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YOUNG STARS IN THE CAMELOPARDALIS DUST AND MOLECULAR CLOUDS. V. MORE YSOs CONFIRMED SPECTROSCOPICALLY

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Abstract. Far red spectra for 22 stars in the Camelopardalis and the northern Perseus dark clouds, suspected to be pre-main-sequence objects (YSOs), are obtained. This evolutionary status is confirmed for ten stars located in the dust and molecular cloud close to the high-mass protostar GL 490, four stars near the H II region Sh2-205 and one star in the dark cloud TGU 1041. All of these objects exhibit emission in the Hα line and some of them emission in the O I and Ca II lines. The spectral energy distributions, equivalent widths of the emission lines and approximate spectral classes are determined. Evolutionary stages of the stars are estimated from 2MASS *J, H,* K_s, IRAS and MSX infrared photometry. Now we have spectral confirmation of the YSO status for 14 stars in the GL 490 area and 8 stars at Sh2-205. Their spectral types are from A to K, but most of them are either Herbig Ae stars or intermediate objects between T Tauri type and Herbig stars. Both these star forming regions are located near the outer edge of the Local arm at a distance of $\sim$900 pc.

Key words: stars: pre-main sequence – stars: emission-line – star-forming regions: individual (GL 490, Sh2-205)

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INTRINSIC COLOR INDICES AND LUMINOSITY SEQUENCES OF STARS IN THE 2MASS TWO-COLOR DIAGRAM

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Abstract. Intrinsic sequences of luminosity V and III stars in the J–H vs. H–K_s diagram of the 2MASS system are determined using about 1250 unreddened and dereddened stars. Intrinsic color indices for MK spectral classes are tabulated and compared with the results in other *JHK* systems.

Key words: stars: fundamental parameters – photometric systems: infrared, 2MASS

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PHOTOMETRY AND CLASSIFICATION OF STARS AROUND THE REFLECTION NEBULA NGC 7023 IN CEPHEUS. II. INTERSTELLAR EXTINCTION AND CLOUD DISTANCES

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Abstract. Interstellar extinction is investigated in a 1.5 square degree area in the direction of the reflection nebula NGC 7023 at $\ell = 104.1°$, $b = +14.2°$. The study is based on photometric classification and the determination of interstellar extinctions and distances of 480 stars down to $V = 16.5$ mag from photometry in the *Vilnius* seven-color system published in Paper I (2008). The investigated area is divided into five smaller subareas with slightly different dependence of the extinction on distance. The distribution of reddened stars is in accordance with the presence of two dust clouds at 282 pc and 715 pc, however in some directions the dust distribution can be continuous or more clouds can be present.

Key words: stars: fundamental parameters, classification – Galaxy: Cepheus Flare, NGC 7023 – ISM: extinction, clouds: individual (TGU 629)

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ON THE LATEST DEEP LIGHT DECLINE EVENT OF DY PERSEI

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Abstract. The behavior of DY Per during the latest deep decline event is studied on the basis of *BVRIJHKLM* photometry, low resolution near-infrared spectra and long-term photographic monitoring in red light. The relation of DY Per to RCB-type stars and to DY Per-like stars is discussed from the viewpoint of properties of their light variations. The spectral energy distribution of DY Per in the wavelength range 0.44–5.0 μm can be approximated by the sum of two blackbody distributions of $T = 2400$ K and 1700 K at light minimum of the deep decline event in 2004, and of $T = 2700$ K and 1100 K at light maximum. In the near infrared spectra at minimum light, CO bands at 1.6 μm and 2.3 μm have been identified. The long-term ($\sim$30 yr) photometric monitoring suggests that the depth of the regular light declines is modulated in time by a wavy function with a cycle length of $\sim$13 years.

