The first year of MAXI: Monitoring variable X-ray sources
— 4th International MAXI Workshop —

Aoyama Gakuin University
Tokyo, Japan

Tuesday, November 30

9:00	*Registration*		
10:00	10	M. Matsuoka	Opening remarks
10:10	30 [O-01]	N. Kawai	MAXI highlights
10:40	Session 1. Black Hole		
10:40	20 [O-02]	N. Shaposhnikov	Discovery and Monitoring of a new Black Hole Candidate XTE J1752-223 with RXTE
11:00	20 [O-03]	P.A. Curran	Swift observations of black hole candidate, XTE J1752-223, during outburst
11:20	20 [O-04]	K. Yamaoka	Suzaku observations of two Galactic black hole candidates XTE J1752-223 and MAXI J1659-152
11:40	30 [O-05]	R. Matsumoto	Global Magnetohydrodynamic Simulations of State Transitions in Black Hole Candidates
12:10	*Lunch / Poster Viewing*		
14:00	30 [O-06]	H. Negoro	Outbursts and State Transitions in Black Hole Candidates observed by MAXI
14:30	20 [O-07]	J. Kennea	A Swift Program of Follow-up Observations of MAXI Galactic Transients
14:50	15 [O-08]	P. Gandhi	Constraining accretion from coordinated multi-wavelength rapid timing observations of X-ray binaries
15:05	30 [O-09]	E. Kuulkers	INTEGRAL Galactic bulge monitoring program
15:35	15 [O-10]	R.A. Krivonos	The 7-year view of the accreting X-ray binaries in the Galaxy with INTEGRAL
15:50	*Coffee Break / Poster Viewing*		
16:20	30 [O-11]	C.B. Markwardt	Monitoring the Galactic Center with the RXTE PCA
16:50	30 [O-12]	E.A. Hays	Fermi Observations of Galactic Transients
17:20	15 [O-13]	A. Kong	Monitoring variable X-ray sources in nearby galaxies
17:35	Session 2. MAXI instrument and services		
17:35	30 [O-14]	M. Sugizaki	Status of Calibration and Data Analysis of MAXI GSC

Wednesday, December 1

9:00		Session 3. Nova and CV	
9:00	25 [O-15]	J.P. Osborne	Swift observations of novae
9:25	25 [O-16]	M. Tsujimoto	Recent progress of hard X-ray studies of classical novae
9:50	20 [O-17]	Y. Tsuboi	New Results on Stellar Flares Monitored with MAXI/GSC
10:10	25 [O-18]	M. Kimura	The scientific results of MAXI/SSC
10:35		*Coffee Break / Poster Viewing*	
11:00		Session 4. Low Mass X-ray Binaries	
11:00	30 [O-19]	J. in 't Zand	X-ray bursts and superbursts: what can MAXI do?
11:30	30 [O-20]	D. Altamirano	Observations of AMSP/bursters
12:00	15 [O-21]	M. Linares	The Fermi-GBM X-ray burst monitor
12:15		*Group photograph*	
12:20		*Lunch / Poster Viewing*	
14:00		Session 5. High Mass X-ray Binaries	
14:00	30 [O-22]	M.H. Finger	Fermi/GBM monitoring of Accreting pulsars
14:30	30 [O-23]	P. Ubertini	INTEGRAL review of HMXBs, SFXTs
15:00	25 [O-24]	T. Mihara	Binary pulsars observed with MAXI
15:25		*Coffee Break / Poster Viewing*	
15:55	30 [O-25]	A. Santangelo	New views on accreting X-ray pulsars
16:25	30 [O-26]	J.D. Scargle	Time Series Analysis of Data With Gaps
16:55	15 [O-27]	A. Bodaghee	Revealing the nature of HMXBs through multi-wavelength and statistical analyses
17:10	20 [O-28]	K. Makishima	Magnetars, X-ray Pulsars, and Related Objects
18:00		*Banquet registration*	
18:30		*Banquet*	

Thursday, December 2

9:00		Session 6. Transient monitoring programs	
9:00	30 [O-29]	L. Walkowicz	Transient Observations with LSST
9:30	20 [O-30]	B. Paul	ASTROSAT-LAXPC
9:50		Session 7. GRB	
9:50	20 [O-31]	M. Serino	Gamma-ray bursts and short X-ray transients observed by MAXI : A summary of the first year
10:10		*Coffee Break / Poster Viewing*	
10:40	30 [O-32]	S.G. Djorgovski	Exploring the Variable Sky with the Catalina Real-Time Transient Survey
11:10	30 [O-33]	T. Morokuma	Subaru Wide-Field Variability Survey
11:40	15 [O-34]	S. Kulkarni	Palomar Transient Factory
11:55		Session 8. MAXI catalog	
11:55	20 [O-35]	Y. Ueda	Extragalactic Survey with MAXI and the First MAXI/GSC Catalog
12:15		*Lunch / Poster Viewing*	
14:00		Session 9. AGN	
14:00	20 [O-36]	N. Isobe	MAXI observation of Blazars
14:20	30 [O-37]	G. Madejski	Fermi results of AGN
14:50	30 [O-38]	S.J. Wagner	Multifrequency Variability of Blazars
15:20	10	A. Yoshida	Concluding remarks

ORAL PAPERS

[O-01]

Highlights from MAXI observations

N. Kawai (Tokyo Tech) on behalf of the MAXI Team

Tokyo Tech

MAXI started operation as an X-ray all-sky monitor on the Japanese Experiment Module "Kibo" of the International Space Station in August 2009. Since then, MAXI has detected outburst episodes Be X-ray binaries, black hole candidates, low-mass X-ray binaries, and active galactic nuclei. It also detected flares of active stars, gamma-ray bursts, and short X-ray transients from unidentified sources. I present an overview of the operation and scientific highlights of MAXI in its first 14 months.

[O-02]

Discovery and Monitoring of a new Black Hole Candidate XTE J1752-223 with RXTE: RMS spectrum evolution, BH mass and the source distance

Nikolai Shaposhnikov (UMD/CRESST/GSFC), Craig Markwardt (GSFC), Jean Swank (GSFC), Hans Krimm (USRA/CRESST/GSFC)

University of Maryland

I will report on the discovery and monitoring observations of a new galactic black hole candidate XTE J1752-223 by Rossi X-ray Timing Explorer (RXTE). The new source appeared on the X-ray sky on October 21 2009 and was active for almost 8 months. Phenomenologically, the source exhibited the low-hard/high-soft spectral state bi-modality and the variability evolution during the state transition that matches standard behavior expected from a stellar mass black hole binary. We model the energy spectrum throughout the outburst using a generic Comptonization model assuming that part of the input soft radiation in the form of a black body spectrum gets reprocessed in the Comptonizing medium. We follow the evolution of fractional root-mean-square (RMS) variability in the RXTE/PCA energy band with the source spectral state and conclude that broad band variability is strongly correlated with the source hardness (or Comptonized fraction). We follow changes in the energy distribution of rms variability during the low-hard state and the state transition and find further evidence that variable emission is strongly concentrated in the power-law spectral component. We discuss the implication of our results to the Comptonization regimes during different spectral states. Correlations of spectral and variability properties provide measurements of the BH mass and distance to the source. The spectral-timing correlation scaling technique applied to the RXTE observation during the hard-to-soft state transition indicates a mass of the BH in XTE J1752-223 between 8 and 11 solar masses and a distance to the source about 3.5 kiloparsec.

[O-03]

Swift observations of black hole candidate, XTE J1752-223, during outburst

P.A. Curran, T.J. Maccarone, P. Casella

Laboratoire AIM, CEA-Saclay

We present broadband (0.002-1150keV) Swift observations of the recently discovered black hole candidate, X-ray transient, XTE J1752-223, obtained over the period of outburst from October 2009 to June 2010. From Swift-UVOT data we confirm the presence of an optical counterpart which displays variability correlated, in the soft state, to the X-ray emission observed by Swift-XRT. The optical counterpart also displays hysteretical behaviour between the states not normally observed in the optical bands, suggesting a possible contribution from a synchrotron emitting jet to the optical emission in the hard state. We offer a phenomenological treatment of the spectra as an indication of the canonical spectral state of the source during different periods of the outburst. We find that the high-energy hardness-intensity diagrams over two separate bands follows the canonical behavior associated with black hole binaries. Our XRT timing analysis shows that in the hard state there is signi ficant variability below 10Hz which is more pronounced at low energies, while during the soft state the variability is at negligible levels. These properties of XTE J1752-223 support its candidacy as a black hole in the Galactic centre region.

[O-04]

Suzaku observations of two Galactic black hole candidates XTE J1752-223 and MAXI J1659-152 triggered by MAXI

Kazutaka Yamaoka (Aoyama Gakuin Univ.), and MAXI and Suzaku team

Aoyama Gakuin University

Following the MAXI detection and discovery of two Galactic black hole candidates (BHCs) XTE J1752-223 and MAXI J1659-152, we carried out Suzaku DDT ToO observations once on Feb. 23, 2010 and three times on Sep. 28, 30, and Oct. 1, 2010 for each source. These observations have been done in approved observation scheme of Suzaku-MAXI collaborations. As for XTE J1752-223, Suzaku observed a high/soft state where the disk emissions with an innermost temperature of about 0.5 keV are dominant in the broadband spectrum, whereas, for MAXI J1659-152, it observed an intermediate state where both soft and hard component are dominant. In this paper, we will show the preliminary results and discuss the origin of the broadband spectrum for two BHCs in the different spectral states.

[O-05]

Global Magnetohydrodynamic Simulations of State Transitions in Black Hole Candidates

R. Matsumoto, T. Ogawa, T. Kawashima (Chiba Univ.), H. Oda (SHAO), M. Machida (Kyushu Univ.)

Chiba University

We present the results of global three-dimensional magnetohydrodynamic simulations of hard-to-soft state transitions in black hole candidates. We included radiative cooling term in the energy equation. When the accretion rate exceeds the threshold for the onset of the cooling instability in optically thin, hard state disk, the vertical contraction of the disk enhances the strength of mean azimuthal magnetic fields. We found that the disk can stay in an optically thin, intermediate state supported by magnetic pressure. We computed the photon spectrum by post processing the simulation results using the Monte Carlo method and found that when the cooling instability takes place, the black hole candidate evolves from a low/hard state to the bright hard state. Hard X-ray luminosity further increases when the increase of the accretion rate from the cool region triggers the cooling instability in the inner region. When the magnetic flux supporting the disk is lost either by buoyant rise of magnetic flux or by dissipation in the disk, the disk will complete the transition to the soft state. The increase of the radio flux observed during the transition from the bright hard state to the soft state can be explained by the release of the magnetic energy stored in the disk.

[O-06]

Outbursts and State Transitions in Black Hole Candidates observed by MAXI

H. Negoro (Nihon University) and MAXI Team

Nihon University, CST

MAXI continuously observes serveral black hole candidates in our Galaxy and LMC. MAXI already detected various state transitions in Cyg X-1, GX 339-4, Swift J1752.5-127, and black hole transients, H 1743-332, 4U 1630, XTE J1752-223, and MAXI J1659-125. From these observations, we try to clarify what happens during the transitions, and what triggers the transitions. In any case, fast alerts just before the transitions and soon after the outbursts are crucial to detect, for instance, radio and high energy gamma-ray jets or emission. We also present some successful examples of alerts from our MAXI transient alert system.

[O-07]

A Swift Program of Follow-up Observations of MAXI Galactic Transients

J. A. Kennea (PSU), K. Yamoaka (Aoyama-Gakuin U.), H. Krimm (CRESST/GSFC/USRA), P. Curran (UCL-MSSL), V. Mangano (INAF-IASFPA), P. Romano (INAF-IASFPA) and P. Evans (U. Leicester)

Pennsylvania State University

Beginning in April 2010, as part of a Cycle 6 Swift Guest Investigator program, we have been performing rapid follow-up observations of MAXI detected X-ray transients with the Swift X-ray telescope (XRT) and the Ultra-violet/Optical telescope(UVOT), with the aim to provide accurate localizations and identifications of these sources. XRTs 24 arc-minute diameter field of view is well matched to cover the MAXI error circles, and Swifts rapid slewing capability means that we can be on target of a MAXI transient within hours of it being reported. By combining XRT and UVOT data, we are able to provide localizations of transients with 2 arc-second accuracy, Here we present results of the follow-up observations so far. Highlights include confirmation that a MAXI detected transient is indeed HD 347929/1RXS J180724.2+194217 in X-ray outburst, and a Swift BAT trigger and subsequent XRT/UVOT follow-up observation of LS V +44 17, shortly after the initial MAXI detection of the X-ray r ise of this object. We present future plans for this program.

[O-08]

Constraining accretion from coordinated multi-wavelength rapid timing observations of X-ray binaries

P. Gandhi(ISAS), K. Makishima (U. Tokyo), V.S. Dhillon (U. Sheffield), T.R. Marsh (U. Warwick), A.C. Fabian (U. Cambridge), J. Malzac (U. Toulouse) & A. Kubota (Shibaura)

ISAS/JAXA

It has long been believed that the optical and infrared (OIR) fluxes of compact accreting sources will not generally show fast, stochastic variability. This is because reprocessing of high energy photons is thought to be the primer driver of the OIR fluxes. In recent work, we have found fast (sub-second) optical variations in accreting black hole and neutron star binaries. The power spectra of the source light curves show wide-band noise and even low-frequency quasi-periodic oscillations. These are characteristics very similar to those found in X-ray observations. The OIR fluxes show some clear and intriguing correlations with the X-ray fluxes on timescales of 0.1-10 s, which can place quantitative physical constraints on the accretion processes for the first time. Detailed statistical analyses including the inter-band coherence, phase lags and rms spectrum will be discussed. These show unambiguously that at least two separate components (e.g. a jet and a corona) are intera cting via some underlying connections (e.g. a strong magnetic field threading the entire inner flow regions). OIR timing studies are thus proving detailed insight on compact accreting sources, complementing X-ray constraints.

