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# Interacting Binaries

An Electronic Newsletter

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## 1 Editorial

Dear IB friends,

Welcome to the 32st edition of the Interacting Binaries Newsletter. First of all, apologies for the very long delay in getting this issue out to you, we will try hard to get back to a more regular routine. Nevertheless, we hope that this collection of abstracts will be useful, and please keep on sending us your abstracts, conference announcements, thesis summaries, job adds etc, and encourage your colleagues to join the mailing list.

As always: happy reading,

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## 2 Abstracts of refereed papers

### Two new intermediate polars with a soft X-ray component

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*Astronomy & Astrophysics, published (2008A&A...489.1243A)*

We analyze the first X-ray observations with XMM-Newton of 1RXS J070407.9+262501 and 1RXS 180340.0+401214, in order to characterize their broad-band temporal and spectral properties, also in the UV/optical domain, and to confirm them as Intermediate Polars. For both objects, we performed a timing analysis of the X-ray and UV/optical light curves to detect the white dwarf spin pulsations and study their energy dependence. For 1RXS 180340.0+401214 we also analyzed optical spectroscopic data to determine the orbital period. X-ray spectra were analyzed in the 0.2–10.0 keV range to characterize the emission properties of both sources. We find that the X-ray light curves of both systems are energy dependent and are dominated, below 3–5 keV, by strong pulsations at the white dwarf rotational periods (480 s for 1RXS J070407.9+262501 and 1520.5 s for 1RXS 180340.0+401214). In 1RXS 180340.0+401214 we also detect an X-ray beat variability at 1697 s which, together with our new optical spectroscopy, favours an orbital period of 4.4 hr that is longer than previously estimated. Both systems show complex spectra with a hard (up to 40 keV) optically thin and a soft (85–100 eV) optically thick components heavily absorbed by material partially covering the X-ray sources. Our observations confirm the two systems as Intermediate Polars and also add them as new members of the growing group of 'soft' systems which show the presence of a soft X-ray blackbody component. Differences in the temperatures of the blackbodies are qualitatively explained in terms of reprocessing over different sizes of the white dwarf spot. We suggest that systems showing cooler soft X-ray blackbody components also possess white dwarfs irradiated by cyclotron radiation.

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### RXTE determination of the intermediate polar status of XSS J00564+4548, IGR J17195–4100, and XSS J12270–4859

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*Astronomy and Astrophysics, Volume 487, Issue 1, 2008, pp.271-276, published (2008A&A...487..271B)*

Aims. We determine the nature of the intermediate polar candidates XSS J00564+4548, IGR J17195–4100, and XSS J12270–4859. Methods: Pointed RXTE observations searched for intermediate polar characteristics in these candidate systems. Results: XSS J00564+4548 exhibits a period of  $465.68 \pm 0.07$  s, which we interpret as the spin period, an energy dependent modulation depth, and a spectrum that is fit by a 22 keV photoelectrically absorbed bremsstrahlung with an iron line profile. IGR J17195–4100 shows several candidate periodicities and a spectrum that is fit by a power law with an iron line. XSS J12270–4859 exhibits a candidate spin period of  $859.57 \pm 0.64$  s and

a spectrum that is fit by a power law with no evidence of an iron line. Conclusions: XSS J00564+4548 is confirmed to be an intermediate polar. IGR J17195–4100 and XSS J12270–4859 both show some properties of intermediate polars, but cannot be confirmed as definite members of the class here.

*Download/Website:* <http://arxiv.org/abs/0806.0751>

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### **Circular polarization survey of intermediate polars I. Northern targets in the range $17^{\text{h}} < \text{R.A.} < 23^{\text{h}}$**

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*Astronomy and Astrophysics, in press (arXiv:0901.3516)*

**Context.** The origin, evolution, and ultimate fate of magnetic cataclysmic variables are poorly understood. It is largely the nature of the magnetic fields in these systems that leads to this poor understanding. **Fundamental properties,** such as the field strength and the axis alignment, are unknown in a majority of these systems. **Aims.** We undertake to put all the previous circular polarization measurements into context and systematically survey intermediate polars for signs of circular polarization, hence to get an indication of their true magnetic field strengths and try to understand the evolution of magnetic cataclysmic variables. **Methods.** We used the TurPol instrument at the Nordic Optical Telescope to obtain simultaneous UBVRi photo-polarimetric observations of a set of intermediate polars, during the epoch 2006 July 31 – August 2. **Results.** Of this set of eight systems two (1RXS J213344.1+510725 and 1RXS J173021.5–055933) were found to show significant levels of circular polarization, varying with spin phase. Five others (V2306 Cyg, AO Psc, DQ Her, FO Aqr, and V1223 Sgr) show some evidence for circular polarization and variation of this with spin phase, whilst AE Aqr shows little evidence for polarized emission. We also report the first simultaneous UBVRi photometry of the newly identified intermediate polar 1RXS J173021.5–055933. **Conclusions.** Circular polarization may be ubiquitous in intermediate polars, albeit at a low level of one or two percent or less. It is stronger at longer wavelengths in the visible spectrum. Our results lend further support to the possible link between the presence of soft X-ray components and the detectability of circular polarization in intermediate polars.

*Download/Website:* <http://arxiv.org/abs/0901.3516>

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### **RXTE confirmation of the intermediate polar status of IGR J15094–6649**

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*Astronomy and Astrophysics, submitted (arXiv:0901.3983)*

**Aims.** To establish the X-ray properties of the intermediate polar candidate IGR J15094–6649 and therefore confirm its inclusion into the class. **Methods.** 42856 s of X-ray data from RXTE was analysed. Frequency analysis was used to constrain temporal variations and spectral analysis used to characterise the emission and absorption properties. **Results.** A spin period of  $809.7 \pm 0.6$  s is present, revealed as a complex pulse profile whose modulation depth decreases with increasing X-ray energy. The spectrum is well fitted by either a  $19 \pm 4$  keV Bremsstrahlung or

Gamma= $1.8 \pm 0.1$  power law, with an iron emission line feature and significant absorption in each case. Conclusions. IGR J15094-6649 is confirmed to be an intermediate polar.

*Download/Website:* <http://arxiv.org/abs/0901.3983>

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### ULTRACAM observations of two accreting white dwarf pulsators

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*Monthly Notices of the Royal Astronomical Society, published (2009MNRAS.393..157C)*

In this paper we present high time-resolution observations of GW Librae and SDSS J161033.64-010223.3 (hereafter referred to as SDSS 1610) – two cataclysmic variables which have shown periodic variations attributed to non-radial pulsations of the white dwarf. We observed both these systems in their quiescent states with ULTRACAM on the VLT and the University of Cape Town Photometer on the SAAO 1.9m telescope, and detect the strong pulsations modes reported by previous authors. The identification of further periodicities in GW Lib is limited by the accretion-driven flickering of the source, but in the case of SDSS 1610 we identify several additional low-amplitude periodicities. In both sources we find the pulsation modes to be stronger in amplitude at bluer wavelengths. In the case of SDSS 1610, there is evidence to suggest that the two primary signals have a different colour dependence, suggesting that they may be different spherical harmonic modes. We additionally observed GW Lib during several epochs following its 2007 dwarf nova outburst, using ULTRACAM on the VLT and the Auxiliary Port Imager on the William Herschel Telescope. This is the first time a dwarf nova containing a pulsating white dwarf has been observed in such a state. We do not observe any periodicities, suggesting that the heating of the white dwarf had either switched-off the pulsations entirely, or reduced their relative amplitude in flux to the point where they are undetectable. Further observations eleven months after the outburst taken with RATCam on the Liverpool Telescope still do not show the pulsation modes previously observed, but do show the emergence of two new periodic signals, one with a frequency of  $74.86 \pm 0.68$  cycles/day ( $P = 1154$ s) and a  $g'$ -band amplitude of  $2.20\% \pm 0.18$ , and the other with a frequency of  $292.05 \pm 1.11$  cycles/day ( $P = 296$ s) and a  $g'$  amplitude of  $1.25\% \pm 0.18$ . In addition to the WD pulsations, our observations of GW Lib in quiescence show a larger-amplitude modulation in luminosity with a period of approximately 2.1 hours. This has been previously observed, and its origin is unclear: it is unrelated to the orbital period. We find this modulation to vary over the course of our observations in phase and/or period. Our data support the conclusion that this is an accretion-related phenomenon which originates in the accretion disc.

*Download/Website:* <http://uk.arxiv.org/abs/0810.5528>

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### On the apsidal motion of BP Vulpeculae

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*New Astronomy, in press (arXiv:0812.2363)*

BP Vulpeculae is a bright eclipsing binary system showing apsidal motion. It was found in an earlier study that it shows retrograde apsidal motion which contradicts theory. In this paper we present the first *BV* light curve of the system and its light curve solution as well as seven new times of the minima from the years 1959-1963. This way we could expanded the baseline of the investigation to five decades. Based on this longer baseline we concluded that the apsidal motion is prograde agreeing with the theoretical expectations and its period is about 365 years and the determined internal structure constant is close to the theoretically expected one.

