The International Meeting on Eclipsing Binary Stars Systems

Shandong University, Weihai, China
September 28-29, 2024

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https://bsnp.info/International-Meeting-2
Meeting Location: Weihai Xuefu Hotel Golden Beach, No.130 North Huanhai Road, Gao District, Weihai, ShanDong, China

Oral Presentations

Searching for contact binary merging progenitors —— the analysis of extremely low mass ratio contact binaries

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Estimations by Kochanek et al. (2014) suggested that the stellar merging event happens roughly once every 10 yr in our Galaxy. However, only one confirmed contact binary merging event has been observed up to now; that is, V1309 Sco (Tylenda et al. 2011). Theoretical studies have proposed that contact binaries exhibit a low mass ratio cutoff and will merge into fast-rotating single star due to the Darwin instability (e.g., Rasio 1995; Li & Zhang 2006; Arbutina 2007, 2009; Jiang et al. 2010; Wadhwa et al. 2021, 2024). The research on contact binaries with extremely low mass ratios is very essential to search for the progenitors of contact binary merger and analyze the low-mass ratio limit. This talk will present the analysis of extremely low mass ratio contact binaries carried out by our research group during the recent years.

Are estimations of absolute parameters of contact binary systems reliable with photometric results?

Atila Poro (BSN Project & Raderon AI Lab., Canada)
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Contact binary system investigations have a variety of major objectives, one of which is to estimate the absolute parameters. The accuracy of these estimations is significant for investigating the evolution of contact systems and parameter relationships. There are various methods used to estimate the absolute parameters. In many studies, either empirical relations or Gaia parallax are used for this purpose. The empirical relationships of the parameters are obtained from the samples; But how reliable are these samples, whose content is mostly from systems analyzed only with photometric data? This is an important question that will show how accurate the empirical relationships are. On the other hand, there are serious limitations for estimating absolute parameters using Gaia parallax. Also, in recent years, the use of the MCMC method for light curve solutions has increased, which has a direct impact on the results of estimating absolute parameters. Has the MCMC method been used correctly in studies so far?

New Catalog of Am-type Chemically Peculiar Stars Based on LAMOST

Xiao-man Tian, Zhi-hua Wang, Li-ying Zhu and Xiao-Ling Yang
Presenter: Xiao-man Tian (Shandong Jiaotong University, Shandong, China)
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total of about 21,600 Am candidates were detected with the MKCLASS code based on the low-resolution spectra of the Large Sky Area Multi-Object Fiber Spectroscopic Telescope Data Releases 8 (v1.0), 9 (v0), and 10 (v0), which greatly expands the database of Am-type stars. By crossmatching the known catalogs of Am stars and our Am candidates with the AAVSO International Variable Star Index catalog, a catalog of the largest eclipsing Am binaries was obtained, which includes 754 binaries and provides a substantial sample with which to study Am stars. Fundamental information, including atmospheric parameters of the two kinds of candidates, are collected and listed in the catalogs, such as temperature, log g, and metallicity. We further carried out statistical analysis of the types of parameters. In our new catalog, there are some Am candidates with a temperature lower than 7000 K and some eclipsing Am binary candidates with a period of less than 1 day, which poses challenges to the slow rotation of stars classified as type Am observed in previous research. These candidates are significant and provide a great opportunity to explore the real relationship between Am-type stars' peculiarity and slow stellar rotation. The Hertzsprung–Russell diagram of Am stars and the primary stars of eclipsing Am binary candidates indicate that a majority of the Am stars and almost all primary stars of binaries are in or around the main-sequence evolution stage.

