Joint Assembly:

JSPS-DST Asia Academic Seminar

CPS 8th International School of Planetary Sciences

Challenges in Astronomy: Observational Advances

September 26 – October 1, 2011

Minami-Awaji Royal Hotel, Hyogo, Japan

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Hosted by
Japan Society for the Promotion of Science (JSPS), Indian Department of Science and Technology (DST), and Center for Planetary Science (CPS) under the MEXT Global COE Program: "Foundation of International Center for Planetary Science", a joint project between Kobe University and Hokkaido University.

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Monday, 26 September, 2011

15:00 - 18:00	Registration
18:00 - 12:00	Opening Reception

Tuesday, 27 September, 2011

7:30 - 8:45	<Breakfast>
8:45 - 9:00	**Opening Keynote**: Yushitsugu Nakagawa (CPS, Japan)
9:00 - 10:15	**Lecture 1**: (Chair: Yoichi Itoh) Sebastian Wolf (Univ. of Kiel, Germany) *The Birthplace of Planets : Observations and Modeling of Circumstellar Disks*
10:15 - 10:45	<Break>
10:45 - 12:00	(Chair: Yoichi Itoh) **Lecture 1**: Sebastian Wolf (University of Kiel, Germany)
12:30 - 13:30	<Lunch>
14:00 - 15:15	(Chair: Takahiro Sumi) **Lecture 2**: David Bennett (Univ. Notre Dame, USA) *Detection of Extrasolar Planets by Gravitational Microlensing from the Ground and Space*
15:15 - 15:45	<Break>
15:45 - 17:00	(Chair: Takahiro Sumi) **Lecture 2**: David Bennett
18:00 - 19:00	<Dinner>
19:00 - 21:00	**Poster session 1 with short talks (P-03 to P-23)**

Wednesday, 28 September, 2011

7:30 - 9:00	<Breakfast>
9:00 - 10:15	(Chair: Masaki Ishiwatari) **Lecture 3**: Annapurni Subramaniam (IIA, India) *Probing the Geography, History, and Chemistry of Nearby Galaxies with Future Telescopes*
10:15 - 10:45	<Break>

10:45 - 12:00	(Chair: Masaki Ishiwatari)
	Lecture 3: Annapurni Subramaniam
12:30 - 13:30	<Lunch>
14:00 - 15:15	(Chair: Manabu Yuasa)
	Lecture 4-a: Ajit Kembhavi (IUCAA, India)
	Virtual Observatories: Tools and Applications
15:15 - 15:45	<Break>
15:45 - 17:00	(Chair: Manabu Yuasa)
	Lecture 4-b: Masatoshi Ohishi (NAOJ, Japan)
	Data Discovery in and Science Results by means of VOs
18:00 - 19:00	<Dinner>
19:00 - 21:00	**Poster session 2 with short talks (P-24 to P-44)**

Thursday, 29 September, 2011

7:30 - 9:00	<Breakfast>
9:00 - 10:15	(Chair: Hiroaki Isobe)
	Lecture 5: Jayaram Chengalur (NCRA/TIFR, India)
	Atomic Hydrogen in the Universe
10:15 - 10:45	<Break>
10:45 - 12:00	(Chair: Hiroaki Isobe)
	Lecture 5: Jayaram Chengalur
12:30 - 13:30	<Lunch>
14:00 - 18:00	<Excursion>
18:00 - 19:00	<Dinner>
19:00 - 21:00	Free Discussions

Friday, 30 September, 2011

7:30 - 9:00	<Breakfast>
9:00 - 10:15	(Chair: Kiyoshi Kuramoto)
	Lecture 6: Hideyo Kunieda (Nagoya Univ., Japan)
	Violent Universe Explored by Japanese X-ray Satellites
10:15 - 10:45	<Break>
10:45 - 12:00	(Chair: Kiyoshi Kuramoto)
	Lecture 6: Hideyo Kunieda
12:30 - 13:30	<Lunch>
14:00 - 15:15	(Chair: Hideyuki Tagoshi)
	Lecture 7: Nobuyuki Kanda (Osaka City Univ., Japan)
	Frontier of Gravitational Wave Astronomy - Opening

New Window of Astrophysics and Cosmology –
lecture 1 : Fundamentals of Gravitational Wave and its Detection

15:15 - 15:45 <Break>

15:45 - 17:00 (Chair: Hideyuki Tagoshi)
Lecture 7: Nobuyuki Kanda (Osaka City Univ., Japan)
Frontier of Gravitational Wave Astronomy - Opening New Window of Astrophysics and Cosmology –
lecture 2 : Physics, Astrophysics and Cosmology with Gravitational Waves

18:00 - 21:00 <Banquet>

Saturday, 1 October, 2011

7:30 - 9:00 <Breakfast>

Facility Tour to Kamioka Observatory, for a limited number of participants only

Poster (All posters will be on display Monday - Friday)

P-03　Shan Yin

The influences of the preceding winter Northern Hemisphere An nular Mode to the spring extreme low temperature events in the north of eastern China

P-04　Fei Zheng

The Relationship between the Preceding Boreal Winter Southern Hemisphere Annular Mode and the Spring Precipitation in South China

P-05　Kiehunn Bach

Theretical Modelling of Stars : Determination of Physical Parame ters of mu Cas

P-06　Fayose Sola

Seasonal Variation of Total Electron Content at a Terrestrial Point Within Equatorial Anomaly Region

P-10　Wonseok Kang

Detailed Abundance Analysis for Planet Host Stars

P-11　Sheelu Abraham

A Difference Boosting Approach for the Photometric Detection of Point Sources From Multi-band Survey

P-13　Tetsuya Matsui

Figure-ground reversal about "type-behavior" and "token-behavior" in plays (Analized by rough sets derived lattices).

P-15　Jithesh Vadakkumthani

An upper limit on the black hole mass for optically dark X-ray bright sources in nearby galaxies

P-16　Takuhiro Aota

The shock chemistry of phosphorus in the L1157 B1 shocked region

P-17　Kou Yamada

Type I migration in an optically thin disk

P-18　Sho Manabe

Search for unknown exoplanets by detection of transit timing vari

ations

P-19 **Bhavya Bhaskaran**
Recent Star Formation history of some Young Open Clusters

P-20 **Takashi Shimonishi**
Near-infrared Spectroscopic Survey of the Large Magellanic Cloud with AKARI

P-21 **Chin-Ping Hu**
Time-Frequency Analysis of Superorbital Modulation of X-ray Binary SMC X-1 by Hilbert-Huang Transform

P-22 **Siyi Xu**
The Fate of Extrasolar Minor Planets

P-23 **Huynh Anh Le Nguyen**
Medium Resolution Spectral Library Of Late-type Stellar Templates In Near-Infrared Band

P-24 **Kazuhiro Kanagawa**
The Relation of structure between The Red Giants and The Gas Giant Planets

P-25 **ChiaJung Chuang**
Optical Identification of un-ID Fermi GeV sources

P-26 **Nisha Katyal**
Interstellar Dust Models towards some IUE Stars

P-27 **Ananta Pradhan**
Observations of far ultraviolet diffuse radiation from the Small Magellanic cloud.

P-30 **Laxmikant Chaware**
Isophotal shapes of early-type galaxies to very faint levels

P-32 **Soma Mandal**
Variability of ultra-luminous X-ray sources

P-33 **Shruti Tripathi**
XMM-Newton and Suzaku observations of AGN

P-34 **Yogesh Chandola**
HI absorption towards nearby compact radio sources

P-35 **Broja Dutta**

Evidence of Two component flows around the Galactic black hole candidates during their outbursts

P-38 **Tabasum Masood**

Entropy Changes in the clustering of Galaxies in an Expanding Universe

P-39 **Bari Maqbool**

Structure and Stability of X-Ray Irradiated Accretion Disk

P-40 **Kunwar Singh**

Observations of Solar Chromosphere with Hinode

P-41 **Kaustubh Vaghmare**

Point Spread Function for Spitzer IRAC Mosaics for 2-D Decompo sition of Lenticular Galaxy Images

P-42 **Shalima Puthiyaveettil**

Mid-Infrared counterparts of X-ray sources in NGC1399

P-43 **Daisuke Suzuki**

Detection efficiency of planets in the low magnified gravitational microlensing events

P-44 **Devraj Pawar**

RXTE Observations of XTE J1701-407; new possible outburst

Lecture Abstracts

The birthplace of planets: Observations and Modeling of circumstellar disks
Sebastian Wolf, University of Kiel (Germany)

The detection of extrasolar planets and planetary systems has enormously stimulated and invigorated the studies of planet formation during the last decade. In particular, a detailed picture of the evolution of circumstellar disks which provide the material and environment from and in which planets are expected to form, has been developed. However, the planet formation process itself is in major parts still under discussion. In order to improve our understanding of planet formation and to refine existing hypotheses for the various phases of this process, adequate observational constraints are required.