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### How many cataclysmic variables are crossing the period gap? A test for the disruption of magnetic braking

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*Monthly Notices of the Royal Astronomical Society, published (2008MNRAS.389.1563D)*

We apply population synthesis techniques to calculate the present-day number of two types of white-dwarf main-sequence star (WDMS) binaries within the cataclysmic variable 2 to 3 h period gap. The first are post-common envelope binaries with secondary stars that have masses  $0.17 \leq M_2/M_\odot \leq 0.36$  (gap post- common envelope binaries; gPCEBs), such that they will commence mass transfer within the period gap. The second type are systems that were cataclysmic variables (CVs) at some point in their past, but detached once they evolved down in orbital period to  $\approx 3$  h as a consequence of disrupted magnetic braking, and are crossing the period gap via gravitational radiation (detached cataclysmic variables ;dCVs). Full population synthesis calculations are performed where we either assume constant, global values of the common envelope ejection efficiency,  $\alpha_{CE}$ , or consider  $\alpha_{CE}$  as a function of secondary mass. Several forms of magnetic braking are also considered. We predict an excess of dCVs over gPCEBs within the period gap of  $\approx 4$  to  $\approx 13$  assuming  $\alpha_{CE} = 0.1 - 0.6$ , and an initial mass ratio distribution of the form  $n(q) = 1$ . This excess is revealed as a prominent peak at the location of the period gap in the orbital period distribution of the combined gPCEB and dCV population. We suggest that if such a feature is observed in the orbital period distribution of an observed sample of short orbital period WDMS binaries, this would strongly corroborate the disruption of magnetic braking.

Download/Website: <http://uk.arxiv.org/abs/0805.4700>

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### Optical spectroscopy and photometry of SAX J1808.4–3658 in outburst

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*Monthly Notices of the Royal Astronomical Society, in press (arXiv:0901.3991)*

We present phase resolved optical spectroscopy and photometry of V4580 Sagittarii, the optical counterpart to the accretion powered millisecond pulsar SAX J1808.4–3658, obtained during the 2008 September/October outburst. Doppler tomography of the N III  $\lambda$ 4640.64 Bowen blend emission line reveals a focused spot of emission at a location consistent with the secondary star. The velocity of this emission occurs at  $324 \pm 15$  km s<sup>-1</sup>; applying a “K-correction”, we find the velocity of the secondary star projected onto the line of sight to be  $370 \pm 40$  km s<sup>-1</sup>. Based on existing pulse timing measurements, this constrains the mass ratio of the system to be  $0.044^{+0.005}_{-0.004}$ , and the mass function for the pulsar to be  $0.44^{+0.16}_{-0.13} M_{\odot}$ . Combining this mass function with various inclination estimates from other authors, we find no evidence to suggest that the neutron star in SAX J1808.4–3658 is more massive than the canonical value of  $1.4 M_{\odot}$ . Our optical light curves exhibit a possible superhump modulation, expected for a system with such a low mass ratio. The equivalent width of the Ca II H and K interstellar absorption lines suggest that the distance to the source is  $\sim 2.5$  kpc. This is consistent with previous distance estimates based on type-I X-ray bursts which assume cosmic abundances of hydrogen, but lower than more recent estimates which assume helium-rich bursts.

*Download/Website:* <http://uk.arxiv.org/abs/0901.3991>

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### The spectroscopic orbit and the geometry of R Aqr

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*Astronomy & Astrophysics, in press (arXiv:0804.4139)*

R Aqr is one of the closest symbiotic binaries and the only D-type system with radial velocity data suitable for orbital parameter estimation. The aims of our study are to derive a reliable spectroscopic orbit of the Mira component, and to establish connections between the orbital motion and other phenomena exhibited by R Aqr. We reanalyze and revise the velocity data compiled by McIntosh & Rustan complemented by additional velocities. We find an eccentric orbit ( $e = 0.25$ ) with a period 43.6 yr. This solution is in agreement with a resolved VLA observation of this system. We demonstrate that the last increase in extinction towards the Mira variable in 1974–1981 occurred during its superior, spectroscopic conjunction, and can be due to obscuration by a neutral material in the accreting stream. We also show that jet ejection is not connected with the orbital position.

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### XMM-Newton and Optical Observations of Cataclysmic Variables from SDSS

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*The Astronomical Journal, in press (arXiv:0901.1850)*

We report on *XMM-Newton* and optical results for 6 cataclysmic variables that were selected from Sloan Digital Sky Survey spectra because they showed strong HeII emission lines, indicative of being candidates for containing white dwarfs with strong magnetic fields. While high X-ray background rates prevented optimum results, we are able to confirm SDSSJ233325.92+152222.1 as an intermediate polar from its strong pulse signature at 21 min and its obscured hard X-ray spectrum. Ground-based circular polarization and photometric observations were also able to confirm SDSSJ142256.31-022108.1 as a polar with a period near 4 hr. Photometry of SDSSJ083751.00+383012.5 and SDSSJ093214.82+495054.7 solidifies the orbital period of the former as 3.18 hrs and confirms the latter as a high inclination system with deep eclipses.

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### New Complexities in the Low-State line profiles of AM Herculis

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*Astrophysical Journal, published (2008ApJ...688.1302K)*

When accretion temporarily ceases in the polar AM Her, the emission line profiles are known to develop several distinct components, whose origin remains poorly understood. The new low-state spectra reported here have a more favorable combination of spectral resolution ( $R \sim 4500$ ), time resolution ( $\sim 3$ -min exposures), and S/N than earlier work, revealing additional details of the orbital dependence of the line profiles. The central strong feature of H $\alpha$  is found to be composed of two components of similar strength, one having  $K \sim 100$  km sec<sup>-1</sup> and phased with the motion of the secondary star, the other having little or no detectable radial velocity variations. We attribute the central line component to gas near the coupling region, perhaps with a contribution from irradiation of the secondary star. The two satellite components have RV offsets of  $\sim \pm 250$  km sec<sup>-1</sup> on either side of the central strong H $\alpha$  peak. These satellites most likely arise in large loops of magnetically confined gas near the secondary star due to magnetic activity on the donor star and/or interactions of the magnetic fields of the two stars. Doppler maps show that these two satellite features have concentrations at velocities that match the velocity locations of L4 and L5 in the system.

Download/Website: <http://uk.arxiv.org/abs/0810.2551>

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### Observations of V592 Cas - An Outflow at Optical Wavelengths

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*Astronomical Journal, in press (arXiv:0810.3245)*

We present new red optical spectra of V592 Cas aimed at exploring the properties of the outflow of this system in a spectral region where the underlying white dwarf and the accretion disk do not contribute significantly to the observed absorption components of the H $\alpha$  and HeI line profiles. We use the H $\alpha$  emission line to study the wind, which appears as pronounced blueshifted P-Cygni absorption troughs whose low velocity end contaminates the blue side of the emission line profile. The wind appears to be episodic in nature, with multiple events reaching velocities of 5000 km/sec in H $\alpha$ . Similar (but weaker) wind signatures appear in the HeI 5876 Å line but are absent in HeI 6678 Å. Our data suggest that during wind episodes the wind is phase dependent and is visible for half the orbit of the system. Considering that V592 Cas is viewed almost face-on, the symmetry axis of the outflow can not be orthogonal to the disk and/or the outflow must have some other inherent asymmetry in outflow geometry. A possible origin of the wind is in a disk hotspot, either at the initial impact point of the accretion stream on the disk edge or as a result of disk overflow (similar to SW Sextantis stars). Simultaneous optical photometry during one night of our spectroscopic observations indicate that there is no clear relationship between the optical brightness variations and the strength of the outflow in this system.

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### Variation of fluxes of RR Tel emission lines measured in 2000 with respect to 1996

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*PASJ, in press (arXiv:0811.4557)*

The aim of this work is to make available unpublished non-Fe<sup>+</sup> emission line fluxes from optical spectra of the symbiotic nova RR Tel which were taken in 2000, and to compare them with fluxes of the same lines from spectra taken in 1996. After leaving out blends and misidentifications as well as the unreliable far-red and violet lines, we present the log(F<sub>2000</sub>/F<sub>1996</sub>) flux ratios for identified non-Fe<sup>+</sup> lines. Mean values of log(F<sub>2000</sub>/F<sub>1996</sub>) for different ionization potential ranges of the ions producing the lines are shown separately for the permitted and forbidden lines. All means show fading, which is larger in the lowest range of ionization potential. Provisional interpretations are suggested. We also measured the FWHM in 2000; the known decrease with time of lines due to the same ion has continued.

*Download/Website:* <http://uk.arxiv.org/abs/0811.4557> *Contact:* E-Mail of the responsible person

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### On the evolutionary status of short-period cataclysmic variables

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*Monthly Notices of the Royal Astronomical Society, published (2008MNRAS.388.1582L)*

We present high-speed, three-colour photometry of seven short period ( $P_{\text{orb}} \leq 95$  mins) eclipsing CVs from the Sloan Digital Sky Survey. We determine the system parameters via a parametrized model of the eclipse fitted to the observed lightcurve by  $\chi^2$  minimization. Three out of seven of the systems possess brown dwarf donor stars and are believed to have evolved past the orbital period minimum. This is in line with predictions that 40–70 per cent of CVs should have evolved past the orbital period minimum. Therefore, the main result of our study is that the missing population of post-period minimum CVs has finally been identified. The donor star masses and radii are, however, inconsistent with model predictions; the donor stars are approximately 10 per cent larger than expected across the mass range studied here. One explanation for the discrepancy is enhanced angular momentum loss (e.g. from circumbinary discs), however the mass-transfer rates, as deduced from white dwarf effective temperatures, are not consistent with enhanced angular momentum loss. We show it is possible to explain the large donor radii without invoking enhanced angular momentum loss by a combination of geometrical deformation and the effects of starspots due to strong rotation and expected magnetic activity. Choosing unambiguously between these different solutions will require independent estimates of the mass-transfer rates in short period CVs.