Statistical and theoretical studies of W UMa-type contact binaries

Xu-Dong Zhang, Sheng-Bang Qian, Wen-Ping Liao
Presenter: Xu-Dong Zhang (School of Physics and Electronic Science, Guizhou Normal University, China)
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Period cut-off, minimum mass ratio and different evolutionary pathways for A/W subtype are three hotspots of W UMa-type contact binaries. Firstly, contact binaries with known orbital periods, mass ratios, masses, and radii are compiled, then a lower limit (0.15 d) of orbital period is obtained by studying the correlation among four physical parameters (orbital period P, mass ratio q, mass of primary star M1, and separation between two components a). Secondly, considering the excess in radius and luminosity of secondary components, radial density distribution is proposed and the mass–luminosity relation is investigated. Overluminosity in A-subtype is because the secondary components are evolved from initial more massive stars, while in W-subtype is due to energy transfer. Thirdly, a model is developed to establish the relationship between the critical gyration radius (k) of the primary component and the mass ratio (q) by considering the different dimensionless gyration radii of main-sequence stars with varying masses. The low mass ratio limit (qmin = 0.038 ∼ 0.041 for overcontact degree f = 0 ~ 1) is obtained. Furthermore, the radial density distributions are estimated within the range of 0.3Msun ∼ 4.0Msun, based on the mass-radius relationship of main-sequence stars. Subsequently, the physical meaning of the minimum k value is proposed, which leads to an explanation for the cause of the minimum mass ratio. Finally, a stability criterion is proposed, which is based on both the mass ratio and the total mass of the two components.

A 0.33% calibration of the W UMa-type contact binary luminosity scale based on Gaia DR3

Jing Li, Xiaodian chen, Shu Wang, and Kun Wang
Presenter: Jing Li (China West Normal University, China)
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W Ursa Majoris (W UMa)-type contact binary systems (CBs) with period-luminosity (PL) relations are valuable statistical distance indicators. The PL relations of CBs are affected by metallicity. Here, we establish PL relations in nine bands from optical to mid-infrared (BP, G, RP, J, H, KS, $W1$, $W2$, $W3$) and period luminosity-metallicity (PLZ) relations in five composite bands based on Gaia parallaxes. The 3σ dispersion of PLZ relations gradually decreases from the optical to mid-infrared bands, with the minimum dispersion off 0.138 mag. We fit the best PL relations for three bands ($W1$, WG,BP,RP, $WW1$,BP,RP) under different parallax uncertainties and obtain a minimum parallax zero-point of zp = 24±4 μas. After fixing the parallax zero-point, wefindthe best PL relations with a parallax uncertainty of 2%, resulting in a calibration of CBs luminosity with 0.33% accuracy, which is more precise than Cepheid variables. These results indicate that CBs are excellent standard candles. Additionally, we find slight deviations in the PL relations within different metallicity ranges compared to the overall PL relations.

Measuring Tidal Friction in Short Period Binary Stars

Kaloyan Penev (University of Texas at Dallas, USA)
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Tidal friction plays an important role in shaping the orbits of binary stars and exoplanet systems with short orbital periods. However, the physical processes that produce this friction are currently not well understood, with multiple competing theoretical models in circulation. Our research group is taking advantage of the recent explosion of observational data to provide empirical measurements of tidal dissipation for comparison to theory and/or directly usable to calculate the tidal evolution of binary stars and exoplanet systems. I will present the gradually emerging picture of tidal friction in Sun-like stars from recent efforts by our group and others.

Deep Probabilistic Neural Network for Inverse Tidal Evolution

Torsha Majumder, Joshua A. Schussler, Kaloyan Penev
Presenter: Torsha Majumder (University of Lethbridge, Canada)
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Tidal forces impact the behavior of binary star systems, affecting their observable properties. An analysis of approximately 200 eclipsing binaries observed by the Kepler mission, combined with available stellar and orbital parameters, has led to a catalog suitable for studying the amount and properties of tidal dissipation. We will calibrate a tidal dissipation model to simultaneously allow the reproduction of the observed eccentricities of all systems and the period-eccentricity envelope of the entire population. We conduct an MCMC sampling to propagate the observational uncertainties to the final result, which requires a likelihood function to assess how well a given set of parameters aligns with observations. We use a numerical solver at each MCMC step to find the initial orbital period and eccentricity that match the present-day values in the Kepler catalog. However, the solver needs to run many evolutions, testing different initial conditions to reproduce the final values. To address this challenge, we developed a probabilistic deep neural network to provide reasonable estimates for the initial values, requiring fewer evolutions to find the correct initial values owing to faster solver convergence. We first transformed the standardized stellar and orbital parameters into a new latent space using a variational auto-encoder to extract new embeddings from the regression data set without lossy compression; it enables faster training and prevents vanishing gradients. Subsequently, a probabilistic neural network is modeled as an independent normal distribution, assuming non-linearity in the data to learn the statistical parameters, which we then used to estimate suitable initial guesses for the solver. This presentation will cover the data preprocessing methods implemented before the data transformation, the design and application of the variational auto-encoder and the non-linear probabilistic neural network, and an analysis of the results obtained in identifying suitable initial estimates of the parameters for the solver.