In this lecture, observations and models of circumstellar disks at various stages of their evolution will be presented. The potential of the combination of multi-wavelength observations obtained through low and high-angular resolution observations will be outlined. Exemplary case studies will be presented which illustrate state-of-the-art observations and subsequent radiative transfer modeling of circumstellar disks.

Detection of Extrasolar Planets by Gravitational Microlensing from the Ground and Space

David Bennett (Univ. Notre Dame, USA)

Perhaps the newest and highest profile sub-field of astronomy is the study of extrasolar planets. Although the first paper claiming the discovery of an extrasolar planet was published more than 150 years ago, the exoplanet sub-field of astronomy didn't begin to form until the discovery of the first hot Jupiter by Mayor and Queloz in 1995. Since then the field has grown quite rapidly. In the first half of the lecture, I review the variety of methods that have been used to study extrasolar planets highlighting the strengths and weaknesses of each method. I also give an overview of planet formation theory and the challenges that these theories face.

In the second half of my lecture, I focus on the gravitational microlensing method. I discuss the basics of the method and explain its special sensitivity to planets located beyond the so-called "snow-line", where the most massive planets are thought to form. I also show how microlensing is able to detect free-floating planets that have been ejected from the planetary systems of their birth. Finally, I show how a space-based microlensing survey, like the US WFIRST mission, can complete the statistical census of exoplanets that has begun with the Kepler mission. The census resulting from the combination of these two missions will extend down to planets smaller than the Earth at all orbital separations from 0 to infinity. The data gained from WFIRST will be invaluable for advancing our understanding of the planet formation process and will aid in the planning of a future mission that will search for signs of life via spectroscopy of Earth-like planets orbiting nearby stars.

Title:

Probing the geography, history, and chemistry of nearby galaxies with future telescopes

Annapurni Subramaniam

Abstract:

The stellar population in the nearby galaxies are used to understand the formation, evolution and the structure of the galaxies. With the advent of large telescopes we have been able to understand the older population and hence the early evolution of the neighbouring galaxies. A large number of surveys using small telescopes with large field of view have enabled us to cover larger areas of the galaxies including our own, which has resulted in tracing various merger remnants. The future telescopes as well as future instrumentation on large telescopes hold the key to unravel the mysteries presented by our own as well as the nearby galaxies.

Virtual Observatories : Tools and Applications

Ajit Kembhavi
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Abstract
Vast quantities of astronomical data can now be accessed through data archives and other sources. The data can be in highly processed form, presented as ready-to-use tables, or as processed images and spectra. Data on the same set of objects can be available over a wide range of wavelengths, which facilitates multiwavelength studies. The focus has therefore to shift from processing of raw data and images using a variety of techniques, to the scientific and statistical analysis and advanced visualization and of the processed data products, which may be located at different centres, and too vast in size to be transported easily to the user. Virtual Observatories (VO) provide the appropriate framework for addressing these issues.

Over the past several years, internationally coordinated VO projects have developed comprehensive standards for addressing all data related issues. These are being implemented to develop end-user applications and tools, which can be used address various astronomical problems depending on the use of data. There is growing use of these tools in astronomical research, and their need will be more acutely felt when data from large surveys will become available over the coming years.

In my talk I will describe some important VO tools, and their use in addressing various astronomical problems, and briefly consider some important and interesting scientific results which have been obtained using the tools.

Data Discovery in and Science Results by means of VOs

Masatoshi Ohishi, National Astronomical Observatory of Japan
masatoshi.ohishi@nao.ac.jp

Virtual Observatories (hereafter VOs) in astronomy have been developed in many countries as a new research infrastructure in the 21st century, which is defined as "A collection of integrated astronomical data archives and software tools that utilize computer networks to create an environment in which research can be conducted" (http://www.encyclopedia.com/html/v1/virtobserv.asp).

The participating countries (VO projects) established a consortium, the International Virtual Observatory Alliance (IVOA; http://www.ivoa.net), to develop interoperable protocols for data discovery, data retrieval, data analysis, and others, where the most important functionality in VOs is data discovery – how to discover desired data that may be located somewhere in the world. Once a data provider (observatory, data center, and others) have implemented defined metadata and published them, those data can immediately be found from other researchers.

The ultimate purpose of the VOs is to obtain science results from large amount of data, multi-wavelength data, time-series of data, and others. Of course such research was possible in the past and even now, however, the process needed much man-power and long time. It can be found that the VO technologies can accelerate such studies very much that may enable us to conduct (real) statistical astronomical research.

In my lecture I will present fundamental structure to realize VOs, and examples of science results by means of VOs, that are obtained by many researchers (data scientists in astronomy) in the world. VOs may open a new research paradigm in astronomy – Data Intensive Astronomy.

Atomic Hydrogen in the Universe

Jayaram N. Chengalur, NCRA-TIFR

Atomic hydrogen's (HI) spectral line at rest wavelength of 21cm is by far the most widely observed line at low radio frequencies. The bulk of the observations are of gas in galaxies at essentially zero redshift, where the line in an important tracer of the dynamics of galaxies. Observations of the average HI content of galaxies at redshifts between 0-1 give important information on the evolution of the gas content of galaxies. HI absorption has been observed in Damped Lyman-alpha systems with redshifts as high as 3. In these systems HI is a useful tracer of the dynamics of the systems, as well as carrying information on the physical conditions in the absorber. Finally there are several on going efforts to try and detect the 21cm emission from HI at the epoch of recombination. In this lecture I will discuss the HI observations at a range of different redshifts.

Violent Universe Explored by Japanese X-ray Satellites

H. Kunieda(Nagoya University)

Abstract

Universe had been explored for thousands of years only by optical observations. From 1960's space observations onboard spacecrafts became possible to broaden the observational window up to UV and X-rays, which are absorbed by the earth atmosphere. Since electro-magnetic waves in different wave bands are emitted by different mechanisms. X-rays are produced from hot(T > 10^6 K) plasmas or high energy particles, while optical lights are mostly emitted from main sequence stars, infrared light is found from dusts and radio emission are from cold molecule in vibration or rotation modes. Therefore, X-ray observations reveal violent activities of the Universe, which have never been recognized in other wave bands.

In my lecture, the first subject is on the supernovae and their remnants. At the end of the life of massive stars, the gravitational energy of contraction of a star is converted to the kinetic energy of expanding shell with the total energy more than 10^51 ergs. As a shock front propagates in the interstellar medium, kinetic energy is converted to thermal energy to create hot plasmas(T > 10^6 K) there. Imaging spectroscopy of such thermal emission from super nova remnants tells us the elements(abundance), temperature and dynamics of the hot gas, and its environment. In addition, non-thermal emission has been found from SNR without any emission line features of hot plasmas. It suggests non-thermal emission produced by high energy electrons and magnetic fields. Kinetic energy of the SN explosion mentioned above is also converted into high energy particles by acceleration mechanisms.

Black holes (several MSolar) are to be created after the SN explosion of very massive(> 30 MSolar) stars. It may evolve by eating up ambient plasma and merging with black holes. At the center of most of galaxies, it is believed that there are super massive(10^6-9 MSolar) black holes thus evolved. Gravitational energy of accreting matter onto black holes is released from the region close to the black hole radius (Rg= 2GM/c^2). Emission from the region so close to Rg is subject to the gravitational effects, such as gravitational red shifts, as well as relativistic beaming and Doppler effects. Strong radiation from the nucleus irradiates the accretion disc and material around it. Reflection and transmission features can be found in X-ray spectra. Only form such spectral and temporal X-ray data, we are able to examine the geometry and size of structure around the black holes.

In this lecture, I will explain above issues based on X-ray data mostly obtained by Japanese Missions: ASCA(1993-2001) and SUZAKU(2005-).

