Oportunidades de pesquisa - DAS/INPE

Francisco Jablonski

2014/04/08

Tópicos recentes

- Sistemas Binários
- Exoplanetas via Microlentes Gravitacionais
- Estrutura Galáctica
- Instrumentação

Sistemas Binários

- Dissertação de Júlio Tello: binárias eclipsantes do OGLE que estão no 2MASS
  RevMexAA, 35, 119, (2009)
- Tese de Júlio Tello: Estudo detalhado de binárias eclipsantes selecionadas, usando código WD
  ASP Conf. Series, 435, 93, (2010)
- Dissertação e Tese de Leonardo A. Almeida
  A&A 525, A84 (2011) <– flare gigante na tripla LHS 1070
  Proc. IAUS, 276, 495, (2010) <– LTE em QS Vir
  ApJ, 766,1, (2013) <– LTE em NSVS 14256825

Sistemas Binários: NSVS 14256825

Monthly Notices of the ROYAL ASTRONOMICAL SOCIETY

Mon. Not. R. Astron. Soc. **423**, 478–485 (2012) doi:10.1111/j.1365-2966.2012.20891.x

A photometric and spectroscopic study of NSVS 14256825: the second sdOB+dM eclipsing binary*

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Sistemas Binários: NSVS 14256825

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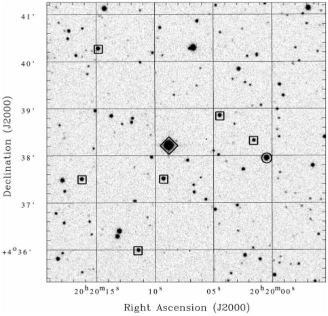

Figure 1. Finding chart for NSVS 14256825 in the R_C band obtained using the OPD/LNA 0.6-m telescope. The circle shows NSVS 1425, the diamond is the adopted reference star and the squares outline additional comparison stars.

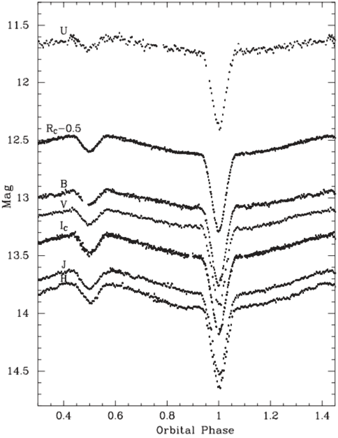

Figure 2. Calibrated NSVS 1425 light curves in the U, B, V, R_C, I_C, J and H bands folded on the 0.1104-d orbital period. The R_C-band curve was displaced upwards by 0.5 mag to improve visualization.

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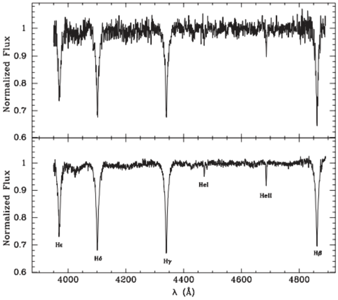


Figure 3. Upper panel: a normalized individual spectrum of NSVS 1425 with 900 s integration time. Lower panel: the average of 36 spectra after correcting for orbital motion.

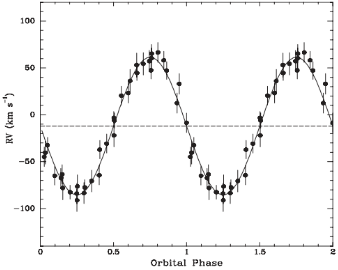


Figure 4. Radial velocity of the prominent lines in the spectra of NSVS 1425. The phases are calculated using the ephemeris presented in Section 3.1.

Sistemas Binários: NSVS 14256825

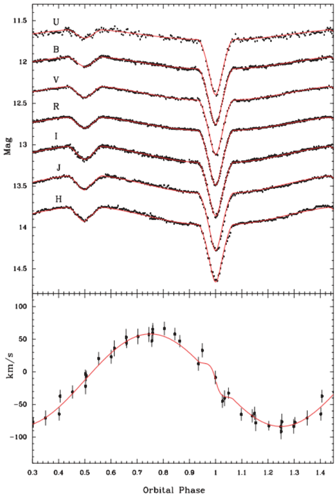


Figure 6. The best simultaneous fit for the U, B, V, R_C, I_C, J and H light curves and radial-velocity data using the WD code. The light curves are the same as those shown in Fig. 2 displaced vertically for better visualization.