[O-09]

INTEGRAL Galactic bulge monitoring program

E. Kuulkers (ESA/ESAC, Spain), et al.

ESA/ESAC

The central region of our Galaxy, the Galactic bulge, is a rich host of variable high-energy X-ray and gamma-ray point sources. These sources include bright and relatively faint X-ray transients, X-ray bursters, persistent neutron star and black-hole candidate binaries, high-mass X-ray binaries, etc.. We have a program to monitor the Galactic bulge region regularly and frequently with the gamma-ray observatory INTEGRAL, whenever it is observable. As a service to the scientific community the high-energy light curves of sources present, as well as the images of the region are made available through the WWW at http://integral.esac.esa.int/BULGE/ as soon as possible after the observations have been performed. We show the ongoing results of this exciting program.

[O-10]

The 7-year view of the accreting X-ray binaries in the Galaxy with INTEGRAL

R. Krivonos, S. Tsygankov, E. Churazov, R. Sunyaev (MPA, Garching; IKI, Moscow) M.Revnivtsev, A.Lutovinov (IKI, Moscow)

Max Planck Inst. for Astrophysics

During seven years of successful work, the INTEGRAL observatory have performed the deepest ever survey of accreting binaries with compact objects. Types of faint accreting binaries, available to INTEGRAL within our Galaxy, are beyond reach of any other orbital observatories both in our and in distant galaxies. I will present the latest observational results of the INTEGRAL Galactic survey including counting individual sources and study of the unresolved hard X-ray emission, and will make emphasis on studies of populations of sources. Different samples of sources, gathered by INTEGRAL allow us to probe a variety of astrophysical phenomena, among which one can name models of evolution of stellar binaries, and their distribution in the Galaxy, distribution of strength of magnetic field of young and old neutron stars, history of star formation and much more.

[O-11]

Monitoring the Galactic Center with the RXTE PCA

C. B. Markwardt (NASA/GSFC), J. H. Swank (NASA/GSFC)

NASA/GSFC

Since 1999, the Rossi X-ray Timing Explorer PCA instrument has monitored the galactic center region. While the original scans covered about 250 sq. deg. of the central galactic bulge region, the monitored region has now grown to more than 700 sq. deg., including the Aquila arm. The principle goals of the program are to detect previously unknown faint X-ray transients, and also renewed outbursts of known transients. In total, close to two hundred sources are monitored, with a limiting flux of between 0.5 mCrab and 2 mCrab (2-10 keV), depending on the density of sources. The program has detected close to 50 previously unknown X-ray sources. Of special note are the handful of newly detected accreting millisecond X-ray pulsars, such as XTE J1751-305, XTE J1814-338 and XTE J1807-294, as well as repeat outbursts of known pulsars such as SAX J1808.4-3658. In addition, the program has detected both new and known black hole candidates and accreting (slow) X-ray pulsars. The main legacy of the RXTE PCA galactic scans is that X-ray transients occur at many fluxes, recurrence timescales, and duty cycles. Intensive monitoring will expand our understanding of these curious sources.

[O-12]

Fermi Observations of Galactic Transients

E. Hays on behalf of the Fermi LAT collaboration

NASA/GSFC

This talk will provide an overview of the status of the Fermi mission with an emphasis on the capabilities important for detecting and monitoring Galactic transients in the MeV-GeV band. I will present the current results on the Galactic transients observed by the Large Area Telescope.

[O-13]

Monitoring variable X-ray sources in nearby galaxies

A.K.H. Kong (National Tsing Hua University, Taiwan)

National Tsing Hua University, Taiwan

In the last decade, it has been possible to monitor variable X-ray sources in nearby galaxies. In particular, since the launch of Chandra, M31 has been regularly observed. It is perhaps the only nearby galaxy which is observed by an X-ray telescope regularly throughout operation. With 10 years of observations, the center of M31 has been observed with Chandra for nearly 1 Msec and the X-ray skies of M31 consist of many transients and variables. Furthermore, the X-ray Telescope of Swift has been monitoring several ultraluminous X-ray sources in nearby galaxies regularly. Not only can we detect long-term X-ray variability, we can also find spectral variation as well as possible orbital period. In this talk, I will review some of the important Chandra and Swift monitoring observations of nearby galaxies in the past 10 years. I will also present a "high-definition" movie of M31 and discuss the possibility of detecting luminous transients in M31 with MAXI.

[O-14]

Status of Calibration and Data Analysis of MAXI GSC

M. Sugizaki (RIKEN)

RIKEN

We review the status of the response calibration and data analysis of MAXI/GSC. Light curves and images of about 200 pre-registered X-ray sources are processed from the all-sky scan data every data. They are archived on the MAXI public web site. The spectra and response files will also be open to public sooner since October, 2010. The monitor targets and the archived data have been updated frequently so far according to the updates of the software and calibration files. We briefly introduce the procedure of the GSC data analysis, then present the status of the instrument response calibration and the expected science performance as well as the future update plan.

[O-15]

Swift observations of novae

Julian Osborne (Leicester)

University of Leicester

The flexible and responsive Swift ToO programme has enabled unprecedented X-ray and UV coverage of classical and recurrent novae, and has motivated high spectral resolution observations using the Chandra and XMM grating spectrometers. I review these observations and their results. A large variety of behaviors and new phenomena have been revealed by Swift. Examples include correlated, anti-correlated and uncorrelated X-ray and UV flux variations, a 35 second X-ray period in two novae, and fast flux variations of >100x in the early super-soft X-ray flux. X-ray spectral analysis of the super-soft source using both blackbody and atmosphere models show the evolution of the white dwarf photosphere, while spectral analysis of the harder emission allows the ejecta shocks to be described.

[O-16]

Recent progress of hard X-ray studies of classical novae

M. Tsujimoto (JAXA ISAS) and D. Takei (Rikkyo U.)

JAXA ISAS

Classical novae (CNe) are explosions caused by a nuclear runaway on the surface of a while dwarf (WD) when the critical mass is reached for the matter accreted from its companion star. The defining characteristic of CNe is a sudden increase in the optical brightness by 10 mag, but CNe also show a variety of phenomena across wavelengths. In the X-rays, two types of emission after a CNe have been known for decades: super-soft emission from the heated WD surface, and hard emission presumably caused in shocks by the CN ejecta. Unlike the super-soft emission, the hard emission has not been observed in a systematic manner for its transient and faint nature. The start of monitoring campaign by Swift for X-ray bright CNe drastically changed the situation, making timely pointing observations using X-ray observatories feasible. Many new discoveries were reported in the hard X-ray regime and in the higher energy bands, including the detection of non-thermal emission, Fe fluorescence from rekindled accretion, altered chemical composition in the plasma. We review the recent progress of hard X-ray observational studies mainly made with Suzaku, XMM, and Chandra and discuss utility of MAXI in this field.

[O-17]

New Results on Stellar Flares Monitored with MAXI/GSC

Yohko Tsuboi, Kyohei Yamazaki, Akiko Uzawa, Takanori Matsumura (Chuo Univ.), Satoshi Nakahira (Aoyama Gakuin Univ.), Motoki Nakajima (Nihon Univ.), and the MAXI team.

Chuo Univ.

Monitor of All-Sky X-ray Image (MAXI) started its operation in 2009 August. Owing to its unprecedentedly high sensitivity as an all-sky X-ray monitor, and to its capability of real-time data transfer, MAXI is able not only to make a continuous monitor of X-ray sources, but also to catch quickly various transient X-ray events, like flares on stars. Making use of this capability, we have searched stellar flares, and have detected thirteen flares from six RS CVns and one flare from a Young Stellar Objects. These flares are on the high-end as flares from stars. In this talk, we will report the characteristics of X-ray flares in the sources.

[O-18]

The first year result of MAXI/SSC

Masashi Kimura, Hiroshi Tsunemi, Hiroki Kitayama (Osaka University), Hiroshi Tomida, Masaru Matsuoka (JAXA), Arata Daikyuji (Miyazaki University)

Osaka University

Solid-state Slit Camera (SSC) is CCD camera installed on MAXI. The SSC consists of two CCD cameras: each contains 16 CCD chips. The CCD chip has 1024 x 1024 pixels and area of 25mm square. These CCD chips are cooled down to -60 degree using a combination of the radiator and the peltier cooler. In one year of operation, MAXI/SSC has detected over 70 X-ray sources and several bursts from known X-ray sources. In this presentation we report the status of MAXI/SSC as well as the preliminary result of monitoring X-ray transients obtained from the operation of the first year.

[O-19]

X-ray bursts and superbursts: what can MAXI do?

Jean in 't Zand

SRON

Research in the field of thermonuclear flashes on neutron stars, visible as X-ray bursts, has made a considerable development in the past decade thanks to high-throughput measurements with RXTE-PCA and wide field imaging with BeppoSAX-WFC, RXTE-ASM, HETE-WXM and INTEGRAL. The latter category of observations has surfaced very rare kinds of X-ray bursts such as superbursts. MAXI falls in the same category and one may expect a significant contribution from this instrument. I will review current hot topics in X-ray bursts and superbursts and address the question what MAXI can do.

[O-20]

Observations of AMSP/bursters

D. Altamirano

University of Amsterdam

In the first year MAXI has given us the possibility to follow the outburst evolution of several Accreting Millisecond X-ray pulsars and X-ray bursters. These observations constitute an invaluable contribution when it is needed to put single event results in the context of long-term outburst evolution and spectral state changes. In this talk I will show examples in which MAXI monitoring observations have played a key role. I will also emphasize the importance of including more sources in the list of monitored AMXPs and X-ray bursters.

[O-21]

The Fermi-GBM X-ray burst monitor

M. Linares (MIT) for the Fermi-GBM X-ray burst collaboration.

MIT

We discuss the first results of the Fermi-GBM all-sky search for X-ray bursts. The very large field of view and X-ray response of the Fermi-GBM make it a unique instrument to study rare, bright and short-lived X-ray bursts. We are performing a systematic search that exploits such capabilities. We present results on long/intermediate type I X-ray bursts, an unusual kind of thermonuclear bursts from accreting neutron stars, and show how Fermi-GBM is giving for the first time robust measurements of their recurrence time.

[**O-22**]

Fermi/GBM monitoring of Accreting pulsars

Mark H. Finger (USRA) for the GBM Pulsar Team

Universities Space Research Association

Since the Launch of Fermi we have been using the twelve NaI detectors of the Gamma-ray Burst Monitor (GBM) to monitor the pulsations of bright accreting pulsars in the 8-50 keV energy band. I will discuss our measurement techniques, the science problems we are interested in addressing, and some recent results.

[O-23]

INTEGRAL review of HMXBs, SFXTs

P. Ubertini (Istituto di Astrofisica Spaziale e Fisica Cosmica, Rome, Italy)

INAF/IASF-Rome

The talk will review the INTEGRAL discovery of Supergiant Fast X-Ray Transient (SFXT) and in general the properties of the High Mass X-ray Binaries (HMXB) observed in the 8 years in orbit.
In fact, INTEGRAL has discovered a new class of strongly absorbed X-ray binaries during its initial observation of the Galaxy Center and Plane. The prototype is IGR J16318-4848, associated with a sgB[e] star. This discovery was mainly due to the INTEGRAL unique capability to monitor the galactic center and bulge area for long periods at an unprecedented sensitivity level (<0.2 mCrab) in the soft gamma-ray range (15 keV-10 MeV) if compared with other wide-field instruments. To date most of the members of this new class of HMXB has been discovered with INTEGRAL. More than half of these sources have supergiant companions and a substantial fraction are slow (∼100-1000s) X-ray pulsars. They are embedded in dense environments and the emission is so heavily absorbed that these sources were not detected/identified before with soft X-ray instruments.
Among the class of HMXB INTEGRAL has discovered a puzzling new sub class of transient sources: the Supergiant Fast X-ray Transients (SFXT). They show short X and soft gamma-ray outbursts typically lasting from a fraction of an hour to a few hours. The total number of these sources is already comparable to that of persistent supergiant X-ray binaries: what is the different physical process active in the tow cases? The nature of their short outbursts, in a few cases recurrent, is still not clear. The more plausible explanation is connected with clumps in the stellar wind accretion, eventually generated at some distance from the giant star by magnetic field.

[O-24]

Binary pulsars observed with MAXI

T. Mihara, T. Yamamoto, M. Sugizaki (Riken) M. Nakajima (Nihon-u) and the MAXI team

RIKEN

One of the merit of MAXI observation is small constraints of the Sun angle. The nominal avoidance angle is 4 degrees and the observable sky in one days is 95 %. Thus MAXI can monitor the intensities of the Be transient pulsars as well as persistent pulsars continuously. The Be binary pulsars are one of the bright X-ray sources. The optical companion star is rapidly rotating and has a stellar disk around it. When the pulsar passes the disk, it flares up. The size of the outburst depends on the stellar activity. MAXI has monitored some X-ray outbursts from its beginning to the end. The sources are A 0535+26, GX 304-1, GRO J1008-57, 2S 1417-624, V 0332+53, LS V +44 17, XTE J1946+274, and EXO 2030+375. There was an optical observations of H-alpha lines in the giant/normal outbursts of A 0535+26. The X-ray flare period was different from the orbital period. Also, X-ray pre-cursors were seen. Their mechanisms are not certain. The super orbital modulation was observed from Her X-1, LMC X-4, and SMC X-1. A cyclotron line feature was discovered from GX 304-1 by the follow-up observations with RXTE and Suzaku.