Radial differential rotation in close binaries with a pulsating sdB component

Weikai Zong; Xiao-Yu Ma; Wenchao Su; and Stephane Charpinet
Presenter: Weikai Zong (Beijing Normal University, China)
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Differential rotation is crucial for angular momentum transport, magnetic activity, and chemical mixing in stars. Recently, we discovered significant signatures of radial differential rotation in three pulsating sdB stars through asteroseismology. Analyzing Kepler and TESS photometry revealed that all three stars exhibit both gravity and pressure modes, which probe different depths of the internal structure. All three stars exhibit a faster rotation rate in their envelopes compared to their inner cores. Strong evidence suggests that tidal forces accelerate the envelopes, as all three stars are unsynchronous with their (close) orbits. These findings may open a new avenue for investigating angular momentum transport between orbit and rotation via tidal forces, which induce internal gravity waves in stars with radiative envelopes and convective cores.

EW-type Eclipsing Binaries from Sky Survey Data

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EW-type eclipsing binaries, both inside and outside our Galaxy, have been proved to be powerful tools for studying a wide range of astrophysical problems. They usually consist of F, G and K type stars and the component stars are embedded in a common envelope. Due to the strong interactions between the component stars, the formation and evolution scenario for EW-type eclipsing binaries are entirely different from those of single stars, and still remain to be an open issue. In this talk, we will present our recent research work on searching EW-type eclipsing binaries from sky survey data.

The First Light Curve Solutions of 23 Contact Binary Stars Using TESS Survey

Atila Poro, Esfandiar Jahangiri, Razieh Aliakbari, Elham Sarvari, Saeideh Ranjbaryan Iri Olya, and Mehmet Tanriver
Presenter: Esfandiar Jahangiri (BSN Project, Iran)
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We presented the first light curve analysis of 23 W Ursae Majoris (W UMa)-type contact systems with short orbital periods. Observational data from the Transiting Exoplanet Survey Satellite (TESS) is used in this investigation. We performed a light curve analysis using the PHysics Of Eclipsing BinariEs (PHOEBE) Python code and the Markov Chain Monte Carlo (MCMC) algorithm. Sixteen of the target systems required the addition of a starspot on one of the companions. The Gaia DR3 parallax was utilized to estimate the absolute parameters of these systems. According to each component's effective temperature and mass, it was recognized that ten of the systems are A-subtypes and thirteen are W-subtypes. We compared the results of our photometric mass ratio with a new method that estimates it using the third derivative of the light curve. The $\Delta a(R_{\odot})$ that is obtained by estimating absolute parameters using the parallax and light curve solutions of Gaia DR3 is discussed. We updated twelve two-dimensional empirical parameter relationships and displayed the positions of the target systems in the diagrams.

The Evolution of the Supersoft X-Ray Source WX Cen Dominated by Magnetic Wind

Lei Zang, Shengbang Qian
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WX Cen is most likely one of the Galactic counterparts of compact binary supersoft X-ray sources as a member of the V Sagittae class, in which mass is transferred from a donor secondary to a massive white dwarf primary via an accretion disk. Based on the photometric observations from the TESS space telescope and AAVSO database, 218 times of light minimum were determined. By collecting all available eclipse timings of WX Cen from the literature together with those newly determined, we constructed an O−C diagram and analyzed the variations in the orbital period of the eclipsing binary. It is confirmed that the orbital period is continuously decreasing. The white dwarf is more massive than the donor secondary. By considering a conservative mass transfer from the secondary to the primary, the orbital period of WX Cen should be increasing, which is opposite to the observed continuous decrease. Therefore, the decrease in the period can be plausibly explained as the result of angular momentum loss (AML) via magnetic wind from the secondary and/or from the accretion disk. The AML causes the donor secondary with a low mass to continually be filling its critical Roche lobe and transferring material to the white dwarf. In this way, the evolution of WX Cen is dominated by the magnetic wind and continuously radiating supersoft X-rays.