Parameter	Model 1	Model 2
Fitted parameters		
$q = (M_2/M_1)$	0.28 ± 0.013	0.26 ± 0.012
i (°)	82.5 ± 0.4	82.5 ± 0.3
Ω_1^a	4.58 ± 0.13	4.55 ± 0.11
Ω_2^a	2.80 ± 0.15	2.69 ± 0.12
T_1 (K)	$42\,300 \pm 400$	$42\,000 \pm 500$
T_2 (K)	2400 ± 600	2550 ± 550
a^b ($R_\odot$)	0.74 ± 0.04	0.80 ± 0.04
$A_2^c(U)$	1.50 ± 0.11	2.0 ± 0.15
$A_2^c(B)$	1.50 ± 0.11	1.35 ± 0.13
$A_2^c(V)$	1.50 ± 0.11	1.20 ± 0.12
$A_2^c(R_C)$	1.50 ± 0.11	1.05 ± 0.09
$A_2^c(I_C)$	1.50 ± 0.11	1.3 ± 0.12
$A_2^c(J)$	1.50 ± 0.11	0.95 ± 0.14
$A_2^c(H)$	1.50 ± 0.11	1.10 ± 0.15
$x_2(U)$	0.64 ± 0.04	0.68 ± 0.04
$x_2(B)$	0.69 ± 0.04	0.74 ± 0.05
$x_2(V)$	0.78 ± 0.03	0.80 ± 0.04
$x_2(R_C)$	0.83 ± 0.02	0.87 ± 0.02
$x_2(I_C)$	0.90 ± 0.03	0.92 ± 0.03
$x_2(J)$	0.93 ± 0.04	0.95 ± 0.04
$x_2(H)$	0.98 ± 0.05	0.99 ± 0.05
Roche radii[g]		
r_1 (pole)	0.231 ± 0.006	0.233 ± 0.005
r_1 (side)	0.233 ± 0.006	0.235 ± 0.005
r_1 (point)	0.235 ± 0.007	0.236 ± 0.006
r_1 (back)	0.234 ± 0.007	0.236 ± 0.006
r_2 (pole)	0.180 ± 0.016	0.194 ± 0.014
r_2 (side)	0.182 ± 0.016	0.198 ± 0.016
r_2 (point)	0.191 ± 0.019	0.210 ± 0.019
r_2 (back)	0.189 ± 0.019	0.207 ± 0.018

Sistemas Binários: NSVS 14256825

Table 6. Fundamental parameters for NSVS 1425.

Parameter	Model 1	Model 2
M_1 ($M_\odot$)	0.346 ± 0.079	0.419 ± 0.070
M_2 ($M_\odot$)	0.097 ± 0.028	0.109 ± 0.023
R_1 ($R_\odot$)	0.173 ± 0.010	0.188 ± 0.010
R_2 ($R_\odot$)	0.137 ± 0.008	0.162 ± 0.008
T_1 (K)	$42\,300 \pm 500$	$42\,000 \pm 400$
T_2 (K)	2400 ± 500	2550 ± 500
$\log g_1$	5.50 ± 0.14	5.51 ± 0.11
$\log g_2$	5.15 ± 0.16	5.05 ± 0.13
a ($R_\odot$)	0.74 ± 0.04	0.80 ± 0.04

primary of NSVS 1425 is an sdBO star which means that this system is very similar to AA Dor and, hence, in a rare evolutionary stage (Heber 2009).

Comparing the values of $\log g$ derived from the simultaneous fit to photometric and spectroscopic data (Table 6) with those obtained from the modelling of the spectral lines of the primary star (Section 3.3), it is clear that the model with metallicity equal to that adopted by Klepp & Rauch (2011) provides consistent results, whereas the model with zero metallicity has a discrepancy. We noticed that the same kind of discrepancy had been found by Rauch (2000) in the analysis of the primary in AA Dor. Rauch (2000) obtained $\log g = 5.21$ from spectroscopic data, whereas Hilditch,

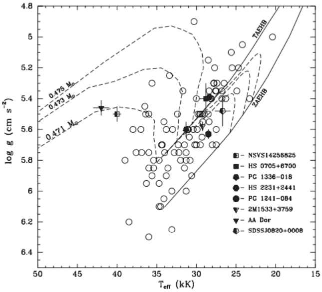


Figure 7. Position on the ($T_{\rm eff}$, $\log g$) diagram of the hot component of NSVS 1425 compared with other sdB stars (see Table 1). Isolated sdB and sdOB stars presented in Edelmann (2003) are shown with open circles. Dashed lines represent evolutionary tracks for different masses in the post-EHB evolution (Dorman et al. 1993). The zero-age extreme horizontal branch (ZAEHB) and terminal-age extreme horizontal branch (TAEHB) are represented by solid lines.