[O-25]

New Views on Accreting Pulsars

Andrea Santangelo

IAAT- Kepler Center University Tuebingen

Since their discovery accreting pulsars, both persistent and transients, have been a wonderful astrophysical laboratory to study the physics of accretion in the extreme conditions of very high magnetic and gravitational fields, and in different luminosity regimes. However, in spite of more than forty years of research many of the geometrical and physical aspects of the emission from these systems remain unexplained. In this paper I review the last ten years of research on accreting pulsars. These efforts have provided not only new insights but also unexpected surprises.

[O-26]

Time Series Analysis of Data With Gaps

J. Scargle

NASA Ames Research Center

The presence of gaps in the time series means that some of the standard methods of analysis cannot be used, but do not necessarily mean that the full information content cannot be retreived. In addition, there exist analysis methods that effectively account for not only gaps in otherwise evenly sampled data, but also for the case where the sampling is at arbitrary times. I will review methods for computing correlation function, power spectra (both Fourier and Wavelet), structure functions, and time-scale and time-frequency distributions – all of these can be computed in but auto- (single time series) as well as cross- (two or more time series) modes.

[O-27]

Revealing the nature of HMXBs through multi-wavelength and statistical analyses

A. Bodaghee, J.A. Tomsick (UC Berkeley), J. Rodriguez (CEA Saclay)

UC Berkeley, Space Sciences Laboratory

Around 100 high-mass X-ray binaries (HMXBs) belonging to the Milky Way have been detected above 20 keV. This energy range is important because it holds clues to the accretion processes driving the emission, and sometimes the identity of the compact object itself. While many of these HMXBs were discovered in the hard X-rays, clarifying their nature required subsequent observations with telescopes operating at lower energies. First, we summarize recent results of our long-term follow-up campaign to help clarify the nature of HMXBs. Specifically, we present highlights from Suzaku observations of XTE J1739-302 and IGR J16207-5129, as well as HMXBs observed with Chandra, Swift, XMM-Newton, and optical/IR telescopes. Thanks to the expanding ranks of HMXBs in our Galaxy, we are able to perform more reliable statistical analyses on the three currently-known types of HMXB: those with supergiant companions (SGXBs); those with Be companions (BEXBs); and the enigmatic Supergiant Fast X- ray Transients (SFXTs). We present new diagnostic tools, akin to the "Corbet diagram," in which HMXBs tend to segregate based on their dominant accretion mechanism. We show how these diagrams can help constrain models of accreting pulsars, and how they illustrate the way in which SFXTs span across the divided populations of BEXBs and SGXBs, bolstering the intriguing possibility that some SFXTs represent an evolutionary link. Using the latest Galactic spiral arm model, we revisit the use of HMXBs as tracers of recent massive star formation, in particular for sources in the direction of the inner spiral arms. We present the first ever spatial correlation function for HMXBs and OB-forming complexes. Our results indicate that at distances less than a few kpc from a given HMXB, it is more likely to have neighbors that are known massive-star forming regions as opposed to objects drawn from random distributions. We investigate the implications that this has for kick velocities that can be achieved during the birth of these systems.

[O-28]

Magnetars, X-ray Pulsars, and Related Objects

K. Makishima, M. Sasano, K. Nakajima, T. Nakano, H. Nishioka, T. Yuasa, K. S. Yamada, Nakazawa, J. S. Hiraga (U-Tokyo), T. Enoto (Stanford), Y. E. Nakagawa, T. Mihara (RIKEN), A. Bamba, T. Sato (Tokyo Metro-U/ISAS), Y. Terada, T. Kohzu, and T. Yasuda (Saitama-U)

University of Tokyo

Recent X-ray observations, including in particular those with Suzaku covering a wide energy band, have much reinforced the high-magnetic-field interpretation of magnetars. These include the discovery of clear evolution of their wide-band spectra (Enoto et al. 2010), and detection of a hard-tail component from their weaker short bursts (Nakagawa et al., in prep.). Nevertheless, the origin of magnetars remains a big mystery. To address the issue, we extend our Key Project for Suzaku AO4, and attempt to conduct comprehensive studies from the following four approaches. (1) To measure magnetic fields of MAXI-detected transient X-ray pulsars (e.g., GX 304-1 by Mihara in this WS), and investigate their magnetic field distribution in the >5e12 G range. (2) To study SuperGiant Fast X-ray Transients (SFXTs), under a hypothesis that they are somewhat aged binary magnetars. We have already obtained new results by analyzing archival Suzaku data. (3) To search SNRs and other environments for new magnetar candidates (e.g., CXOU J171405.7 by Sato et al. 2010). (4) To investigate SNRs associated with magnetars, trying to find their distinct characteristics that can be associated with the birth of mangetars.

[O-29]

Transient Observations with LSST

Lucianne Walkowicz

UC Berkeley Astronomy Dept

In the coming decade, LSST's combination of all-sky coverage, consistent long-term monitoring, and flexible criteria for event identification will revolutionize studies of a wide variety of astrophysical phenomena. The umbrella of time domain science with LSST encompasses objects both familiar and exotic, from classical variables within our Galaxy to explosive cosmological events. LSST will make localization for gravity wave events possible, identify counterparts to GRBs and X-ray flashes, and discover new supernovae. Increased sample sizes of known-but-rare observational phenomena will quantify their distributions for the first time, thus challenging existing theory. Perhaps most excitingly, LSST will provide the opportunity to sample previously untouched regions of parameter space, where transient events are expected on theoretical grounds, but have not yet been observed. LSST will generate 'alerts' within 60 seconds of detecting a new transient, permitting the community t o follow up unusual events in greater detail. Here, I highlight some of the scientific opportunities LSST will provide, as well as the challenges we face and opportunities for community involvement.

[O-30]

ASTROSAT-LAXPC

Biswajit Paul (Raman Research Institute, Bangalore) and the LAXPC Team

Raman Research Institute

ASTROSAT is an astronomy satellite designed for simultaneous multi-wavelength studies in the optical/UV and a broad X-ray energy range. The Large Area Xenon Proportional Counters (LAXPC) of ASTROSAT will enable high time resolution X-ray measurements in the 2-80 keV band with moderate energy resolution. We will give a brief summary of the payloads and present status of ASTROSAT and discuss some of the main science topics that will be addressed with the LAXPC with particular emphasis on X-ray binaries.

[O-31]

Gamma-ray bursts and short X-ray transients observed by MAXI : A summary of the first year

M. Serino, and MAXI team

RIKEN

MAXI observed 14 gamma-ray bursts (GRBs) and short X-ray transients in the first year. Among these 5 events were confirmed by simultaneous detections by other satellites. This number is slightly higher than that expected before the launch. It may be due to MAXI's unique capability to observe low-energy portion of GRBs below 10 keV. In fact, about a half of the observed events have soft spectra, which may be classified into X-ray flashes or X-ray rich GRBs. Another remarkable feature of MAXI is that it can cover about 85% of the whole sky every 92 minutes. This feature enables us to survey not only X-ray afterglows but also pre-burst emissions of the well-localized bursts observed by other satellites. We present the results of analyses of gamma-ray bursts and short X-ray transients from the first year observations of MAXI.

[O-32]

Exploring the Variable Sky with the Catalina Real-Time Transient Survey

S. G. Djorgovski, A. J. Drake, A. A. Mahabal, M. J. Graham, C. Donalek (Caltech), E. Beshore, S. Larson (LPL, Univ. of Arizona)

Caltech

Exploration of the time domain is now one of the most vibrant research frontiers in astronomy. Catalina Real-Time Transient Survey (CRTS) covers approx. 3/4 of the entire sky repeatedly, with time baselines ranging from minutes to years. To date, over 2000 unique optical transients have been discovered, including supernovae, blazars, CVs, other types of variable stars and AGN, etc. Many of them are followed up by multi-wavelength observations. In a systematic exploration of the observable parameter space like this, there is a possibility of discovering previously unknown types of objects and phenomena.

[O-33]

Subaru Wide-Field Variability Survey

T. Morokuma

University of Tokyo

We present our survey for optically variable objects such as active galactic nuclei (AGN) and distant supernovae (SNe) with a wide-field optical imager, Suprime-Cam, on the prime focus of the 8.2-m Subaru telescope. By combining with 50-100 ksec exposure X-ray data obtained with XMM-Newton, we confirmed that optical variability is a useful tool for finding AGN and found that it plays a complementary and important role for studying low-luminosity AGN with X-ray observation. We found that a significant fraction of optical-variability-selected AGN are below the X-ray detection limit, which was also shown by studies with HST. The SN sample is used for cosmology and SN studies such as rates, its host galaxy properties, and its progenitors. We also introduce the next-generation wide-field imager, Hyper Suprime-Cam (HSC), installed on the Subaru telescope in 2011 fall, our survey plan and expected results with Subaru/HSC.

[O-34]

Palomar Transient Factory

S. Kulkarni, R. Quimby (Caltech)

Caltech

The Palomar Transient Factory (PTF) was designed to explicitly to chart the transient sky with a particular focus on events which lie in the nova-supernova gap.. With its innovative two-telescope architecture it achieves both high cadence and large areal rate of coverage. PTF was commissioned during the summer of 2009. PTF is now finding an extragalactic transient every 20 minutes and a Galactic (strong) variable every 10 minutes. Spectroscopy undertaken at Keck and Palomar has allowed us: identify an emerging class of ultra-luminous supernovae, discover luminous red novae, undertake UV spectroscopy of Ia supernovae, discover supernovae powered by something other than Nickel-56, clarification of sub-classes of core collapse and thermo-nuclear explosions, map the systematics of core collapse supernovae, a trove of eclipsing binaries and many others.

[O-35]

Extragalactic Survey with MAXI and the First MAXI/GSC Catalog

Y. Ueda, K. Hiroi, N. Isobe, M. Hayashida (Kyoto), M. Sugizaki (RIKEN), the MAXI team

Department of Astronomy, Kyoto University

We report the current status of the first MAXI source catalog from extragalactic sky at Galactic latitudes higher than 10 degrees. The GSC data in the 4-10 keV band integrated for the first 7-months are utilized, which are currently best-calibrated. We also report the results of cross identification of the MAXI sources with existing catalogs in various wavelengths, and discuss their properties. The MAXI survey is expected to achieve the best sensitivity for populations of moderately absorbed AGNs among any all sky X-ray missions, and is complementary to ROSAT all sky survey and hard X-ray (>10 keV) surveys by the Swift and INTEGRAL satellites. The details of the source detection technique and catalog content are presented in Hiroi et al. (this conference).

[O-36]

MAXI observation of Blazars

N. Isobe and the MAXI team

Department of Astronomy, Kyoto University

Longterm X-ray observations of blazars with MAXI are reported. One of the most important properties of blazars is their rapid intensity variation, which is a useful probe for the high energy phenomena related to their jets, including the particle acceleration. The unprecedentedly high sensitivity of MAXI as an all-sky X-ray monitor makes it the ideal observatory for studies of the longterm variation of blazars. Actually, MAXI has successfully detected several strong X-ray flares from the high-energy peaked BL Lac object Mrk 421 with the X-ray flux at highest level among those ever recorded from the object. The physical quantities associated with the flares were estimated, from the close examination on the MAXI lightcurve. These results clearly demonstrate the potential of MAXI for the variability of blazars.

[**O-37**]

Fermi results on AGN

Greg Madejski, on behalf of the Fermi Collaboration

SLAC / KIPAC

The Fermi gamma-ray observatory, launched just over two years ago - during the previous MAXI meeting - is performing flawlessly. The most prominent extragalactic point sources are highly variable and luminous jet-dominated active galaxies. Fermi LAT observations, coupled with well-sampled data in radio, mm, IR, optical, X-ray, and TeV gamma-ray bands allow us to probe the structure of relativistic jets, and put new constraints on the location of the region of energy dissipation into radiation. In this talk, I will summarize the gamma-ray properties of AGN measured by Fermi, and will highlight new results for several sources (such as 3C279, Mkn 421, 3C454.3, and AO 0235+164) inferred from multi-band observations.

[O-38]

Multifrequency Variability of Blazars

S. Wagner

LSW Heidelberg

Variability in Blazars allows important constraints on the size of emitting regions, Doppler-boost, the time-scale for particle acceleration, and loss-timescales. Since all of the above vary with energy, multifrequency studies are mandatory. Nonetheless individual events seem not to provide unique pictures. Recent advances in population studies will be discussed.

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[P-01]

Spectral Evolution of the Black Hole X-ray Binary XTE J1752-223 Observed with MAXI

Satoshi Nakahira, Kazutaka Yamaoka(AGU), Hitoshi Negoro(Nihon Univ), Yoshihiro Ueda(Kyoto Univ.) and the MAXI team

Aoyama Gakuin University

The MAXI/GSC observed the black hole candidate XTE J1752-223 in the 2009-2010 outburst from the onset to the end.From the GSC light curve, it spent about three months to enter the high/soft state (HSS) through two plateau phases in the rising part of the outburst. The source definitely lies in the extreme low/hard state (LHS) during the first plateau period, and in the intermediate state just after the second plateau period, which was confirmed by RXTE, but spectral properties during the second plateau period (from the beginning of the December 2009 to mid-January 2010) were not well investigated due to the solar avoidance limitation of many X-ray satellites.Only the MAXI/GSC and Swift/BAT could this interesting phase, so we performed a broadband spectral analysis of the entire outburst using a combination of MAXI-GSC and Swift-BAT survey data. In this paper, we will report on the entire outburst behavior, and will discuss the difference between the first and second plateau phase from both observational and theoretical points of view.