Key words: stars: carbon, variables: RCB-type, DY Per-like – stars: individual (DY Per)

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HIGH-RESOLUTION SPECTROSCOPY OF THE METAL-POOR STAR HD 187216

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Abstract. Abundance analysis of the metal-poor, carbon-rich giant HD 187216 using high-resolution ($R \approx 45\,000$) spectrum was performed. An LTE abundance analysis was done for carefully selected clean atomic lines, using the Uppsala atmospheric model with $T_{\rm eff} = 4000$ K, $\log g = 0.75$, $\xi_{\rm t} = 2.8$ km s^{-1} and [Z] = –2.0. The mean metallicity [Fe/H] = –1.7 derived by using singly ionized iron lines is much higher than previously believed. It seems likely that Fe I lines, like many other neutral atomic lines, suffer from non-LTE effects that are significant at low metallicity and gravity. The abundances of the neutron capture elements are found to be enhanced by about 1.3 dex relative to the iron group elements. Possible causes of chemical peculiarities of HD 187216 are discussed.

Key words: stars: abundances, late-type, carbon – stars: individual (HD 187216)

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OPTICAL EVOLUTION OF THE OUTBURST OF THE SYMBIOTIC NOVA V4368 SGR = WAKUDA'S PECULIAR STAR

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Abstract. We present the complete V band light-curve of the outburst of V4368 Sgr over the 16 years elapsed since its onset in 1993, and provide also its B–V, R_C–I_C and V–I_C colors from CCD observations. Recent absolute spectrophotometry of the star is compared with earlier similar data. V4368 Sgr remained stable at optical maximum around $V = 10.26$ mag for four years, from 1995 to 1998, and since then very smoothly and slowly declined to $V = 11.65$ mag in 2009, still a whole 10 mag brighter than in quiescence, when it was below the $\sim$21.5 mag threshold of DSS-I ESO/SERC J and R plates. The spectrum over the last 15 years has kept its low ionization character, while the overall intensity of the emission lines (Balmer, He I, [O I], Fe II and [Fe II]) has increased by $\sim$10 times. This has been accompanied by a corresponding increase in intensity of the nebular continuum which has now almost overwhelmed the emission from the fading outbursting star. As at the time of maximum brightness, the emission lines in 2009 are still very sharp and with no P-Cyg absorption flanking them, indicating that mass loss from V4368 Sgr is keeping very low or absent, and no fast wind from the outbursting star has so far emerged.

Key words: stars: novae – stars: binaries: symbiotic, individual (V4368 Sgr)

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HIGH FREQUENCY LIMITS IN PERIODICITY SEARCH FROM IRREGULARLY SPACED DATA

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Abstract. Notions and limits from standard time series analysis must be modified when treating series which are measured irregularly and contain long gaps. The classical Nyquist criterion to estimate frequency range which is potentially recoverable must be modified to handle this more complex situation. While basic exposition of the modified criterion is given in earlier papers, some minor problems and caveats are treated here. Using simple combination of arguments we show that for small sample sizes the modified Nyquist limit may overestimate the obtainable frequency range. On the other hand, we will demonstrate that very high Nyquist limit values which are typical of irregularly sampled data can often be taken seriously and, using proper observational techniques, the frequency ranges for "time spectroscopy" can be significantly widened.

Key words: Methods: data analysis – numerical – statistical

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REGARDING THE POTENTIAL IMPACT OF DOUBLE STAR OBSERVATIONS ON CONCEPTIONS OF THE UNIVERSE OF STARS IN THE EARLY 17TH CENTURY

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Abstract. Galileo Galilei believed that stars were distant suns whose sizes, measured via his telescope, were a direct indication of distance – fainter stars (appearing smaller in the telescope) were farther away than brighter ones. Galileo argued in his *Dialogue* that telescopic observation of a chance alignment of a faint (distant) and bright (closer) star would reveal annual parallax, if such double stars could be found. This would provide support both for Galileo's ideas concerning the nature of stars and for the motion of the Earth. However, Galileo actually made observations of such double stars, well before publication of the *Dialogue*. We show that the results of these observations, and the likely results of observations of any double star that was a viable subject for Galileo's telescope, would undermine Galileo's ideas, not support them. We argue that such observations would lead either to the more correct conclusion that stars were sun-like bodies of varying sizes which could be physically grouped, or to the less correct conclusion that stars are not sun-like bodies, and even to the idea that the Earth did not move. Lastly, we contrast these conclusions to those reached through applying Galileo's ideas to observations of visible stars as a whole.