Sistemas Binários - tópicos em aberto

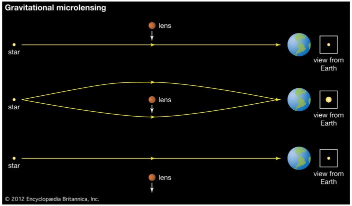
- Catálogo e taxonomia das $\sim$ 8000 BE do OGLE
- Sistemas triplos entre as BE do OGLE
- Sistemas com LTE
- As binárias eclipsantes do Kepler

Exoplanetas via Microlentes Gravitacionais

$$\alpha = \frac{4GM}{rc^2}$$

$$\theta_E = \sqrt{\frac{4GMD_{LS}}{c^2 D_L D_S}}$$

$$\theta_E \approx 0.5\sqrt{\frac{M}{M_\odot}}\,\mathrm{mas}$$



Exoplanets via Microlentes Gravitacionais

Hwang et al., ApJ, 778:55, 2013

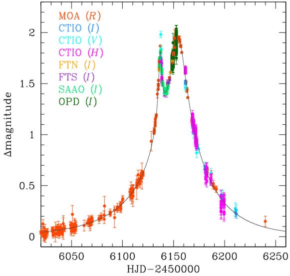


Figure 1. Light curve of MOA-2012-BLG-486. The presented model curve is based on the single-band binary-source model. The notation in the parenthesis after the legend of each observatory denotes the passband of observation.

Kains et al., A&A, 552, 70, 2013

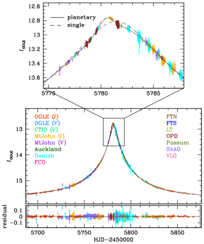


Figure 1. Light curve of OGLE-2011-BLG-0251. Data points are plotted with 1-σ error bars, and the upper panel shows a zoom around the perturbation region near the peak

Exoplanetas via Microlentes Gravitacionais

Planet	Mass (M_J)	Projected separation (AU)	Period (d)	Eccentricity	Inclination (°)	Year of discovery
MOA-2007-BLG-192L b [1]	0.01	0.66				2008
MOA-2007-BLG-400L b [2]	0.9	0.85				2008
MOA-2011-BLG-293L b	2.4	1.0				2012
MOA-2008-BLG-310L b [3]	0.23	1.25				2009
MOA-2009-BLG-387L b [4]	2.6	1.8	1970			2011
MOA-2009-BLG-319 b [5]	0.157	2.0				2010
OGLE-2005-BLG-390L b [6]	0.017	2.1	3500			2005
OGLE-2006-BLG-109L b [7]	0.727	2.3	1790		64	2008
OGLE-2005-BLG-169L b [8]	0.04	2.8	3300			2005
MOA-2009-BLG-266L b [9]	0.0327	3.2	2780			2010
OGLE-2007-BLG-368L b [10]	0.0694	3.3				2008
OGLE-2005-BLG-071L b [11]	3.5	3.6	~ 3600			2005
OGLE-2006-BLG-109L c [7]	0.271	4.5	4931	0.15	64	2008
OGLE-2003-BLG-235Lb [12]	2.6	5.1				2004
MOA-bin-1 b	3.7	8.3				2012
OGLE-2012-BLG-0026L b	0.11	3.82				2012
OGLE-2012-BLG-0026L c	0.68	4.63				2012
MOA-2010-BLG477L b[13]	1.5	2±1				2012
OGLE-2011-BLG-0251 b	0.53±0.21	2.72±0.75 or 1.5±0.5				2012/2013
OGLE-2012-BLG-0406L b	2.73±0.43	3.45±0.26				2013
OGLE-2012-BLG-0358L b	1.9±0.2	0.87				2013
MOA-2008-BLG-379 b	5±2.5	4±1.6				2013
MOA-2010-BLG-328L b	0.03 ± 0.0075	0.92 [14]				2013
MOA-2008-BLG-379 b	5±2.5	4±1.6				2013
MOA-2011-BLG-262 or MOA-2011-BLG-262 b[15]	~3.2 or 0.055 [note 1]	Free-floating or ~1				2013

