

ABSTRACTS OF THE PAPERS PUBLISHED IN BALTIC  
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**YOUNG STARS IN THE CAMELOPARDALIS DUST AND  
MOLECULAR CLOUDS. VI. YSOs VERIFIED BY SPITZER AND  
AKARI INFRARED PHOTOMETRY**

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**Abstract.** Using photometric data of infrared surveys, young stellar object (YSO) status is verified for 141 objects selected in our previous papers in the Cassiopeia and Camelopardalis segment of the Milky Way bounded by Galactic coordinates  $(\ell, b) = (132\text{--}158^\circ, \pm 12^\circ)$ . The area includes the known star-forming regions in the emission nebulae W3, W4 and W5 and the massive YSO AFGL 490. Spectral energy distribution (SED) curves between 700 nm and 160  $\mu\text{m}$ , constructed from the GSC 2, 2MASS, IRAS, MSX, Spitzer and AKARI data, are used to estimate the evolutionary stages of these stars. We confirm the YSO status for most of the objects. If all of the investigated objects were YSOs, 45% of them should belong to Class I, 41% to class II and 14% to Class III. However, SEDs of some of these objects can be affected by nearby extended infrared sources, like compact H II regions, infrared clusters or dusty galaxies.

**Key words:** stars: formation – stars: pre-main-sequence – infrared: stars – ISM: dust, clouds

## WIDE FIELD CCD PHOTOMETRY OF THE OPEN CLUSTER NGC 752

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**Abstract.** The results of CCD photometry in the seven-color *Vilnius* system of 3058 stars down to  $V \sim 18.0$  mag in a 1.5 square degree field around the cluster NGC 752 are presented. For most of the stars brighter than  $V = 17.0$  mag, photometric spectral and luminosity classes are determined. The catalog of 1174 stars down to  $V = 15.5$  mag is given in the paper. The entire catalog will be available at the CDS Simbad database. The color-magnitude diagram indicates an extension of the cluster's main sequence down to 5 mag below the turnoff point.

**Key words:** techniques: photometric – stars: fundamental parameters, classification – Galaxy: open clusters: individual (NGC 752)

**MULTICOLOR CCD PHOTOMETRY OF THE OPEN CLUSTER  
IC 361**

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**Abstract.** CCD photometry in the eight-color *Vilnius + I* system for 7250 stars down to  $I = 19.6$  mag has been obtained in the  $20' \times 26'$  field of the open cluster IC 361 in Camelopardalis. The catalog of 1420 stars down to  $V \sim 18.5$  mag is presented. It contains the coordinates,  $V$  magnitudes, seven color indices, quantitative photometric spectral types, absolute magnitudes and distances. The interstellar extinction is found to be non-uniform across the field, with the values of  $A_V$  in the range 1.9 to 2.4 mag. The distribution of distance moduli of individual stars shows that the cluster is located as far as, or just beyond, the Perseus spiral arm.

**Key words:** stars: fundamental parameters – Galaxy: open clusters: individual (IC 361)

## CHEMICAL COMPOSITION OF THE RS CV<sub>n</sub>-TYPE STAR LAMBDA ANDROMEDAE

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**Abstract.** Photospheric parameters and chemical composition are determined for the single-lined chromospherically active RS CV<sub>n</sub>-type star  $\lambda$  And (HD 222107). From the high resolution spectra obtained on the Nordic Optical Telescope, abundances of 22 chemical elements and isotopes, including such key elements as <sup>12</sup>C, <sup>13</sup>C, N and O, were investigated. The differential line analysis with the MARCS model atmospheres gives  $T_{\text{eff}} = 4830$  K,  $\log g = 2.8$ ,  $[\text{Fe}/\text{H}] = -0.53$ ,  $[\text{C}/\text{Fe}] = 0.09$ ,  $[\text{N}/\text{Fe}] = 0.35$ ,  $[\text{O}/\text{Fe}] = 0.45$ ,  $\text{C}/\text{N} = 2.21$ ,  $^{12}\text{C}/^{13}\text{C} = 14$ . The value of <sup>12</sup>C/<sup>13</sup>C ratio for a star of the RS CV<sub>n</sub>-type is determined for the first time, and its low value gives a hint that extra-mixing processes may start acting in low-mass chromospherically active stars below the bump of the luminosity function of red giants.

**Key words:** stars: RS CV<sub>n</sub> binaries, abundances – stars: individual ( $\lambda$  And = HD 222107)

## **DISK GALAXY MODELS DRIVEN BY STOCHASTIC SELF-PROPAGATING STAR FORMATION**

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**Abstract.** We present a model of chemical and spectrophotometric evolution of disk galaxies based on a stochastic self-propagating star formation scenario. The model incorporates galaxy formation through the process of accretion, chemical and photometric evolution treatment, based on simple stellar populations (SSP), and parameterized gas dynamics inside the model. The model reproduces observational data of the late-type spiral galaxy M 33 reasonably well. Promising test results prove the applicability of the model, and the adequate accuracy for the interpretation of disk galaxy properties.