Key words: history of astronomy, Galileo

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SPECTRAL ANALYSIS OF YSOs AND OTHER EMISSION-LINE STARS IN THE NORTH AMERICA AND PELICAN NEBULAE REGION

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Abstract. Far red spectra for 34 stars with V magnitudes between 15 and 18 in the direction of the North America and Pelican nebulae (NAP) star-forming region are obtained. Some of these stars were known earlier as emission-line objects, others were suspected as pre-main-sequence stars from photometry in the *J, H,* K_s and *Vilnius* systems. We confirm the presence of the Hα line emission in the spectra of 19 stars, some of them exhibit also emission in the O I and Ca II lines. In some of the stars the Hα absorption line is filled with emission. To estimate their evolutionary status, the spectral energy distributions, based on *Vilnius*, 2MASS, MSX and *Spitzer* photometry, are applied. Only eight emission-line stars are found to be located at a distance of the NAP complex. Others are either chromospherically active stars in front of the complex or distant luminous stars with Hα absorption and emission components. For five stars with faint emission the data are not sufficient to estimate their distance. One star is found to be a heavily reddened K-supergiant located in the Outer arm. The stars, for which we failed to confirm the emission in Hα, are mostly red dwarfs located in front of the NAP complex, two of them could be binaries with L-type components. Taking into account the stars suspected to be YSOs by their 2MASS colors we conclude that the NAP complex can possess a considerable population of young stars hidden behind the dust cloud.

Key words: stars: pre-main sequence – stars: emission-line – star-forming regions: individual (North America, Pelican)

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EXTINCTIONS AND DISTANCES OF DARK CLOUDS FROM UGRIJHK PHOTOMETRY OF RED CLUMP GIANTS: THE NORTH AMERICA AND PELICAN NEBULAE COMPLEX

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Abstract. A possibility of applying 2MASS *J, H,* K_s, IPHAS *r, i* and MegaCam *u, g* photometry of red giants for determining distances to dark clouds is investigated. Red clump giants with a small admixture of G5–K1 and M2–M3 stars of the giant branch can be isolated and used in determining distances to separate clouds or spiral arms. Interstellar extinctions of background red giants can be also used for mapping dust surface density in the cloud.

Key words: ISM: dust clouds: individual (LDN 935) – stars: fundamental parameters (classification, colors) – photometric systems: 2MASS, IPHAS, MegaCam, Vilnius

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PHOTOMETRY AND CLASSIFICATION OF STARS IN THE DIRECTION OF THE DARK CLOUD TGU 619 IN CEPHEUS. I. A CATALOG OF MAGNITUDES, COLOR INDICES AND SPECTRAL TYPES OF 1304 STARS

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Abstract. The catalog contains magnitudes and color indices of 1304 stars down to ~ 16.6 mag in V measured in the seven-color *Vilnius* photometric system in the area of 1.5 square degrees with the center at Galactic coordinates 102.4°, +15.5°, containing the dark cloud TGU 619 in the Cepheus Flare. For most of the stars spectral and luminosity classes determined from the photometric data are given.

