Cláudia Vilega Rodrigues

Maio/2018

Workshop da DAS

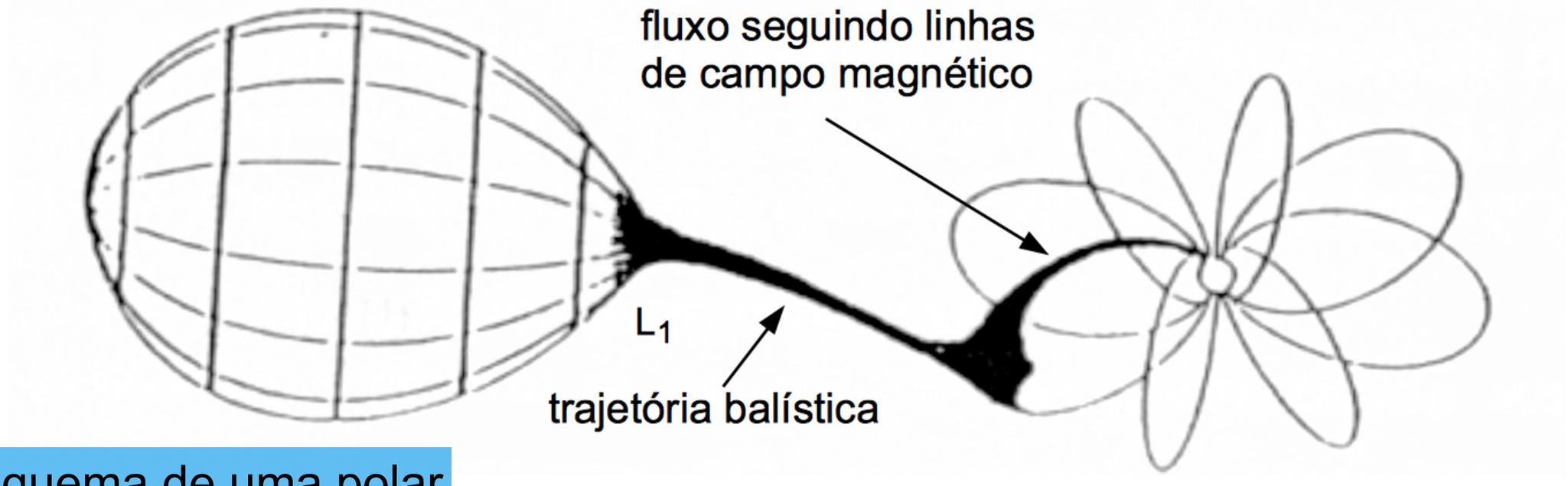
2017 em 1 slide

* Produtividade
  - 2 artigos: 1 AJ e 1 MNRAS
* Projeto Instrumental
  - SPARC4
* 3 orientações
* Bolsa Produtividade CNPq - Nível 2

Variáveis cataclísmicas, com ênfase nas magnéticas

Polares (e IPs)

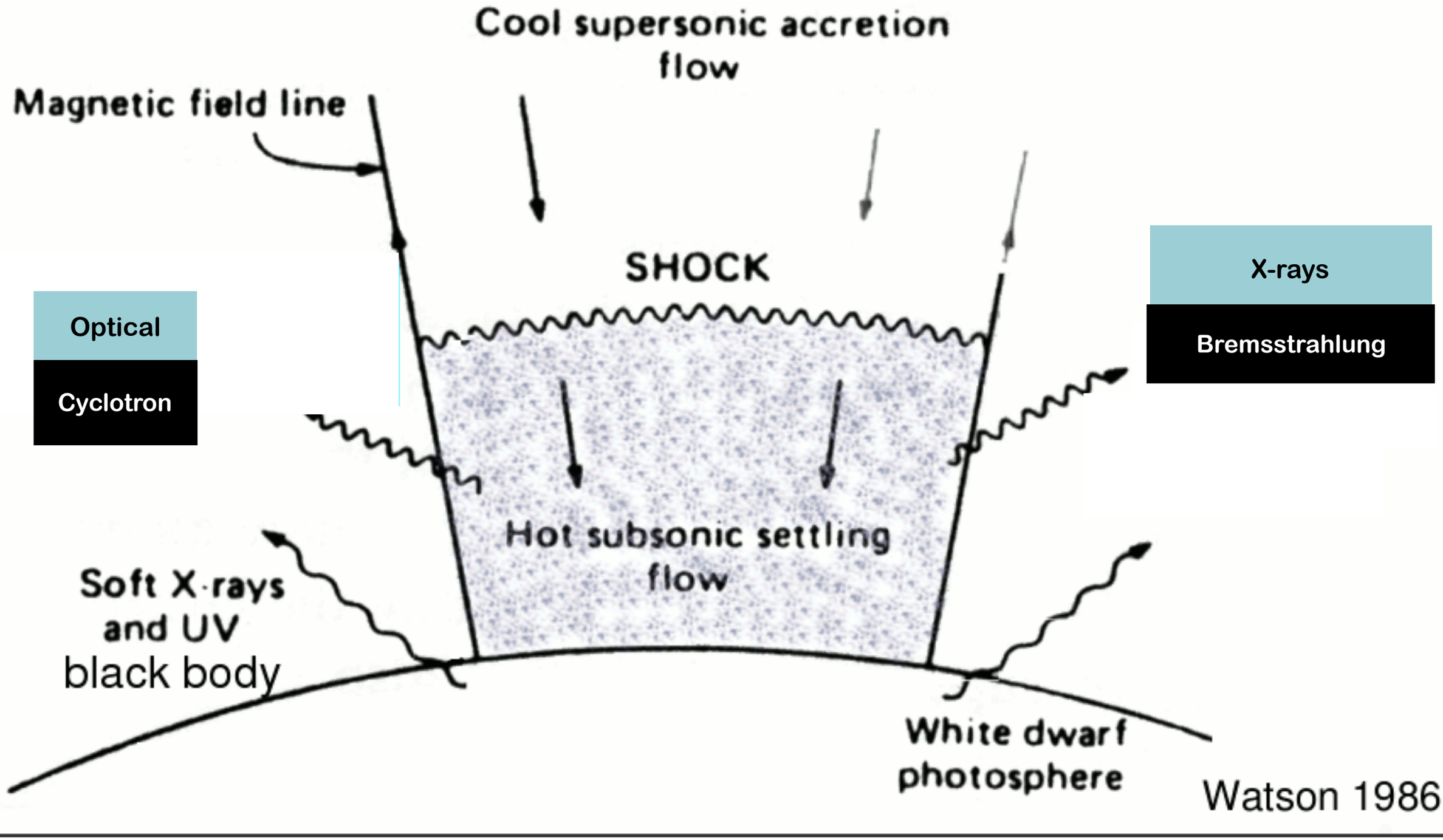
- Observações: fotometria, polarimetria e espectroscopia
- Modelos ópticos e raios X