The white dwarfs in our sample show a strong tendency towards high masses. We show that this is unlikely to be due to selection effects. The dominance of high-mass white dwarfs in our sample implies that erosion of the white dwarf during nova outbursts must be negligible, or even that white dwarfs grow in mass through the nova cycle. Amongst our sample there are no Helium core white dwarfs, despite predictions that 30–80 per cent of short period CVs should contain Helium core white dwarfs. We are unable to rule out selection effects as the cause of this discrepancy.

*Download/Website:* <http://uk.arxiv.org/abs/0806.1129>

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### Binary Planetary Nebulae Nuclei towards the Galactic Bulge. I. Sample Discovery, Period Distribution and Binary Fraction

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*Astronomy & Astrophysics, in press (arXiv:0901.4419)*

Binarity has been hypothesised to play an important, if not ubiquitous, role in the formation of planetary nebulae (PNe). Yet there remains a severe paucity of known binary central stars required to test the binary hypothesis and to place strong constraints on the physics of the common-envelope (CE) phase of binary stellar evolution. Large photometric surveys offer an unrivalled opportunity to efficiently discover many binary central stars. We have combined photometry from the OGLE microlensing survey with the largest sample of PNe towards the Galactic Bulge to systematically search for new binaries. A total of 21 periodic binaries were found thereby more than doubling the

known sample. The orbital period distribution was found to be best described by CE population synthesis models when no correlation between primary and secondary masses is assumed for the initial mass ratio distribution. A comparison with post-CE white dwarf binaries indicates both distributions are representative of the true post-CE period distribution with most binaries exhibiting periods less than one day. An estimated close binary fraction of 12–21% is derived and is the first robust and independent validation of the prevailing 10–15% fraction estimated by Bond (2000). This suggests that binarity is not a precondition for the formation of PNe and that close binaries do not play a dominant role in the shaping of nebular morphologies. Systematic effects and biases of the survey are discussed with implications for future photometric surveys.

*Download/Website:* <http://arxiv.org/abs/0901.4419>

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### **Unveiling the nature of *INTEGRAL* objects through optical spectroscopy. VII. Identification of 20 Galactic and extragalactic hard X–ray sources**

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*Astronomy & Astrophysics, in press (arXiv:0811.4085)*

Within the framework of our program of assessment of the nature of unidentified or poorly known *INTEGRAL* sources, we present here spectroscopy of optical objects, selected through positional cross-correlation with soft X–ray detections (afforded with satellites such as *Swift*, *ROSAT*, *Chandra* and/or *XMM-Newton*) as putative counterparts of hard X–ray sources detected with the IBIS instrument onboard *INTEGRAL*. Using 6 telescopes of various sizes and archival data from two on-line spectroscopic surveys we are able to identify, either for the first time or independent of other groups, the nature of 20 *INTEGRAL* hard X–ray sources. Our results indicate that: 11 of these objects are active galactic nuclei (AGNs) at redshifts between 0.014 and 0.978, 7 of which display broad emission lines, 2 show narrow emission lines only, and 2 have unremarkable or no emission lines (thus are likely Compton thick AGNs); 5 are cataclysmic variables (CVs), 4 of which are (possibly magnetic) dwarf novae and one is a symbiotic star; and 4 are Galactic X–ray binaries (3 with high-mass companions and one with a low-mass secondary). It is thus again found that the majority of these sources are AGNs or magnetic CVs, confirming our previous findings. When possible, the main physical parameters for these hard X–ray sources are also computed using the multiwavelength information available in the literature. These identifications support the importance of *INTEGRAL* in the study of the hard X–ray spectrum of all classes of X–ray emitting objects, and the effectiveness of a strategy of multi-catalogue cross-correlation plus optical spectroscopy to securely pinpoint the actual nature of unidentified hard X–ray sources.

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### Analysis of the variability of the luminous emission line star Mwc314

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*Astronomy & Astrophysics, published (2008A&A...487..637M)*

Context: We investigate the surroundings of MWC314 in the framework of the study of hot emission line star environments using the SAC method. This star is either a B[e] supergiant or a luminous blue variable and appears to be extremely luminous and massive. Aims: We determine the structure and physical conditions of the emitting region and study possible variations. Methods: We measured the absorption and emission line radial velocities and the emission line fluxes on high-resolution spectra obtained with Aurelie at the 1.52 m Haute Provence telescope in July 1998, with Elodie at the 1.93 m Haute Provence Telescope at various epochs and with echelle spectrographs of the Asiago and Loiana observatories (Italy) in 2006. We used the statistical approach of the self absorption curve method (SAC) to determine physical parameters of the line emitting region. Results: We detected drastic variations of the photospheric absorption line radial velocities, while the emission line radial velocities appeared to be stable. The Cr II, Ti II and Fe II emission lines have a complex structure. They are double peaked and each has two 60 km/s separated components and is composed of a narrow and broad component, while the [Fe II] line components are narrower. The fit of the various components of the Fe II lines to a SAC curve indicates that some intensities are affected by self absorption. We obtained a Boltzmann type population law whose mean excitation temperature is 6500 K for the narrow component lower and upper levels. We obtained a Boltzmann type population law of 10500 K for the forbidden transition upper levels. Conclusions: From the absorption lines we confirm the binarity of MWC314. The periodicity has nevertheless to be improved with a higher sampling frequency. Our results from the emission lines are consistent with line formation in a rotating disk around a star. The typical minimum radius of the line emitting region obtained from the SAC study is  $3.5 \cdot 10^{13}$  cm ( $2.0 - 6.3 \cdot 10^{13}$  cm). We argue in the framework of a very simplified geometrical model that the [FeII] lines are formed further out than the permitted Cr II, Ti II and Fe II lines in a disk inclined  $25^\circ$  to the plane of the sky (error  $5^\circ$ ). If the rotation of the disk is Keplerian the Fe II lines are emitted in a zone between 0.4 and  $7 \cdot 10^{13}$  cm, while for rotation with conservation of angular momentum they are emitted from 0.4 to  $2 \cdot 10^{13}$  cm.

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### Post common envelope binaries from SDSS. IV: SDSSJ121258.25–012310.1, a new eclipsing system

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*Astronomy & Astrophysics, in press (arXiv:0901.2051v1)*

From optical photometry we show that SDSSJ121258.25–012310.1 is a new eclipsing, post common-envelope binary with an orbital period of 8.06 hours and an eclipse length of 23 minutes. We observed the object over 11 nights in different bands and determined the ephemeris of the eclipse to  $\text{HJD}_{\text{mid}} = 2454104.7086(2) + 0.3358706(5) \times E$ , where numbers in parenthesis indicate the uncertainties in the last digit. The depth of the eclipse is  $2.85 \pm 0.17$  mag in the V band,  $1.82 \pm 0.08$  mag in the R band and  $0.52 \pm 0.02$  mag in the I band. From spectroscopic observations we measured the semi-amplitude of the radial velocity  $K_2 = 181 \pm 3$  km/s for the secondary star. The stellar and

binary parameters of the system were constrained from a) fitting the SDSS composite spectrum of the binary, b) using a  $K$ -band luminosity-mass relation for the secondary star, and c) from detailed analyses of the eclipse light curve. The white dwarf has an effective temperature of  $17700 \pm 300$  K, and its surface gravity is  $\log g = 7.53 \pm 0.2$ . We estimate that the spectral type of the red dwarf is  $M4 \pm 1$  and the distance to the system is  $230 \pm 20$  parsec. The mass of the secondary star is estimated to be in the range  $M_{\text{sec}} = 0.26 - 0.29 M_{\odot}$ , while the mass of the white dwarf is most likely  $M_{\text{wd}} = 0.46 - 0.48 M_{\odot}$ . From an empirical mass-radius relation we estimate the radius of the red dwarf to be in the range  $0.28 - 0.31 R_{\odot}$ , whereas we get  $R_{\text{wd}} = 0.016 - 0.018 R_{\odot}$  from a theoretical mass-radius relation. Finally we discuss the spectral energy distribution and the likely evolutionary state of SDSS1212-0123.

*Download/Website:* <http://arxiv.org/abs/0901.2051>

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### Time-resolved optical observations of five cataclysmic variables detected by *INTEGRAL*

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*Monthly Notices of the Royal Astronomical Society, in press (arXiv:0901.2841)*

The ESA  $\gamma$ -ray telescope, *INTEGRAL*, is detecting relatively more intrinsically rare cataclysmic variables (CVs) than were found by surveys at lower energies. Specifically, a large fraction of the CVs that are *INTEGRAL* sources consists of asynchronous polars and intermediate polars (IPs). IP classifications have been proposed for the majority of CVs discovered by *INTEGRAL*, but, in many cases, there is very little known about these systems. In order to address this, I present time-resolved optical data of five CVs discovered through *INTEGRAL* observations. The white dwarf spin modulation is detected in high-speed photometry of three of the new CVs (IGR J15094-6649, IGR J16500-3307, and IGR J17195-4100), but two others (XSS J12270-4859 and IGR J16167-4957) show no evidence of magnetism, and should be considered unclassified systems. Spectroscopic orbital period ( $P_{\text{orb}}$ ) measurements are also given for IGR J15094-6649, IGR J16167-4957, IGR J16500-3307, and IGR J17195-4100.