KIC 8840638: A new eclipsing binary consisting of δ Scuti-type oscillations

Taozhi Yang (Xi'an Jiaotong University, China)
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In this paper, we analyze the light variation of KIC 8840638 using high-precision time-series data from Kepler mission. The analysis reveals this target is a new detached Algol-type eclipsing binary system with a delta Scuti component, rather than a single delta Scuti star previously known. The frequency analysis of short-cadence data reveals 95 significant frequencies, most of which lie in a frequency range of 23-32 d^{-1}. Among them, seven independent frequencies are detected in the typical frequency range of delta Scuti stars and they are identified as pressure modes. In addition, a possible large separation value of Delta nu = 36.5(0.1) muHz is also detected with the Fourier transform and autocorrelation function analysis. The orbital frequency f_{orb} (=0.320008 d^{-1}) and its harmonics are also detected directly in the frequency spectrum. The binary modellings derived from PHOEBE indicate this binary system is in detached configurations with a mass ratio of q = {0.33}^{+0.06}_{-0.04}, an inclination angle of 40.19^{+3.96}_{-2.84} degrees. The derived parameters and binary evolutionary model suggest that the primary star is an object on the verge of leaving the main sequence with temperature 7600 K, while the secondary appears to be a cool component entering the giant branch, with a temperature 3100 K lower than the primary. Moreover, this system has undergone a mass ratio reversal, where the more massive star is the gainer component, and the less massive one is the donor star.

Periodic variable stars in ZTF and TESS

Xiaodian Chen, Shu Wang, Xinyi Gao
Presenter: Xiaodian Chen (NAOC, China)
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In the last five years, the number of periodic variable stars has increased by three million. We used the ZTF DR2 data to find and build a catalog that includes 780,000 periodic variable stars. These periodic variable stars were classified into 11 types, which greatly complemented the variable stars in Galactic disk. Based on the latest ZTF DR16 data, we found 2 million periodic variable candidates. We also found 0.3 million periodic variable candidates from TESS. In this presentation, we describe methods for identifying and classifying periodic variable stars. We will also present studies that can be carried out based on new samples of eclipsing binaries.

Study on the Mass Transfer and the Tidally Tilted Pulsators in Algol type Binary stars

Huiting Zhang, Shengbang Qian, Wenping Liao, Minyu Li
Presenter: Huiting Zhang (Yunnan University, China)
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The Algol type is a sime-detected binary where the secondary fills the Roche lobe and there is mass transfer from the secondary to the primary. The primary is a hot B or A type main sequence star 9000-15000K. The secondary is a cool giant or subgiant star (F-KIII/IV) 4000-6000K. Algol-type binaries are some of the best astrophysical laboratories for studying mass transfer and gas accretion. The physics of the mass transfer or accretion disc: The structures formed during accretion depend on the separation of the components, the radius of the primary, and the mass ratio. If the gainer is smaller than a certain size, the infalling material has too much angular momentum for the stream to directly impact the gainer. The mass flow misses the object and may collide with itself, changing its direction and feeding into a stable disk. This behavior usually occurs in long-period systems (P 6 days), which are called Long-period Algols (LPAs). The research significance of the Mass Transfer and the Tidally Tilted Pulsators in Algol type Binary stars: 1. The accretion disc may provide an explanation for the long-period variation observed in some double-period variables (DPVs). 2. The oscillating Eclipsing Algol (oEA) systems may be indicative of the truth behind the Tidally tilted pulsators (TTPs) observed in semidetached binaries.

Dynamical Effects in Massive Young Binary Stars

E. Budding, G. Inlek
Presenter: Edwin Budding (Carter Observatory, Wellington, New Zealand)
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Remarkable advances have been made in high-precision photometry with the advent of satellite-borne facilities. Such data have introduced new evidence; both unexpected and relating to effects that were thought about for long time. In the latter category, spin-axis precession may now be observable in massive young close binary systems. Applying appropriate analytical tools, we may test light curve modelling parameters and consider the ratio of orbital and precession periods. The modelling refers to the structure coefficients, familiar from apsidal motion studies, as well as the mechanical ellipticities of the components.