Esquema de uma polar

Cropper (1990)

Região emissora



Cyclops

Cyclotron Emission of Polars

- Modelo de emissão de regiões pós-choque no óptico e em raios X

Cyclops - 2017/2018

* Código está no github

* Várias atualizações

- Inclusão de curvas de luz em raios-X
- Uniformização da entrada de dados
- Inclusão de bandas ópticas representadas por várias frequências
- etc

Espectropolarimetria de AM Her

* Mestrado de Yasmin Amado (2018)
  - Dados do CFHT do objeto protótipo das polares
  - Espectropolarimetria com excelente resolução espectral e resolução temporal satisfatória

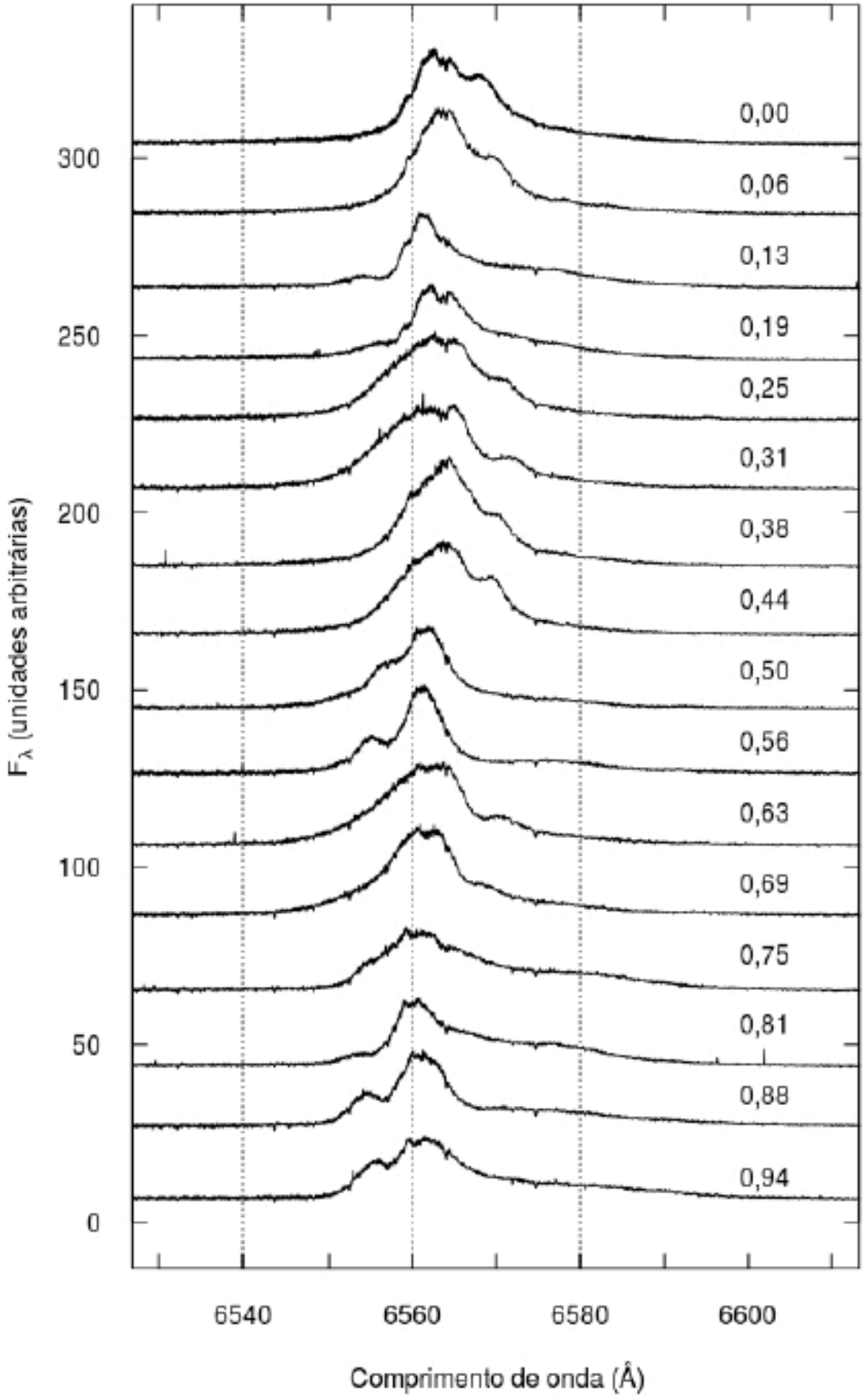


Figura 4.4 - Espectros de fluxo com aumento na linha de Hα 6563Å. É possível notar que a linha é composta por componentes que variam ao longo do período orbital. As linhas de emissão nas fases 0,0; 0,06; 0,75; 0,81; 0,88 e 0,94 apresentam pelo menos 4 componentes.

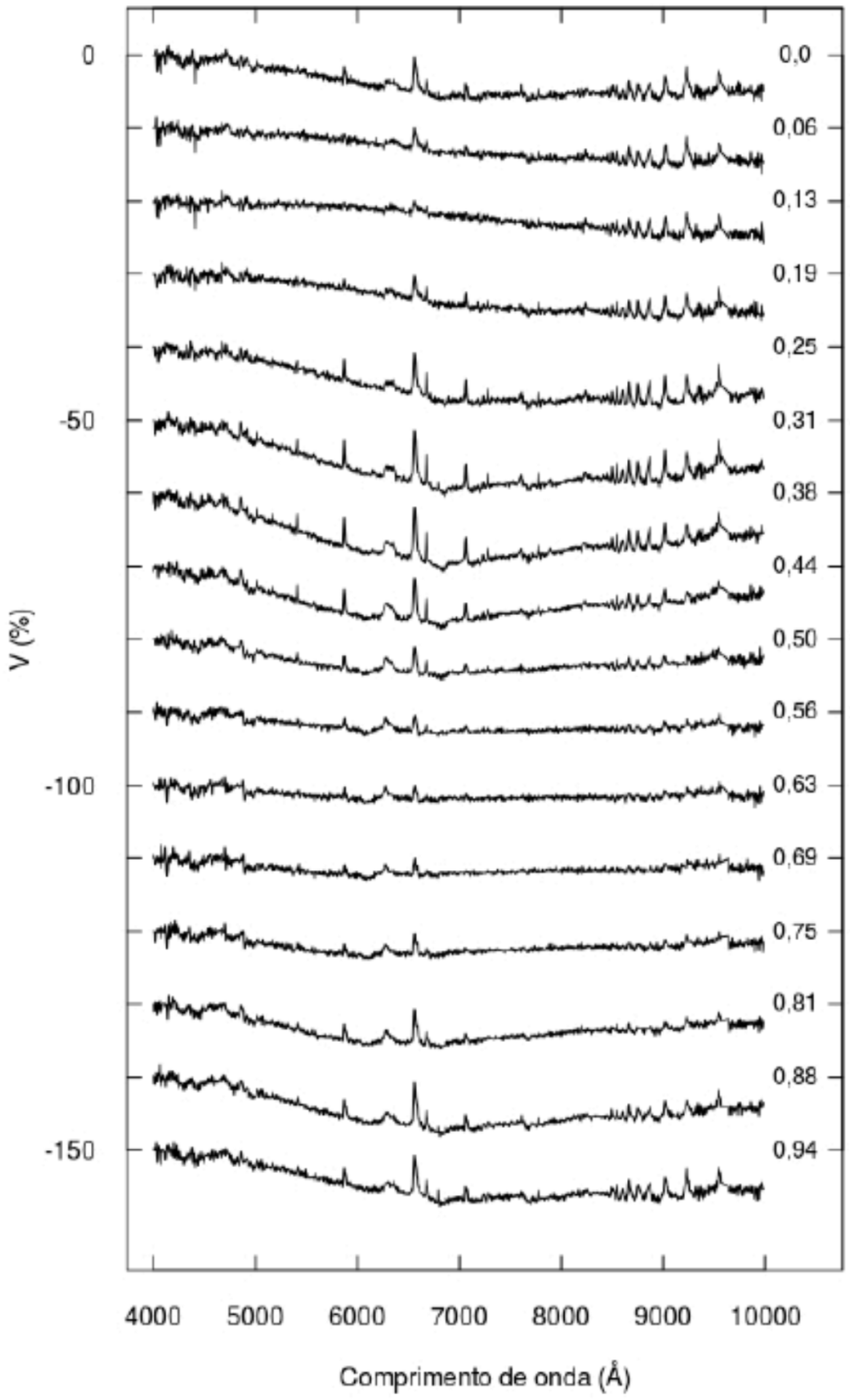
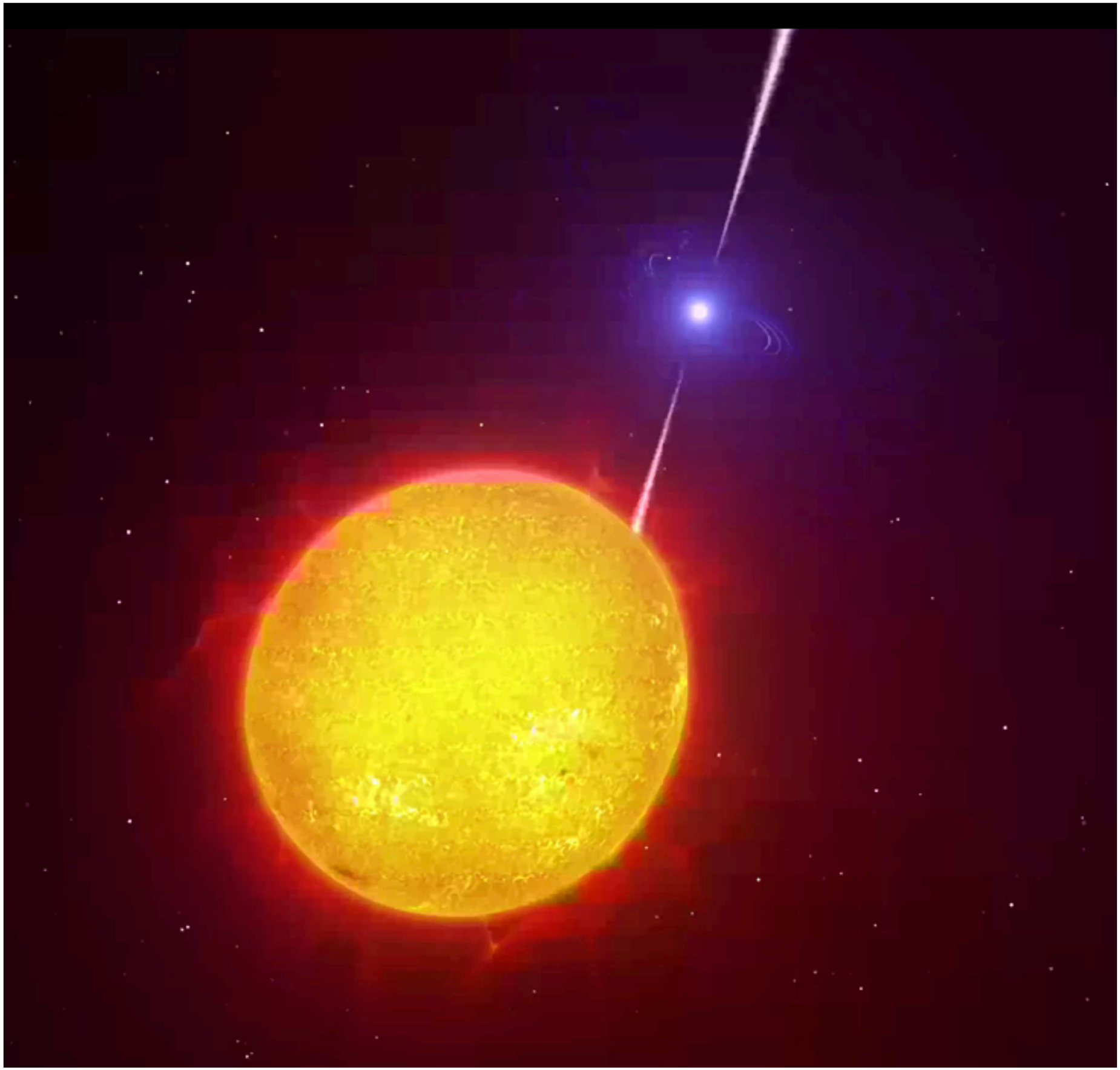