*Download/Website:* <http://xxx.lanl.gov/abs/0901.2841>

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### Post Common Envelope Binaries from SDSS. V: Four eclipsing white dwarf main sequence binaries

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*Monthly Notices of the Royal Astronomical Society, in press (arXiv:0812.2510)*

We identify SDSS 011009.09+132616.1, SDSS 030308.35+005444.1, SDSS 143547.87+373338.5 and SDSS 154846.00+405728.8 as four eclipsing white dwarf plus main sequence (WDMS) binaries from the Sloan Digital Sky Survey, and report on follow-up observations of these systems. SDSS 0110+1326, SDSS 1435+3733 and SDSS 1548+4057 contain DA white dwarfs, while SDSS 0303+0054 contains a cool DC white dwarf. Orbital periods and ephemerides have been established from multi-season photometry. SDSS 1435+3733, with  $P_{\text{orb}} = 3$  h has the shortest orbital period of all known eclipsing WDMS binaries. As for the other systems, SDSS 0110+1326

has  $P_{\text{orb}} = 8$  h, SDSS 0303+0054 has  $P_{\text{orb}} = 3.2$  h and SDSS 1548+4057 has  $P_{\text{orb}} = 4.4$  h. Time-resolved spectroscopic observations have been obtained and the H $\alpha$  and CaII  $\lambda\lambda$  8498.02,8542.09,8662.14 triplet emission lines, as well as the NaI  $\lambda\lambda$  8183.27,8194.81 absorption doublet were used to measure the radial velocities of the secondary stars in all four systems. A spectral decomposition/fitting technique was then employed to isolate the contribution of each of the components to the total spectrum, and to determine the white dwarf effective temperatures and surface gravities, as well as the spectral types of the companion stars. We used a light curve modelling code for close binary systems to fit the eclipse profiles and the ellipsoidal modulation/reflection effect in the light curves, to further constrain the masses and radii of the components in all systems. All three DA white dwarfs have masses of  $M_{\text{WD}} \sim 0.4 - 0.6 M_{\odot}$ , in line with the expectations from close binary evolution. The DC white dwarf in SDSS 0303+0054 has a mass of  $M_{\text{WD}} \gtrsim 0.85 M_{\odot}$ , making it unusually massive for a post-common envelope system. The companion stars in all four systems are M-dwarfs of spectral type M4 and later. Our new additions raise the number of known eclipsing WDMS binaries to fourteen, and we find that the average white dwarf mass in this sample is  $\langle M_{\text{WD}} \rangle = 0.57 \pm 0.16 M_{\odot}$ , only slightly lower than the average mass of single white dwarfs. The majority of all eclipsing WDMS binaries contain low-mass ( $< 0.6 M_{\odot}$ ) secondary stars, and will eventually provide valuable observational input for the calibration of the mass-radius relations of low-mass main sequence stars and of white dwarfs.

*Download/Website:* <http://uk.arxiv.org/abs/0812.2510>

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## The defining characteristics of intermediate polars – the case of three-candidate systems

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Intermediate polars (IPs) are a group of cataclysmic variables (CVs) which are thought to contain white dwarfs which have a magnetic field strength in the range  $\sim 0.1-10$  MG. A significant fraction of the X-ray sources detected in recent deep surveys has been postulated to consist of IPs. Until now two of the defining characteristics of IPs have been the presence of high (and complex) absorption in their X-ray spectra and the presence of a stable modulation in the X-ray light curve which is a signature of the spin period, or the beat period, of the accreting white dwarf. Three CVs, V426 Oph, EI UMa and LS Peg, have characteristics which are similar to IPs. However, there has been only tentative evidence for a coherent period in their X-ray light curve. We present the results of a search for coherent periods in XMM-Newton data of these sources using an autoregressive analysis which models the effects of red noise. We confirm the detection of a  $\sim 760$  s period in the soft X-ray light curve of EI UMa reported by Reimer et al. and agree that this represents the spin period. We also find evidence for peaks in the power spectrum of each source in the range 100–200 s which are just above the  $3\sigma$  confidence level. We do not believe that they represent genuine coherent modulations. However, their X-ray spectra are very similar to those of known IPs. We believe that all three CVs are bona fide IPs. We speculate that V426 Oph and LS Peg do not show evidence for a spin period since they have closely aligned magnetic and spin axes. We discuss the implications that this has for the defining characteristics of IPs.

*Download/Website:* <http://arxiv.org/abs/0804.1223>

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### Post Common Envelope Binaries from SDSS - III. Seven new orbital periods

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We present follow-up spectroscopy and photometry of 11 post common envelope binary (PCEB) candidates identified from multiple Sloan Digital Sky Survey (SDSS) spectroscopy in an earlier paper. Radial velocity measurements using the NaI  $\lambda\lambda$  8183.27,8194.81 absorption doublet were performed for nine of these systems and provided measurements of six orbital periods in the range  $P_{\text{orb}} = 2.7 - 17.4$  h. Three PCEB candidates did not show significant radial velocity variations in the follow-up data, and we discuss the implications for the use of SDSS spectroscopy alone to identify PCEBs. Differential photometry confirmed one of our spectroscopic orbital periods and provided one additional  $P_{\text{orb}}$  measurement. Binary parameters are estimated for the seven objects for which we have measured the orbital period and the radial velocity amplitude of the low-mass companion star,  $K_{\text{sec}}$ . So far, we have published nine SDSS PCEBs orbital periods, all of them  $P_{\text{orb}} < 1$  d. We perform Monte-Carlo simulations and show that  $3\sigma$  SDSS radial velocity variations should still be detectable for systems in the orbital period range of  $P_{\text{orb}} \sim 1 - 10$  days. Consequently, our results suggest that the number of PCEBs decreases considerably for  $P_{\text{orb}} > 1$  day, and that during the common envelope phase the orbital energy of the binary star is maybe less efficiently used to expell the envelope than frequently assumed.

Download/Website: <http://uk.arxiv.org/abs/0808.2148>

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### Post common envelope binaries from SDSS. II: Identification of 9 close binaries with VLT/FORS2

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Post common envelope binaries (PCEBs) consisting of a white dwarf and a main sequence star are ideal systems to calibrate current theories of angular momentum loss in close compact binary stars. The potential held by PCEBs for further development of close binary evolution could so far not be exploited due to the small number of known systems and inhomogeneity of the sample. The Sloan Digital Sky Survey is changing this scene dramatically, as it is very efficient in identifying white dwarf/main sequence (WDMS) binaries, including both wide systems whose stellar components evolve like single stars and - more interesting in the context of close binary evolution - PCEBs. We pursue a large-scale follow-up survey to identify and characterise the PCEBs among the WDMS binaries that have been found with SDSS. We use a two-step strategy with the identification of PCEBs among WDMS binaries in the first phase and orbital period determinations in the second phase. Here we present first results of our ESO-VLT/FORS2 pilot-study that has the target of identifying the PCEBs among the fainter ( $g \gtrsim 18.5$ ) SDSS WDMS

binaries. From published SDSS catalogues we selected 26 WDMS binaries to be observed with ESO-VLT/FORS2 in service mode. The design of the ESO-VLT/FORS2 observations was to get two spectra per object separated by at least one night. We used the NaI  $\lambda\lambda$  8183.27,8194.81 doublet to measure radial velocity variations of our targets and performed additional follow-up spectroscopy using Magellan-Clay/LDSS3 of two systems showing significant radial velocity variations. Using a spectral decomposition/fitting technique we determined the white dwarf effective temperatures and surface gravities, masses, and secondary star spectral types for all WDMS binaries in our sample. Among the 26 observed WDMS binaries we find 9 strong PCEB candidates showing clear ( $\geq 3\sigma$ ) radial velocity variations, and we estimate the fraction of PCEBs among SDSS WDMS binaries to be  $\sim 35 \pm 12\%$ . We find indications for a dependence of the relative number of PCEBs among SDSS WDMS binaries on the spectral type of the secondary star. These results are subject to small number statistics and need to be confirmed by additional observations. The orbital periods of two PCEB candidates, SDSS J1047+0523 and SDSS J1414-0132, we measured to be 9.17 hrs and 17.48 hrs respectively. This pilot study demonstrates that our survey is highly efficient in identifying PCEBs among the SDSS WDMS binaries, and will indeed provide the observational parameters that are necessary to constrain the theoretical models of close binary evolution.

*Download/Website:* <http://uk.arxiv.org/abs/0709.4545>

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### Outburst characteristics of the dwarf nova V452 Cassiopeiae

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V452 Cas was thought to have rare outbursts, but monitoring from 2005 to 2008 has shown that the outburst interval is about one month and is weakly periodic. Observations of seven superoutbursts over the same period shows a very repeatable superoutburst period of  $146 \pm 16$  days. Time series photometry of the 2007 September superoutburst shows that the outburst reached magnitude 15.3 at maximum and had an amplitude of 3.2 magnitudes. The outburst lasted for 12 days. Early superhumps with an amplitude of 0.3 magnitudes and period of  $P_{sh}=0.08943(7)$  days gave way to superhumps with decreasing amplitude and  $P_{sh}=0.08870(2)$  days later in the outburst, corresponding to a continuous period change  $\dot{P}/P = -9(2) \times 10^{-4} \text{d}^{-1}$ . V452 Cas has one of the smallest outburst amplitudes and shortest superoutburst periods of typical UGSU systems.