The study of orbital period variations in select W UMa-type binaries based on TESS observations

Jiang Lin-qiao, Li Chao-Yue, Wei Jie
Presenter: Jiang Lin-Qiao (Leshan Normal University, China)
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Orbital period variations are a common phenomenon in W UMa-type binaries, typically caused by mass transfer between components, the gravitational influence of distant stellar or substellar companions, among other factors. While TESS's primary mission is to search for exoplanets, it also provides a wealth of high-precision photometric data that can be used to study orbital period changes in W Uma-type binaries. In this study, we analyze a selection of W UMa-type binaries using TESS observations to investigate their orbital period variations and discuss the potential mechanisms driving these changes.

Gravitational waves and binary systems

Rosa Poggiani (University of Pisa, Italy)
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Gravitational wave emission has been detected in the mergers of compact binary systems (black hole-black hole, neutron star-neutron star, neutron star-black hole). Different classes of binary systems are gravitational sources in different bands of the gravitational spectrum. The presentation will discuss some case studies. The role of optical observations of binary systems will also be discussed.

A review of the significance of the role of third bodies in the formation and evolution of Close Binaries

Shanti Priya Devarapalli, Ravi Raja Pothuneni and Rukmini Jagirdar
Presenter: Shanti Priya Devarapalli (Osmania University, India)

Investigating the influence of a third body on the orbital stability of close binary systems is crucial for understanding their intricate dynamics. Understanding the role of third bodies is vital for resolving observational inconsistencies and can offer profound insights into the formation and evolution of the close binary systems. A close-in stellar component around a binary pair primarily affects the orbital evolution of the central binary system by extracting angular momentum from the system during early dynamical interactions or late evolution. In the present study, we present a statistical analysis of about one hundred and twenty short-period binaries (P_bin < 1 day) with the possible presence of a third body. These systems are well-studied with derived third body periods (~1 yr < P3 < 261 yr) and masses (~0.001 Msun - 3.2 Msun). The study also focuses on exploring the dynamic impact of third bodies on the orbital stability of close binary systems. Additionally, we intend to present the parameters and results of a few close binaries studied using ground-based observations and highlight the importance of precise photometric observations in accurately determining the orbital parameters of the third body.

Discovery of an Ultrashort-Period Contact Eclipsing Binary Based on LAMOST Time-Series Spectra and TESS Photometric Data

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Contact binaries with periods shorter than the period cutoff are extremely rare and serve as excellent astrophysical laboratories for studying phenomena such as binary star mergers, common envelope evolution, the origin of luminous red nova outbursts, and the formation of rapidly rotating single stars with potential planetary systems. In this work, we report the first discovery of an ultrashort-period contact binary with an orbital period of only 0.168 days, based on time-series spectra from LAMOST and photometric data from TESS. Radial velocities of the contact binary were derived from LAMOST spectra, and orbital period variations were analyzed using data from TESS and other ground-based photometric telescopes. Additionally, 19 intense stellar flare events were detected in the TESS photometric data, indicating strong magnetic activity in this unique ultrashort-period eclipsing binary.

Exoplanet Transit Database and TRESCA projects as a part of VarAstro, the new open network for variable star observation and research

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Well known Exoplanet Transit Database, launched more than 15 years ago, serves international community of amateur and professional observers and researchers in the field of exoplanetary research. I will present the current project components and fuctionalities, data use policies, current collaborations, and how it will be integrated into newly developed system "VarAstro" - an open network for variable star observation and research, if which I will give a short overview.

Workshop

Eclipsing Binary stars and their importance in Astronomical studies

Filiz KAHRAMAN ALICAVUS (Canakkale Onsekiz Mart University, Türkiye)
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The eclipsing binary systems are one of the valuable objects in astrophysical studies to comprehend the evolution and structure of stellar systems. These objects are key tools for estimating fundamental stellar parameters such as mass, radius with a significant accuracy. The precise fundamental stellar parameters are used for modeling the structure of stellar systems and their evolution hence to deeply understand these phenomena the eclipsing binaries are essential. In this talk, the importance of eclipsing binaries, their structure, and evolution will be presented. Additionally, steps of the detailed analysis of such systems will be introduced.