FRONTIER OF GRAVITATIONAL WAVE ASTRONOMY -OPENING NEW WINDOW OF ASTROPHYSICS AND COSMOLOGY-

NOBUYUKI KANDA / OSAKA CITY UNIVERSITY

Gravitational wave is a propagation of space-time distortion, which is predicted by Einstein in general relativity. Strong gravitational waves will come not only from some drastic astronomical objects like as coalescences of neutron star binaries, black holes, supernovae, pulsars, but also from cosmological origines as inflation, cosmic string etc. To search these gravitational waves, large-scale laser interferometers will compose a global network of detectors. LCGT in japan, advanced LIGO in USA, advanced Virgo in Europa, LIGO Australia, INDIGO in India and Einstein Telescope are constructing / upgrading / planning. now. Network of these gravitational wave detectors will start in late 2016 or 2017, and may discover the gravitational waves. We will learn about the basic concept and current status of gravitational wave detection, and discuss about prospects of *'gravitational wave astronomy'* in the following two lectures.

1. Fundamentals of Gravitational Wave and its Detection

We will learn what is a gravitational wave, and how to detect/measure it. We should remark Einstein's general theory of relativity to understand the gravitational wave. On the other hand. we will introduce the fundamentals of detectors. Modern detector type is a laser interferometer with large (km size) beam base-line, using high power laser and high quality optics. It is extremely high-sensitivity measurement of space-time distortion. We will see the wonderful physics of fundamental characteristics of detector instruments. We also display the recent status of world wide detectors. LCGT (Large-scale Cryogenic Gravitational wave Telescope) is now constructing in Kamioka-mine, Japan.

2. Physics, Astrophysics and Cosmology with Gravitational Waves

Current constructing gravitational wave detectors will reach its search range for coalescences of neutron star binary is over 200 Mpc. Detectors will be sensitive also for gravitational waves originate massive black-holes, supernovae, pulsars, etc. Since most of gravitational wave events are from high-energy phenomenon of the astronomical objects, these might have counterpart evidences in electromagnetic radiation (visible light, X/gamma ray), neutrino, high energy particles or others. For the future detector using space craft will be capable to receive gravitational waves not only from huge numbers of compact binaries but also from cosmological origines. Space-based gravitational wave detectors may probe the early universe and study the cosmology. We will discuss about the physics, astrophysics and cosmology with gravitational waves.

Poster Abstracts

The influences of the preceding winter Northern Hemisphere Annular Mode to the spring extreme low temperature events in the north of eastern China

YIN Shan[1, 2], LI Jianping[1], and FENG Juan[1]

1. *State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing,* 100029

2. *Graduate University of Chinese Academy of Sciences, Beijing,* 100049

Abstract The relationship between the preceding boreal winter Northern Hemisphere Annular Mode (NAM, also called Arctic Oscillation) and the spring extreme low temperature events in the north of eastern China during 1959-2008 was examined in this study. The results show that there exists a significantly inverse relationship between the preceding winter (December-February) NAM and the following spring (March-May) extreme low temperature events in the north of eastern China. When the preceding winter NAM is stronger, negative and positive geopotential height anomalies are associated in the upper and lower level over the north of eastern China in the following spring, respectively. Accordingly, there is anomalous sinking motion and vertical heating accompanied, resulting in less low temperature events. The opposite circumstance is obviously observed in the weaker preceding winter NAM years. Furthermore, the possible physical mechanism associated is explored. The results indicate that the Eurasian snow cover is the potential bridge connecting the signals in the two seasons with each other. During the stronger preceding winter NAM years, the Eurasian spring snow cover area becomes smaller, as a result, most part of Northern Asian is warmer than normal, which offers a counteract background for the occurrence of spring extreme low temperature events in the north of eastern China. Therefore, the preceding winter NAM contributes to the frequency and strength of the following springtime extreme low temperature in the north of eastern China, yielding a potential valuable signal in predicting the springtime extreme low temperature events in the above-mentioned region.

Key words Northern Hemisphere Annular Mode (NAM), extreme low temperature, negative correlation, Eurasian snow cover

The Relationship between the Preceding Boreal Winter Southern Hemisphere Annular Mode and the Spring Precipitation in South China

ZHENG Fei[1, 2] and LI Jianping[1]

1 State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029

2 Graduate University of Chinese Academy of Science, Beijing 100049

The Southern hemisphere Annular Mode (SAM) is the most important pattern of climate variability in the middle and high latitudes of the Southern Hemisphere. As its hemispheric-scale, SAM can impact climate world-widely. The relationship between the preceding boreal winter (December-February) SAM and the following spring (March-May) rainfall in South China (RSC) was examined statistically by methods such as SVD, correlation and composite analysis. The results show there is a significant negative correlation relationship between the preceding winter SAM Index (SAMI) and the following spring RSC. In order to understand the physical mechanism of this relationship, the role of SST anomalies in 30°～70°S playing was discussed. When winter SAMI is strong, latent heat fluxes change because of the change of sea surface wind speed, thus leading to SST abnormally high (low) in 30°～45°S (45°～70°S). Because of ocean's large heat capacity, the SST anomalies continue to the following spring and further cause atmospheric circulation anomalies. For example, the west ridge of West Pacific subtropical high weakens and extends less to the east; an abnormal cyclonic circulation exists in West Pacific region; South China is controlled by abnormal northerlies; the total troposphere in South China is almost controlled by abnormal sinking movement, and the relative humidity was abnormal small, all these conditions lead to less RSC. When winter SAMI is weak, the contrary is the case. In conclusion, winter SAM can impact the following spring RSC through SST anomalies, and this mechanism can be called 'ocean-bridge'.

Theoretical Modelling of Stars : Determination of Physical Parameters of μ Cas

K. Bach[1], W. Kang[2], & Y.-C. Kim[3]

1. Yonsei University Observatory, Korea
2. Department of Astronomy & Space Science, Kyunghee University, Korea
3. Department of Astronomy, Yonsei University, Korea

ABSTRACT

We have determined physical dimensions of μ Cas astrometric binary system through a series of stellar modelling such as abundance analysis, evolutionary computation, asteroseismology and 3-D Radiation-Hydrodynamics (RHD). In spite of the well-defined parallax and astrometric orbit from *HIPPARCOS*, there has been a chronic mass ratio problem between components. Recently, the optical interferometric observation of the *CHARA* array has detected the radius of the primary star. Moreover, from the high resolution spectroscopic observation, we find that μ Cas have $\alpha-$element enhanced chemical composition with respect to the scaled solar abundance by a factor of two. Combining global properties from spectro-photometric observations, physical parameters for μ Cas have been calibrated within the frame work of standard stellar theory. Then, a reliable set of physical parameters has been defined through a statistical minimization between theoretical model grids. In addition, the mode oscillation frequency of the best model has been calculated in the context of the stellar evolution and structure theory. With a well-constrained initial configuration from 1-D analysis, the numerical 3-D Radiation-hydrodynamical simulation for surface convection has been computed. The aim of this study is to constrain the physical dimensions and is to describe physical processes through a complete modelling for stars.

Subject headings: stars : atmospheres – Sun : photosphere – numerical : hydrodynamics – numerical : radiative transfer

SEASONAL VARIATION OF TOTAL ELECTRON CONTENT AT A TERRESTRIAL POINT WITHIN EQUATORIAL ANOMALY REGION

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Abstract

Increasing application of Global Navigational Satellite Systems GNSS has further strengthened interest in understanding of ionospheric scintillations as a result of its impact on GNSS signals. GNSS offer a remarkable new way to study ionospheric structure and associated perturbations. The monitoring of Ionospheric Scintillation and variability of Total Electron Content TEC over a terrestrial point within equatorial anomaly region has been achieved by using the NovAtel GSV 4000B GPS-SCINDA system at Akure (7.3^0N, 5.2^0E), Nigeria. This system is capable of tracking up to 14 GPS satellites simultaneously. Seasonal variations of Total Electron Content within the equatorial anomaly region were examined. TEC maximises in daytime at about local noon and exhibits seasonal redistribution.

Detailed Abundance Analysis for Planet Host Stars

Wonseok Kang[1], Sang-Gak Lee[2], Kiehunn Bach[3], Kang-Min Kim[4]

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[2] *Department of Physics and Astronomy, Seoul National University, Seoul 151-747, Republic of Korea*
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ABSTRACT

We have obtained the spectra of 166 F, G, K type stars including 93 planet host stars using BOES (BOAO Echelle Spectrograph) with BOAO 1.8 m telescope. The spectroscopic parameters for model atmosphere were determined by self-consistent fine analysis of Fe lines. By the measurements of equivalent widths (EWs), we estimated the abundances of 25 elements including n-capture elements, such as C, N, O, Na, Mg, Al, Si, K, Ca, Sc, Ti, V, Cr, Mn, Co, Ni, Cu, Zn, Sr, Y, Zr, Ba, Ce, Nd, and Eu. And the S abundance was determined by synthetic spectrum of triplet lines near 6757 Å. For abundance analysis, the accuracy of EW measurement is very important so that we have developed the TAME (Tool for Automatic Measurement of Equivalent-width) for fast and uniform measurement of a large set of EWs.