Figura 4.6 - Os 16 espectros de polarimetria de AM Her ao longo de um ciclo orbital, deslocados em 10 unidades negativas com as respectivas fases à direita de cada espectro.

Projeto

* Polarimetria de AR Sco
  - primeiro pulsar de anã branca (Marsh et al. 2016)
  - objeto linearmente polarizado (Buckley et al. 2016)

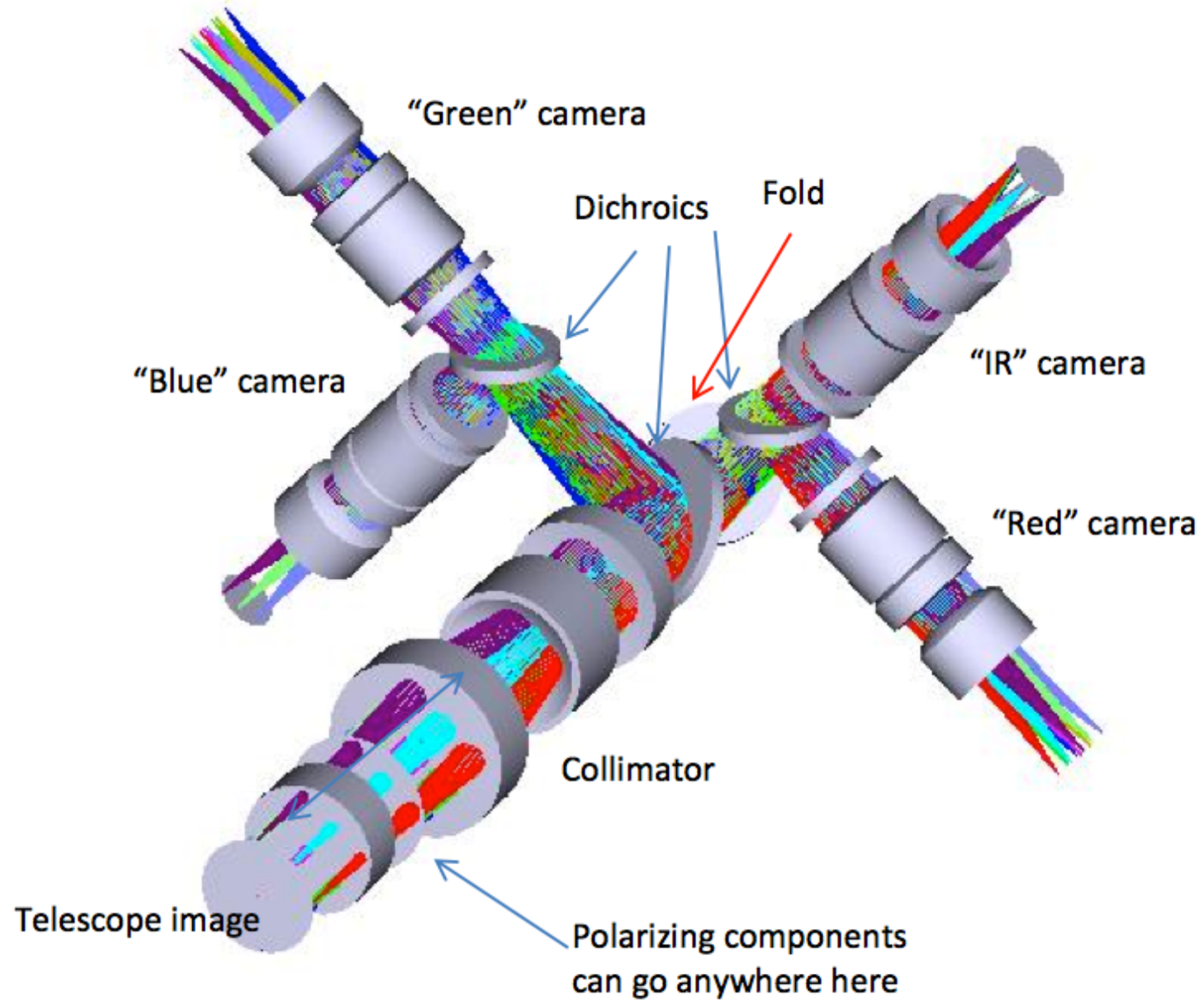
* temos dados do LNA em várias noites, que permitem estudar a variação temporal da polarização com o período orbital e o com o de batimento



https://en.wikipedia.org/wiki/AR_Scorpii

Instrumentação astronômica

SPARC4



* Projeto de instrumento para telescópio 1,6 m do OPD
* Câmera 4 bandas simultâneas (griz)
  - polarimetria
  - resolução temporal da ordem/melhor que 1s

SPARC4

* Financiamento atual: Finep
* Aquisições concretizadas
  - câmeras científicas
  - dicróicos
  - colimador, câmeras ópticas (2017)
  - óptica polarimétrica (2017)
  - barris da óptica principal (2017)
* Finalização do projeto mecânico e controle em curso
* Montagem dos barris em curso

Characterization of the SPARC4 CCDs

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[2]Instituto Nacional de Pesquisas Espaciais, Avenida dos Astronautas, 1758, São José dos Campos-SP, Brasil.

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Abstract. We present the photometric characterization of the four iXon Ultra 888 CCD cameras of the SPARC4 instrument, which will be installed on the 1.6 m telescope of the *Pico dos Dias* Observatory in Brazil. We applied experimental methodologies for a systematic characterization of the read noise, electronic gain, dark current, and quantum efficiency of the CCDs. We have analyzed the statistical distribution of the read noise, and also its spatial gradient and temporal variability, where we obtained an average value of the read noise of 6.33 electrons. We applied the Janesick method to determine the electronic gain, where we obtained an average value of 3.35 e-/ADU. We have also obtained an average dark current of 0.00014 e-/pix/s for CCD internal temperature of -70 °C. We have inspected the dependency of the dark current with temperature and the spatial distribution of the dark current, where we found a variable profile in the CCD 9917. We developed an experiment using a bench mounted monochromator to obtain the spectral dependency of the quantum efficiency in the spectral range between 350 nm and 1100 nm, where we measured the quantum efficiency for each camera. The camera 9915 presents the highest quantum efficiency of 95.8 %. Our results are compared with those from the manufacturer. These experiments allow us to diagnose the performance of these CCD cameras, an important sub-system of the SPARC4 instrument. It also provides a systematic way for monitoring the aging of the CCDs.

Keywords: instrumentation: detectors - methods: data analysis - techniques: image processing.