[P-02]

Suzaku Observation of the transient black hole binary XTE J1752−223

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Department of Physics, Saitama University

The black hole candidate XTE J1752−223 was discovered on October 23, 2009 with RXTE/PCA and was observed by several other satellites in X-ray band, including MAXI. MAXI succeeded in covering whole picture of the outburst from low/hard state to high/soft state, and to low/hard state again. (Nakahira et al. 2010). Triggered by MAXI team, Suzaku carried out a ToO observation XTE J1752−223 with the wide X-ray band instruments on February 24, 2010. As Reis et al. (2010) reported, the source flux exceeded 400 mCrab and the spectrum was described with MCD, power-law model and broadened iron line. In general, we have to carefully estimate the effect of event pileup at the CCD image peak of such a bright source to avoid that effect. We independently estimated the pileup affected region in particular, and found that the region within 2 arcmin from the image peak is likely to be affected by pileup at least. In this paper we show the result of pileup estimation and the effect for the X-ray spectrum with the larger discarding area, and also the accretion disk parameter based on the obtained spectra.

[P-03]

RXTE follow-up observations of the new black hole candidate MAXI J1659-152

Kazutaka Yamaoka, Satoshi Nakahira, Atsumasa Yoshida (Aoyama Gakuin U.), Hitoshi Negoro (Nihon Univ.), Yoshihiro Ueda (Kyoto Univ.), Philip Kaaret (Univ. of Iowa), and the MAXI team

Aoyama Gakuin University

The MAXI is a high sensitive X-ray all-sky monitor with a detection sensitivity of 15 mCrab in a day and 6 mCrab in a week. To unveil characteristics and populations of faint X-ray sources with this flux range, we have an approved RXTE ToO program of new MAXI sources with the 5-50 mCrab flux. This observation can be triggered up to five sources, and the net exposure is 30 ksec for each. The first trigger to this program was newly discovered black hole candidate MAXI J1659-152, and an RXTE pointing observation started soon after the discovery. In this poster presentation, details of our ToO program and observations of MAXI J1659-152 are presented.

[P-04]

Multi-band optical monitoring of GRB100925A/MAXI J1659-152

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National Astronomical Observatory of Japan

We present photometric data of GRB100925A/MAXI J1659-152 obtained over several weeks after the trigger event. The multi-band observations were performed with the MITSuME 50cm telescope at Akeno Observatroy and Okayama Astrophysical Observatory, the Murikabushi 1m telescope at Ishigakijima Astronomical Observatory and the 188cm telescope at Kottamia Astronomical Observatory in Egypt. The light curves of this black-hole candidate shows that the increase in brightness is about 0.4 magnitude in 2 days after the first observation. Short term variations up to 0.2 mag in one hour were continuously observed.

[P-05]

Kanata optical photometric and polarimetric observations of MAXI J1659-152

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MAXI J1659-152 (R.A., Dec = 16h59m10s, -15d16m05s) (J2000) was first detected as GRB 100925A by Swift/BAT. Then, this source turned out to be a Galactic X-ray transient because an X-ray pre-activity before the Swift/BAT trigger had been reported. We observed the optical counterpart of this X-ray transient with the 1.5m Kanata telescope located in Higashi-Hiroshima Observatory. We performed photometric observations using the V, Rc, Ic band filters. We began observations at 2010-09-28 10:00 UT (MJD 55467.418). The magnitudes of this source were V=16.6+/-0.2 (calibrated against The Tycho-2 Catalogue), Rc=16.0+/-0.1, and Ic=15.8+/-0.1 (calibrated against The USNO-B1.0 Catalog) at the first night. We found that the R- and I-band fluxes then decreased gradually. The source faded to R=16.8+/-0.2 and I=16.4+/-0.1 at 2010-10-06 10:16 UT. We report those photometric results and, in addition, the result of polarimetric observation in our poster.

[P-06]

Optical aspect of variability of X-ray transient MAXI J1659-152

T. Ohshima, T. Kato, H. Maehara (Kyoto University), S. Kiyota (VSOLJ)

Department of Astronomy, Kyoto University

The X-ray transient MAXI J1659-152 was detecteded by MAXI/GSC and Swift on September, 2010. The optical counterpart also brightened at this time. We took optical observations of this object using CCD camera. In this poster, we will discuss that the relation between X-ray variation and optical variation and the short-time vatiations during the brightening.

[P-07]

X-ray and Near-Infrared Observations of the Black Hole Candidate GX 339-4

M.Shidatsu, Y.Ueda, F.Tazaki, T.Yoshikawa (Kyoto University), T.Nagayama (Nagoya University), T.Nagata (Kyoto University), N.Oi (Graduate University for Advanced Studies), K.Yamaoka (Aoyama Gakuin University), H.Takahashi (Hiroshima University), A.Kubota (Shibaura Institute of Technology), J.Cottam (NASA), R.Remillard (Massachusetts Institute of Technology), H.Negoro (Nihon University), and the MAXI team

Department of Astronomy, Kyoto University

We present our latest X-ray and near-infrared results of the Galactic black hole candidate GX 339-4 observed with Suzaku and IRSF (Infra-Red Survey Facility) in 2009 March during the low/hard state. The X-ray spectral analysis indicates that the accretion disk is truncated, and that its inner part is almost fully covered by hot corona with an electron temperature of approximately 170 keV. The Comptonized corona has an inhomogeneous structure with at least two optical depths, tau = 0.91 and 0.25. The one-day averaged near-infrared light curves are found to be correlated with hard X-ray flux. The radio to near infrared spectral energy distribution suggests that the optically thin synchrotron radiation from the compact jets dominates the near-infrared flux. We estimate that the magnetic field and size of the jet base are $\sim 10^4$ G and $\sim 10^9$ cm, respectively, and that the synchrotron self Compton component contributes less than 10% of the total X-ray flux.
Finally, we also report results from the long term monitoring of GX 339-4 with MAXI and discuss the spectral evolution.

[P-08]

Revealing the spectral/temporal evolution of Cyg X-1 under Suzaku & MAXI collaboration

S.Torii, K.Makishima, S.Yamada, K.Nakazawa

The University of Tokyo

Over the past 3 decades, the Low/Hard state of black hole binaries has remained rather poorly understood. This limitation is now being overcome by the wide-band capability of Suzaku. In fact, a Suzaku observation of Cyg X-1 in the Low/Hard state led to a view that an optically-thick disk partially intrudes into a hot corona, the disk is truncated at 10 gravitational radii, and the corona is highly inhomogeneous (Makishima+08).
From 2005 to 2009, Cyg X-1 was observed 25 times with Suzaku. The source meanwhile stayed mostly in the Low/Hard state, but approached the Soft state on June 2009. We applied a unified spectral and timing analysis to all these data sets. The results suggest that, as the 2–10 keV luminosity increases, (1) the corona shrinks, (2) the inner radius of the optically-thick disk decreases, and (3) the disk intrudes deeper into the corona.
These results will be much enhanced through a collaboration between MAXI and Suzaku. For example, we may select a transition phase from the Low/Hard state to the High/Soft state, and examine how the Comptonized hard continuum in the former state turns into the enigmatic steeper hard-tail emission which is seen in the latter state.

[P-09]

Stability of MRI Turbulent Accretion Disks

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Center for Computational Astrophysics, National Astronomical Observatory of Japan

We study the stability of geometrically thin accretion disks with non-standard α parameter, which characterizes the efficiency of the angular momentum transport. Following recent results of numerical simulations of the Magnetorotational instability (MRI) driven turbulence, we assume that α increases with the magnetic Prandtl number. By adopting Spitzer's microscopic diffusivities, we obtain local structures of geometrically thin accretion disks consistently including effects of MRI-driven turbulence. Since the magnetic Prandtl number increases with the temperature, the efficiency of the angular momentum transport and thus viscous heating rate are smaller for a larger radius when $\delta > 0$. We find that such disks can be unstable to gravitational, thermal, and secular instabilities. It is most remarkable feature that the thermal and secular instabilities can grow in the middle part of accretion disks even when the radiation pressure is negligible, while the standard Shakura & Sunyaev's accretion disk (constant α) is stable to these instabilities. We conclude that it would be difficult to maintain the steady mass accretion state unless the Pm-dependence of the MRI-driven turbulence is weak. Consideration of Pm dependence of α due to the MRI-driven turbulence may make the phase transition of accretion disks less mysterious.

[P-10]

The observation result of Galactic X-ray sources by MAXI

M. Ishikawa(Sokendai), K. Kawasaki, S. Ueno, H. Tomida, M. Kohama, (JAXA), T. Mihara, Y.E. Nakagawa, M. Sugizaki, M. Serino, T. Yamamoto, T. Sootome, M. Matsuoka (RIKEN), N. Kawai, M. Morii, K. Sugimori, R. Usui (Tokyo Tech), A. Yoshida, K. Yamaoka, S. Nakahira (AGU), H. Tsunemi, M. Kimura (Osaka U.), H. Negoro, M. Nakajima H. Ozawa, F. Suwa (Nihon U.), Y. Ueda, N. Isobe, S. Eguchi, K. Hiroi (Kyoto U.), A. Daikyuji (Miyazaki U.), A. Uzawa, T. Matsumura, K. Yamazaki (Chuo U.) report on behalf of the MAXI team:

Sokendai

Introduce the result of analysis for some known X-ray sources from the observation results by MAXI.

[P-11]

The outbursts era of the microQSO H1743-322

Capitanio, F., Ubertini, P., Bazzano, A., Del Santo M.

IASF-Roma INAF

On March 2003 after about 25 years, H 1743322 was observed again in outburst by the INTEGRAL satellite. After this bright outburst the source entered in a new phase showing several more outbursts within a few years. These outbursts had an unusual regularity insomuch as it is even possible to extrapolate two different recurrence periods. This peculiar behaviour has been observed before only in the BH 4U1630-47 until 1998. Moreover some of these outbursts did not follow the state transition sequence expected for a BH X-ray binary. We review here the high energy spectral and temporal evolution ofH1743-322 as seen by INTEGRAL, Swift and RXTE with special attention to differences and similarities between the outbursts and the nature of the their recurrence. Moreover we present some results of a NIR campaign performed during the 2009 outbursts.

[P-12]

X-ray spectral variability in the ultraluminous X-ray source Holmberg IX X-1

K. Vierdayanti (Kyoto University, present affiliation:**Institut Teknologi Bandung), C. Done, T. P. Roberts (University of Durham), S. Mineshige (Kyoto University)**

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We present our recent study on ultraluminous X-ray source (ULXs), Holmberg IX X-1, published in the Monthly Notices. We use XMM-Newton and Swift data to study a spectral variability in ULX Holmberg IX X-1. The source luminosity varies by a factor of 3-4, giving rise to corresponding spectral changes which are significant, but subtle, and not well tracked by a simple hardness ratio. Instead, we co-add the Swift data in intensity bins and do full spectral fitting with disc plus thermal Comptonization models. All the data are well fitted by a low temperature, optically thick Comptonizing corona, and the variability can be roughly characterized by decreasing temperature and increasing optical depth as the source becomes brighter, as expected if the corona is becoming progressively mass loaded by material blown off the super-Eddington inner disc. This variability behaviour is seen in other ULX which has similar spectra, but is opposite to the trend seen in the ULX with much softe r spectra. This supports the idea that there are two distinct physical regimes in ULXs, where the spectra go from being dominated by a disc-corona to being dominated by a wind.

[P-13]

Discovery of Cyclotron line from GX 304-1 during the Brightest Outburst in August 2010, observed by MAXI/GSC, Suzaku, and RXTE.

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Nihon University/ RIKEN

GX 304-1 is a classical Be/X-ray binary pulsar with a 272-second period, discovered by high energy X-ray balloon observations in 1967. Transient outburst activities by 132-day interval had been frequently observed during 1970s. Since 1980s, the source had been in a quiescent state and no significant X-ray flux had been detected for 28 years until the outburst detection by INTEGRAL in June, 2008(ATel #1613). It suggested that the source might return to the active phase by 2008.
MAXI/GSC has detected outbursts from GX 304-1 three times every 132-day interval during the first one-year operation since August 2009. The third outburst in August 2010 reached a flux of 700 mCrab in a 4-10 keV band, which is the brightest among the outbursts ever observed from this source. We conducted the follow-up observation by Suzaku and RXTE, then discovered the cyclotron line at around 51 keV as reported in ATel #2796. We present the change of the spectral shape and the pulsation period during the outburst obtained from the MAXI/GSC, Suzaku and RXTE data, then discuss about the physical condition of magnetic field on the neutron star.