Pulsating variables – Effects of their presence in Eclipsing Binaries

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The intrinsic variables exhibit changes in their apparent magnitude caused by internal processes. The pulsating variables also show alterations in their lights because of energy accumulation in ionization zones inside the stars. As a result of deviation from hydrostatic equilibrium, they oscillate with the sound waves that go from the envelope to the deep layers of a star. Therefore, utilizing the pulsating variables, the interior structure of stars in different evolutionary statuses could be investigated. In this talk, the different type of pulsating variables, their importance on stellar examination, and the steps of their analysis will be introduced.

Pulsating Eclipsing Binaries and Applications on Their Analysis

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The existence of pulsating variables in eclipsing binary stars has been known for decades. They are significant laboratories for deeply understanding the interior structure of stellar systems. With the binary properties accurate fundamental stellar parameters, which are essential for precise theoretical modeling, could be obtained, in addition to oscillations that could go deep layers inside the star. Therefore, the attention paid to investigations of the pulsating variables in eclipsing binaries is significantly increasing. In this talk, information about the pulsating variables in eclipsing binaries and the application of their analysis will be given.

Poster Presentations

A photometric and spectroscopic study of semi-detached eclipsing binaries

Yajuan Lei, Guiping Zhou, Liang Wang, Guangwei Li, Kai Li, Tuan Yi
Presenter: YaJuan Lei (National Astronomical Observatories, Chinese Academy of Sciences, China)
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Semi-detached eclipsing binaries offer an exceptional opportunity to validate the evolutionary models of interacting binaries. This entails determining the absolute parameters and evaluating the evolutionary status of the binary components through simultaneous analysis of both light and radial velocity curves. The Transiting Exoplanet Survey Satellite (TESS) provides high-precision light curves, while the Large Sky Area Multi-Object Fiber Spectroscopic Telescope Medium-Resolution Spectroscopic Survey (LAMOST MRS) offers multiple epoch observations. The fusion of these data arises the chance to derive precise parameters for binaries. By cross-matching the eclipsing binary catalog from TESS with that from LAMSOT MRS, semi-detached eclipsing binaries with radial velocities coverage spanning more than 0.3 phases were authenticated. The absolute parameters for these systems were determined by simultaneous modeling of light curves and radial velocities using the Wilson-Devinney program. Additionally, the secular orbital variations were further analyzed using O-C curves.

The First Light Curve Analysis of the Total Eclipse Binary System EL Tuc

Elham Sarvari, Eduardo Fernández-Lajús, and Atila Poro
Presenter: Elham Sarvari (Independent astrophysics researcher, Iran)

We conducted the first light curve study of the binary star EL Tuc within the Binary Systems of South and North (BSN) Project framework. The photometric observations were made using standard multiband BV RcIc filters at an observatory in Argentina. We presented a new ephemeris for EL Tuc and a linear fit to the O-C diagram, utilizing our extracted times of minima and additional literature. We employed the PHysics Of Eclipsing BinariEs (PHOEBE) Python code and the Markov chain Monte Carlo (MCMC) approach for the system's light curve analysis. The target system's light curve solution required a cold starspot on the hotter component. We conclude that EL Tuc is a total contact binary system with a low mass ratio of q = 0.172 ± 0.002, an orbital inclination of i = 83.74 ± 0.40 degree, and a fillout factor of f = 53.7 ± 1.6%. We used the P − a relationship and the Gaia Data Release 3 (DR3) parallax method to determine the absolute parameters of EL Tuc to compare the precision of our results. This system was classified as W-type based on the mass and effective temperature of the companion stars. The positions of the systems were depicted on the M−L, M−R, T−M, and q−L_ratio diagrams. The relationship between the spectroscopic and photometric mass ratios of binaries was discussed.