As a results, we have confirmed that the mean metallicity of planet host stars are 0.13 dex higher than that of comparison stars. For elements other than iron, we have found that the mean value of [Mn/H] ratio for planet host stars are as much as 0.22 dex higher than for comparisons. And we note that the difference of mean [X/H] ratio is more than 0.15 dex for Na, Co, N, Al, Cu, Ni, Sc, and Si, in order of difference. Furthermore, we have performed the Kolmogorov-Smirnov test (K-S test) for [X/H] ratios between two groups of planet host stars and comparison stars and investigated the proportion of planet host stars to all samples in each bin of [X/H] ratio. As a result, we find that it is fairly not possible that the distribution of [X/H] belonged to the same population, for the elements of O, Na, Mg, Al, Si, and Zn. And we observe that the proportion of planet host stars is increasing with [X/H] ratios as an exponential function for C, O, Mg, Si, S, Ca, Sc, Cr, and Zn.

In addition to this, the opacities and equation of states (EOS) of the chemical mixtures have been calculated from the elemental analysis. Then, the evolutionary phases of the planet host stars have been computed in the context of standard stellar models. Between theoretical model grids, the detailed physical dimensions of the best model have been determined.

Keywords : stars: chemical abundances — stars: fundamental parameters — stars: planetary systems

A Difference Boosting Approach for the Photometric Detection of Point Sources From Multi-band Survey

Sheelu Abraham, Ninan Sajeeth Philip[*], Ajit Kembhavi[†]

Abstract

With the advent of new detector technology and many large scale sky surveys, astronomical dataset grows to several terabytes in size. New automated classification tools are required to analyse this huge volume of data, especially at fainter magnitudes where the noise levels and the fewer samples with confirmed nature introduces significant challenges for the classification. In a recent research, with support from the Indian Space Research Organisation (ISRO), we developed an efficient Bayesian classifier to construct a catalogue of about 5.5 million unresolved photometric detections in Sloan Digital Sky Survey (SDSS) Seventh Data Release. These objects were classified as stars, galaxies and quasars from a region of colour space that was selected for the study. The resulting catalogue is estimated to have a completeness of 95% upto 22nd magnitude in SDSS i-band. On comparison with spectroscopically confirmed cases, it indicates better accuracy than existing methods for the classification and separation of quasars, stars and galaxies at fainter magnitudes. Our method has predicted about 1.5 times more quasar candidates and have also identified a few redshift patches at which SDSS colours of quasars and some stars are almost indistinguishable. The poster presentation shall cover the major findings of this research.

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Figure-ground reversal about "type-behavior" and "token-behavior" in plays (Analized by rough sets derived lattices).

Tetsuya Matsui

Type-token distinction is important concept on the field of philosophy, mathematics and cognitive science. And figure-ground reversal is useful concept of perceive science, Gestalt psychology, and literary theory. In this research we use these two concepts to analyze figure-ground reversal in Japanese novels. We compare “figure-ground reversal of type” with “figure-ground reversal of token”. In this research “type” means behavior that actually act in stories and “token” means behavior token in some character`s lines. To see figure-ground reversal in novels we use concept of rough sets derived lattices. Texts to analyze are “Haru”(Takehisa Yumeji), “Mittu no takara”(Akutagawa Ryunosuuke), “Nagasaki Shohin”(Akutagawa Ryunosuke), “Poran no hiroba”(Miyazawa Kenji), “Seinen to shi”(Akutagawa Ryunosuke), “Aki no Taiwa”(Kishida Kunio), “Ano hoshi ha itu arawareryka”(Kishida Kunio). Each texts are Japanese plays. We judged degrees about figure-ground reversal by complementarity of lattice. In the result lattices by “type” and “token relatively disagree in the beginning of play and as story progress, complementarity two lattice coincide.

An upper limit on the black hole mass for optically dark X-ray bright sources in nearby galaxies

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ABSTRACT

Compact, off-nuclear X-ray point sources in nearby galaxies, with luminosities $\sim 10^{39}$ - 10^{41} ergs s^{-1} are referred to as Ultra-Luminous X-ray sources (ULXs). Detailed understanding of the nature of ULX sources has come from X-ray, optical and radio observations. In the present study we have taken the archival *HST ACS/WFPC2* images that correlate with the *Chandra* X-ray positions. Optical counterparts were searched for 84 X-ray point sources from thirteen nearby elliptical galaxies. Some of these X-ray point sources were found to have potential counterparts within an error circle of few arc seconds. For X-ray sources without optical counter parts, which we call optically dark X-ray sources, we estimated the upper limit of black hole mass and for six of them their black hole mass $M_{BH} < 5000 M_{\odot}$. In particular, an ultra-luminous X-ray source (ULXs) in NGC 4486 has $M_{BH} < 1244 M_{\odot}$.

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The shock chemistry of phosphorus in the L1157 B1 shocked region.

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Abstract

Since shock waves are ubiquitous in interstellar space, a thorough understanding of shock chemistry is important to interpret observed chemical composition. This is particularly true for star-forming regions. For example, outflow gases from protostar bring on shock waves due to collision with surrounding gas.

L1157 dark cloud harbors a low-luminosity Class 0 protostar, which drives a well-collimated molecular outflow. L1157 B1 is a shocked region formed by an interaction between the molecular outflow and ambient gas. Since the B1 position is spatially apart from the protostar, the "pure" shock chemistry can be investigated. Because of this reason, many observational studies are conducted to investigate physical and chemical condition (e.g. Bachiller & Pérez Gutiérrez 1997, Hirano & Taniguchi 2001, Sugimura et al. 2011). Especially, recent observations focus on chemical composition (e.g. Arce et al. 2008).

Very recently, Yamaguchi et al. (2011) reported detection of PN for the first time in the L1157 B1 shocked region. Chemistry of P-bearing species has been investigated in the pseudo-time dependent model (e.g. Charnley & Millar 1994). For example, Charnley & Millar (1994) investigated P-chemistry in the hot core model, in which they assumed a constant warm temperature (100K-300K) and high density (2.0×10^{7} cm^{-3}), and showed that PN can be produced enough to be observed. But shock chemistry calculations that especially focus on p-bearing species have not been conducted.

In this work, we study the evolution of the P-bearing species in a 1D C-shock model. Temporal variations of physical parameters (density and temperature) are adopted from Jiménez-Serra et al. (2008). We found that observed abundance of PN can be reproduced in a C-shock model with v=20km/s, n=2.0×10^{4} cm^{-3}, only if the N atom abundance is high ($n(N)/n(H2) > 10^{-6}$) in the pre-shock gas.

Type I migration in an optically thin disk

Kou Yamada:Center for Planetary Science, Kobe University
Satoshi Inaba:School of International Liberal Studies, Waseda University

Gravitational interaction between a low-mass planet and a protoplanetary gaseous disk is one of the important physical processes in the formation of planetary systems and giant planets. It has been known since 1980's that a planet embedded in disks should undergo a fast decay toward their central star, on timescales much shorter than the lifetime of the disk. This process is called type I migration. Previous works adopted a disk with the constant temperature distribution and lack proper treatment of the energy balance. Recently, taking the energy balance into consideration, the planet-disk interaction has been investigated by some authors. These studies pointed out that, in the disk with the negative power law distribution of the entropy, a planet might move away from a central star (i.e., outward migration).

Yamada and Inaba (Mon. Not. R. Astron. Soc. 411, 184–192, 2011) studied the type I migration of planets in disks, considering a cooling effect of gas due to radiation. They found that the total torque exerted on a planet by an adiabatic disk decreases with an increase in the power law index of the entropy distribution. The torque changes the sign from positive (outward migration) to negative (inward migration) at $\lambda=-0.4$, where λ is the power law index of the entropy distribution. They also found that the total torque decreases with an increase in opacity of a disk if a cooling effect is taken into account. The type I migration is influenced by the dust opacity of a disk. Yamada and Inaba used a constant opacity in a disk even though it is expected to change in a disk because it depends on the size, species, and density of dust grains.