[P-14]

Supergiant Fast X-ray Transients with Swift: catching outbursts and monitoring programs

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Swift is shedding new light on the phenomenon of Supergiant Fast X-ray Transients (SFXTs), a recently discovered class of High-Mass X-ray Binaries, whose optical counterparts are O or B supergiants, and whose X-ray outbursts are about 10,000 times brighter than their quiescent state. Thanks to its unique automatic fast-slewing and broad-band energy coverage, Swift is the only observatory which can detect outbursts from SFXTs from the very beginning and observe their evolution panchromatically. Taking advantage of Swift's scheduling flexibility, we have been able to regularly monitor a small sample of SFXTs with 2-3 observations per week (1-2 ks) for two years with the X-Ray Telescope (XRT). Our campaigns cover all phases of their lives, across 4 orders of magnitude in flux. We report on our findings on the long-term properties of SFXTs, their duty cycle, and the most recent outbursts caught by Swift which we followed in the X-ray for several days. Futhermore, we discuss the possibile contribution of MAXI to this field in light of our findings.

[P-15]

Studies s of SFXTs with MAXI and Suzaku

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University of Tokyo

A SFXT (Super-giant Fast X-ray Transient)is a subclass of High Mass X-ray Binaries,composed of a supergiant and a highly magnetized neutron star.Although SFXTs are usually X-ray dim ($L \sim 10^{32}$ erg/s),they sometimes show fast and violent X-ray flares with 2-3 orders of magnitude flux increases.
Trying to understand the flaring mechanism of SFXTs,we analyzed archival Suzaku data of one such object, IGR J16195-4945.An intense flare with a duration of some 10 ks was detected with the XIS and the HXD.During the flare, the absorbing column did not increase,and the fluorescent Fe-K line became weaker or broader.These results argues against a popular scenario which invokes clumpy stellar winds to explain the SFXT flares.Instead, the data prefer an alternative scenario which assumes "magnetic gating".
The properties of SFXTs make them an ideal target of MAXI.Actually, MAXI has detected some of them,including the 5560-sec pulsator 4U 2206+543.Since this object was observed with Suzaku in 2007,we will present analysis of the Suzaku data.
Finally, ASTRO-H will provide a powerful diagnostics of Fe-K lines during flares.We may detect Doppler shifts due to a sudden infall of matter from the Alfvenic surface.

[P-16]

Magnetized Vela X-1

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Institut fur Astronomie und Astrophysik

We present the results of recent observations of a well known HMXB Vela X-1 with Suzaku and review other observed characteristics of a system with aim to estimate the magnetic field of the neutron star. We conclude, that the observed long pulse period of 283.5 s and its evolution, the "off-states", the observed quasi-periodic oscillations and the noise power spectrum of the X-ray emission may be consistently explained if the neutron star has a magnetic field greater than 10^{13} G.

[P-17]

Intenisty and energy dependent profiles of transient HMXB pulsars GRO J1008-57, 1A 1118-61 and GX 304-1

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Raman Research Institute

We will present complex pulse profile evolution during the outbursts of a set of transient HMXB pulsars. All these sources also show very strong energy dependence of complex pulse profiles. The pulse profiles appear to be double peaked upto 10 keV and have a single peak at higher energy. We find that the energy spectra can be well fitted with a partial covering power-law model with high energy cutoff and an iron fluorescence line emission. The pulse phase resolved spectral analysis shows that the partial covering with high energy cutoff model parameters have significant changes with the pulse phase. We will show that this spectral model naturally explains the complex energy dependence of the pulse profiles.

[P-18]

Outburst of LS V +44 17 detected by MAXI, RXTE, Swift

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Tokyo Institute of Technology

On 2010 March 31, MAXI discovered an outburst from LS V +44 17 which is one of the Be/X-ray Binaries (BeXBs). BeXBs consist of a neutron star orbiting around an early-type Be star. This BeXB, LS V +44 17 had not showed any outbursts since 1997 when the source identified as BeXB. After the MAXI discovery, RXTE and Swift observed the source both in three times. Pulse profiles of the outburst obtained by RXTE showed the dip-like structures at soft X-ray bands(2-10 keV) when the outburst was nearly most bright. This kind of structures are discovered at GX 1+4, A0535+262 and RX J0812.4-3114. Those origin is interpreted as a partial 'eclipse' of a shaded emission region by an accretion column of the neutron star. But, it is unsure that the explanation can be applied to LS V +44 17. In my talk, I will present results of phase resolved spectroscopy to explain the dip-like structures of the pulse profiles of LS V +44 17 and show spectra variation during the outburst which obtained by MAXI.

[P-19]

Optical spectroscopic follow-up of the V0332+53 outburst

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ASIAA

We report the optical spectroscopic follow-ups of the outburst of Be/X-ray pulsar V0332+53. The outbursts from V0332+53 were reported by Swift/BAT (Krimm et al 2009) and MAXI/GSC (Nakahira et al 2010). Our spectroscopic observations were started at Jan. 28, 2010 using the Hiyoyu/Lulin (Taiwan), BOES/BOAO (Korea) and KOOLS/OAO (Japan). Totally four epochs observations were made. The observation using the KOOLS at OAO was simultaneous observation with the Suzaku ToO. The equivalent width of the observed H-alpha line is significantly larger than those of typical quiescent phase, and similar to the previous burst phases except of the outburst in 2008. Combination with MAXI light curve, we discuss the X-ray pulsar/Be star binary system.

[P-20]

Analysis a new activity of the Be X-ray pulsar A0535+26

M. Nakajima (Nihon Univ.) on be half of the MAXI team

Nihon University

We report on the analysis resutls of the current X-ray activities of Be X-ray transient pulsar A0535+26 observed with MAXI/GSC. From 2009, the source again re-entered an active phase showing the periodic X-ray outbursts. In the current activities, the precursor events have been observed before the normal/giant outbursts. The present precursor and outburst period is to be 115-days instead of the 110-day oribital period. This difference would be related to the structure of the circumstellar disk of the companion Be star.

[P-21]

Optical Spectroscopic observations of the Be/X-Ray binary A0535+262/V725 Tau during the giant outburst in 2009

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1) Kytoto Univ. 2) Hokkai-gakuen Univ. 3) OAO/NAOJ 4) GAO

Kyoto University

Optical high dispersion spectroscopic observations of the Be/X-ray binary A0535+262/V725 Tau during the giant outburst will be reported. The giant outburst occurred in A0535+262 in November 2009 for the first time since 2005. We carried out the spectroscopic monitoring from November 2009. In the brightening phase of the giant outburst, the observation performed densely (almost at every night). Obtained H-alpha, H-beta and He I emission line, exhibiting dramatical profile variability during the giant outburst, has highly redshifted (100km/s) bright component, which had weakened before the normal outburst in March 2010. We discuss profile variability of these emission lines.

[P-22]

Wide band observation of the neutron star X-ray binary GS1826-238 with Suzaku

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Aoyama Gakuin University

We report on simutaneous X-ray (Suzaku) and radio (ATCA) observations of the low mass X-ray binary GS 1826-238 which has resemble spectrum like black hole binaries. Suzaku observed this source on 21-23 Oct. 2009 for a net exposure of about 100 ksec, while the ATCA radio telescope observed it with 5 and 9 GHz on 22 Oct. for 12 hours. Unfortunately, we did not detect radio counter parts with 3 sigma upper limits of 0.09 mJy and 0.12 mJy in 5 and 9 GHz respectively. Suzaku has succesfully obtained a broadband X-ray energy spectrum in the 0.5-120 keV range with a good statstics. The averaged spectrum can be well explained by a blackbody plus a power law with an exponential cutoff of 51 keV. Comparison with the low/hard state of black hole binaries will be discussed.

[P-23]

Pulse-to-pulse variability of accreting pulsars: two regimes of accretion

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The accretion flow in the vicinity of the accretor is generally expected to be highly non-stationary. Although from the theoretical point of view the problem of non-stationary accretion has been addressed by many authors, observational study of this phenomenon is often problematic as it requires very high statistics of X-ray data and a specific analysis technique. In our research we used high-resolution data taken with the modern X-ray stellites, such as RXTE and INTEGRAL, on several brightest transient and persistent pulsars, to perform an in-depth study of their variability on time scales comparable to the pulsation period - "pulse-to-pulse variability". Our approach allowed us for the first time to study the dependence of the pulsar's spectrum on the ampliude of individual pulses. Our results show that the pulsars exhibit two different regimes of accretion distinguished by the different pulse-amplitude dependencies of their spectra which we interpret in terms of different accretion flow structure close to the neutron star surface.

[P-24]

LMXBs in their hard state: studies with Suzaku, MAXI, and ASTRO-H

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University of Tokyo

Low-Mass X-ray binaries (LMXBs) are known to have soft and hard states, like Black Hole Binaries (BHBs). Since LMXBs are similar to BHBs in many respects, comparison between them will help us to understand their accretion mechanisms.
With this in mind, we analyzed archival Suzaku data of the recurrent transient LMXB Aql X-1. The data were obtained on 7 occasions during an outburst, covering both the hard and soft states. The soft-state data gave consistent results with previous studies (Mitsuda+1984, Makishima+1986). In the hard state, the source was detected up to 100 keV with the HXD, and the accretion geometry became much clearer than before.
Currently, more than 20 LMXBs are being detected with MAXI, and some of them (e.g., 4U 1646-53 and Cyg X-2) clearly exhibit semi-periodic (a few months) state transitions. By monitoring their MAXI light curves, we can select their low-state periods, and perform scheduled Suzaku observations.
To better qualify the high-energy cutoff in the hard state of LMXBs, and to search for any hidden non-thermal signals, a significant jump will be provided by the ASTRO-H SGD.

[P-25]

Transient Low Mass X-ray binaries seen by INTEGRAL: already known sources and new IGRs

A. Tarana, A. Bazzano, P. Ubertini, F. Capitanio (INAF/IASF-Roma) and on behalf of the IBIS survey team

INAF/IASF-Roma

We report on the study of the high energy emission of transient Neutron Stars in Low Mass X-ray Binary systems, with different characteristics, performed with INTEGRAL. The X and Gamma behaviour of the sources has been monitored through light curves in different energy bands to look for the temporal variability, then the hardness-intensity diagrams have been constructed, and finally we performed a fine spectral extraction to discuss the physical parameters dominating the spectral variations. We also study a sample of the new transient sources discovered by IBIS (IGRs) during the INTEGRAL monitoring over the last six years. Performing a timing and spectral study with a multi-wavelength approach whenever possible, we try to understand their nature.

[P-26]

Orbital evolution of the Low Mass X-ray Binaries 4U 1822-37, XTE J1710-281 and MXB 1658-298

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Raman Research Institute

The orbits of X-ray binaries evolve due to redistribution of the angular momentum due to different types of interactions between the components of the binary system and/or mass loss through wind. Accurate measurement of the rate of change of the orbital period is therefore, necessary in order to understand the evolution of compact binary systems. Using the eclipse timing technique, we have derived/updated the estimates of orbital periods and period derivatives in three eclipsing low mass X-ray binaries, 4U 1822-37, XTE J1710-281 and MXB 1658-298. In view of our results, we discuss several physical mechanisms that could be responsible for the observed orbital evolution in these LMXBs.

[P-27]

Ginga Observation of a Recurrent Soft X-Ray Transient Source 1RXS J170930.2-263927

S. Yamauchi (Nara Women's University)

Nara Women's University

A transient X-ray source was detected in scanning observations in the Galactic bulge region in 1990 March (source D in Yamauchi and Koyama 1990, PASJ, 42, L83). Using scan data obtained with Ginga in 1990 March and 1990 April and the revised satellite attitude data, the source position was re-determined. The revised sky position is in agreement with that of a recurrent soft X-ray transient source 1RXS J170930.2-263927=XTE J1709-267. The spectrum is similar to those obtained with RXTE and Beppo SAX, while the flux in 1990 March is estimated to be about 100 mCrab. The Ginga results indicate that 1RXS J170930.2-263927 was in outburst in 1990 March-April before the detection in the ROSAT all-sky survey in 1990 August.

[P-28]

MAXI observation of Crab pulsar during the gamma-ray flare in September 2010

Mikio Morii, Nobuyuki Kawai, Ryuichi Usui, Kosuke Sugimori (Tokyo Tech), Mutsumi Sugizaki, Tatehiro Mihara, Takayuki Yamamoto, Masaru Matsuoka (RIKEN), and the MAXI team

Tokyo Institute of Technology

Crab is the standard candle of high energy X-ray and gamma-ray astronomy. The X-ray and gamma-ray fluxes and spectra have been believed to be stable for a long time scale of years. Surprisingly, on 2010 Sep. 19, AGILE and FERMI detected the GeV flare, in which the GeV flux enhanced about factor two (ATEL #2855, #2861). On the other hand, the X-ray flux change was not reported by RXTE-ASM, Swift-BAT and INTEGRAL-ISGRI (ATEL #2858, #2856). Therefore, the cause of the GeV flare is thought to be the activity at the nebula. MAXI observed the X-ray pulsation during the GeV flare, then MAXI can check the changes of the pulse fraction and the profile during these days and such the hypothesis. We will report this analysis.

[P-29]

The First MAXI/GSC View of Galactic Magnetars

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Institute of Physical and Chemical Research (RIKEN)

Magnetars are strongly magnetized neutron stars with surface magnetic fields of $\sim 10^{14}$ G. Based on observational and theoretical studies, 5 soft gamma repeaters and 9 anomalous X-ray pulsars are generally known as the galactic magnetars. Their quiescent emission consists of a thermal component (<10 keV), and a hard power law component with a very hard index of 1 (> 10 keV; e.g., Enoto et al. 2010). Some of them presented a flux increasing by a factor of 2-3 accompanied by high burst activities and/or enhanced emission with unusual spectral properties (e.g., Kaneko et al. 2010). Their continuous monitoring is crucial, since comparisons of properties between low and high flux phases give useful information in order to reveal radiation mechanisms. Thanks to a wide field of view and a better sensitivity than RXTE by a factor of a few in a 2-30 keV range of the MAXI/GSC, it is suitable for this purpose. We analyzed the galactic magnetars, and detected at least AXP 4U 0142+614 (∼3 mCrab; >10 sigma) and AXP 1E 1547-5408 (∼1.5 mCrab; >14 sigma) using 1 and 4 week data, respectively. In this talk, we will report the first MAXI/GSC view of the galactic magnetars on long-term variability.

