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A SEARCH FOR SYMBIOTIC STARS IN THE MILKY WAY

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Abstract. We present the search for symbiotic stars in the Northern Galactic Plane within the IPHAS imaging survey. The criterion used to select this class of objects is a combination of the IPHAS r – $H\alpha$ vs. r – i color-color diagram with the 2MASS J – H vs. H – K diagram. This allows us to distinguish symbiotic stars from other classes of $H\alpha$ -emitting evolved stars and nebulae. Confusion with young stars in star-forming regions can be also limited by a careful selection of the regions of the Milky Way to be investigated. In this way, more than a thousand new candidate symbiotic stars have been selected so far, and a spectroscopic campaign to determine their real nature is in progress.

Key words: stars: binaries: symbiotic – Galaxy: stellar content

1. INTRODUCTION

One of the basic numbers to discuss the evolutionary channels leading to and originating from symbiotic stars is their population size in the Galaxy and in other stellar systems. This is a poorly known figure. The total *estimated* number of symbiotic stars in the Galaxy ranges from 3×10^3 (Allen 1984) to a few 10^5 (Munari & Renzini 1992; Magrini, Corradi & Munari 2003), but presently only 173 Galactic symbiotic stars plus another 26 suspected ones are known (Belczyński et al. 2000). This small number is likely the consequence that no systematic searches for symbiotic stars have been done so far, and the known sample is mainly the result of the study of peculiar (variable or outbursting) individual stars. In this contribution, we report the search for symbiotic stars in the Milky Way within IPHAS, the INT Photometric $H\alpha$ Survey of the Northern Galactic Plane.

2. IPHAS

IPHAS is an international collaboration, whose aim is to produce a complete, fully photometric and spatially detailed $H\alpha$ map of the part of the Galactic Plane