*Download/Website:* <http://arxiv.org/abs/0805.1591>

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### SDSS J162718.39+120435.0 - a dwarf nova in the period gap

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SDSS J162718.39+120435.0 was suspected of being a dwarf nova from spectroscopic observations made available by the Sloan Digital Sky Survey. Photometry conducted during the 2008 outburst, the first ever outburst of this object detected and followed up in real time, shows that the outburst reached magnitude 14.6 at maximum, had an amplitude of 4.6 magnitudes and lasted for at least 18 days. Common superhumps were detected with an amplitude of up to 0.4 magnitudes, confirming it to be a member of the SU UMa family. Initially the superhump period, Psh, was 0.10993(7) days (2.638 hours), but it subsequently reduced to Psh=0.10890(9) days (2.614 hours) later in the outburst. The period change corresponds to the end of the plateau period of the outburst. The orbital period, Porb, was estimated from the two Psh values as between 0.1026d and 0.1016d, which places SDSS1627 near the centre of the period gap in the orbital period distribution of cataclysmic variables.

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### Transient jets in the symbiotic prototype Z Andromedae

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*Astrophysical Journal, published (2009ApJ...690.1222S/arXiv:0811.0158)*

We present development of the collimated bipolar jets from the symbiotic prototype Z And that appeared and disappeared during its 2006 outburst. We monitored the outburst with the optical high-resolution spectroscopy and multicolor  $UBVR_C$  photometry. In 2006 July, Z And reached its historical maximum at  $U \sim 8.0$ . After  $\sim 1$  mag decline in mid-August, it kept its brightness at a high level of  $U \sim 9$  up to 2007 January. During this period, rapid photometric variations with  $\Delta m \sim 0.06$  mag on the timescale of hours developed. Simultaneously, high-velocity satellite components appeared on both sides of the  $H\alpha$  and  $H\beta$  emission line profiles. Their presence was transient, being detected to the end of 2006. They were launched asymmetrically with the red/blue velocity ratio of 1.2–1.3. From about mid-August onward they became symmetric at  $\sim \pm 1200 \text{ km s}^{-1}$ , reducing the velocity to  $\sim \pm 1100 \text{ km s}^{-1}$  at their disappearance. Spectral properties of these satellite emissions indicated ejection of bipolar jets collimated within an average opening angle of  $6^\circ$ . If the jets were expelled at the escape velocity then the mass of the accreting white dwarf is  $M_{\text{WD}} \sim 0.64 M_\odot$ . We estimated the average outflow rate via jets to  $\dot{M}_{\text{jet}} \sim 2 \times 10^{-6} (R_{\text{jet}}/1 \text{ AU})^{1/2} M_\odot \text{ yr}^{-1}$ , during their August–September maximum, which corresponds to the emitting mass in jets,  $M_{\text{jet}}^{\text{em}} \sim 6 \times 10^{-10} (R_{\text{jet}}/1 \text{ AU})^{3/2} M_\odot$ . During their lifetime, the jets released a total mass of  $M_{\text{jet}}^{\text{total}} \approx 7.4 \times 10^{-7} M_\odot$ . Evolution in the rapid photometric variability and asymmetric ejection of jets around the

optical maximum can be explained by a disruption of the inner parts of the disk caused by radiation-induced warping of the disk.

*Download/Website:* <http://arxiv.org/abs/0811.0158>

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### Notices to investigation of symbiotic binaries. IV. Optical light curves from the near ultraviolet

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*New Astronomy, published (2009NewA...14..336S)*

The aim of this note is to reconstruct optical light curves (LC) from the near-UV fluxes of the ultraviolet spectra of symbiotic binaries during their quiescent phases. The method is based on the fact that the nebular component of radiation dominates the near-UV during quiescent phases and represents the main source of the light variability in the optical. We demonstrate this approach on example of two quiet symbiotic stars, SY Mus and RW Hya. Using their IUE spectra we determined  $U$  and  $B$  magnitudes in the standard Johnson system. Values derived from the near ultraviolet are fainter than those measured photometrically by  $\Delta U \approx 0.2$  and  $\Delta B \approx 0.4$ . This difference is due to emission lines.

*Download/Website:* [http://www.ta3.sk/astrskop/articles/NewA\\_14\\_336.pdf](http://www.ta3.sk/astrskop/articles/NewA_14_336.pdf)

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### Orbital periods of cataclysmic variables identified by the SDSS. V. VLT, NTT and Magellan observations of nine equatorial systems

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*Monthly Notices of the Royal Astronomical Society, published (2008MNRAS.391..591S)*

We present VLT and Magellan spectroscopy and NTT photometry of nine faint cataclysmic variables (CVs) which were spectroscopically identified by the Sloan Digital Sky Survey. We measure orbital periods for five of these from the velocity variations of the cores and wings of their H $\alpha$  emission lines. Four of the five have orbital periods shorter than the 2–3 hour period gap observed in the known population of CVs. SDSS J004335.14–003729.8 has an orbital period of  $P_{\text{orb}} = 82.325 \pm 0.088$  min; Doppler maps show emission from the accretion disc, bright spot and the irradiated inner face of the secondary star. In its light curve we find a periodicity which may be attributable to pulsations of the white dwarf. SDSS J163722.21–001957.1 has  $P_{\text{orb}} = 99.75 \pm 0.86$  min. By combining this new measurement with a published superhump period we estimate a mass ratio of  $q \approx 0.16$  and infer the physical properties and orbital inclination of the system. For SDSS J164248.52+134751.4 we find  $P_{\text{orb}} = 113.60 \pm 1.5$  min. The Doppler map of this CV shows an unusual brightness distribution in the accretion disc which would benefit from further observations. SDSS J165837.70+184727.4 had spectroscopic characteristics which were very different between the SDSS spectrum and our own VLT observations, despite only a small change in brightness. We measure  $P_{\text{orb}} = 98.012 \pm 0.065$  min from its narrow H $\alpha$  emission line. Finally, SDSS J223843.84+010820.7 has a comparatively longer period of  $P_{\text{orb}} = 194.30 \pm 0.16$  min. It contains a magnetic white dwarf and, with  $g = 18.15$ , is brighter

than the other objects studied here. These results continue the trend for the fainter CVs identified by the SDSS to be almost exclusively shorter-period objects with low mass transfer rates.

*Download/Website:* <http://uk.arxiv.org/abs/0809.1753>

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### **Orbital periods of cataclysmic variables identified by the SDSS. IV. SDSS J220553.98+115553.7 has stopped pulsating**

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*Monthly Notices of the Royal Astronomical Society, published (2008MNRAS.388..709S)*

We present VLT and Magellan spectroscopy and NTT photometry of nine faint cataclysmic variables (CVs) which were spectroscopically identified by the Sloan Digital Sky Survey. We measure orbital periods for five of these from the velocity variations of the cores and wings of their H $\alpha$  emission lines. Four of the five have orbital periods shorter than the 2–3 hour period gap observed in the known population of CVs. SDSS J004335.14–003729.8 has an orbital period of  $P_{\text{orb}} = 82.325 \pm 0.088$  min; Doppler maps show emission from the accretion disc, bright spot and the irradiated inner face of the secondary star. In its light curve we find a periodicity which may be attributable to pulsations of the white dwarf. SDSS J163722.21–001957.1 has  $P_{\text{orb}} = 99.75 \pm 0.86$  min. By combining this new measurement with a published superhump period we estimate a mass ratio of  $q \approx 0.16$  and infer the physical properties and orbital inclination of the system. For SDSS J164248.52+134751.4 we find  $P_{\text{orb}} = 113.60 \pm 1.5$  min. The Doppler map of this CV shows an unusual brightness distribution in the accretion disc which would benefit from further observations. SDSS J165837.70+184727.4 had spectroscopic characteristics which were very different between the SDSS spectrum and our own VLT observations, despite only a small change in brightness. We measure  $P_{\text{orb}} = 98.012 \pm 0.065$  min from its narrow H $\alpha$  emission line. Finally, SDSS J223843.84+010820.7 has a comparatively longer period of  $P_{\text{orb}} = 194.30 \pm 0.16$  min. It contains a magnetic white dwarf and, with  $g = 18.15$ , is brighter than the other objects studied here. These results continue the trend for the fainter CVs identified by the SDSS to be almost exclusively shorter-period objects with low mass transfer rates.

*Download/Website:* <http://uk.arxiv.org/abs/0805.1110>

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### Cataclysmic Variables from SDSS VII. The Seventh Year (2006)

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*The Astronomical Journal, in press (arXiv:0901.3177)*

Coordinates, magnitudes and spectra are presented for 39 cataclysmic variables found in Sloan Digital Sky Survey spectra that were primarily obtained in 2006. Of these, 12 were CVs identified prior to the SDSS spectra (GY Cnc, GO Com, ST LMi, NY Ser, MR Ser, QW Ser, EU UMa, IY UMa, HS1340+1524, RXJ1610.1+0352, Boo 1, Leo 5). Follow-up spectroscopic observations of seven systems (including one from year 2005 and another from year 2004) were obtained, resulting in estimates of the orbital periods for 3 objects. The new CVs include two candidates for high inclination, eclipsing systems, 4 new Polars and three systems whose spectra clearly reveal atmospheric absorption lines from the underlying white dwarf.