Revisited Empirical Parameter Relationships Using a Largest Sample Contact Systems

Razieh Aliakbari, Esfandiar Jahangiri, Elham Sarvari, Atila Poro
Presenter: Razieh Aliakbari (Physics Society of Iran, Iran)
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We generated the largest bibliographic compilation of orbital and stellar parameters, including 1080 contact binary systems. Increasing the number of contact binary stars utilized in samples to examine the empirical relationships of parameters is one of the objectives of investigating new systems. We used a statistical study of the largest bibliographic compilation of stellar and orbital parameters sample presented by Latković et al. (2021). The sample of Latković et al. (2021) included 687 contact binary systems. So, we first checked all parameter values entered in this sample and corrected a number of typos in entering values. After we added new studies from the literature, the sample provided a total of 1080 contact binary systems. This new sample contains: system name, orbital period, dP/dt, light curve solutions' parameters (q, i, f, T1,2, r(mean1,2), absolute parameters (M1,2, R1,2, L1,2), presence or absence of third light, and starspot, system type (A or W), type of eclipse (partial or total), solver program, and type of observation (photometric or spectroscopic). We updated the two-dimensional (2D) parameter relationships of contact binary systems using the sample that was gathered.

The study on B-type stars with low mass ratio

Chang Linfeng, Qian Shengbang
Presenter: Chang Linfeng (Yunnan University, China)
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Early-type stars with faint companions are less explored due to observational difficulties. In such systems, the low-mass components contribute such a small flux to the total that their characteristics are hard to detect with ground-based telescopes. However, the development of space telescopes brings the chance to further study such pairs.

A Year Observing Binary Star Systems

Sabrina BAUDART (Société Astronomique de France, France)
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In this presentation, I will explore the fascinating world of eclipsing binary systems through the lens of a yearlong observational study. Focusing on a selection of systems I have meticulously observed, I will present their unique specifications, including orbital parameters, mass ratios, and luminosity variations. Each system presents its own set of challenges, particularly in analyzing the light curves that reveal the intricate dance of these stellar pairs. From irregular light variations to complex eclipse timings, these obstacles provide insight into the diverse nature of binary systems. By discussing the methods used to overcome these challenges, this presentation aims to shed light on the complexities and rewards of studying eclipsing binaries, offering both seasoned astronomers and enthusiasts a deeper understanding of these celestial phenomena.

Investigations on equatorial cool spot and period variations of contact binary UV Lyn and EF Boo

Wangjingjing, Guo meng
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The O'Connell effect and variations in light curves are often attributed to star-spots of magnetic activities, the photometric observations are important methods for investigations on spots. Based on these parameters of spots, we could studies on their evolution, migration, and explore the relations between spots activities and CCE/strucutre of binary, orbital period variations. W-subtype solar-like contact binary is important targets. From ground-based and space telescope, we obatined some light curves for UV Lyn and EF Boo, O'Connell effect and variations are found. These phenomena indicated that there are some magnetic activities on the surface of the components, and the observational results are importrant to acknowladge the time scale of O'Connell effect, dark spots. Based on the solutions by using W-D program, an equatorial cool spot on less massive component for UV Lyn, one on massive component for EF Boo were derived. The O'Connell effect variations maybe due to spot migrations along with time gradually. Furthermore, their orbital period show long-term increseing superimposed periodic oscillation. We also found there is no conrrelation between O'Connell effect and orbital period.

First Light Curve Analysis of the EM Tuc Contact Binary System

Sepideh Houshiar, Abbas Abedini, Atila Poro, Eduardo Fernández-Lajús
Presenter: Sepideh Houshiar (University of Qom, Iran)
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The short-period eclipsing binary EM Tuc's first photometric solutions are presented. These ground-based observations were made using the 2.15 m Jorge Sahade (JS) telescope at the southern hemisphere observatory Complejo Astronómico El Leoncito (CASLEO) Observatory in Argentina. We used B, V, R_c, and I_c filters. The times of minima of this system were extracted and compiled, and its O-C diagram was discussed. The PHysics Of Eclipsing BinariEs (PHOEBE) Python code and the Markov chain Monte Carlo (MCMC) approach were utilized for the light curve analysis. The light curve solution of this system required the addition of a cold starspot on the secondary component. We calculated the absolute parameters of the system using the Gaia DR3 parallax. The orbital angular momentum (J_0) of EM Tuc indicates that this system is located in a region corresponding to contact binaries. The position of this system in several experimental relationships of parameters showed that the results are in good agreement with them.