Pós-graduação

Pós-graduação

* Orientações
  - Conclusão de uma dissertação
    * Yasmin Amado (M - Capes - 2018)
  - Em andamento (2017)
    * Isabel de Jesus Lima (D - Fapesp)
    * Sarah Villanova Borges (M - ITA)

* 1 disciplina em 2017
  - Variáveis cataclísmicas

Publicações 2017

The Astronomical Journal, 153:144 (18pp), 2017 April https://doi.org/10.3847/1538-3881/aa610d
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Exploratory Spectroscopy of Magnetic Cataclysmic Variables Candidates and Other Variable Objects*

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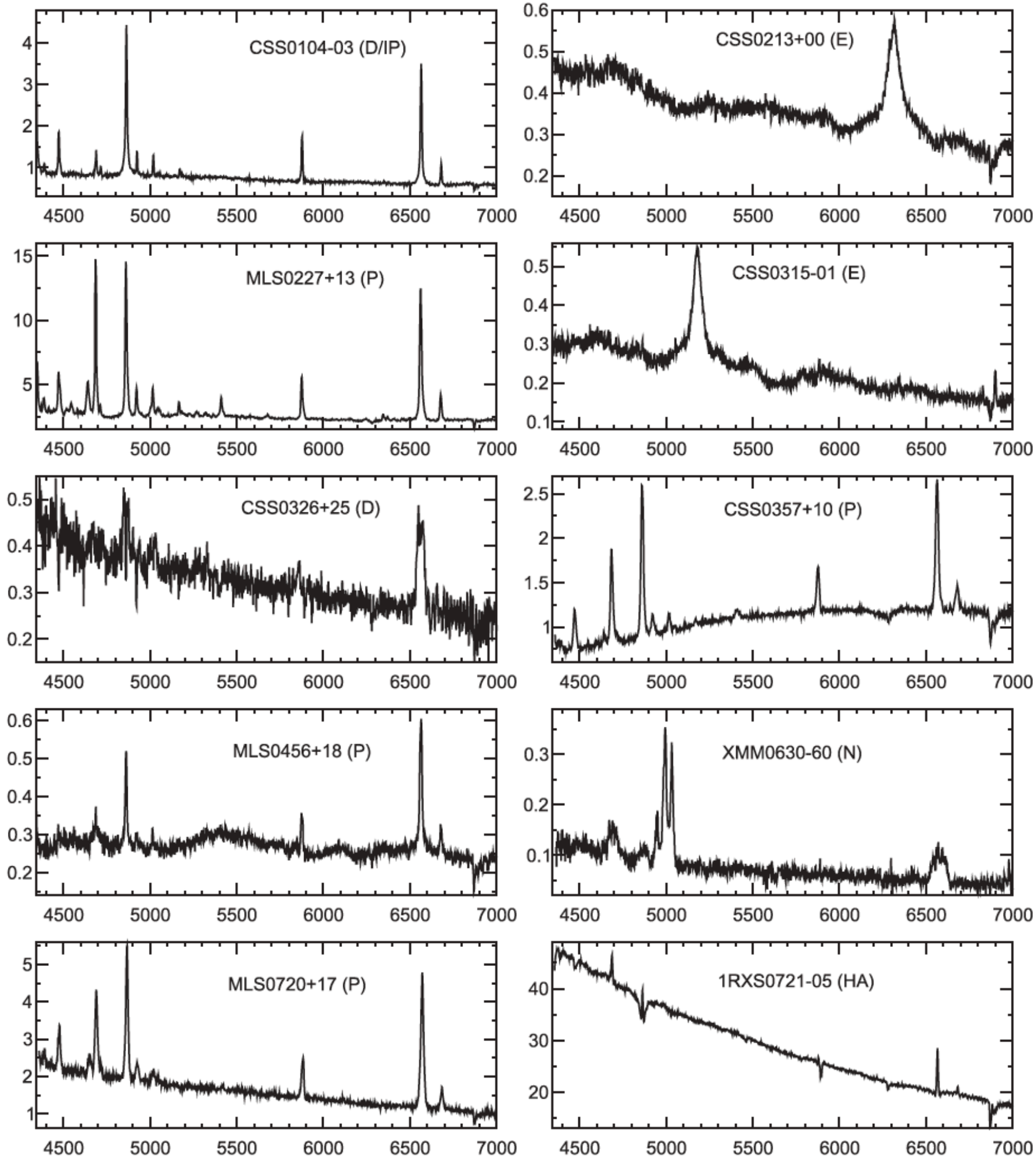
Abstract

The increasing number of synoptic surveys made by small robotic telescopes, such as the photometric Catalina Real-Time Transient Survey (CRTS), provides a unique opportunity to discover variable sources and improves the statistical samples of such classes of objects. Our goal is the discovery of magnetic Cataclysmic Variables (mCVs). These are rare objects that probe interesting accretion scenarios controlled by the white-dwarf magnetic field. In particular, improved statistics of mCVs would help to address open questions on their formation and evolution. We performed an optical spectroscopy survey to search for signatures of magnetic accretion in 45 variable objects selected mostly from the CRTS. In this sample, we found 32 CVs, 22 being mCV candidates, 13 of which were previously unreported as such. If the proposed classifications are confirmed, it would represent an increase of 4% in the number of known polars and 12% in the number of known IPs. A fraction of our initial sample was classified as extragalactic sources or other types of variable stars by the inspection of the identification spectra. Despite the inherent complexity in identifying a source as an mCV, variability-based selection, followed by spectroscopic snapshot observations, has proved to be an efficient strategy for their discoveries, being a relatively inexpensive approach in terms of telescope time.