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### Cataclysmic Variable Primary Effective Temperatures: Constraints on Binary Angular Momentum Loss

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*The Astrophysical Journal, in press (arXiv:0811.2447)*

We review the most decisive currently available measurements of the surface effective temperatures,  $T_{\text{eff}}$ , of white dwarf (WD) primaries in cataclysmic variables (CVs) during accretion quiescence, and use these as a diagnostic for their time averaged accretion rate,  $\langle \dot{M} \rangle$ . Using time-dependent calculations of the WD envelope, we investigate the sensitivity of the quiescent  $T_{\text{eff}}$  to long term variations in the accretion rate. We find that the quiescent  $T_{\text{eff}}$  provides one of the best available tests of predictions for the angular momentum loss and resultant mass transfer rates which govern the evolution of CVs. While gravitational radiation is completely sufficient to explain the  $\langle \dot{M} \rangle$  of strongly magnetic CVs at all  $P_{\text{orb}}$ , faster angular momentum loss is required to explain the temperatures of dwarf nova primaries (non-magnetic systems). This provides evidence that a normal stellar magnetic field structure near the secondary, providing for wind launching and attachment, is essential for the enhanced braking mechanism to work, directly supporting the well-known stellar wind braking hypothesis. The contrast in  $\langle \dot{M} \rangle$  is most prominent for orbital periods  $P_{\text{orb}} > 3$  hours, above the so-called *period gap*, where  $\langle \dot{M} \rangle$  differs by orders of magnitude, but a modest enhancement is also present at shorter  $P_{\text{orb}}$ . The averaging time which  $\langle \dot{M} \rangle$  reflects depends on  $\langle \dot{M} \rangle$  itself, being as much as  $10^5$  years for low- $\langle \dot{M} \rangle$  systems and as little as  $10^3$  years for high- $\langle \dot{M} \rangle$  systems. We discuss in some detail the security of conclusions drawn about the CV population in light of these time scales and our necessarily incomplete sample of systems, finding that, due to the time necessary for the quiescent  $T_{\text{eff}}$  to adjust, the consistency of measurements between different systems places significant constraints on possible long-timescale variation in  $\dot{M}$ . Measurements for non-magnetic systems above the period gap fall below predictions from traditional stellar wind braking prescriptions, but above more recent predictions with somewhat weaker angular momentum loss. We also

discuss the apparently high  $T_{\text{eff}}$ 's found in the VY Scl stars, showing that these most likely indicate  $\langle \dot{M} \rangle$  in this subclass even larger than predicted by stellar wind braking.

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### The decline in irradiation from the white dwarf in old novae

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*Astronomy and Astrophysics, Volume 483, Issue 2, 2008, pp.547-556, published (2008A&A...483..547T)*

**Aims.** We have investigated how a flux ratio analysis of the light curves of cataclysmic variables can be used to calculate the luminosity irradiating the secondary star in the classical novae QU Vul, V Per, DD Cir, DN Gem, V1432 Aql, and WY Sge. **Methods:** We undertook phase-resolved, near-infrared K band photometry of QU Vul and V Per. Using data from QU Vul we show how flux ratios taken between fiducial orbital phases in the light curves of irradiated CVs can be used to measure the degree of heating of the secondary star. We compared the heating effect obtained from flux ratio analysis with more formal modelling, or by measurements taken from the literature, and found good agreement. We used the results to determine how irradiation changes with time since the nova outburst. **Results:** The light curve of QU Vul shows the presence of two maxima in the K band, which are displaced from phase 0.25 towards the 0.5 phase position, as would be expected from heating of the inner face of the secondary star by radiation from hot primary. Nova V Per, on the other hand shows evidence for a hot spot on the accretion disc, and it would appear that heating of the inner face is not occurring. The results of the flux ratio analysis of the objects examined are plotted as a function of time since the nova explosions occurred. There is marginal evidence for a decline in flux with time since the outburst, superimposed on considerable scatter, which is likely to be caused by the different temperature reached in each nova explosion. The decline is consistent with the declines others have seen. We conclude that it is the decline in reprocessed irradiation from the cooling white dwarf alone, rather than a decline in mass transfer rate, that could be the cause of the decrease in optical brightness seen in old novae.

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### A planetary nebula around nova V458 Vul undergoing flash ionization

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*Astrophysical Journal Letters*, in press (arxiv:0810.0401)

Nova V458 Vul erupted on 2007 August 8th and reached a visual magnitude of 8.1 a few days later. H $\alpha$  images obtained six weeks before the outburst as part of the IPHAS galactic plane survey reveal an 18th magnitude progenitor surrounded by an extended nebula. Subsequent images and spectroscopy of the nebula reveal an inner nebular knot increasing rapidly in brightness due to flash ionization by the nova event. We derive a distance of 13 kpc based on light travel time considerations, which is supported by two other distance estimation methods. The nebula has an ionized mass of  $0.2 M_{\odot}$  and a low expansion velocity: this rules it out as ejecta from a previous nova eruption, and is consistent with it being a  $\sim 14,000$  year old planetary nebula, probably the product of a prior common envelope (CE) phase of evolution of the binary system. The large derived distance means that the mass of the erupting WD component of the binary is high. We identify two possible evolutionary scenarios, in at least one of which the system is massive enough to produce a Type Ia supernova on merging.

Download/Website: <http://arxiv.org/0810.0401>

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### 3 Other abstracts

#### XSS J0056+4548 : a hard X-ray intermediate polar in the period gap

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*Astronomer's Telegram, published (2009, N.1895)*

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#### The 2008 February superoutburst of V452 Cas

*Christopher Lloyd*<sup>1</sup>, *Roger Pickard*<sup>2</sup>, *Jeremy Shears*<sup>3</sup>, *Ian Miller*<sup>4</sup>, *David Boyd*<sup>5</sup>, *Steve Brady*<sup>6</sup>

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*Open European Journal on Variable Stars, published (2008OEJV...90...1L)*

Abstract: Observations of the 2008 February outburst of V452 Cas show that the profile, duration and magnitude at maximum were very similar to the previous superoutburst in 2007 September. Low-amplitude variations consistent with previously observed superhumps were also seen.

Download/Website: <http://arxiv.org/abs/0809.0472>

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#### The Physics of Wind-Fed Accretion

*Christopher W. Mauche*<sup>1</sup>, *Duane A. Liedahl*<sup>1</sup>, *Shizuka Akiyama*<sup>2</sup>, *Tomasz Plewa*<sup>3</sup>

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*In "Cool Discs, Hot Flows: The Varying Faces of Accreting Compact Objects," ed. M. Axelsson (New York: AIP), published (2008AIPC.1054....3M)*

We provide a brief review of the physical processes behind the radiative driving of the winds of OB stars and the Bondi-Hoyle-Lyttleton capture and accretion of a fraction of the stellar wind by a compact object, typically a neutron star, in detached high-mass X-ray binaries (HMXBs). In addition, we describe a program to develop global models of the radiatively-driven photoionized winds and accretion flows of HMXBs, with particular attention to the prototypical system Vela X-1. The models combine XSTAR photoionization calculations, HULLAC emission models appropriate to X-ray photoionized plasmas, improved models of the radiative driving of photoionized winds, FLASH time-dependent adaptive-mesh hydrodynamics calculations, and Monte Carlo radiation transport. We present two- and three-dimensional maps of the density, temperature, velocity, ionization parameter, and emissivity distributions of representative X-ray emission lines, as well as synthetic global Monte Carlo X-ray spectra. Such models help to better constrain the properties of the winds of HMXBs, which bear on such fundamental questions as the long-term evolution of these binaries and the chemical enrichment of the interstellar medium.

Download/Website: <http://arxiv.org/abs/0806.1073>

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### Are the INTEGRAL Intermediate Polars Different?

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*A Population Explosion: The Nature & Evolution of X-ray Binaries in Diverse Environments. AIP Conference Proceedings, Volume 1010, pp. 230-234 (2008), published (2008AIPC.1010..230N)*

One of the biggest surprises of the INTEGRAL mission was the detection of large numbers of magnetic cataclysmic variables—in particular the intermediate polar (IP) subclass. Not only have many previously known systems been detected, but many new ones have also been found and subsequently classified from optical follow-up observations, increasing the sample of IPs by 15%. We have recently been using a particle hydrodynamic code to investigate the accretion flows of IPs and determine the equilibrium spin-rates and accretion flow patterns across a wide range of orbital periods, mass ratios and magnetic field strengths. We use the results of these accretion flow simulations to examine whether the INTEGRAL IPs differ from the overall population and conclude that they do not. Most IPs are likely to be INTEGRAL sources, given sufficient exposure. Currently however, none of the ‘EX Hya-like’ IPs, with large spin-to-orbital period ratios and short orbital periods, are detected by INTEGRAL. If this continues to be the case once the whole sky has a comparable INTEGRAL exposure, it may indicate that the ring-like mode of accretion which we demonstrate occurs in these systems is responsible for their different appearance.

*Download/Website:* [http://physics.open.ac.uk/~ajnorton/papers/florida\\_integral.pdf](http://physics.open.ac.uk/~ajnorton/papers/florida_integral.pdf)

*Contact:* A.J.Norton@open.ac.uk

### CHARA and e-VLBI observations of Algol

Paragi, Zs.<sup>1,7</sup> Csizmadia, Sz.<sup>2,7</sup> Borkovits, T.<sup>3</sup> Mosoni, L.<sup>4</sup> Sturmman, L.<sup>5</sup> Abraham, P.<sup>2</sup> Garrett, M. A.<sup>6</sup>

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*From Planets to Dark Energy: the Modern Radio Universe. Proceedings of Science, p.122, published*

We present first results from long baseline optical and radio interferometry observations of the Algol system. We probe the close binary in these different regimes with comparable resolution (milliarcsecond scales) with the CHARA and the e-EVN arrays.