Key words: stars: fundamental parameters, classification – Galaxy: Cepheus Flare – ISM: clouds: individual (TGU 619)

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NLTE ABUNDANCES OF SODIUM, MAGNESIUM AND BARIUM IN THE GLOBULAR CLUSTERS M10 AND M71

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Abstract. We derive NLTE abundances of Na, Mg and Ba in four late-type giants belonging to globular clusters M10 and M71. The obtained relative [Na/Fe] ratios, which were measured only in M10, are positive, with the average value [Na/Fe] = +0.3. The ratios [Mg/Fe] in both clusters are supersolar, +0.15 to +0.28, while [Ba/Fe] scatter between –0.14 and +0.09. Differences between the NLTE abundances derived in this work and those obtained in LTE by Mishenina et al. (2003) are small, typically within ±0.1 dex. We also perform numerical simulations with the CO^{5}BOLD 3D hydrodynamical stellar atmosphere code to investigate the influence of convection on the formation of spectral lines used in our NLTE study. For this purpose we use a model of late-type giant with $T_{\rm eff}$ = 4020 K, $\log g$ = 1.0, [M/H] = –1.0 and find that for Na, Mg and Ba the 3D–1D abundance corrections are below $\sim$0.02 dex. However, their size strongly depends on the value of microturbulent velocity used with the 1D model.

Key words: stars: late-type – stars: abundances stars: atmospheres – globular clusters: individual: M10, M71 – techniques: spectroscopic

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CHAOS IN A DISK GALAXY MODEL INDUCED BY ASYMMETRIES IN THE DARK HALO

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Abstract. We study the regular or chaotic nature of motion in a disk galaxy with a dense nucleus and an asymmetric dark halo. Two cases, the 2D model and the 3D model, are investigated. In the 2D model, a considerable fraction of the phase plane is covered by chaotic orbits. Two factors seem to be responsible for the chaotic motion: (i) the dense nucleus and (ii) the asymmetries in the dark halo. Our numerical experiments suggest, that there are several chaotic components on the Poincaré phase plane. Different chaotic components are induced by the asymmetries in the halo. Each chaotic component seems to have a different value of the Lyapunov Characteristic Exponent, for small values of the asymmetry parameter λ and a unique LCE for larger values of λ. A comparison of the present results with outcomes from previous work is also presented.

Key words: galaxies: kinematics and dynamics – galaxies: star orbits: regular and chaotic motion, halos

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STARL – A PROGRAM TO CORRECT CCD IMAGE DEFECTS

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Abstract. We present a program tool, STARL, designed for automatic detection and correction of various defects in CCD images. It uses genetic algorithm for deblending and restoring of overlapping saturated stars in crowded stellar fields. Using Subaru Telescope Suprime-Cam images we demonstrate that the program can be implemented in the wide-field survey data processing pipelines for production of high quality color mosaics. The source code and examples are available at the STARL website.

Key words: methods: data analysis – techniques: image processing – surveys

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PROPERTIES OF RED GIANT BRANCHES OF STAR CLUSTERS IN THE MAGELLANIC CLOUDS AND THEIR RELATION WITH CLUSTER METALLICITY. II. MEAN PHOTOMETRIC COLORS OF CLUSTER RGBs

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Abstract. We derive new calibrations that relate the mean $J-K_s$ photometric colors of red giant branch (RGB) stars at $M_{K_s} = -5.5$ and -5.0 with cluster metallicity. The new calibrations are derived using a sample of intermediate age (1–8 Gyr) clusters in the Large and Small Magellanic Clouds, with the JHK_s photometry taken from the SIRIUS photometric survey of the Magellanic Clouds. Cluster metallicities are literature data, obtained either from the high resolution or infrared calcium triplet spectroscopy of individual RGB stars. We find systematic differences between the RGB color vs. metallicity relations derived in this work and those determined by Valenti et al. (2004), the latter ones obtained for a sample of old Galactic globular clusters. In terms of age, this discrepancy corresponds to ~ 5 Gyr and therefore can be attributed to the age difference between the two cluster samples used in the derivation of the corresponding RGB color vs. metallicity relations.