Title:
Search for unknown exoplanets by detection of transit timing variations

Author:
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Abstract:
Presently, about 550 exoplanets are known, and about 90% exoplanets have been detected by the radial velocity (RV) method. However, if observed from outside of the solar system, planets less-massive than Jupiter and Saturn will not be detected by the RV method. So, we try to detect such planets, i.e., terrestrial exoplanets by other method.
Now, about 130 transiting exoplanets are known, and almost all of them are known as systems with a single exoplanet. In such systems, it is predicted that transits occur at constant periods. But if there are additional exoplanets, periods of transits will not be constant for two reasons. One, revolution period of host star will not be synchronized with that of transiting planet. Two, transiting planet are affected by gravitational scattering of additional exoplanets. So, we make transit observations many times to detect transit timing variations (TTVs), and try to detect additional terrestrial exoplanets in known transiting planetary systems.
Since April 2010, we have made observations for XO-3b. XO-3b is known transiting exoplanet and orbits host star XO-3 (F5V, V=9.8 mag). We made transit observations 14 times, and we got 3 full transit light curves. Next, we analyzed these transit data, we found these transits occurred few minutes faster than calculated transit times. Because these TTVs are larger than accuracy of transit time, we understand these TTVs are significant. But only 3 data were not enough to indicate presence of additional exoplanets, so we could not detect.
In our poster presentation, we will introduce results of our transit observations and analyses.

Recent Star formation history of some Young Open Clusters:

Bhavya Bhaskaran

Young open clusters are always been a platform for the star formation studies. Irrespective of the previous assumption that all members in the cluster are coeval, recent studies show the presence of age range in young open clusters. Our study, based on multi-wavelength analysis of clusters younger than 30Myr tries to identify any episodic formation of stars in young clusters. In this poster we present the result obtained for 5 young clusters; all less than 30Myr.We used deep field optical UBVRI photometry, spectroscopy, NIR data from 2MASS and Spitzer data at mid and far IR wavelengths. Optical and Spectroscopic observations of Young Open Clusters, which were not studied previously, were carried out using HCT. IRAF is used for image reduction procedures. Emission Stars in the cluster are analyzed to get their evolutionary nature. We have looked for episodic star formation in these clusters, giving rise to a range in age for the cluster stars and attempt to model their star formation history. For all the clusters we studied, we find an age spread among the cluster members. Star formation is either episodic or continuous giving the duration as the cluster age itself.

Near-infrared Spectroscopic Survey of the Large Magellanic Cloud with AKARI

Takashi Shimonishi
The University of Tokyo

Infrared satellite AKARI is equipped with InfraRed Camera (IRC) which has a powerful wide-field multi-object spectroscopic capability. We have performed a spectroscopic survey of the Large Magellanic Cloud (LMC) with the IRC/AKARI.

The LMC is the nearest irregular galaxy to the Milky Way, and it is one of the few galaxies which we can obtain spatially resolved information of individual stars. So far various kinds of surveys have been performed toward the LMC. However, there are still few spectroscopic surveys in the infrared wavelength range. Infrared spectral information is necessary for the classification and the investigation of the individual spectral features of infrared bright objects, e.g. young stellar objects or mass-losing evolved stars.

As a result of the spectroscopic survey of the LMC with IRC/AKARI, we obtained 2 -- 5 micron spectra of ~3000 point sources in the LMC. In terms of the number of sources, this is the largest infrared spectroscopic survey ever performed toward the LMC. In this presentation, we introduce this survey and examples of a science with the survey data in more detail.

Time-Frequency Analysis of Superorbital Modulation of X-ray Binary SMC X-1 by Hilbert-Huang Transform

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Abstract

The high-mass X-ray binary (HMXB) SMC X-1 exhibits a superorbital modulation with a dramatically varying period ranging between $\sim$ 40d and $\sim$ 60d. This research studies the time-frequency properties of the superorbital modulation of SMC X-1 based on the observations made by the All-Sky Monitor (ASM) onboard the Rossi X-ray Timing Explorer (RXTE).We analyzed the entire ASM database collected since 1996. The Hilbert-Huang Transform (HHT), developed for non-stationary and nonlinear time series analysis, was adopted to derive the instantaneous superorbital frequency. The resultant Hilbert spectrum is consistent with dynamic power spectrum while it shows more detailed information in both the time and frequency domains. The RXTE observations manifest that the superorbital modulation period was mostly approximately $\sim$ 55d, whenas it changed to $\sim$ 45d around MJD 50,800 and MJD 54,000. Our analysis further indicates that the instantaneous frequency changed in a time scale of hundreds of days between $\sim$MJD 51,500 and $\sim$MJD 53,500. Based on the instantaneous phase defined by HHT, we folded the ASM light curve to derive a superorbital profile, from which an asymmetric feature and a low state with barely any X-ray emissions (lasting for $\sim$0.3 cycles) were observed. We also calculated the correlation between the mean period and the amplitude of the superorbital modulation. The result is similar to the recently discovered relationship between the superorbital cycle length and the mean X-ray flux for Her X-1.

The Fate of Extrasolar Minor Planets

Siyi Xu
(University of California, Los Angeles)

We report Spitzer IRAC observation of 14 white dwarfs which display evidence of being polluted by tidally-disrupted minor planets. The main results are: (i) about 50% heavily polluted warm (T>9,000K) white dwarfs have an infrared excess; and (ii) none of the polluted cool (T<9,000K) white dwarfs exhibit an infrared excess. We also identify the hottest white dwarf, PG 0843+517 (T=23,900K), to possess a close-in dust disk. We propose two distinctive modes of accretion onto white dwarfs. (1) Asteroids may be perturbed into the tidal radius and subsequently disintegrate into dust disks, which are accreted onto the white dwarf. (2) At least some disrupted comet-like objects are responsible for the polluted cool white dwarfs, perhaps following direct impact, without producing an infrared excess.

MEDIUM RESOLUTION SPECTRAL LIBRARY OF LATE-TYPE STELLAR TEMPLATES IN NEAR-INFRARED BAND

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We present medium resolution spectra in the near-infrared (IR) band 1.4-1.8um, at R = 5000-10000 of template stars in G, K, and M types observed by the echelle spectrometer, IRCS, at the SUBARU 8.2 m telescope. The identified lines of the template star spectra are done base on the reference of Arcturus. We measure the EWs of the features, and compare our results to Meyer et al. 1998. We conclude that our results are more accurate than Meyer results, and the studying of stellar spectra will have more efficiency results if the spectral resolution are equal or more than medium resolution (R >= 6000). From our results, we use the Mg (1.71113um) line to estimate approximate temperature for late-type stars. The library of the template stellar spectra in ASCII format are available to download on the World Wide Web.

**** 언론 매체 홍보 희망 여부***: 원함[ ], 원하지 않음 [√]**

*** 세간의 관심을 불러일으킬 만한 최신 연구결과를 널리 알리고 싶으시면 표시해 주시기 바랍니다. 홍보를 원할 경우 교육 및 홍보 위원회 (위원장 김석환)에서 개별적으로 접촉해서 도와줄 것입니다.

Registration number for JAP: pschool8-0005

The Relation of structure between The Red Giants and The Gas Giant Planets

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Equilibria and evolution of gravitating systems that consist of multi-components often appear in astrophysical problems. Especially, the behavior of two components gravitating systems with a core component at center and an envelope component extending around the core component, so-called core-halo structure, is important and can be applied in many astrophysical problems, such as formation and evolution of globular clusters or the clusters of galaxies. The typical example of core-halo structure is stellar structure of red giant phase. Such stellar structure can be well described by a double-polytrope model (Fujimoto &Tomisaka 1992). This model shows why red giant star has an structure expanding more than the main sequence stars of equivalent parameters.

In this study, we apply the double polytrope model to the formation and evolution of gas giant planets because they also have the core-halo structure. According to core accretion scenario, gas giant planets, such as Jupiter or Saturn, are formed by gas capture by the solid core which are formed through collision and merging of planetesimals. Planets formed in such a way have a structure which is composed of a solid core made of rock or ice and a gaseous envelope around rocky or icy core. This structure should be resembled red giant star.

As for the gas giant planets, it is known that if a planet has more massive core than a critical value, it causes a runaway accretion of gas onto the planets to form gas giant planets with gaseous massive envelope (Mizuno 1980; Bodenheimer & Pollack 1986). On the other hand, the double polytrope changes the structural behavior according to the mass ratio between the core and envelope; if the core is more massive than the envelope, the envelope structure is determined by the externally by the gravity of the core and expands as the mass of envelope increases, while otherwise, the envelope structure is dominated by the self-gravity and shrinks in radius as the envelope mass increases. In the poster, I discuss about the structure in common between red giant star and gas giant, and in particular, the relationship of the thermal nature of latter and the runaway accretion of gas giant planets.