Exoplanetas via Microlentes Gravitacionais: Publicações 2013/14

- Henderson et al. arXiv:1403.3092, 2014 *Candidate Gravitational Microlensing Events for Future Direct Lens Imaging*
- Hwang et al., ApJ 778, 55, 2013 *Interpretation of a Short-term Anomaly in the Gravitational Microlensing Event MOA-2012-BLG-486*
- Choi et al., ApJ 768, 129, 2013 *Microlensing Discovery of a Population of Very Tight, Very Low Mass Binary Brown Dwarfs*
- Kains et al., A&A, 552, 70, 2013 *A giant planet beyond the snow line in microlensing event OGLE-2011-BLG-0251*
- Gould et al., ApJ 763, 141, 2013 *MOA-2010-BLG-523: "Failed Planet"= RS CVn Star*
- Street et al., ApJ 763, 67, 2013 *MOA-2010-BLG-073L: An M-dwarf with a Substellar Companion at the Planet/Brown Dwarf Boundary*
- Han et al., ApJ 762, 28, 2013 *The Second Multiple-planet System Discovered by Microlensing: OGLE-2012-BLG-0026Lb, c—A Pair of Jovian Planets beyond the Snow Line*

Estrutura Galáctica

THE ASTROPHYSICAL JOURNAL, 778:32 (18pp), 2013 November 20 doi:10.1088/0004-637X/778/1/32

A GALAXY MODEL FROM TWO MICRON ALL SKY SURVEY STAR COUNTS IN THE WHOLE SKY, INCLUDING THE PLANE

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ABSTRACT

We use the star count model of Ortiz & Lépine to perform an unprecedented exploration of the most important Galactic parameters comparing the predicted counts with the Two Micron All Sky Survey observed star counts in the J, H, and K_S bands for a grid of positions covering the whole sky. The comparison is made using a grid of lines of sight given by the HEALPix pixelization scheme. The resulting best-fit values for the parameters are: 2120 ± 200 pc for the radial scale length and 205 ± 40 pc for the scale height of the thin disk, with a central hole of 2070^{+2000}_{-800} pc for the same disk, 3050 ± 500 pc for the radial scale length and 640 ± 70 pc for the scale height of the thick disk, 400 ± 100 pc for the central dimension of the spheroid, 0.0082 ± 0.0030 for the spheroid to disk density ratio, and 0.57 ± 0.05 for the oblate spheroid parameter.

Key words: Galaxy: fundamental parameters – Galaxy: structure – infrared: stars – stars: statistics

- Modela contagens em JHK_S *no céu todo*
- `HEALPix` com 3072 linhas de visada
- busca de parâmetros via NS e MCMC

Estrutura Galáctica

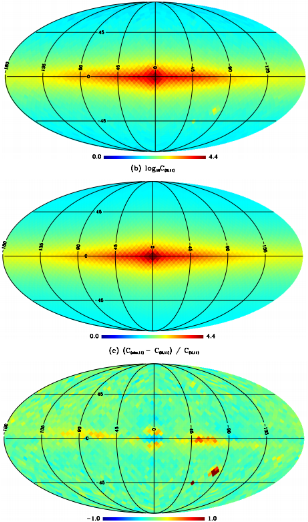

Figure 13. (a) Observed cumulative star counts for $K_S < 11$ sampled according to the $N_{side} = 16$ HEALPix scheme (3072 grid points). Each grid point is the result of a cone search of one square degree area. The counts are color-coded in a logarithmic scale to facilitate visualization. (b) Predicted cumulative star counts from our model in the same band with the same count coding as in (a). (c) Relative differences $(C_{(obs,11)} - C_{(M,11)})/C_{(M,11)}$ of (a) and (b) color coded in a linear scale, to emphasize the details.

Estrutura Galáctica

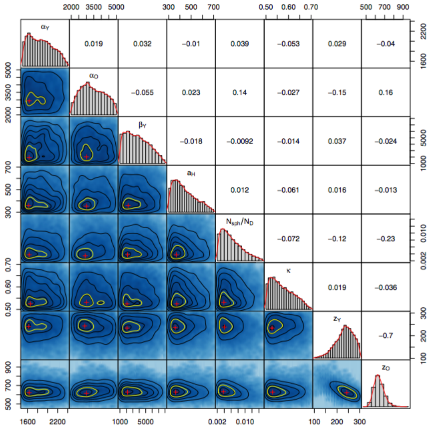

Figure 6. Joint a posteriori probability densities for the parameters of our model after 7×10^4 iterations of an MCMC, considering the finer grid of 382 points, shown in Figure 2. The marginalized one-dimensional histograms for the parameters are displayed on the diagonal. We also included the correlation coefficients between each pair of parameters. The symbols are as in Figure 3.

Instrumentação

- BTFI
  Oliveira et al. 2013, PASP, 125, 396
- J-PAS
  Benitez et al. 2014, ArXiv 1403.5237
- SPARC4
  Rodrigues et al. 2012, SPIE, 8446, 26
- CRYOCOMP