Key words: galaxies: Magellanic Clouds – galaxies: star clusters – star clusters: abundances – infrared: stars – techniques: photometric

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FLARE LOOP SIZES IN YOUNG SUNS

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Abstract. We analyse 27 solar flares observed with GOES and RHESSI in the X-ray bands at 3.1–24.8 keV and 12–25 keV and in $H\alpha$. The flaring region diameter in X-rays is found to correlate with the $H\alpha$ decay duration, and this correlation is used to approximate the flare loop semilength. We propose the method to measure the coronal loop semilengths in young solar-type stars by using the flare Hα decay durations. Assuming the standard plasma dynamics and no loop heating, for the loop semilength we obtain $\sim 10^{10}$ cm. The post-flare heating effect of a flare on a young solar-type star in the NGC 2547 cluster was also investigated in X-rays using the emission measures vs. temperature trajectories observed with XMM-Newton. Post-flare heating during the flare decay reduces the loop semilength by a factor of 2 to 10. The XMM-Newton data give approximately the same loop semilengths. Thus, in very young solar-type stars the flare loop semilengths could be comparable to stellar radii.

Key words: stars: flares, coronae – Sun: flares, corona

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17TH CENTURY PHOTOMETRIC DATA IN THE FORM OF TELESCOPIC MEASUREMENTS OF THE APPARENT DIAMETERS OF STARS BY JOHANNES HEVELIUS

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Abstract. The book *Mercurius in Sole Visus Gedani* published in 1662 by Johannes Hevelius contains a table of magnitudes and apparent telescopic diameters of nineteen stars. The data fit to a simple model, suggesting that Hevelius produced what is essentially a table of surprisingly precise photometric data.

Key words: history and philosophy of astronomy – techniques: photometric

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INTRODUCTION TO GAMMA-RAY BURSTS

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Abstract. Gamma-ray bursts are the most luminous explosions in the Universe. Even nowadays, almost four decades after their discovery, their origin is still not fully explained and remains the focus of intense research and debate. Milestones in observations and leading theoretical models of the prompt gamma-ray burst and its afterglow are reviewed.

Key words: gamma rays: bursts

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GLOBAL CHARACTERISTICS OF GAMMA-RAY BURSTS OBSERVED WITH INTEGRAL

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Abstract. The gamma-ray instruments on board INTEGRAL have detected and localized 62 gamma-ray bursts (GRBs) to date. The peak flux distribution of these bursts shows that INTEGRAL detects proportionally more weak GRBs than Swift because of its higher sensitivity in a smaller field of view. Spectral lags, i.e., the time delay in the arrival of low-energy gamma rays with respect to high-energy gamma rays, are measured for 31 of the GRBs. Two groups are identified in the spectral lag distribution of INTEGRAL GRBs, one with short lags < 0.75 s (between 25–50 keV and 50–300 keV) and one with long lags > 0.75 s. Most of the long-lag GRBs are inferred to have low redshifts because of their long spectral lags. They are mainly observed in the direction of the supergalactic plane and hence reflect the local large-scale structure of the Universe. This low-luminosity population appears to be distinct from typical cosmological GRBs.

Key words: gamma rays: bursts

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GAMMA-RAY BURSTS: CONNECTING THE PROMPT EMISSION WITH THE AFTERGLOW

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Abstract. With the early afterglow localizations of gamma-ray burst positions made by Swift, the clear delimitation of the prompt phase and the afterglow is not so obvious anymore. It is important to see weather the two phases have the same origin or they stem from different parts of the progenitor system. We will combine the two kinds of gamma-ray burst data from the Swift-XRT instrument (windowed timing and photon counting modes) and from BAT. A thorough desription of the applied procedure is given. We apply various binning techniques to the different data: Bayes blocks, exponential binning and signal-to-noise type of binning. We present a handful of flux curves and their possible applications.