Optical Identification of un-ID Fermi GeV sources

ChiaJung Chuang

In the 1990s, CGRO/EGRET opened a new window in the high energy (MeV to GeV). These optical counterparts of gamma-ray sources are Pulsars, Blazars, globular cluster and so on. Specially, they found some normal galaxies and normal galaxies emitted gamma ray. In order to understand gamma ray radiation process, optical identify become important. Fermi satellite launched in 2008 and improved sensitivity, wide field of view (>2 sr) and source location determination (<0.5'). Fermi team published 1451 gamma ray sources detected by LAT/Fermi in the First Fermi-LAT catalog (1FGL) and half of them (630 source) are un-identified. We pick up 16 targets from 1FGL based on energy larger than 1.5*10^11 erg/cm^2/s and higher galactic latitude for expecting these targets will be high fraction to be AGN/Blazars. In the first step, we use color method to pick up blue color to be some candidates in the LAT 95% error region by using LOT/Lulin and Sloan Digital Sky Survey-Data Release 8 (SDSS-DR8). Second step, we use variability method to find short variability in these candidates by using LOT/Lulin and the Pan-STARRs that is a project for wide-field image. The most brightness one (1FGL J1231.1-1140) in our list is possible a Millisecond pulsar (MSP) (Maeda et. al 2011), and the PSR J1231-1411 has X-ray emission detected by SUZAKU. In our data, we don't detected optical emission in this error region is about 7.44". In the future, we will check variability for J1231-1411 in the Fermi error region to confirm it's MSP and we will finish data analysis for these 16 targets to find possible type of gamma ray source.

Interstellar Dust Models towards some IUE Stars

Nisha Katyal

We use composite grain models to interpret the observed interstellar extinction for 48 stars observed by the International Ultraviolet Explorer (IUE) satellite. The sample includes stars with a range of various environments from dense clouds; HII regions to diffuse clouds. The composite grain model consists of a host silicate spheroid and inclusions of graphite. The extinction efficiencies for the composite grains are calculated using discrete dipole approximation (DDA) and are compared with the observed extinction curves derived from the IUE data.

Observations of far ultraviolet diffuse radiation from the Small Magellanic Cloud

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Abstract

We report the first observations of far ultraviolet (FUV: 1000 – 1150 Å) diffuse radiation from the Small Magellanic Cloud (SMC) obtained with the *Far Ultraviolet Spectroscopic Explorer (FUSE)*. We have adopted the data analysis method of Murthy & Sahnow (2004) for extraction of diffuse surface brightnesses from the *FUSE* spectra. The strength of FUV diffuse surface brightness in the SMC ranges from around 10^3 photons cm^{-2} s^{-1} sr^{-1} Å^{-1} to a maximum of 2.5×10^5 photons cm^{-2} s^{-1} sr^{-1} Å^{-1} at 1004 Å . The contribution of FUV diffuse emission to the total FUV radiation field was found to be 34% – 44% in the SMC with a maximum uncertainty of 30%. We also found that much less light is scattered in the FUV than at longer wavelengths with the stellar radiation going into heating the interstellar dust. The FUV diffuse fraction from the SMC is much higher than the Large Magellanic Cloud (LMC: Pradhan et al. 2010) which is attributed to the relatively higher value of albedo of SMC dust compared to the LMC dust and less number of hot stars in the SMC compared to the LMC. The FUV diffuse flux is also related to the Hα emission indicating that much of the Hα emission is dust scattered emission.

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Isophotal shapes of early-type galaxies to very faint levels

Laxmikant Chaware, Ajit K. Kembhavi, Russell Cannon, Ashish Mahabal, and S. K. Pandey

Abstract

Shapes of isopotes of early-type galaxies is important as they are correlated with the physical properties of the galaxies. In the poster we report on a study of isophotal shapes of a sample of 132 early-type galaxies (E/SO) to faint outer regions down to 0.1% of the sky brightness which is a first effort to study the isophotal shapes to such faint levels. The galaxies are from Large Format Camera fields (LFC) obtained using the Palomar 5 m Hale telescope, with integrated exposures ranging from 1 to 4 hours in SDSS r, i and z bands.

It has been observed that shape of isophotes of early-type galaxies often varies along the radius. In this study we derived average values of isophotal shape parameters in four different radial bins along the semi-major axis of a galaxy, instead of assigning a single global characteristic value of a parameter for the galaxy as done by the earlier researchers studying isophotal shapes. We obtained empirical fitting formulae for the probability distribution of the different isophotal parameters in each bin and investigated for a possible correlation of isophotal shape parameters with other global properties of galaxies and whether the correlation changes along the semi-major axis of the galaxy. The main finding of our study is that the isophotal shapes of inner regions of our sample galaxies are statistically different from the isophotal shapes observed at outer regions. This has important implications for theories of galaxy formation and evolution as it suggests that outer and inner part of the early-type galaxies might not have co-evolved.

VARIABILITY OF ULTRA-LUMINOUS X-RAY SOURCES

Soma Mandal(Taki Government College, Taki, West Bengal, India) and
Ranjeev Misra (Inter-University Center for Astronomy and Astrophysics, Pune, India)

ABSTRACT

We have chosen 30 nearby galaxies observed with *Chandra* for our analysis. We will analyze a sample of X-ray sources of these galaxies in the time scale 2-10 ksec and estimate their variance to study variability. We will also analyze individual sources and classify them according to their variability behavior. We will discuss our results and its implications.

XMM-Newton and Suzaku observations of AGN

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AGN are known to be variable in all wavebands and in all timescales with the largest amplitude variation in X-rays. There are several space missions e.g. Chandra, XMM-Newton, SWIFT, Suzaku which are dedicated to X-ray observations and have provided a wealth of discrete detail, yielding sensitive constraints on physical conditions in the emitting plasmas. Despite these observational details, the nature of the variability of AGN remains unknown. Understanding from theoretical considerations of turbulent accretion disks near black holes has been limited due to the highly uncertain nature of the non linear physics involved. On the other hand, the lack of systematic data over wide energy ranges has hindered an empirical understanding of the variability. In order to understand the variable behaviour of Active galactic Nuclei, we undertake a study that involves the study of fractional rms of a sample of AGN with well known black hole mass (by means of Reverberation Mapping technique)in order to study correlation between fractional rms, BH mass, X-ray luminosity, Bolometric luminosity and X-ray spectral shape. I have used XMM-Newton satellite data for this purpose.

Also, I have studied few individual sources using Suzaku and XMM-Newton data to determine their variability strength, cross correlation and time lags. The motivation is to study the energy dependent temporal properties like fractional rms and time lag as a function of energy for AGN with good quality data, to use the X-ray spectrum to constrain the number of spectral components and the type of components (e.g. Comptonization), to combine the spectral and timing study to obtain a self consistent radiative model.

ABSTRACT FOR JSPS-CPS SCHOOL POSTER PRESENTATION

TITLE : HI ABSORPTION TOWARDS NEARBY COMPACT RADIO SOURCES

AUTHORS: YOGESH CHANDOLA, S. K. SIROTHIA, D. J. SAIKIA

INSTITUTE : National Centre for Radio Astrophysics (NCRA-TIFR) , Pune, India -411007

ABSTRACT:

We present the results of Hi absorption measurements towards a sample of nearby Compact Steep-Spectrum (CSS) and Giga-Hertz Peaked Spectrum (GPS) radio sources, the CORALZ sample, using the Giant Metrewave Radio Telescope (GMRT). We observed a sample of 18 sources and find 7 new detections. These sources are of lower luminosity than earlier studies of CSS and GPS objects and we investigate any dependence of Hi absorption features on radio luminosity. Within the uncertainties, the detection rates and column densities are similar to the more luminous objects, with the GPS objects exhibiting a higher detection rate than for the CSS objects. The relative velocity of the blue-shifted absorption features, which are often due to jet-cloud interactions, are within ~ -250 km/ s and do not appear to extend to values over 1000 km /s seen for the more luminous objects. This could be due to the weaker jets in these objects, but requires confirmation from observations of a larger sample of sources. There appears to be no evidence of any dependence of Hi column density on either luminosity or redshift, but these new detections are consistent with the inverse relation between Hi column density and projected linear size.

Evidence of Two component flows around the Galactic black hole candidates during their outbursts.