*Download/Website:* <http://esoads.eso.org/abs/2007mru..confE.122P>

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## Observations of the cataclysmic variable SDSS J081321.91+452809.4

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*Open European Journal on Variable Stars, in press (arXiv:0812.2415)*

Our observations of the first reported outburst of SDSS J081321.91+452809.4 during 2008 April show that this cataclysmic variable is a dwarf nova. The outburst amplitude was at least 3.1 magnitudes and the outburst appears to have been rather short-lived at around 3 days with a rapid decline to quiescence of 0.73 mag/day.

*Download/Website:* <http://arxiv.org/abs/0812.2415>

*Contact:* bunburyobservatory@hotmail.com

## 4 As seen on astro-ph

As in the past, we compile here literature "as seen on astro-ph" that is relevant to binary star research, grouped under various headings. The list below covers the period from 18th April 2008 to 31st December 2008.

### 4.1 Cataclysmic Variables and other White Dwarf Binaries

astro-ph/0804.3126: **Photometric Studies of New Southern SU UMa-type dwarf novae, FL Triangulum Australe and CTCV J0549-4921** by *Akira Imada, et al.*

astro-ph/0804.3316: **Metallicity and effective temperature of the secondary of RS Oph** by *Ya.V.Pavlenko, et al.*

astro-ph/0804.3946: **The serendipitous discovery of a short-period eclipsing polar in 2XMMp** by *J.Vogel, et al.*

astro-ph/0804.4139: **The spectroscopic orbit and the geometry of R Aqr** by *M. Gromadzki, J. Mikolajewska*

astro-ph/0804.4791: **Detectability of gamma-ray emission from classical novae with Swift/BAT** by *F. Senziani, et al.*

astro-ph/0805.0115: **Binary Star Origin of High Field Magnetic White Dwarfs** by *C. A. Tout, et al.*

astro-ph/0805.0338: **SPH Simulations of Direct Impact Accretion in the Ultracompact AM CVn Binaries** by *Joshua Dotence, Matt A. Wood, Isaac Silver*

astro-ph/0805.0427: **Influence of Compton scattering on the broad-band X-ray spectra of intermediate polars** by *V. Suleimanov, et al.*

astro-ph/0805.1110: **Orbital periods of cataclysmic variables identified by the SDSS. IV. SDSS J220553.98+115553.7 has stopped pulsating** by *John Southworth, D W Townsley, B T Gaensicke*

astro-ph/0805.1372: **Transient Heavy Element Absorption Systems in Novae: Episodic Mass Ejection from the Secondary Star** by *Robert Williams, et al.*

astro-ph/0805.1444: **V4633 Sgr - a probable second asynchronous polar classical nova** by *Y. M. Lipkin, E. M. Leibowitz*

astro-ph/0805.1591: **Outburst characteristics of the dwarf nova V452 Cassiopeiae** by *Jeremy Shears, et al.*

astro-ph/0805.2540: **Helium Nova on a Very Massive White Dwarf – A Light Curve Model of V445 Puppis (2000) Revised** by *Mariko Kato, et al.*

astro-ph/0805.2724: **Chandra HETG line spectroscopy of the Non-magnetic Cataclysmic Variable SS Cyg** by *Shunsaku Okada, Ryoko Nakamura, Manabu Ishida*

astro-ph/0805.3108: **RR Pic (1925): A Chandra X-ray View** by *Y. Pekon, S. Balman*

astro-ph/0805.3608: **Discoveries of 3 K-shell Lines of Iron and a Coherent Pulsation of 593-sec from SAX J1748.2-2808** by *Masayoshi Nobukawa, et al.*

- astro-ph/0805.4111: **The 2006 November outburst of EG Aquarii: the SU UMa nature revealed** by *Akira Imada, et al.*
- astro-ph/0805.4289: **V405 Aurigae: A High Magnetic Field Intermediate Polar** by *V. Pirola, et al.*
- astro-ph/0805.4700: **How Many CVs are Crossing the Period Gap? A Test for the Disruption of Magnetic Braking** by *P. J. Davis, et al.*
- astro-ph/0806.0751: **RXTE determination of the intermediate polar status of XSS J00564+4548, IGR J17195-4100, and XSS J12270-4859** by *O. W. Butters, et al.*
- astro-ph/0806.0793: **The changing accretion states of the intermediate polar MU Camelopardalis** by *A. Staude, et al.*
- astro-ph/0806.0797: **ULTRACAM photometry of eclipsing cataclysmic variable stars** by *William James Feline*
- astro-ph/0806.1002: **A transient radio jet in an erupting dwarf nova** by *Elmar Koerding, et al.*
- astro-ph/0806.1129: **On the evolutionary status of short period cataclysmic variables** by *S.P. Littlefair, et al.*
- astro-ph/0806.1317: **QPOs in CVs: An executive summary** by *Brian Warner, Patrick A. Woudt*
- astro-ph/0806.1358: **Photometric study of selected cataclysmic variables II. Time-series photometry of nine systems** by *C. Papadaki, et al.*
- astro-ph/0806.1419: **Time-resolved optical photometry of the ultra-compact binary 4U0614+091** by *T. Shahbaz, et al.*
- astro-ph/0806.1558: **Idling Magnetic White Dwarf in the Synchronizing Polar BY Cam. The Noah-2 Project** by *Ivan L. Andronov, et al.*
- astro-ph/0806.1995: **Multiple time scales in cataclysmic binaries. The low-field magnetic dwarf nova DO Draconis** by *I. L. Andronov, et al.*
- astro-ph/0806.2024: **Eclipse mapping of RW Tri in the low luminosity state** by *A.V.Halevin, A.A.Henden*
- astro-ph/0806.2852: **NSV 13983: A New Dwarf Nova in the Period Gap** by *C. Contreras, C. Tappert*
- astro-ph/0806.4248: **Late Superhumps in WZ Sge-Type Dwarf Novae** by *Taichi Kato, Hiroyuki Maehara, Berto Monard*
- astro-ph/0806.4392: **RR Pictoris: an old nova showing superhumps and QPOs** by *L. Schmidtbreick, et al.*
- astro-ph/0806.4892: **GD 552: a cataclysmic variable with a brown dwarf companion?** by *E. Unda-Sanzana, et al.*
- astro-ph/0807.0210: **The Rate and Spatial Distribution of Novae in M101 (NGC 5457)** by *E. A. Coelho, A. W. Shafter, K. A. Misselt*
- astro-ph/0807.0436: **IP Pegasi in outburst: Echelle spectroscopy & Modulation Doppler Tomography** by *C. Papadaki, H.M.J. Boffin, D. Steeghs*
- astro-ph/0807.1240: **Optical light curves of RS Oph (2006) and hydrogen burning turnoff** by *Izumi Hachisu, et al.*
- astro-ph/0807.1251: **Supersoft X-ray Light Curve of RS Oph – The White Dwarf Mass is Now Increasing** by *Mariko Kato, Izumi Hachisu, Gerardo Juan Manuel Luna*
- astro-ph/0807.1473: **The symbiotic star CH Cygni. II. The broad Ly alpha emission line explained by shocks** by *M. Contini, R. Angeloni, P. Rafanelli*
- astro-ph/0807.1480: **The symbiotic star CH Cygni. I. An analysis of the shocked nebulae at different epochs** by *M. Contini, R. Angeloni, P. Rafanelli*
- astro-ph/0807.2098: **Spectroscopic Observations of WZ Sge-type Dwarf Novae, GW Lib and V455 And in Superoutburst** by *D. Nogami, et al.*
- astro-ph/0807.3255: **The recurrent nova RS Oph: A possible scenario for type Ia supernovae** by *M. Hernanz, J. Jose*
- astro-ph/0807.3920: **Modeling UX Ursae Majoris: An abundance of challenges** by *Albert P. Linnell, et al.*
- astro-ph/0808.1499: **Two new Intermediate Polars with a soft X-ray component** by *G. Anzolin, et al.*
- astro-ph/0808.2148: **Post Common Envelope Binaries from SDSS - III. Seven new orbital periods** by *A.Rebassa-Mansergas, et al.*