**Key words:** galaxies: evolution, structure – galaxies: individual (M 33)

## ORTHOGONAL BASIS FUNCTIONS OVER THE BINOCULAR PUPIL

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Received: 2010 March 30; revised and accepted: 2010 June 25

**Abstract.** Sets of orthogonal basis functions over circular areas – pupils in optical applications – are known in the literature for the full circle (Zernike or Jacobi polynomials) and the annulus. Here, an orthogonal set is proposed if the area is two non-overlapping circles of equal size. The geometric master parameter is the ratio of the pupil radii over the distance between both circles. Increasingly higher order aberrations – as defined for a virtual larger pupil in which both pupils are embedded – are fed into a Gram-Schmidt orthogonalization to distill one unique set of basis functions. The key effort is to work out the overlap integrals between a full set of primitive basis functions of hyperspherical type centered at the mid-point between both pupils. Constructed from the same primitive basis, the orthogonal Karhunen-Loève modes of spatially filtered Kolmogorov phase screens are computed for this shape of mask. Matrix elements of the covariance matrix – an established intra-circle and a special inter-circle category – are worked out in wavenumber space.

**Key words:** instrumentation: interferometers – methods: numerical – atmospheric effects

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**KARHUNEN-LOÈVE BASIS FUNCTIONS OF KOLMOGOROV  
TURBULENCE IN THE SPHERE (Baltic Astronomy, 17, 383, 2008,  
Erratum)**

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Received: 2010 March 3

**Abstract.** The previously published factor, which scales the matrix elements of the eigenvalue equation as a finite outer scale of the von-Kármán model is switched on, is corrected.

**Key words:** turbulence – atmospheric effects – methods: numerical



## ON THE OPTICAL SPECTRUM OF MU CEPHEI

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**Abstract.** High resolution spectra of M-type supergiant  $\mu$  Cep are analyzed. The movements in the atmosphere of this star are highly supersonic and variable with depth. The lines forming in deeper layers show the widths corresponding to 30 km/s. The lines forming in outer layers are much wider, 50 km/s. At the same time, the microturbulent velocity is low, from 4.0 to 4.5 km/s. The atmosphere of  $\mu$  Cep is slightly metal deficient with  $[\text{Fe}/\text{H}] = -0.4$ .

**Key words:** stars: atmospheres – stars: individual:  $\mu$  Cep

## CHEMICAL COMPOSITION OF THE RS CV<sub>n</sub>-TYPE STAR 29 DRACONIS

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**Abstract.** Photospheric parameters and chemical composition are determined for the single-lined chromospherically active RS CV<sub>n</sub>-type star 29 Draconis (HD 160538). From the high resolution spectra obtained on the Nordic Optical Telescope, abundances of 22 chemical elements, including the key elements such as <sup>12</sup>C, <sup>13</sup>C, N and O, were investigated. The differential line analysis with the MARCS model atmospheres gives  $T_{\text{eff}} = 4720$  K,  $\log g = 2.5$ ,  $[\text{Fe}/\text{H}] = -0.20$ ,  $[\text{C}/\text{Fe}] = -0.14$ ,  $[\text{N}/\text{Fe}] = 0.08$ ,  $[\text{O}/\text{Fe}] = -0.04$ ,  $\text{C}/\text{N} = 2.40$ ,  $^{12}\text{C}/^{13}\text{C} = 16$ . The low value of the <sup>12</sup>C/<sup>13</sup>C ratio gives a hint that extra mixing processes in low-mass chromospherically active stars may start earlier than the theory of stellar evolution predicts.

**Key words:** stars: RS CV<sub>n</sub> binaries, abundances – stars: individual (29 Draconis = HD 160538))

**EXTINCTIONS AND DISTANCES TO DARK CLOUDS FROM  
2MASS, MEGACAM AND IPHAS SURVEYS: LDN 1525 IN THE  
DIRECTION OF THE AUR OB1 ASSOCIATION**

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**Abstract.** The possibility of applying photometry from the 2MASS  $J$ ,  $H$ ,  $K_s$ , MegaCam  $u$ ,  $g$  and IPHAS  $r$ ,  $i$ ,  $H\alpha$  surveys for determining the distance to the dark cloud LDN 1525 (TGU 1192) in the direction of the Aur OB1 association is investigated using the red clump giants. The main dust cloud, probably related to the emission nebulae Sh 2-232, Sh 2-233, Sh 2-235, the molecular cloud and the association Aur OB2, is found to be located at a distance of 1.3 kpc from the Sun. The nebula Sh 2-231 can be an object of the Perseus arm. The maximum extinction  $A_V$  found in the cloud is close to 6 mag.