Key words: gamma rays: bursts

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RELATIONSHIP BETWEEN THE GAMMA-RAY AND X-RAY DATA OF THE SWIFT GRBs

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Abstract. Using the canonical correlation analysis of the multivariate statistics we investigate the interrelation between the gamma-ray (the fluence, the 1 s peakflux and the duration) and the X-ray (the early flux, the flux after 24 hours, the decay index, the spectral index and the H I column density) data. By computing the canonical correlations and variables we show that there is a significant interrelation between the gamma-ray and the X-ray data. We computed the canonical loadings, i.e., the correlations of the canonical variables with the original ones. The canonical loadings reveal that the gamma-ray fluence and the early X-ray flux give the strongest contribution to the correlation in contrast to the X-ray decay index and spectral index. A strong contribution of the H I column density to the correlation is found. Accepting for the long GRBs the collapsar model, this effect may be interpreted as an indication for the ejection of a H I envelope by the progenitor during the GRB.

Key words: gamma rays: bursts – X-rays: bursts

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IMPACT ON COSMOLOGY OF THE CELESTIAL ANISOTROPY OF THE SHORT GAMMA-RAY BURSTS

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Abstract. Recently the anisotropy of the short gamma-ray bursts detected by BATSE was announced (Vavrek et al. 2008). The impact of this discovery on cosmology is discussed. It is shown that the anisotropy found may cause the breakdown of the cosmological principle.

Key words: cosmology – gamma-rays: bursts

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OPTICAL BIASES IN THE GRB REDSHIFT OBSERVATIONS

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Abstract. The measured redshifts of gamma-ray bursts (GRBs), detected by the Swift satellite, seem to be larger on average than the redshifts of GRBs detected by other satellites. We analyzed the redshift distribution of GRBs triggered and observed by different satellites (Swift, HETE2, BeppoSax and Ulysses). After considering the possible biases, a significant difference was found at the $p = 95.7\%$ level in the redshift distributions of GRBs measured by HETE and Swift.

Key words: cosmology – gamma-rays: bursts

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THE THIRD GROUP OF GAMMA-RAY BURSTS IN THE SWIFT AND BATSE DATA

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Abstract. Mukherjee at al. (1998) and Horváth (1998), using the BATSE gamma-ray observations on Compton GRO, have found a third component in the duration distribution of gamma-ray bursts. Here we compare the results coming from BATSE and Swift-BAT observations. Both satellite data confirm the presence of short, long and intermediate GRB groups of similar structure.

Key words: cosmology – gamma rays: bursts

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GAMMA-RAY BURST CLASSES FOUND IN THE RHESSI DATA SAMPLE

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Abstract. A sample of 427 gamma-ray bursts (GRBs), measured by the RHESSI satellite, is studied statistically to determine the number of GRB groups. Previous studies based on the BATSE Catalog and recently on the Swift data claim the existence of an intermediate GRB group, besides the long and short groups. Using only the GRB durations T_{90} and χ^2 or F-test, we have not found any statistically significant intermediate group. However, the maximum likelihood ratio test, one-dimensional as well as two-dimensional hardness vs. T_{90} plane, reveal the reality of an intermediate group. Hence, the existence of this group follows not only from the BATSE and Swift datasets, but also from the RHESSI results.

Key words: gamma rays: bursts

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A SEARCH FOR THE INTERMEDIATE SUBGROUP OF GAMMA-RAY BURSTS IN THE SWIFT DATASET

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Abstract. We have searched for the third, 'intermediate', subgroup of gamma-ray bursts among nearly 400 gamma-ray bursts observed by the Swift satellite. The standard χ^2 method and F-test were applied which give support for the existence of this subgroup.