Key words: binaries: close – novae, cataclysmic variables – stars: dwarf novae – stars: variables: general – techniques: spectroscopic

Supporting material: data behind figure, machine-readable table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CSS0213+00 (E)
MLS0227+13 (P)
CSS0315-01 (E)
CSS0326+25 (D)
CSS0357+10 (P)
MLS0456+18 (P)
XMM0630-60 (N)
MLS0720+17 (P)
1RXS0721-05 (HA)
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6500
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MNRAS 472, 3093–3100 (2017) doi:10.1093/mnras/stx2150

HS 2231+2441: an HW Vir system composed of a low-mass white dwarf and a brown dwarf*

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ABSTRACT

HW Vir systems are rare evolved eclipsing binaries composed of a hot compact star and a low-mass main sequence star in a close orbit. These systems provide a direct way to measure the fundamental properties, e.g. masses and radii, of their components, hence they are crucial in studying the formation of subdwarf B stars and low-mass white dwarfs, the common-envelope phase and the pre-phase of cataclysmic variables. Here, we present a detailed study of HS 2231+2441, an HW Vir type system, by analysing BVR_CI_C photometry and phase-resolved optical spectroscopy. The spectra of this system, which are dominated by the primary component features, were fitted using non-local thermodynamic equilibrium models providing an effective temperature $T_{\rm eff} = 28\,500 \pm 500$ K, surface gravity $\log g = 5.40 \pm 0.05$ cm s^{-2} and helium abundance $\log(n({\rm He})/n({\rm H})) = -2.52 \pm 0.07$. The geometrical orbit and physical parameters were derived by simultaneously modelling the photometric and spectroscopic data using the Wilson–Devinney code. We derive two possible solutions for HS 2231+2441 that provide the component masses: $M_1 = 0.19$ M$_\odot$ and $M_2 = 0.036$ M$_\odot$ or $M_1 = 0.288$ M$_\odot$ and $M_2 = 0.046$ M$_\odot$. Considering the possible evolutionary channels for forming a compact hot star, the primary of HS 2231+2441 probably evolved through the red-giant branch scenario *and does not have a helium-burning core, which is consistent with* a low-mass white dwarf. Both solutions are consistent with a brown dwarf as the secondary.

Key words: binaries: eclipsing – brown dwarfs – stars: fundamental parameters – stars: individual: HS 2231+2441 – white dwarfs.

