutron Background of the Hard X-ray Imager onboard *Hitomi*

Hiromasa Suzuki (Univ. of Tokyo),

Kazuhiro Nakazawa (Nagoya Univ.), Koichi Hagino (Tokyo Univ. of Science), Hirokazu Odaka, Aya Bamba (Univ. of Tokyo), and the *Hitomi* HXI team

We investigated in-orbit **Non X-ray Background** produced by atmospheric neutrons by using data of Hard X-ray Imager onboard *Hitomi.*

We found that the flux of properly filtered background data had **a positive correlation with the cosmic-ray flux** in orbit.
→ The background data was dominated by neutrons.



We extracted neutron spectrum and compared it to the estimates by our Monte-Carlo simulations.

Estimation of minimum detectable polarization for X-Calibur balloon-borne experiment.

N. Uchida, on behalf of X-Calibur Japan-U.S.-Sweden collaboration


[Hubrig, S. et al.]

X-Calibur

PI: H. Krawczynski (WUSTL)

- Collaboration b/w JPN, U.S and SWE.
- Observe the X-ray polarization.
- launched from Antarctic in Dec. 2018.
- also planning to launch in 2021.

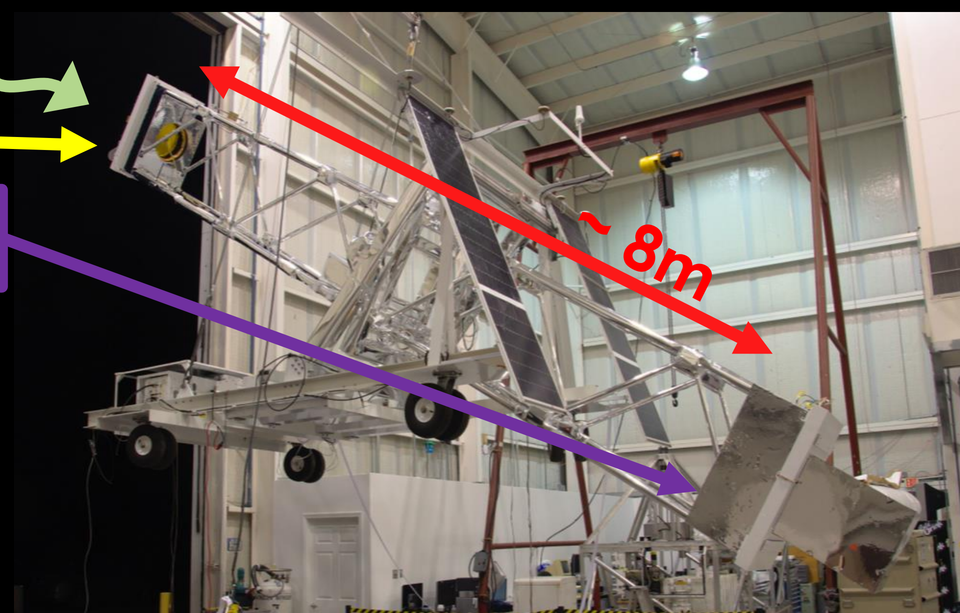
Object: **Vela X-1**
High Mass X-ray Binary

Polarization

Telescope

Polarimeter

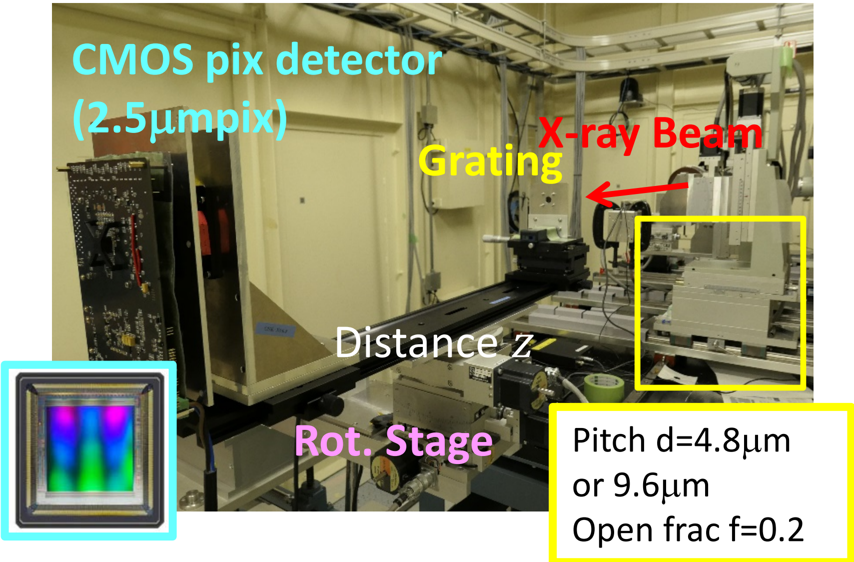
Will be upgraded



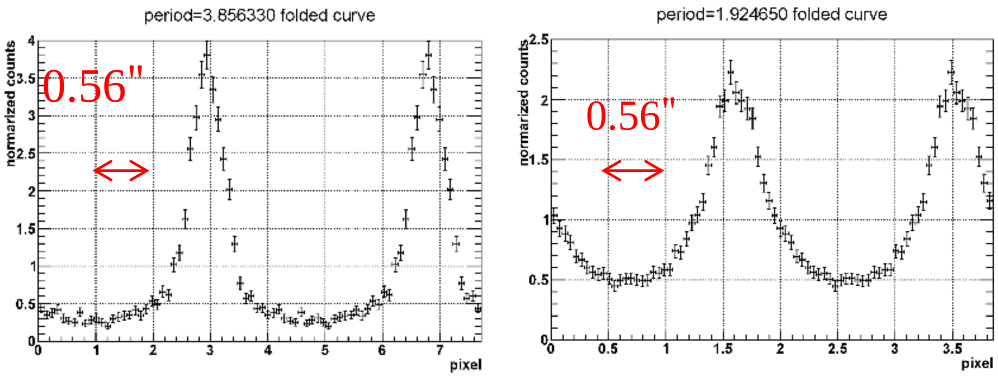
How much improvement of detection efficiency?

Sub Arcsecond (finally Micro Arcsecond) Imaging with Multi Image X-ray Interferometer Module (MIXIM)

SPring8 BL20B2



Stacked Profile of the X-ray Image



MIXIM succeeded in sub arcsecond X-ray Imaging with a grating and a CMOS pixel detector separated by 46cm.

The MIXIM is scalable from the small size (50cm) & subarcsec resolution for very small satellites (MIXIM-S), parasite to 10m size X-ray observatory (MIXIM-P), free fryer units (MIXIM-Z), and ultimately 2.5million km and micro-arcsec resolution (MIXM-L).

We need platforms for any of these !

K. Hayashida, T. Hanasaka, K. Asakura, T. Yoneyema, T. Kawabata,
S. Ide, K. Okazaki, H. Matsumoto, H. Tsunemi (Osaka Univ),
H. Nakajima (Kanto Gakuin Univ), H. Awaki (Ehime Univ.)