Key words: gamma-rays: bursts

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SUZAKU OBSERVATION OF IGR J16318-4848

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Abstract. IGR J16318−4848 is the first example of a new class of highly absorbed X-ray binaries that has been discovered by INTEGRAL. We analyzed the first Suzaku observation of this source (2006 August 14–17), and obtained a spectrum that can be well described by an absorption model (TBabs) and a cutoff powerlaw, plus the Gaussians for the emission lines of Fe Kα, Fe Kβ and Ni Kα. The spectrum also shows a soft excess below 5 keV, which is probably due to a contaminating source (Ibarra et al. 2007). The flux curve varies significantly in hours; however the source remains always in a hard state, with very slight changes on the hardness ratio. Despite the large $N_{\rm H}$ we obtain in the fit to our model, no Compton shoulder is seen in the lines, arguing for a non-spherical and inhomogeneous absorber. The fit requires a slight overabundance of iron with respect to the ISM values of Wilms et al. (2000), as one would expect for an evolved star. Furthermore, the flux ratio of Fe and Ni also points towards a Ni overabundance by a factor of ~ 2 with respect to Fe. The spectral characteristics of the source suggest a neutron star as the compact object in the binary system.

Key words: stars: individual (IGR J16318−4848) – binaries: general – X-rays: binaries

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X-RAY EMISSION OF CATACLYSMIC VARIABLES OBSERVED BY INTEGRAL

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Abstract. Magnetic cataclysmic variables represent a significant fraction of all INTEGRAL detections in hard X-rays and soft gamma rays. Our deep survey of all known intermediate polars revealed five new sources, previously undetected by this mission. Our analysis, based on all available observational data from the IBIS and JEM-X instruments, has shown that the fluxes of some intermediate polars are long-term variable. Moreover, this hard X-ray and soft gamma-ray variability is correlated with changes in the optical. The broad-band spectra (3–100 keV) of surveyed intermediate polars can be fitted well by a thermal bremsstrahlung model, in some cases with the reflection from an optically thick cold medium (the surface of the white dwarf).

Key words: stars: binaries: cataclysmic – X-rays: stars, accretion, accretion disks –

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BLAZARS WITH INTEGRAL

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Abstract. The analysis of the INTEGRAL data for blazars, a specific class of the active galactic nuclei, is described. These objects are promising objects for observations by INTEGRAL, especially during their active states. A strategy for their future investigation is proposed and discussed.

Key words: galaxies: active, blazars – gamma rays: galaxies – space observatories: INTEGRAL

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CZECH PARTICIPATION IN INTEGRAL

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Abstract. The INTEGRAL gamma-ray observatory, launched in October of 2002, is the first astrophysical mission of the European Space Agency with the Czech participation. Here we present and discuss the results of our investigations of cataclysmic variables, blazars, X-ray sources and GRBs obtained during the first six years of the mission.

Key words: space vehicles: INTEGRAL – stars: cataclysmic variables – galaxies: active, BL Lacertae objects – X-rays: stars, galaxies – gamma rays: bursts

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CZECH PARTICIPATION IN IXO

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Abstract. The future space X-ray astronomy imaging missions require very large collecting areas at fine angular resolution and reasonable weight. The new substrates for X-ray mirrors such as silicon wafers and thin thermally formed glass enable wide applications of precise and very light weight (volume densities 2.3 to 2.5 $\mathrm{g\,cm^{-3}}$) optics. Here we describe the recent status of the Czech participation in the IXO space mission with emphasis on the development of new technologies and test samples of X-ray mirrors with precise surfaces, based on new materials, and their applications in space.

Key words: telescopes: X-ray – space vehicles: individual (IXO)

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LOW-DISPERSION SPECTROSCOPY: A COMPARISON OF THE GAIA AND OBJECTIVE-PRISM SURVEYS

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Abstract. The extremely low-dispersion spectroscopy to be implemented in the Gaia space observatory is compared with the ground-based objective-prism plate surveys. Although the dispersion in plate surveys usually is larger than in the Gaia BP/RP spectrometers, the spectral resolutions differ by a factor of 2–3 only, since the resolution of ground-based spectra is seeing-limited. This allows to consider that some of the algorithms developed for digitized objective-prism plates can be also applied for the Gaia spectra.

Key words: stars: fundamental parameters – techniques: spectroscopic – space vehicles (Gaia)

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GROND: A MULTI-CHANNEL IMAGER ON LA SILLA

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Abstract. A short overview of the 7-channel imager GROND, mounted on the MPG/ESO 2.2 m telescope on La Silla, Chile, is given. The imager was commissioned in 2007 and is primarily used for GRB afterglow observations.