[P-30]

Attempts toward Understanding the Formation of Magnetars

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University of Tokyo

Today, "Anomalous X-ray Pulsars" (AXPs) and "Soft Gamma Repeaters" (SGRs) are generally understood as magnetars, which are neutron stars with unusually high magnetic fields. Many active researches of magnetars are being performed by Suzaku, including the "AO4 Key project on Magnetars ". One of the most interesting topics of magnetars is their formation. Although neutron stars, including magnetars, are believed to be a result of supernovae (SNe), it is not yet clear what kind of SNe produce magnetars. In an attempt to obtain clues to this problem, we analyzed archival Suzaku data of the SNR, CTB109, which is associated with the magnetar1E 2254+586. So far, we have not found marked differences between CTB109 and other typical SNRs. As another attempt,we suggest that X-ray flashes, being detected with MAXI with a higher rate than expected, could be associated with the formation of magnetars (e.g., Metzger et al. 2008). Then, MAXI data may be utilized to obtain new information on the magnetar formation.

[P-31]

Discovery of MeV emission from a Magnetar, AXP 1E1547.0-5408, with Suzaku / Wide-band All-sky Monitor

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Saitama University

Magnetars are considered to be neutron stars with strong magnetic fields of 10^{13-14} Gauss. Although many high energy observations are performed on magnetars, the radiation process from them is still a mystery. Here, we report the first discovery of an MeV emission from a magnetar, named AXP 1E1547.0-5408, with the Wide-band All-sky Monitor (WAM) onboard Suzaku satellite, which has a huge effective area of 800 cm^2 in the soft gamma-ray band. In 2009 January 22, the object became active and the WAM detected about 250 bursts in a day and successfully detected the X-ray emissions reaching 1 MeV from one of these bursts. The X-ray spectra obtained with the WAM were well reproduced by the power law model with a photon index of 2.7 and a soft black body component. The data does not require the cut-off or break in the 200 keV to 1.1 MeV range. In this presentation, we will show the detail of this discovery and discuss the importance of future collaborations with WAM and MAXI.

[P-32]

Prior Emission Model for X-ray Plateau Phase of Gamma-Ray Burst Afterglows

R. Yamazaki

Aoyama Gakuin University

The two-component emission model to explain the plateau phase of the X-ray afterglows of gamma-ray bursts (GRBs) is proposed. One component, which is responsible for the plateau and subsequent normal decay phase of the X-ray afterglow, is the prior emission via outflow ejected from the central engine before the main burst. The other is the main outflow, which causes the prompt GRB emission and the initial steep decay phase of the X-ray afterglow. In this model, the transition from the plateau to the subsequent normal decay phase is an artifact of the choice of the zero of time. For events with distinct plateau phase, the central engine is active $10^3 - 10^4$ sec before the launch of the main outflow. According to this model, a prior emission in the X-ray and/or optical bands $10^3 - 10^4$ sec before the prompt GRB emission is possibly seen, which will be tested by MAXI.

[P-33]

Optical observations of the very early phase GRB afterglows with MITSuME

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Tokyo Institute of Technology

The observations of recently observed GRB afterglows are presented. Early phase afterglows of GRBs are believed to provide crucial information on the activities of their central engines and the environments nearby the progenitors. The robotic telescope system "MITSuME" was designed aiming to observe GRB afterglows at multi wavelength within a minute after prompt emissions. In these two years the MITSuME obtained multicolor light curves for 5 GRBs. In this study we show these light curves and possible interpretations for them.

[P-34]

A giant flare from a weak-lined T Tauri Star TWA-7 detected with MAXI/GSC

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Chuo University

A star is born in dense dust and gas. In order to observe the newly-born star themselves, high energy X-ray band (> 2 keV) is a unique window, with high transparency ability. With a high sensitivity in the hard X-ray band (10-20 mCrab/day at 2-10keV band), GSC (Gas Slit Cameras: gas proportional counter) mounted in MAXI (Monitor of All-sky X-ray Image) is strong tool for "no bias" research on star forming region and for search X-ray variabilities such as flares from Young Stellar Objects. In the course of the survey, we detected a giant flare from a weak-line T Tauri star TWA-7, which is a member of TW Hydrae Association, on 2010-09-07 UT18:00 -19:30 (Atel #2836). The detected maximum luminosity in 2-20 keV was 2×10^{33} erg /s, if we assume the distance is 55 pc. This is the brightest among the flares which have been reported in the literatures. In the presentation, we will report the detailed results and discuss the characteristics in the flare.

[P-35]

Search for the prompt X-ray emissions at the ignition of the Galactic classical novae

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Kyushu Univ.

We are searching for the prompt X-ray emissions from the Galactic classical novae (CNe). The CNe are explained as thermonuclear runaways on the surface of accreting white dwarfs. In anologous of the type I X-ray bursts, the CNe possibly emit the prompt X-ray at their ignition, but it had never been detected. The Monitor of All-sky X-ray Image (MAXI) scans all sky every 92 minutes, then it can make a movie of all sky. These data are stored as the archive, so we can search for phenomena back to the past. We try to detect the prompt X-ray emission by analyzing the archive data at the location of the discovered classical novae during the statically observing stage of the MAXI. We analyzed the datum every 1orbit at 1.5-4keV of Gas Slit Camera (GSC) of 9 of the 15 CNe discovered in our Galaxy. Nowadays, no deterministic source has detected yet. In the poster, we will also report about the additional CNe discovered before the workshop.

[P-36]

Suzaku observations of the massive twin star HD159176

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HD159176 is a close binary system which is composed with O7V+O7V type stars. The system is in the young open cluster NGC6383 with a distance of about 1.5 kpc. With almost the same masses, the two stars orbit circulary with a separation of two stellar radii with an orbital period of 3.367 days (Pachoulakis 1995, MNRAS, 280, 153). On this target, one report exists which treated the results of an XMM-Newton observation which was executed in 2004. To investigate the long-term variability, we observed the binary on Feb. 19th 2010 with Suzaku satellite. The Suzaku data showed spectral hardening above 2 keV and showed brighter flux by twice than that of XMM-Newton. We will discuss the origin of the spectral changes in the poster.

[P-37]

MAXI light curves of Active Galactic Nuclei

S. Ueno (JAXA), and MAXI Team

JAXA

Monitor of all-sky X-ray Image (MAXI) was designed to be capable of monitoring variability of a medium-sized sample of active galactic nuclei. We examine current reliability of the MAXI light curves. As of October 2010, the light curves of more than forty sky regions of AGN are available at the MAXI web page, http://maxi.riken.jp/. Except for obvious flux changes of bright AGN (for example, those of Mrk 421, the MAXI result of which is presented by Isobe et al.), individual features of variability in the MAXI light curves of AGN (such as Seyfert galaxies) need careful evaluations. We review effects of data screening and flux evaluation methods on the MAXI light curves.

[P-38]

Quick Follow-up Observation of the Largest X-ray Flare from the TeV blazar Mrk 421

K. Niinuma, M. Kino, K. Hada, K. Asada, S. Koyama, T. Oyama, N. Kawaguchi (NAOJ), H. Nagai (JAXA), N. Isobe (Kyoto Univ.), and T. Hara (GSI/AES)

National Astronomical Observatory of Japan

We carried out the VLBI follow–up observations of the largest X-ray flare from Mrk 421, which was detected in Feb 16, 2010 with MAXI (ATel #2444), using the Japanese VLBI Network (JVN) array. It is usually expected that the delayed increasing of the flux density in the radio band is seen after the high energy flare. In order to examine it, a quick VLBI follow–up observation is essential. Here we report that the VLBI follow–up observation for the largest flare at the first epoch was carried out Mar 7, 2010, which is 19 days from the detection of X-ray flare. The observations at the total of five epochs were done using JVN array at approximately 20-day intervals.

[P-39]

Quasi Periodic Oscillations (QPOs) in Blazars on Diverse Time Scales

A. C. Gupta (ARIES, India)

Aryabhatta Research Institute of Observational Sciences (ARIES)

Blazars, including BL Lacertae objects (BL Lacs) and flat spectrum radio quasars (FSRQs), are subclass of radio-loud active galactic nuclei (AGN) with relativistic jets aligned nearly with the line of sight. Blazar emission extends across the entire electromagnetic (EM) spectrum and they show detectable flux variations on diverse timescales ranging from a few minutes through days and months to decades through all EM bands. The presence of quasi-periodic oscillations (QPOs) is fairly common in both black hole and neutron star binaries in our and nearby galaxies. Recently we have reported claims of QPOs detection on diverse timescales ranging from a few tens of minutes to hours to days and even months by using X-ray and optical time series data of blazars in a series of papers by my group. How to detect QPOs in time series data? What causes QPOs? What are likely the explanation of QPO detection in blazars? I will discuss these in my talk.

[P-40]

The spectral variability of UV-optical continuum emission of Active Galactic Nuclei

T. Minezaki, Y. Sakata, Y. Yoshii, T. Morokuma, S. Koshida, H. Sameshima, T. Aoki (Univ. of Tokyo), and Y. Kobayashi (NAOJ)

Institute of Astronomy, Univ. of Tokyo

We examine whether the spectral shape of UV-optical continuum emission of AGNs changes during flux variation. The long-term optical monitoring observations of 11 nearby Seyfert galaxies and QSOs were carried out by the MAGNUM telescope. The multi-epoch flux data in any two different bands obtained on the same night showed a tight linear flux-to-flux relationship, and the non-variable component of the host galaxy plus narrow emission lines was located on the fainter extension of the best-fit linear regression. The UV spectral variation was examined based on the multi-epoch photometric data of 10 bright QSOs at z=1.0-2.4 observed by the SDSS Legacy Survey. The rest-frame UV flux data in two different bands showed a linear relationship, but in contrast to the optical, the host-galaxy color was systematically redder than the slope of the linear relationship. These results indicate that the spectral shape of continuum emission retains almost constant during flux variation in optical, but it becomes bluer as brighter in UV. Those spectral variability of UV-optical continuum emission can be interpreted by the standard accretion disk model changing the mass accretion rate with a constant black-hole mass, which strongly supports the standard accretion disk model for UV-optical continuum emission of AGNs.

[P-41]

Interpreting the Suzaku Spectra of MCG–6-30-15 without Invoking a High Black-Hole Spin

H.Noda, K.Makishima, S.Yamada, K.Nakazawa (The University of Tokyo)

Department of Astronomy, School of Science, The University of Tokyo

In order to assess the reality of the extreme Kerr black-hole interpretation of MCG–6-30-15 by Miniutti et al. (2007), we re-analyzed the Suzaku XIS and HXD data of this Seyfert galaxy obtained in January 2006. Through intensity-sorted spectroscopy, we discovered a very hard component that varies independently of the dominant power-law emission. This new component, dominant in the 10–30 keV range, can be modeled in several different ways; e.g., a thermal Comptonization emission with a large optical depth, or a partially-absorbed power-law with a photon index of 2. When this component is included in the fitting model, the time-averaged 2.5–55 keV spectrum of MCG–6-30-15 can be reproduced successfully by invoking a moderate reflection coming approximately from a flat plane. At the same time, the best-fit iron-line broadening reduces to a level where the emission region is located at > 8 Rg from the central black hole. Therefore, the super-massive black hole in MCG–6-30-15 is not required to be in the extreme Kerr condition.

[P-42]

Fermi LAT observation of exceptionally bright gamma-ray outbursts from 3C 454.3 in 2009 December and 2010 April

Y. T. Tanaka (ISAS/JAXA), L. Escande (CNRS), B. Lott (CNRS), C. D. Dermer (NRL), on behalf of Fermi/LAT collaboration

ISAS/JAXA

We report on Fermi/LAT observation of exceptionally bright gamma-ray outbursts from 3C 454.3 in December 2009 and April 2010. The 2009 December outburst from 3C 454.3 was extraordinary. Namely, its daily gamma-ray flux reached the highest flux of any blazar ever recorded, and 3C 454.3 became the brightest gamma-ray source in the sky for over 1 week. In April 2010, 3C 454.3 again emitted a bright outburst. Triggered by this outburst, Fermi performed a pointed-mode observation toward 3C 454.3 for 200 ksec. Although the gamma-ray fluxes changed by an order of magnitude during the two outbursts, its spectra which were represented by broken power-law did not show significant time evolution: The spectral indicies and break energy were nearly the same as those in quiescence. Furthermore, no clear loop patterns were seen in the gamma-ray spectral index versus the flux plane as would be expected in acceleration and cooling scenarios. In this presentation, we focus on the light curve and spectrum in gamma-ray band observed by Fermi/LAT, and discuss physical mechanism of gamma-ray emission and jet structure.