Broja Dutta

It is already established in literature that Two component flow are necessary to explain the timing and spectral properties of black hole. We have studied the timing and spectral properties of a few Galactic black hole candidates (such as XTE J1550-564, GRO J1655-40, GX 339-4 etc.) during their outburst. We find that the spectral features of these black hole candidates could be clearly understood by a two component (Keplerian and sub-Keplerian) advective flow (TCAF). We choose the spectral data (PCA) from of the RXTE satellite and fit them quite satisfactorily using TCAF model and also calculate the disc parameters (Keplerian rate, the sub-Keplerian rate, shock location, inner edge of the Keplerian disc). From the timing analysis we find a systematic drifts (onset and in decline phase) in Quasi-Periodic Oscillations (QPOs) frequency during the outburst. This type of evolutions in QPO frequency was seen in the various black hole candidates such as GRO J1655-40, XTE J1550-564, GX 339-4 etc. We model the frequency drift with a propagatory oscillating shock solution where the post-shock region behaves as the Comptonized region. The smoothness of the variation of the QPO frequency over a period of weeks directly supports the view that it is due to the drifting of the Comptonizing region rather than the movements of a blob inside a differentially rotating disk. We conclude the presence of two independent component in the accretion flow.

Entropy changes in the clustering of galaxies in an expanding universe

Tabasum Masood, Naseer Iqbal, Mohammad Shafi Khan

KEYWORDS
Gravitational Clustering; Thermodynamics; Entropy; Cosmology

ABSTRACT
In the present work the approach-thermody- namics and statistical mechanics of gravitating systems is applied to study the entropy change in gravitational clustering of galaxies in an expanding universe. We derive analytically the expressions for gravitational entropy in terms of temperature T and average density n of the particles (galaxies) in the given phase space cell. It is found that during the initial stage of clustering of galaxies, the entropy decreases and finally seems to be increasing when the system attains virial equilibrium. The entropy changes are studied for different range of measuring correlation parameter b. We attempt to provide a clearer account of this phenomena. The entropy results for a system consisting of extended mass (non-point mass) particles show a similar behaviour with that of point mass particles clustering gravitationally in an expanding universe.

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Structure and Stability of X-Ray Irradiated Accretion Disk

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Abstract:

We present here the mathematical approach in calculating the structural changes which take place in the outer regions of the accretion disk due to X-ray irradiation. It is shown here that an X-ray source powered by accretion modifies the outer disc structure. Our calculations for the transition radius and Circularization Radius in case of various low mass X-ray binaries show that the X-ray irradiation becomes dominant after transition radius only in some binary systems.

Observations of Solar Chromosphere with Hinode

Kunwar Singh (Kwasan and Hida Observatories Faculty of Science)

Abstract

Hinode is a very potential mission to study the lower solar atmosphere with an unprecedented detail. The Solar Optical Telescope (SOT) onboard Hinode is a largest telescope ever flown in space. The SOT broadband filter image (BFI) has a temporal resolution of less than 5 s and spatial resolution of 150 km. This has led to many important findings, one of them is the discovery of chromospheric anemone jets in the solar chromosphere. The chromospheric anemone jets are ubiquitous in solar chromosphere and statistical studies show that the typical length, life time and energy of the chromospheric anemone jets are much smaller than the coronal events (e.g. jets/flares/CMEs). Among various observational parameters, the apparent length and maximum velocity shows good correlation. The velocity of chromospheric anemone jets is comparable to the local Alfvèn speed in the lower solar chromosphere. Since the discovery of chromospheric anemonejets by Hinode, several evidences of magnetic reconnection in chromospheric anemone jets have been found and these observations are summarized in this paper. These observations clearly suggest that reconnection occurs quite rapidly as well as intermittently in the solar chromosphere. Such processes would not arisein the solar chromosphere which is fully collisional and partially-ionized. So, it is unclear how the rapid and strongly time-dependent reconnection would occur in the solar chromosphere. It is quite likely that effects arising due to the partial ionization in the solar chromosphere could play an important role in driving such rapid, strongly time-dependent reconnection in the solar chromosphere.

Point Spread Function for Spitzer IRAC Mosaics for 2-D Decomposition of Lenticular Galaxy Images

Kaustubh Vaghmare (Inter-University Centre for Astronomy and Astrophysics)

Abstract:

On both the Hubble classification diagram and the deVaucouleur classification volume, one can see that the lenticular galaxies are placed between spirals and ellipticals. From an evolutionary point of view, this suggests that the lenticular galaxies are an intermediate stage between the spirals and elliptical galaxies. But is this viewpoint correct? Recent studies have indicated that the lenticular galaxies may be classified into “bright” and “faint” galaxies and the various correlations like Kormendy relation, photometric plane, etc are found to be different for these two classes of lenticular galaxies. Even the bar fraction has been found to be different for the two classes, it being larger in the case of the bright galaxies. A dependence on the environment of the galaxies has also been demonstrated i.e. dependence on whether a galaxy is a field galaxy or a member of a cluster. All these findings are strong hints that the lenticular galaxies are a class of their own with a diversified morphology depending upon their environment and formation history.

In order to determine the status of lenticular galaxies in the overall classification scheme, it is necessary to peform a detailed study of large sample of such galaxies. We have undertaken a mutliwavelength study of lenticular galaxies. An important part of this study is to perform a 2-D decomposition or surface photometry of these galaxies to determine the bulge properties. This will allow a comparison of the bulge properties to those of ellipticals and spiral galaxies. We will aslo be able to check for the occurence of pseudobulges and their relation to other morphological features. We propose to do this using images taken at 3.6 micron wavelength using the Infra Red Array Camera on board the Spitzer Space telescope. The severe undersampled nature of the data makes determination of the same quite difficult. We demonstrate that the PSFs provided by Spitzer Science Centre are not suitable for use of IRAC mosaics. We then present a method for modifying them to make them suitable.

Mid-Infrared counterparts of X-ray sources in NGC1399

Shalima Puthiyaveettil (IUCAA)

ABSTRACT

We have used archival Spitzer IRAC images to look for mid-infrared counterparts of 35 X-ray sources in the elliptical galaxy, NGC1399 and study their properties. The IRAC $F_{5.8}/F_{3.6}$ratio has been used to differentiate sources with AGN-like properties. We find that out of the 35 sources with X-ray spectra, 8 are AGN-like point sources. The SEDs of the sources are constructed using Spitzer data in conjunction with optical X-ray data from HST and *Chandra.*

Detection efficiency of planets in the low magnified gravitational microlensing events

Daisuke Suzuki *, for the MOA collaborations

Abstract

Until today, nearly 20 planets including unpublished events are found via gravitational microlensing method. This method allows us to detect planets of mass $< 10M_{\oplus}$ in orbits beyond the snow line. To know the mass distribution of the planets beyond the snow line is important because according to the core accretion planet formation model, gas giant planets are formed in this region through a rapid gas accretion phase.

A statistical analysis of high-mag events which are amplified more than 200(Gould et al. 2010) derived the planet frequency beyond the snow line, but their sample includes the only half of the planets found via gravitational microlensing. The rest of the planets were found in the low-mag events in which the source stars are amplified less than 100. Another statistical analysis using 10 planetary microlensing events(Sumi et al. 2010) derived the mass function slope, but the slope is not normalized and the estimation is at the range of planets mass for Neptune-mass to Jupiter-mass planets.

In order to know the details of the planet frequency at smaller mass region, we have to estimate the detection efficiency precisely. Here we introduce a new method for deriving the detection efficiency of planets in the low-mag events. To estimate the detection efficiency, we simulated the real time anomaly monitoring which are actually conducted in real time when we search for an anomaly in the latest lightcurve. In case an anomaly is found, we also simulated the follow-up observations. From these simulations, we found the detection efficiency of MOA-2009-BLG-266Lb, which is a $10M_{\oplus}$planet found in the low-mag event, is 10%. We also found that the slope of the detection efficiency at the smaller mass region than Neptune mass is steeper. We will apply this method to all the low-mag events observed by MOA-II 1.8m survey telescope at Mt. John University Observatory in New Zealand.