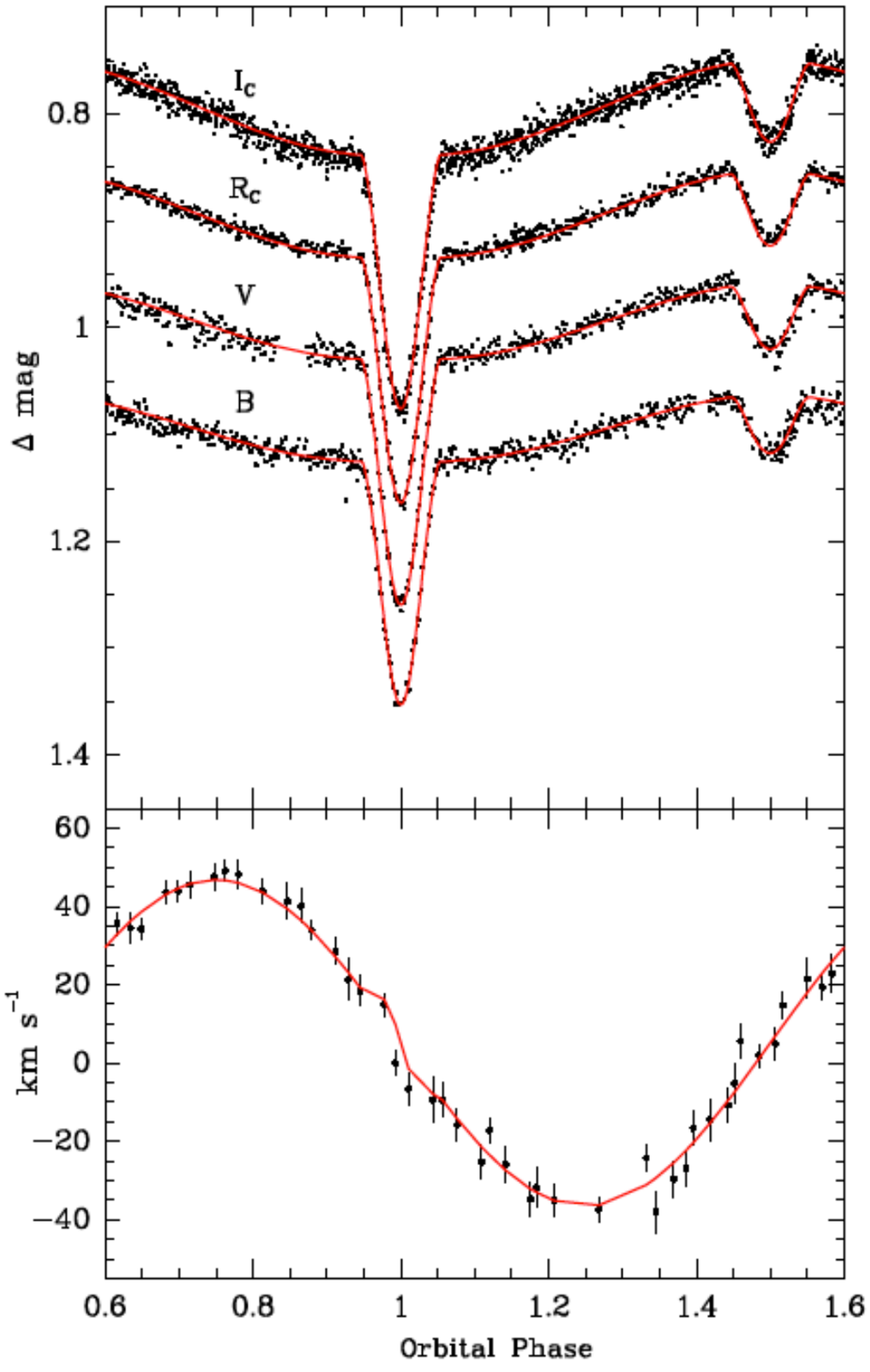

Figure 7. The best simultaneous fits to the light curves in the B, V, R_C and I_C bands and primary radial velocity curve performed with WDC.

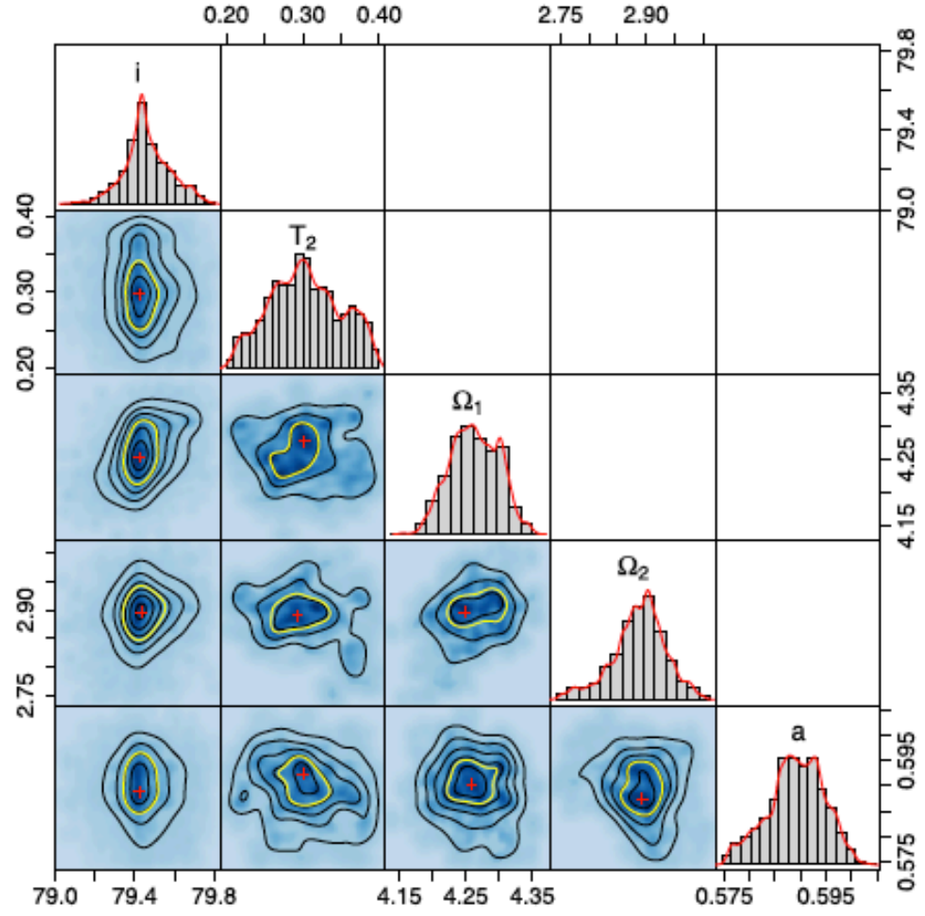

Figure 8. Joint distributions of the a posteriori probability densities for the main parameters fitted in the simultaneous analysis of the HS 2231+2441 light and radial curves. Our MCMC has 2×10^4 iterations sampling the regions around the best solution obtained with $q = 0.19$ found by the PIKAIA algorithm.

massive. When the primary ascends to the red giant branch (RGB), a dynamic mass transfer begins. This leads to the common envelope and a spiral-in phase. The primary envelope absorbs the released gravitational potential energy and it is subsequently ejected. The sdB star develops if the core of the giant still burns helium. The final result is a short-period binary with a sdB plus a main sequence companion.

In the channel discussed above, the resultant sdB star will have a mass larger than ~0.47 $M_\odot$, which is the lower limit needed to ignite the helium in its core (Han et al. 2003). However, a LMWD

Participação em outros projetos

* Continuação do survey espectroscópico de variáveis do CRTS

* Observações e modelagem de duas polares
  - Em colaboração com Alexandre S. Oliveira et al (Univap)

* Polarimetria de LBVs
  - Julio Campagnolo e Marcelo Borges (ON)

Perspectivas 2018

* Finalização da modelagem de duas MCVs
  - V405 Aur (Isabel Lima)
  - V348 Pav (Matheus S. Palhares - Univap)
* Defesa de Sarah Villanova Borges
  - Modelagem da SED de 4U 0142-61
* SPARC4
  - Usinagem
  - Desenvolvimento de subprojetos

Obrigada!