**Key words:** ISM: dust clouds: individual (LDN 1525, TGU 1192) – stars: fundamental parameters (spectral classes, colors) – photometric systems: 2MASS, MegaCam, IPHAS

## STAR CLASSIFICATION POSSIBILITIES WITH THE GAIA SPECTROPHOTOMETERS. II. A METHOD FOR EMPIRICAL DECONTAMINATION OF THE BP/RP SPECTRA

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**Abstract.** The contamination in the Gaia BP and RP spectra, caused by the LSF smearing, is a serious obstacle for the classification of stars since the contamination values at different wavelengths depend on temperatures, gravities, metallicities and interstellar reddenings of stars, and these parameters are unknown before the classification. This makes impossible to apply traditional methods for photometric classification of stars based on color indices or interstellar reddening-free Q-parameters. For determining contamination for the stars of ‘normal’ spectral sequence we propose the method of ‘color equations’, well known in stellar photometry. The equations connecting the decontamination correction at a chosen wavelength with the observed ‘color indices’ are derived. These equations make possible to determine decontamination corrections for unreddened stars with an accuracy of 0.01–0.02 mag in the wavelength range of 400–1000 nm. The equations are different for M-type stars which can be separated from stars of earlier spectral classes using the contaminated RP spectra and treated separately. The equations are valid not only for unreddened stars but also for stars affected by interstellar extinction up to  $A_V = 3$  mag. At shorter wavelengths (350–400 nm) the contamination is much larger and can be determined with lower accuracy.

**Key words:** stars: fundamental parameters (classification, colors, spectral types, luminosities) – ISM: extinction – space vehicles: Gaia

**WIDE FIELD MULTICOLOR CCD PHOTOMETRY IN  
THE VICINITY OF THE OPEN CLUSTER KING 7**

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**Abstract.** We present the results of CCD photometry in the seven-color Vilnius system for 1549 stars down to  $V = 16$  mag in a 1.5 square degree field around the cluster King 7, at the Perseus and Camelopardalis border. Using photometric parameters, two-dimensional spectral types, interstellar extinctions and distances for most of the stars are determined.

**Key words:** stars: fundamental parameters, classification – open clusters: individual (King 7) – Vilnius photometric system

**HIGH VELOCITY SPECTROSCOPIC BINARY ORBITS FROM  
PHOTOELECTRIC RADIAL VELOCITIES: BD+20 5152,  
A POSSIBLE TRIPLE SYSTEM**

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**Abstract.** The spectroscopic orbit of a high proper motion star, BD+20 5152, is calculated from 34 CORAVEL-type radial velocity measurements. The star has a slightly eccentric orbit with a period of 5.70613 d, half-amplitude of 47.7 km/s and eccentricity of 0.049. The center-of-mass velocity of the system is  $-24.3$  km/s. BD+20 5152 seems to be a triple system consisting of a G8 dwarf as a primary component and of two K6–M0 dwarfs as secondary and tertiary components. This model is based on the analysis of its UBVRI and JHK magnitudes. According to the SuperWASP photometry, spots on the surface of the primary are suspected. The excessive brightness in the Galex FUV and NUV magnitudes and a non-zero eccentricity suggest the age of this system to be less than 1 Gyr.

**Key words:** stars: binaries: spectroscopic, individual (BD+20 5152)

**THE APOLLO GROUP ASTEROID 2008 OS9: DISCOVERY,  
ORBIT, ROTATION AND THE YARKOVSKY/YORP EFFECTS**

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**Abstract.** A project for astrometric and photometric observations of asteroids at the Baldone Observatory is described. One of the most important results of the project is the discovery of 2008 OS9, a 600 meter asteroid of the NEO Apollo group. The results of its astrometric and photometric observations at the Moletai and Baldone observatories are presented. From the brightness variation with the 0.27 mag amplitude, a rotation period of 8.430 h is determined. Close approaches of the asteroid to Earth and Venus during the next millenium are predicted. The mean values of secular changes in the semi-major axis, eccentricity and inclination are computed with and without the Yarkovsky and YORP effects. A negative value of the difference between the value of semi-major axis computed with the Yarkovsky and YORP effects and without them,  $da/dt$ , may indicate retrograde rotation of the asteroid.

**Key words:** asteroids: astrometry, photometry, orbits – asteroids: NEO: individual (2008 OS9)

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**CHANGES IN THE CLOUD BELTS OF JUPITER, 1630-1664,  
AS REPORTED IN THE 1665 ASTRONOMIA REFORMATA OF  
GIOVANNI BATTISTA RICCIOLI**

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**Abstract.** A translation of a section from the 1665 "Astronomia Reformatata" of G. B. Riccioli discussing the appearance of the disk of Jupiter during the years 1630–1664; changes in the Jovian cloud belts as recorded by a variety of observers are a major feature of Riccioli's discussion.

**Key words:** planets and satellites: individual (Jupiter) – history of astronomy – Riccioli