[P-43]

Intranight Variability of Blazar Mrk180

A. Aghaee, C. S. Stalin, P. Petitjean, N. Sohrabkhani and M. SabziSarvestani

Sistan and Baluchestan University; IPM

Blazars vary at all wavelengths over a variety of timescales. Various models have been proposed to explain blazar variability, however, the mechanism responsible for variability is not conclusively understood. One factor which can discriminate among the various variability models is that of colour (spectral index) variations of blazars. By this one may be able to better understand the mechanism of blazar variability. It is also, currently inconclusive if all blazars have similiar spectral variability nature. We have therefore carried out quasi-simultaneous multiband monitoring of one of the brightest GeV blazar , Mrk 180, on 23 Apr 2009. We will present the results of intranight variability.

[P-44]

Long-term spectral variation of 3C 66A with Fermi and Kanata

R. Itoh, Y. Fukazawa (Hiroshima-Univ.),
Kanata team and on behalf of the Fermi Large Area Telescope Collaboration

Hiroshima Univ.

3C 66A is an intermediate-frequency peaked BL Lac object detected in the gamma-ray energy band. We have studied the long-term GeV and optical variation of 3C 66A using the Fermi Large Area Telescope (LAT) and the Kanata Telescope. We observed two types of variations. In 2008, the gamma-ray flux, optical flux, optical color, and optical polarization degree show a clear correlation. On the other hand, in 2009-2010, the correlation becomes quite weak; only the optical flux gradually increased. These properties might be explained by two emission regions; one close to the source of Comptonized seed photons, and the other distant.

[P-45]

Blazar Variability in Flux, Color, and Polarization Observed with the "Kanata" Optical-Near-Infrared Telescope

M. Uemura, M. Sasada, R. Itoh, M. Yamanaka, K. S. Kawabata, T. Ohsugi, M. Yoshida (Hiroshima University), M. Kino, and S. Sato (Nagoya University)

Hiroshima University

We have performed photo-polarimetric observations of blazars using the Kanata 1.5-m telescope operated by Hiroshima University. We can obtain simultaneous optical and near-infrared (NIR) images using the instrument, TRISPEC, attached to Kanata. The main aim of our observation was follow-up observations of gamma-ray flares of blazars detected with Fermi. Besides multi-wavelength studies with Fermi, our optical–NIR monitoring data of 42 blazars give us a chance to study the blazar variability in flux, color, and polarization with a time-scale of days–months. Here, we summarize our findings through the observation. We confirmed a strong correlation between the flux and color: an object becomes bluer when it is brighter. This feature was observed about 90% of objects. On the other hand, the correlation between the flux and polarization is much weaker than the flux-color correlation. This is probably because there are multiple variation sources with different time-scales . A correlation between the flux and polarization could be disturbed because of the presence of another polarization component. We also comment possible collaborations between our optical–NIR observations of LBLs/FSRQs and X-ray observations of HBLs with MAXI.

[P-46]

Search for Active Galactic Nuclei using AKARI Mid-infrared All-Sky Survey

S. Oyabu(Nagoya), Y.Toba(Sokendai,ISAS/JAXA), D.Ishihara(Nagoya Univ), H.Matsuhara, T.Wada(ISAS/JAXA), Y.Oyama(ASIAA), M.Malkan(UCLA)

Departoment of Physics, Nagoya University

AKARI, the Japanese infrared satellite launched at February 2006, have a primary mirror of 70cm diameter cooled with the combination of liquid helium and mechanical coolers. It had unique capabilities of near-infrared spectroscopy in the wavelength between 2um and 5um, all-sky survey in the mid- and far-infrared as well as broadband filters consecutively covering the near-, mid- and far-infrared wavelengths. Using the point source catalog in the AKARI Mid-infrared All-Sky Survey, we are searching for Active Galactic Nuclei (AGNs), not only normal AGNs but also dusty AGNs, in the local Universe. AKARI provides remarkable improvement in sensitivity and spatial resolution upon the previous all-sky survey with IRAS. We are performing the follow-up observations of mid-infrared sources showing red-color in the near- and mid-infrared bands with the AKARI near-infrared spectroscopy and the ground-based optical spectroscopy. During the follow-up observations, we have started to detec t hidden AGNs located in galaxies that were previously unrecognized to contain an AGN at other wavelengths.

[P-47]

The First MAXI/GSC Catalog in the Extragalactic Sky

K.Hiroi, Y.Ueda, N.Isobe, M.Hayashida, (Kyoto), and the MAXI team

Kyoto University

We present the first catalog of hard X-ray (4-10 keV) sources at high Galactic latitude, $|b| > 10$ deg, from the first 7-months MAXI/GSC data (2009 September to 2010 March). We have developed a systematic analysis procedure to detect the faintest sources from the MAXI data, by utilizing maximum likelihood image fitting method, where the image response, background, and detailed observational condition are taken into account. The catalog includes more than 300 hard X-ray sources, and many of them are found to be extragalactic active galactic nuclei (AGNs).

[P-48]

The optical spectrum classifications of mid-infrared excess sources found by the AKARI All-SKy Survey

Y.Toba(Sokendai,ISAS/JAXA), S.Oyabu, D.Ishihara(Nagoya Univ), H.Matsuhara, T.Wada(ISAS/JAXA), Y.Ohyama(ASIAA), M.Malkan(UCLA)

Sokendai, ISAS/JAXA

We present optical spectrum classifications of mid-infrared excess sources found by the AKARI All-Sky Survey. AKARI is the first infrared astronomical satellite in Japan launched in 2006. AKARI's main purpose is mid-infrared (9 and 18 micron) All-Sky survey as well as far-infrared (65, 90, 140 and 160 micron) All-Sky Survey. The spatial resolutions and sensitivities are one-order better than those of Infrared Astronomical Satellite IRAS which performed previous All-Sky Survey. As a result, AKARI can detect much fainter objects in much higher pointing accuracy. We are searching for Active Galactic Nuclei (AGNs) using AKARI mid-infrared All-Sky Survey catalog. One of the advantages of the mid-infrared searches is that we can directly detect infrared radiation from the dust torus which surrounds the central engine. About 2000 AGN candidates are selected by comparing their 9um fluxes with Ks-band photometry of Two Micron All-Sky Survey. Then, we obtained 130 spectra from our optical spectroscopic observations at Kitt Peak National Observatory and Lick Observatory and the archived data in the Sloan Digital Sky Survey (SDSS). We have classified these spectra into several types (type I AGNs, type II AGNs, Star-Forming galaxies etc) by these optical emission line ratios.

[P-49]

Clustering of AGNs in All-Sky X-ray Surveys

T. Miyaji,(IA-UNAM-E, UCSD) M. Krumpe, A. L. Coil (UCSD), H. Aceves (IA-UNAM-E) N. Cappelluti

Instituto de Astronomia, Universidad Nacional Autonoma de Mexio

We present results from two recent projects on the correlation function analysis of AGNs from all-sky surveys to investigate the low-redhsift clustering properties of AGNs. We have used ROSAT All-Sky Survey sources identified with broad line AGNs with the Sloan Digital Sky Survey (SDSS). By investigating the cross-correlation function (CCF) between these AGNs and SDSS galaxies, we have overcome the statistical limitation caused by the small number of AGNs. This has allowed us to investigate the luminosity-dependence of AGN clustering, where luminous AGNs (with Log LX¿44) cluster more strongly, like red galaxies, than lower luminosity ones, which cluster like blue galaxies. With a novel method of applying Halo Occupation Distribution modeling to the CCF, we found, not only the mean mass of $\sim 10^{13}$ Msol of DMHs occupied by the AGNs, but also the occupation distribution of the AGNs among the DMHs. As a separate project, we used AGNs in the Swift BAT Survey, which contains both un-obscured (type I) and obscured (type II) AGNs to investigate its auto-correlation function, finding similar results. We discuss the improvements on low-redshift AGN clustering studies expected from MAXI.

[P-50]

Strongly variable AGNs found in the Second XMM-Newton Serendipitous Source Catalogue

N.Kamizasa, Y.Terashima, H.Awaki (Ehime univ.)

Ehime University

X-ray variability is a well-known property of active galactic nuclei (AGNs). Variability on short timescales implies the presence of a relatively low-mass supermassive black hole, which is of great interest to understand evolution of AGNs and physics of growth of black holes. We made our sample consisting of objects showing strong variability from the Second XMM-Newton Serendipitous Source Catalogue (DR3) to search for such a class of objects. We required sources to satisfy the following conditions: (1) the probability that the source is constant $< 10^{-5}$, (2) the count rate for EPIC-pn in 0.2-12 keV >= 0.1 cts/s and (3) Galactic latitude $|b|$ >= 10 deg. 718 sources fulfilled these criteria, and 53 among them were selected as AGNs based on X-ray and optical properties. Four of these were not recognized as AGN in the past and detailed analysis of these four was performed. Their lightcurves show intensity changes by a factor of two or more on timescales of several thousand secon ds. The high energy part of their X-ray spectra were fitted by a power-law model with a photon index 1.8-1.9 for two objects and 2.3-2.6 for the others, which are the ranges for broad-line and narrow-line Seyfert 1s, respectively. Soft X-ray excess was seen in three of these objects, and expressed by a blackbody with $kT \sim$ 0.10-0.17 keV.

[P-51]

Swift Target of Opportunity program

D. N. Burrows

Penn State University

I will discuss aspects of the Swift Target of Opportunity (TOO) program, including recent improvements to our ability to observe TOOs for objects with error boxes larger than the XRT field of view, which is particularly useful for followup of MAXI transients.

[P-52]

Swift-BAT all-sky monitoring: transient phenomena with timescales from days to months.

G. Cusumano, V. La Parola, A. Segreto, A. Maselli, P. Romano (IASFPa-INAF).

IASFPa - INAF

The Burst Alert Telescope (BAT: 14-150 keV) on board of Swift is mainly devoted to the monitoring of a large fraction of the sky (50%-80% per day) for the occurrence of Gamma Ray Bursts. This provides the opportunity for a substantial gain of our knowledge of the Galactic and extragalactic sky in the hard X-ray domain. We have developed a code for the analysis of the survey data collected by the Swift-BAT telescope and produced two hard X-ray source catalogues from the all-sky maps integrated over the first 39 and 54 months of Swift-BAT observations. Here we present the results of a systematic search for transient sources on timescales from a few days up to months.

[P-53]

All-sky Observations with Suzaku Wide-band All-sky Monitor and MAXI

M. Ohno, M. Kokubun, T. Takahashi (ISAS/JAXA), K. Yamaoka (Aoyama Gakuin Univ.), M. Serino, Y. E. Nakagawa, T. Tamagawa (RIKEN), Y. Fukazawa, T. Uehara, Y. Hanabata, T. Takahashi (Hiroshima Univ.), S. Sugita (Nagoya Univ.), N. Vasquez (Tokyo Tech.), Y. Terada, M. Tashiro, W. Iwakiri, K. Takahara, T. Yasuda (Saitama Univ.), N. Ohmori, A. Daikyuji, Y. Nishioka, M. Yamauchi (Univ. of Miyazaki), Y. Urata, P. Tsai (NCU), K. Nakazawa, K. Makishima (Univ. of Tokyo), S. Hong (Nihon Univ.)

ISAS/JAXA

All-sky observation in wide energy band is important for many bright gamma-ray sources as well as other transient phenomena such as Gamma-ray Bursts (GRBs). Suzaku Wide-band All-sky Monitor (WAM) achieves such all-sky observations up to soft gamma-ray band thanks to its wide energy coverage from 50 keV to 5000 keV with very large effective area of 400 cm2 even at 1 MeV. During five year operations, any serious detector problems have not come up and the WAM has successfully detected more than 750 GRBs. Simultaneous detection between the WAM and MAXI of GRB 090831A is an example to perform a GRB spectroscopy in quite wide energy range from a few keV to MeV. In addition, the WAM is monitoring many bright gamma-ray sources such as Crab and Cyg X-1 up to 700 keV by utilizing the earth occultation technique. Combination between the WAM, MAXI, and other all-sky instruments enable us to compare the behavior of their light curves in X-ray with soft gamma-ray energy band. In this presentation, we report on current status of the WAM and discuss synergy between the WAM and MAXI of the all-sky observations.

[P-54]

Optical wide field monitor AROMA-W using multiple digital single-lens reflex cameras

Ichiro Takahashi, Kosuke Tsunashima, Takeda Tatsuhito, Ono Saori, Yamaoka Kazutaka and Atsumasa Yoshida (Aoyama Gakuin University)

Aoyama Gakuin University

We have developed and operated the automatic optical observation device Aoyama Gakuin University Robotic Optical Monitor for Astrophysical objects - Wide field (AROMA-W). It covers a large field of view of about 45 degrees W 30 degrees at a time by the multiple digital single-lens reflex cameras, and provides photometric data in four bands with a limiting V magnitude of about 12-13 magnitude (20 seconds, 3 sigma level). The automatic analysis pipeline which can analyze in parallel with observation has been constructed so far. It can draw the light curves of all stars in the field of view of AROMA-W. We are aiming at the simultaneous observation of the transients (e.g., X-ray nova, Supernova, GRB) that MAXI discovered by using the AROMA-W. We report the developmental status, the observational results of AROMA-W and a possibility of the simultaneous observation to the X-ray transients discovered with MAXI.

[P-55]

WIDGET: Ultra Bright Optical Transients Search

Y. Urata, H-M. Lin (NCU), M. Tashiro and WIDGET team

NCU

The WIDeField telescope for Gamma-ray burst Early Timing (WIDGET) is used for a fully automated, ultra-wide-field survey aimed at detecting the prompt optical emission associated with Gamma-ray Bursts (GRB). WIDGET surveys the HETE-2 and Swift/BAT pointing directions covering a total field of view of 62x62 degree every 10 seconds using an unfiltered system. This monitoring survey allows exploration of the optical emission before the gamma-ray trigger. At the same time, WIDGET is the quite unique instrument to explore ultra-bright optical transients with high time resolution. Combination with the MAXI survey, WIDGET has higher potential to make simultaneous discoveries of optical counterparts for high energy transients. We developed the serendipitous transient finding pipeline. We report the preliminary results.