- astro-ph/0809.0432: **Accretion-disc model spectra for dwarf-nova stars** by *Irit Idan, et al.*
- astro-ph/0809.0472: **The 2008 February superoutburst of V452 Cas** by *Christopher Lloyd, et al.*
- astro-ph/0809.0921: **New Pulsating DB White Dwarf Stars from the Sloan Digital Sky Survey** by *A. Nitta, et al.*
- astro-ph/0809.1169: **AE Aquarii: The first white dwarf in the family of spin-powered pulsars** by *N.R. Ikhsanov, N.G. Beskrovnaya*
- astro-ph/0809.1753: **Orbital periods of cataclysmic variables identified by the SDSS. V. VLT, NTT and Magellan observations of nine equatorial systems** by *John Southworth, et al.*
- astro-ph/0809.1800: **Formation and Evolution of Cataclysmic Variables** by *H. Ritter*
- astro-ph/0809.3559: **The Suzaku Observations of SS Cygni in Quiescence and Outburst** by *Manabu Ishida, et al.*
- astro-ph/0809.3992: **New X-ray observations of the old nova CP Puppis and of the more recent nova V351 Pup** by *M. Orio, et al.*
- astro-ph/0809.4338: **Near-Infrared Studies of V1280 Sco (Nova Scorpii 2007)** by *Ramkrishna Das, et al.*
- astro-ph/0809.4590: **Extragalactic Classical Nova Surveys** by *M. J. Darnley, et al.*
- astro-ph/0809.4592: **Hubble Space Telescope Imaging of the Expanding Nebular Remnant of the 2006 Outburst of RS Ophiuchi** by *D. J. Harman, et al.*
- astro-ph/0809.4593: **Swift Observations of Shock Evolution in RS Ophiuchi** by *M. F. Bode, et al.*
- astro-ph/0809.5041: **VV Pup in a low state: secondary-star irradiation or stellar activity?** by *Elena Mason, et al.*
- astro-ph/0809.5276: **Discovery, photometry, and astrometry of 49 classical nova candidates in M81 galaxy** by *K. Hornoch, et al.*
- astro-ph/0810.1434: **Optical identification of a new cataclysmic variable from integral all sky survey: IGR J08390–4833** by *M.Revnivtsev, et al.*
- astro-ph/0810.1489: **Nova-Like Cataclysmic Variable TT Ari: QPO Behaviour Coming Back From Positive Superhumps** by *Y. Kim, et al.*
- astro-ph/0810.1844: **INTEGRAL/IBIS and Swift/XRT observations of hard cataclysmic variables** by *R. Landi, et al.*
- astro-ph/0810.1887: **Peculiar Red Nova V838 Mon: Accretion and Interaction in a Wide Binary System after Explosion of Its Companion** by *Vitaly Goranskij, et al.*
- astro-ph/0810.2387: **The nature and evolution of Nova Cygni 2006** by *U. Munari, et al.*
- astro-ph/0810.3077: **X-Ray Spectroscopy of the Classical Nova V458 Vulpeculae with Suzaku** by *Masahiro Tsujimoto, et al.*
- astro-ph/0810.3413: **Diagnostics of the Early Explosion Phase of a Classical Nova Using Its X-ray Emission: A Model for the X-ray Outburst of CI Camelopardalis in 1998** by *E. V. Filippova, M. G. Revnivtsev, A. A. Lutovinov*
- astro-ph/0810.4823: **The fainter the better: cataclysmic variable stars from the SDSS** by *John Southworth, B T Gaensicke, T R Marsh*
- astro-ph/0810.5528: **ULTRACAM observations of two accreting white dwarf pulsators** by *C.M. Copperwheat, et al.*
- astro-ph/0811.0158: **Transient jets in the symbiotic prototype Z Andromedae** by *A. Skopal, et al.*
- astro-ph/0811.0363: **Observations of V592 Cassiopeiae with the Spitzer Space Telescope - Dust in the Mid-Infrared** by *D. W. Hoard, et al.*
- astro-ph/0811.0568: **Variation of the Light and Period of the Magnetic Cataclysmic Variable Am Her** by *Belinda Kalomeni, Kadri Yakut*
- astro-ph/0811.0631: **Infrared Spectroscopy of Symbiotic Stars. VII. Binary Orbit and Long Secondary Period Variability of CH Cygni** by *Kenneth Hinkle, Francis Fekel, Richard Joyce*
- astro-ph/0811.0718: **The first two transient supersoft X-ray sources in M 31 globular clusters and the connec-**

- tion to classical novae** by *M. Henze, et al.*
- astro-ph/0811.0786: **Multi-line Doppler imaging of MR Ser in high-state** by *Marcos Diaz, Deoniso Cieslinski*
- astro-ph/0811.1497: **XMM-Newton observation of MACHO 104.20906.960: a dwarf nova candidate with a 2 h period** by *A.A. Nucita, et al.*
- astro-ph/0811.1508: **Spectral analysis of 636 white dwarf - M star binaries from the Sloan Digital Sky Survey** by *Rene Heller, et al.*
- astro-ph/0811.2447: **Cataclysmic Variable Primary Effective Temperatures: Constraints on Binary Angular Momentum Loss** by *Dean M. Townsley, Boris T. Gaensicke*
- astro-ph/0811.3941: **Three-dimensional modeling of the asymmetric blast wave from the 2006 outburst of RS Ophiuchi: Early X-ray emission** by *S. Orlando, J.J. Drake, J.M. Laming*
- astro-ph/0811.3974: **SDSS J080449.49+161624.8: A peculiar AM CVn star from a colour-selected sample of candidates** by *G.H.A. Roelofs, et al.*
- astro-ph/0811.4085: **Unveiling the nature of INTEGRAL objects through optical spectroscopy. VII. Identification of 20 Galactic and extragalactic hard X-ray sources** by *N. Masetti, et al.*
- astro-ph/0811.4557: **Variation of fluxes of RR Tel emission lines measured in 2000 with respect to 1996** by *D. Kotnik-Karuza, M. Friedjung, K. Exter*
- astro-ph/0812.0791: **The white dwarf in dwarf nova SDSS J080434.20+510349.2: Entering the instability strip?** by *Pavlenko Elena*
- astro-ph/0812.1295: **SDSS J162718.39+120435.0 - a dwarf nova in the period gap** by *Jeremy Shears, et al.*
- astro-ph/0812.2415: **Observations of the cataclysmic variable SDSS J081321.91+452809.4** by *Jeremy Shears, Ian Miller, Steve Brady*
- astro-ph/0812.3271: **Photometric Studies of a WZ Sge-Type Dwarf Nova Candidate, ASAS160048-4846.2** by *Yuichi Soejima, et al.*
- astro-ph/0812.4013: **Photometric and Spectroscopic Observations of V1280 Sco** by *Hiroyuki Naito, et al.*
- astro-ph/0812.4043: **Curious Variables Experiment (CURVE). CCD photometry of active dwarf nova DI UMa** by *A. Rutkowski, et al.*
- astro-ph/0812.4096: **Near Infrared Observations of the novae V2491 Cygni and V597 Puppis** by *Sachindra Naik, D. P. K. Banerjee, N. M. Ashok*
- astro-ph/0812.4420: **The very short supersoft X-ray state of the classical nova M31N 2007-11a** by *M. Henze, et al.*

## 4.2 LMXBs and Related Systems

- astro-ph/0804.4606: **The proton low-mass microquasar: high-energy emission** by *Gustavo E. Romero, Gabriela S. Vila*
- astro-ph/0805.0259: **Low-mass X-ray binaries in the bulge of the Milky Way** by *M.Revnivtsev, et al.*
- astro-ph/0805.0422: **X-ray Dust Scattering at Small Angles: The Complete Halo around GX13+1** by *Randall K. Smith*
- astro-ph/0805.1001: **Modeling of non-stationary accretion disks in X-ray novae A 0620-00 and GRS 1124-68 during outburst** by *V.F. Suleimanov, G.V. Lipunova, N.I. Shakura*
- astro-ph/0805.1579: **Millisecond dip events in the 2007 RXTE/PCA data of Sco X-1 and the TNO size distribution** by *Chih-Yuan Liu, et al.*
- astro-ph/0805.1700: **On the X-ray/TeV connection in Galactic jet sources** by *V. Bosch-Ramon, D. Khangulyan, F. A. Aharonian*
- astro-ph/0805.1707: **The physics of non-thermal radiation in microquasars** by *V. Bosch-Ramon*
- astro-ph/0805.2378: **Microquasars: summary and outlook** by *I. F. Mirabel*
- astro-ph/0805.2085: **Models for gamma-ray production in low-mass microquasars** by *Gabriela S. Vila, Gustavo E. Romero*

- astro-ph/0805.4124: **XMM-Newton observations of the low-mass X-ray binary XB1832-330 in the galactic globular cluster NGC 6652** by *L. Sidoli, et al.*
- astro-ph/0805.4603: **Zooming in on a sleeping giant: milliarcsecond HSA imaging of the black hole binary V404 Cyg in quiescence** by *J.C.A. Miller-Jones, et al.*
- astro-ph/0806.0626: **Deep Chandra X-ray Observations of Low Mass X-ray Binary Candidates in the Early-Type Galaxy NGC 4697** by *Gregory R. Sivakoff, et al.*
- astro-ph/0806.0627: **Measurements of Variability of Low Mass X-ray Binary Candidates in the Early-Type Galaxy NGC 4697 from Multi-Epoch Chandra X-ray Observations** by *Gregory R. Sivakoff, et al.*
- astro-ph/0806.0925: **Swift uncovers that SAX J0840.7+2248 is not an X-ray Binary, but BeppoSAX X-ray Rich GRB 980429** by *P. Romano, et al.*
- astro-ph/0806.1166: **Cooling of the crust in the neutron star low-mass X-ray binary MXB 1659-29** by *Edward M. Cackett, et al.*
- astro-ph/0806.2235: **The Formation, Evolution and Parameters of Short-Period Low-Mass X-Ray Binaries with Black-Hole Components** by *L.R. Yungelson, J.-P. Lasota*
- astro-ph/0806.2666: **Origin of X-ray Emission from Transient Black Hole Candidates in Quiescence** by *Gabor Pszota, et al.*
- astro-ph/0806.2736: **Looking for black-holes in X-ray binaries with XMM-Newton: XTE J1817-330 and XTE J1856+053** by *Gloria Sala, Jochen Greiner, Natalia Primak*
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