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RXTE Observations of LMXB XTE J1701-407; new possible outburst

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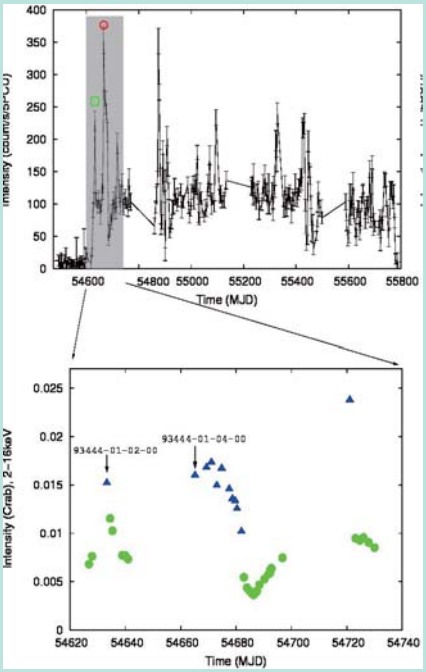
We report the detection of kHz quasi periodic oscillations (QPOs) in the Rossi X-ray Timing Explorer (RXTE) observations of the low mass x-ray binary (LMXB) XTE J1701-407. The source behaviour in the colour-colour diagram and its power spectra indicates the atoll nature of the source. The kilohertz QPOs were detected when the source was in a soft high-intensity state. A QPO of frequency 1156 ± 3.6 Hz was detected in one observation. The fractional root mean square (rms) of this QPO (~30%) is one of the highest observed amongst known atoll sources. Twin QPO peaks were detected twice in observations separated by ~two years. Their frequencies ~742 ± 3.4 Hz and ~1133 ± 8.9 Hz. The frequency difference of 372 ± 17Hz is one of the highest for known atoll sources and is same within errors in both the observations. Also the XTE J1701-407 is one of the least luminous LMXB observed (L_X~0.01 L_{EDD}) in which kHz QPOs have been detected. The ~30 Hz QPO detected in this source is not accompanied by broad components usually detected in other atoll as well as Z sources.



Light Curve

Figure 1: Upper panel : Long term light curve of XTE J1701-407 obtained from the PCA galactic bulge scan monitoring observations. The 39 pointed observations of year 2008 were obtained in the time between the dashed vertical lines. 15 more observations in were obtained till 2011 in a number of campaigns. The arrows mark the approximate time and intensity of the observations in which kHz QPOs are detected.

3 Year Outburst , and probably a new begins!!!

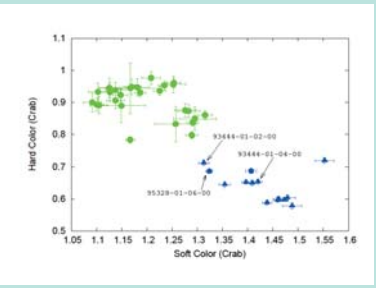
After a outburst of ~3years the source went into quiescence (below PCA detection level, see Atel #3604 of 2011/08/29) and within few days it was detected at ~142 cts/s/5PCU on 2011/09/16. This may be the beginning of a new outburst.

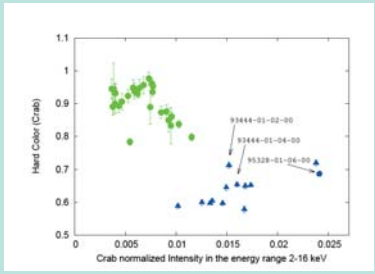
Crab Normalized Light Curve

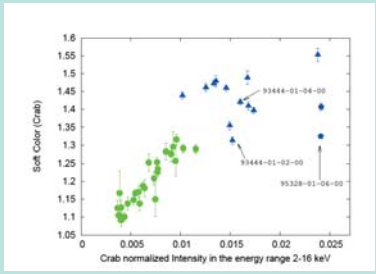
Figure 1: Lower panel : Crab normalized light curve of the 39 pointed observations of June to September 2008. The hard state observations are marked with green circles and soft state observations with blue triangles. The arrows mark the observations in which QPOs are observed.

Color-Color Diagram

Figure 3: Colour-colour diagram of XTE J1701-401 using the 41 pointed observations. Arrows point to the observations in which kHz QPOs are detected. The soft state observations are the blue triangles. The hard state observations are shown in green circles.

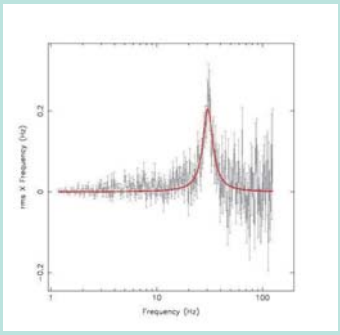






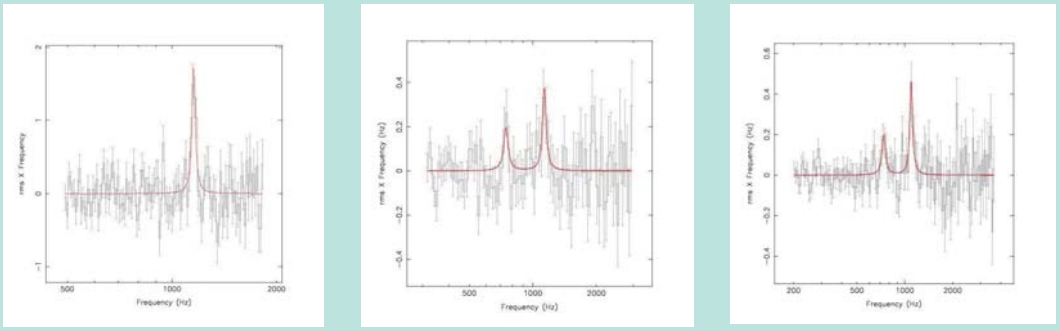
Color-Intensity Diagram

Figure 4: Right panel is the plot of the soft colour with Crab normalized intensity in the 2-16 keV energy range. Left panel is the plot of hard colour with Crab normalized intensity in the 2-16 keV energy range. In this plot the spectrum is seen to become softer as the Luminosity increases.



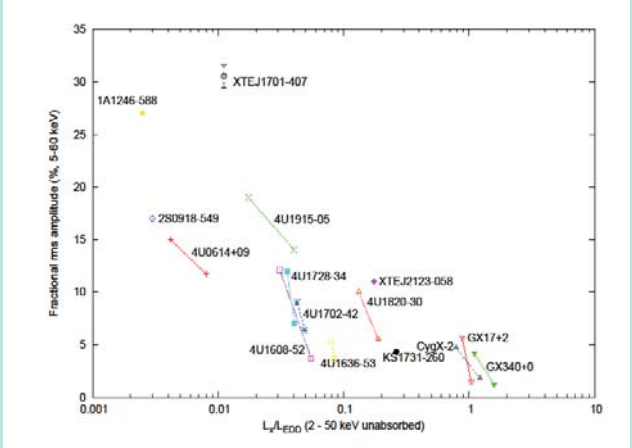
Quasi Periodic Observations

Figure 5: A ~30Hz QPO is detected in the observation 93444-01-02-00 dated 16th June 2008. This QPO is accompanied by a 1156Hz QPO (see first panel of Figure 6).



kHz Quasi Periodic Observations

Figure 6: KHz QPOs have been detected in three observations. The first panel shows a 1156Hz QPO detected in the observation 93444-01-02-00 dated 16th June 2008. In the observations 93444-01-04-00 dated 18th July 2008 and 95328-01-06-00 dated 17th August 2010 twin kHz QPOs were detected. The difference in the frequency of the twin kHz QPOs is ~370 Hz. It is interesting to note that the frequency difference is same (within errors) for the two observations separated by ~24 months. In case of the upper kHz QPO observed in 93444-01-04-00 (second panel), the root mean square (rms) amplitude is ~30% in the 5-60 keV energy range. This is the highest rms observed in a kHz QPO in a low mass X-ray binary.



Luminosity Vs fractional rms

Figure 7: Luminosity Vs fractional rms amplitude in the energy range 5 -60 keV of the upper kHz QPO in various LMXBs. There is a decrease in the fractional rms amplitude as the source luminosity increases, both within one source and between sources. In addition to the low luminosity atoll sources this plot also contains the following Z sources: Cygnus X-2, GX 17+2 and GX 340+0.

Low Mass X-ray Binary XTE J1701-407	
Discovery	8th June 2008
Co-ordinates	17h01m53s, -40o47'00''.96
Distance	4 to 6 kpc

Some references for XTE J1701-407:

The Swift Capture of a long X-ray burst from XTE J1701-407, Linares M., Wijnands R., van der Klis M., A. W., P.S.P.D.N.C., R. S., 2009, MNRAS

The new intermediete long bursting source XTE J1701-407, Falanga M., Cumming A., Bozzo E., Chenevez J., Mar. 2009, A&A, 496, 333

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ATel #3604; N. Degenaar, R. Wijnands, D. Altamirano (University of Amsterdam), et al.