[P-56]

K-ART (Korea Array Radio Telescope) and Monitoring of Radio Transients

Jeong-Sook Kim, Soon-Wook Kim (Korea Astronomy and Space Science Institute), Yong-Sun Park (Seoul National University)

Korea Astronomy and Space Science Institute

Korea Array Radio Telescope (K-ART), a proto-type radio array telescope, is desined for 300-450 MHz wavebands. The system is located in the Jeju Island of the South Korea, and is currently in its testing mode since last mid-October 2010. It is primarily designed for monitoring solar activity and radio transients. K-ART has a capacity to monitor transients for about 2hours per day, with a spatial resolution of about 10 minutes and a timing resolution of milliseconds. The sensitivity is expected to be a few mJy or less. We propose to monitor radio transients such as X-ray binaries, cataclysmic variables and quasars, on the target-of-opportunity mode, in addition to the scheduled observation.

[P-57]

MAXI/GSC

T. Mihara and the MAXI team

RIKEN

Gas Slit Camera (GSC) is the instrument in the MAXI mission. The GSC utilizes twelve large area proportional counters (PC), a slit and slats collimator. The energy range is 2-30 keV. The GSC has two FOVs of 160 x 3 degrees. One is toward forward direction of ISS and the other is the zenithal direction. Two arches of FOV scans the sky in every 92 minutes with ISS rotation. The slats collimator makes the narrow arc FOV, and the one-dimensional position-resolution of the PC resolves the X-ray sources within the FOV. Thus the position resolution is determined by the slats collimator and a combination of the slit and the position resolution of the detector. These make the point spread function of 1.5 x 1.5 degrees. The background is 1.2×10^{-4} c/s/cm^2/keV, which is almost the same level with Ginga/LAC. The 5-sigma sensitivity is 15 mCrab/day, which is improved to with the sqrt (t) law. It will reach the 5 sigma confusion limit of 0.5 mCrab in 900 days, if the pariticle-backgroun d estimation is accurate enough.

[P-58]

Operation status of MAXI and ISS

M. Kohama, H. Tomida, S. Ueno, Y. Adachi, H. Itamoto, M. Ishikawa, K. Kawasaki (JAXA), T. Mihara, M. Sugizaki, M. Serino, M. Matsuoka (RIKEN), H. Negoro (Nihon univ.) and MAXI Team

JAXA

In July 2009, MAXI and "Kibo" Exposed Facility were delivered to International Space Station(ISS) by Space Shuttle Endeavour and were completed by the operation of Koichi Wakata and ISS Crew. MAXI was powered on in August/03/2009, and MAXI observation has been started from August/17/2009. We report the recent one year operation status of the MAXI and ISS. The operation of MAXI did not so go well easily. It sufferd from some troubles of communications. "Kibo" Operation team and MAXI Operation team have improved some onboad telecommunication system and the ground equipments to store MAXI data more completly. Now, MAXI observation data are almost completly delivered to our analysis system.

[P-59]

Calibration of Alignments of the MAXI/GSC

Kosuke Sugimori, Nobuyuki Kawai, Mikio Morii, (Tokyo Tech), Mutsumi Sugizaki, Motoko Serino (RIKEN), and the MAXI team.

Tokyo Institute of Technology

One of the important goals of MAXI is to discover X-ray transient objects and inform the world of their positions. For follow-up observations with other satellites and telescopes, we must reduce the position uncertainties as small as possible. We therefore performed calibration of alignments of the MAXI/GSC. MAXI's field of view is restricted by the slats collimators to a narrow and long rectangle, which scans the sky in the direction perpendicular to the long dimension. The position of an X-ray source along the scan direction is determined by the time when the X-ray source crosses MAXI's FoV. To determine the position of the X-ray source perpendicular to the scan direction, we use the position of the X-ray image on the detector. The misalignment of a GSC camera around the orbital rotation axis is determined by the lag of the detection time of an X-ray source whose position is well known. One around another axis along the moving direction is determined by the shift of the X- ray image on the camera. The misalignment around the third axis is estimated by the change of incident angle caused by the precession of the ISS orbital plane. As a result, we reduced the systematic error in position determination from the initial uncalibrated value of 1.0 degree to 0.2 degree.

[P-60]

The scientific results of MAXI/SSC

H.Tomida, M.Matsuoka (JAXA), H.Tsunemi, M.Kimura, H.Kitayama (Osaka-U), A.Daikyuji (Miyazaki-U)

JAXA/ISAS

SSC (Solid-state Slit Camera) is an X-ray CCD camera on MAXI. In the first year observation from Aug 2009, SSC has detected over 70 sources. SSC is sensitive to 0.5keV, some of the sources are not deteced with MAXI/GSC. In the poster, we will presents the all-sky map, light cirves, and the spectra obatained with MAXI/SSC.

[P-61]

In Orbit Performance of the MAXI/SSC 1

Arata Daikyuji, Makoto Yamauchi (University of Miyazaki)
Hiroshi Tsunemi, Masashi Kimura, Hiroki Kitayama (Osaka University)
Hiroshi Tomida, Masaru Matsuoka (JAXA)

University of Miyazaki

Solid-state Slit Camera (SSC) is an X-ray CCD camera onboard the MAXI mission of the International Space Station (ISS). Its observation energy range is 0.5-12 keV, and the field of view (FOV) is 1.5 degree (FWHM) W 90 degree. Two sets of SSC sensors scan the sky as the rotation of the ISS. The CCD of SSC is normally cooled down to around -60 degree C. Sometimes the temperature of a certain CCD becomes higher than -52 degree C. We find that the thermal noise of CCD explodes at this condition. Furthermore, we notice an edge glow of each CCD probably due to the IR of Sun light. In case of the edge glow at the daytime, the background become continuously high and prevent us from observing the sky. The moon light generates high background region forming a diamond shape. There is also unknown Al-K background line which sometimes appears in the background spectrum. The presence of Al-K line can be judged using the count ratio 1.3-2.1 keV to 2.1-3.7 keV. In this poster, we will report the details of the background and the way of background screening of the SSC.

[P-62]

In Orbit Performance of the MAXI/SSC 2

Hiroki Kitayama, Hiroshi Tsunemi, Masashi Kimura (Osaka University)
Hiroshi Tomida, Masaru Matsuoka (JAXA)
Arata Daikyuji (Miyazaki University)

Osaka University

MAXI was launched in July, 2009 and observation started from August,2009. MAXI/SSC consists of 32 CCDs each of which is 1 inch square. The CCD is usually working in parallel sum mode (64-binning). When the ISS passes through the South Atlantic Anomaly(SAA),where the background is high,the MAXI/SSC stops observation. Furthermore, the MAXI/SSC doesn't observe when the Sun is near the FOV. This is because the day time image shows the saturation in the electronics on the edge of the CCD and the background is quite different from that of the night time image. In the result, the observation time of the MAXI/SSC is about 30% of one day. The MAXI/SSC has calibration source at the edge of CCDs which radiates Mn-K X-rays. In addition, collimator origin Cu-K emission line can be seen. The gain and energy resolution of the CCD is continuously monitored both by the Mn-K X-rays and by the Cu-K X-rays. In Mn-K X-rays, the energy resolution of the CCD is 147eV(FWHM) at the time of launch. The FWHM at the Cu-K line is gradually decreasing. In this poster,we report the performance of the MAXI/SSC in orbit.

[P-63]

MAXI Alert System and Its Improvement

Fumitoshi Suwa, Hitoshi Negoro, Hiroshi Ozawa(Nihon University), and MAXI team

Nihon University

One of main objectives of MAXI, Monitor of All-sky X-ray Image, is to discover X-ray transient objects. By scanning all the sky, MAXI can observe short- and long-term X-ray variabilities. Therefore, MAXI is the best X-ray instrument for the discovery of X-ray transient objects. Observational data are sent to the nova-search system that is a real-time X-ray transient monitor at the Tsukuba Space Center. The system also analyzes time series data at each spherical area. If the system detects large intensity variations above a threshold, the data of the area are sent to the alert system, where adjoining data are put together as one event. If it is admitted that the event is a transient object, the system reports the information soon to MAXI-team members. 39 transient objects or phenomena were reported to ATel and 12 GRBs including soft X-ray flashes were reported to GCN using this system by September in 2010. We present the outline of the system and improvements newly added to the system, for example a check of shading by a solar paddle.

[P-64]

Optimization of the auto-detection algorithm in the MAXI nova alert system and reanalysis of archival data

Hiroshi Ozawa, Hitoshi Negoro, Fumitoshi Suwa (Nihon University), and MAXI Team

Nihon University

We have developed the MAXI alert system in order to detect transient objects. The system has successfully detected a number of transient objects since MAXI began observation. We did not search transient objects systematically for the first three months, because the system had not been ready. In this study, we optimize the detection algorithm using data obtained with MAXI so far and reanalyze archival data.

[P-65]

Small Satellite "TSUBAME" for Polarimetry of Gamma-ray Burst

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Polarimetry in the hard X-ray and soft gamma-ray band plays a crucial role in the understanding of mechanism of the particle acceleration and the high-energy emission in Gamma-Ray Bursts (GRB). TSUBAME is a university-built small satellite mission to measure polarization of hard X-ray photons (30-100 keV) from prompt emission of GRB. TSUBAME has two instruments: the Wide-field Burst Monitor (WBM) and the Hard X-ray Compton Polarimeter (HXCP). The WBM is always monitoring half sky and determines the positions of gamma-ray transients with an accuracy of +/- 15 deg. When a GRB is detected, the onboard CPU calculates the coordinate and then the satellite slews rapidly using the Control Moment Gyro (CMG). Thanks to the high speed attitude control system, TSUBAME can start polarimetry observation earlier than 15 s from the trigger. We are now developing the engineering model of two detectors, HXCP and WBM. We present the science mission of TSUBAME and developmental status of two detectors in this poster.

[P-66]

Gamma-Ray Burst Monitor for the CALET Mission (CGBM) onboard ISS 1: Scientific goal and expected background

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Aoyama Gakuin University

The CALET (Calorimetric Electron Telescope) is the second utilization mission of the exposed facility of Japanese Experimental Module "Kibo" on ISS the following the MAXI, which is now scheduled for launch in 2013. The scientific goal of this mission is to solve the origin of high energy electrons and to detect signals from dark matters. The primary instrument, calorimeter (CAL), is sensitive to high energy electrons and gamma-rays in the GeV-TeV range, and the gamma-ray burst monitor (CGBM) with a low energy coverage of 7 keV to 20 MeV are also attached to achieve a broadband observation of gamma-ray bursts and other transients. It consists of two types of detectors: three LaBr3 crystals in 7 keV to 1 MeV and one BGO-plastic phoswich scintillator in the range of 100 keV to 20 MeV. The LaBr3 has an excellent energy resolution, but it has not been operated in space yet. In this presentation, scientific goal, expected observational performance, and expected detector background including proton-induced radio-activated component of the CGBM will be described, and a possible collaboration with MAXI will be discussed.

[P-67]

Gamma-Ray Burst Monitor for the CALET Mission (CGBM) onboard ISS 2: Current Development Status

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Aoyama Gakuin University

The Calorimetric Electron Telescope(CALET) is the experiment to observe high energy electrons and gamma-rays. The CALET is the second mission for "Kibo" Exposed Facility of the International Space Station. It will be launched by HVT and set on the ISS. We are developing the Gamma-ray Burst Monitor(CGBM). It has four detectors. Three of them are the detector employing LaBr3(Ce) crystal and one is the phoswich detector which utilizes BGO crystal and plastic scintillator. Now, we are investigating detector's performance and if it can endure the space environment. We irradiated the gamma-rays and proton beams to study its durability to radiations. I will present development status and the outcome of the experiment.

[P-68]

Thomson X-ray Polarimeter for a Small Satellite Mission

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Raman Research Institute

We will describe a Thomson X-ray polarimeter developed for a small satellite mission. The instrument works in the 5-30 keV band and will be suitable for X-ray polarisation measurement in about 50 hard X-ray sources. The accretion powered X-ray pulsars, black hole X-ray binaries, rotation powered pulsars and non-thermal SNR will be the prime targets for this mission. In spite of its moderate sensitivity, this experiment can give us unique opportunity to expand the field of X-ray astronomy into a hitherto unexplored dimension.

[P-69]

A New Coded-Mask CCD Camera Optimized for the International Space Station

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We present a new design of coded-mask CCD camera optimized for the International Space Station (ISS). With 2-dimensional mask, it will localize an X-ray source with a spatial resolution of arc-seconds. A unit camera has a square field of view (FoV) of $60^\circ \times 60^\circ$, of which a CCD pixel sees only a fraction, to reduce the contamination by nearby bright sources. The combination of such three cameras can cover a celestial semicircle between the two orbital poles and thus scan all the sky in one orbital period, as long as the cameras are turned on. Two CCD-driving modes are possible; the synchronized mode, where pixel charges are transfered to cancel the orbital motion of the ISS, and the normal mode, where an X-ray star leaves its trail in CCD images due to the orbital motion, and the position resolution is therefore limited.
The status of the development of a coded-mask CCD camera (not optimized for the ISS) at Aoyama Gakuin Univ. is also reported.