Key words: instrumentation: photometers – gamma rays: bursts

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TESTS OF LOBSTER-EYE OPTICS FOR A SMALL X-RAY TELESCOPE

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Abstract. The lobster-eye design for the grazing incidence X-ray optics provides a wide field of view of the order of many degrees. For this reason it can be convenient for the construction of space all-sky X-ray monitors. Two experimental lobster-eye specimens, called P25 and P90, are described. These lobster eyes are built in simple modules, their length does not exceed 1 m and a future version can be held on a small satellite. The results of tests of these modules in visible light are presented.

Key words: space vehicles: instruments – X-rays: optics (lobster eye) – X-rays: telescopes

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TESTS OF IMAGING WITH LOBSTER-EYE X-RAY OPTICS AND MEDIPIX2 DETECTOR

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Abstract. The lobster-eye type of reflective X-ray optics provides a wide field of view and for this reason it can be a convenient approach for the construction of space all-sky X-ray monitors. The hybrid semiconductor pixel device Medipix2 is a single-particle counting detector of ionizing radiation with the photon energy above 3.5 keV. It has small dimensions (256×256 square pixels with a pitch of 55 μm) and low power consumption. The results of preliminary experiments with the Medipix2 detector and the lobster-eye optics are presented and discussed. Tests are performed with X-rays having a photon energy of about 8 keV. The field of view and the spatial resolution are determined. The dependence of the image distortion and the intensity on the source position is investigated.

Key words: space vehicles: instruments – X-rays: optics (lobster eye) – X-rays: telescopes

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BURST ALERT ROBOTIC TELESCOPE AND OPTICAL AFTERGLOWS

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Abstract. The Burst Alert Robotic Telescope (BART) is an autonomous observatory with a 25 cm telescope, dedicated to gamma-ray burst observations and monitoring the objects interesting for high energy astrophysics. The instrument has detected afterglows of the gamma-ray bursts GRB 060218 and GRB 060512.

Key words: gamma rays: bursts, observations – telescopes: robotic

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WEB-BASED APPROACH TO THE INTEGRAL DATA

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Abstract. Our extensive exploration of the INTEGRAL data in gamma and X-ray domains had two principal aims: to cover as many sources of chosen categories as possible (with sufficient upper limits of their fluxes) and to check for their eventual variability. This means treating a large number of time-resolved results that can be most easily approached using a web interface that allows to receive outputs with a few clicks. In this paper we describe details of such interface together with the parameters of the present content of the database behind it.

Key words: gamma-rays: bursts – space vehicles: INTEGRAL – variable stars: cataclysmic – galaxies: blazars

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SPECTRA IN THE DIGITIZED FIRST BYURAKAN SURVEY

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Abstract. The Digitized First Byurakan Survey (DFBS) is accessible on a dedicated web site at the Department of Physics of La Sapienza University. It covers about 17 000 square degrees and provides low resolution spectra of sources down to $B = 16.5$ mag. Both the digitized plates and the automatically extracted spectra can be retrieved. We present the main characteristics of the spectra and their relevance as proxies for the low dispersion spectra which will be provided by the forthcoming Gaia mission. Detectability of spectral features, overall spectral energy distribution and accuracy of the photometric information is briefly discussed.

Key words: surveys – techniques: spectroscopic

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MODELING OF ASTRONOMICAL IMAGES

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Abstract. A wavelet-based method is proposed for modeling a star image form when parameters of the imaging system are unknown. It is assumed that the PSF of whole system can be described by a two-dimensional Gaussian function with one parameter. The relation between this parameter and the shape of the probability density function of the wavelet coefficient is shown. This allows us to estimate the blur parameter directly from the image itself.

Key words: techniques: image processing, image modeling, point spread function, wavelet transform