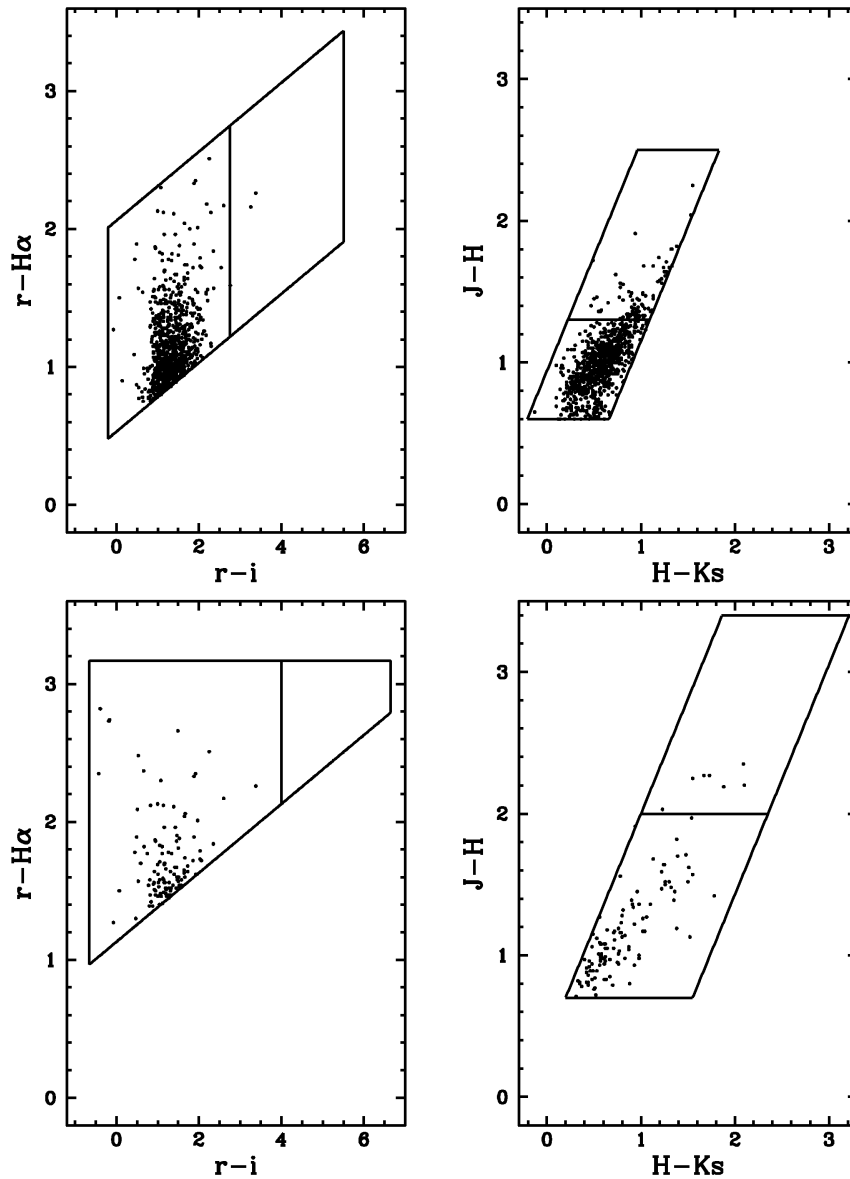


Fig. 1. Top: the selection boxes for S-type symbiotic stars in the IPHAS and 2MASS two-color diagrams. Dots are 871 candidate symbiotic stars brighter than $r = 19$ mag extracted from the IPHAS photometric catalogue. Bottom: the same for 119 candidate symbiotic stars of the D type.

between latitudes -5° and $+5^\circ$ that is visible from the Northern hemisphere. The IPHAS observations are done using the Wide Field Camera (WFC) at the 2.5 m Isaac Newton Telescope (INT) at the Observatorio del Roque de los Muchachos on La Palma, Spain. The WFC is installed at the prime focus of the telescope and consists of a mosaic of four $2k \times 4k$ EEV CCDs, providing a field of view of $34' \times 34'$ with a sampling of $0.33''$ per pixel. The IPHAS images are taken through three filters: a narrow-band $H\alpha$ ($\lambda_c = 6568 \text{ \AA}$; $\text{FWHM} = 95 \text{ \AA}$) and two broad-band Sloan r and i filters, with matched 120, 30 and 10 s exposures, respectively. In this way, the magnitude range $13 \leq r \leq 20$ is covered for point sources (the fainter end at 10σ).

the sky to be covered by IPHAS has been observed: the resulting photometric catalogue contains more than 100 million point sources. Further information on the IPHAS objectives, products, and first results can be found in Drew et al. (2005).

3. SELECTION CRITERIA FOR SYMBIOTIC STARS

IPHAS gives us the opportunity to detect a large number of new symbiotic stars in the Milky Way. The search for symbiotic systems in IPHAS takes advantage of the strong $H\alpha$ emission that characterizes this class of objects, which are therefore easily separated from normal main-sequence and giant stars. As symbiotic stars also contain a luminous red giant, their search is most effective if the IPHAS colors are combined with near-IR colors from the 2MASS survey. We have shown that in this way symbiotic stars can also be separated from other emission-line objects, like planetary nebulae, Be stars, or cataclysmic variables (Rodriguez-Flores 2006). Overlapping with other $H\alpha$ emitting stars in star-forming regions can be minimized by an adequate selection of the zones of the Milky Way to be studied.

For the time being, candidate symbiotic stars are chosen by means of “selection boxes” in the IPHAS $r-i$ vs. $r-H\alpha$ diagram AND in the 2MASS $J-H$ vs. $H-K$ diagram (see Figure 1). These boxes have been defined using an adequate number of known symbiotic stars observed with the same instrumentation as in IPHAS, and using the 2MASS point-source catalog which includes most of the known symbiotic stars.

4. PERSPECTIVES

The selection boxes for S-type and D-type symbiotic stars, respectively, as defined in Rodriguez-Flores (2006) are shown in Figure 1. In the figure, we also show 871 candidate S-type symbiotic stars with $r < 19$ mag, and 119 D-type candidates, that we have selected so far from the IPHAS point-source photometric catalog. Many more candidates are expected to appear in the future when the photometric catalog is analyzed in a more comprehensive way.

The spectroscopic confirmation as genuine symbiotic stars of three of these candidates, observed recently in a test run at the INT telescope, demonstrates the potentiality of the selection method and opens the way to significant increase of the number of symbiotic stars known in the Milky Way. With this aim we are planning an intensive spectroscopic campaign.

REFERENCES

- Allen D. A. 1984, PASA, 5, 369
- Belczyński K., Mikolajewska J., Munari U., Ivison R. J., Friedjung M. 2000, A&AS 146, 407
- Drew J. E., Greimel R., Irwin M. J. et al. 2005, MNRAS, 362, 753
- Magrini L., Corradi R. L. M., Munari U. 2003, in *Symbiotic Stars Probing Stellar Evolution*, eds. R. L. M. Corradi, J. Mikolajewska & T. J. Mahoney, ASP Conf. Ser., 303, 539
- Munari U., Renzini A. 1992, AJ, 397, 87
- Rodriguez-Flores E. R. 2006, DEA Thesis, University of La Laguna, Spain