

# NEAR-IR PERIOD-LUMINOSITY RELATIONS FOR VARIABLE STARS IN $\omega$ CENTAURI

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We report on an extensive time-series study of the globular cluster  $\omega$  Centauri (NGC 5139), obtained in the framework of the VVV Templates project (Catelan et al. 2013, arXiv: 1310.1996). This cluster was chosen for this project due to its large variable star content. A total of 42 and 100 epochs of the cluster in  $J$  and  $K_S$ , respectively, were taken using VIRCAM@VISTA, and PSF photometry was performed to derive light curves for 270 pulsating stars (RRab, RRc, type II Cepheids and SX Phoenixis) with an unprecedented phase coverage in the near-IR. Period-Luminosity (PL) relations in both bands were derived using Fourier fitted magnitudes for RR Lyrae and Type II Cepheids, while weighted-average magnitudes were used for SX Phe stars. Using the PL relation for RRab stars derived by Dékány et al. (2013, ApJ, 776, 19L) in the VISTA  $K_S$  system, we determine a distance modulus of  $(m - M)_0 = 13.78 \pm 0.04$  mag, in good agreement with Del Principe et al. (2006, ApJ, 652, 362). From Type II Cepheids we derived a value of  $(m - M)_0 = 13.67 \pm 0.07$  mag, similar to what was found by Matsunaga et al. (2006, MNRAS, 370, 1979). For SX Phe stars, we use the derived periods and magnitudes to infer their pulsation modes, and we confirm that at least 12 of them are fundamental-mode pulsators (Olech et al. 2005, MNRAS, 363, 40).

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# HIGH-IONIZATION ACCRETION SIGNATURES IN COMPACT BINARY CANDIDATES FROM SOAR TELESCOPE OBSERVATIONS

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The increasing number of synoptic surveys made by small robotic telescopes, like the photometric Catalina Real-Time Transient Survey (CRTS – Drake et al., 2009, ApJ, 696, 870), represents a unique opportunity for the discovery of new variable objects and also to improve the samples of many classes of variables. Our goal in this work was the

discovery of new polars, a subclass of magnetic Cataclysmic Variables (mCVs) with no accretion disk, and Close Binary Supersoft X-ray Sources (CBSS), strong candidates to Type Ia Supernova progenitors. Both are rare objects and probe interesting accretion scenarios. Finding spectral features associated to high-ionization mass accretion constrains the CBSS or magnetic CV nature for the candidates, expanding the hitherto small samples of these classes (specially CBSS) and allowing for detailed observational follow-up. We used the Goodman Spectrograph on SOAR 4.1 m Telescope to search for signatures of high-ionization mass accretion, as He II 468,6 nm emission line and inverted Balmer decrement, on 39 variable objects selected mostly from CRTS. In this sample we found 14 strong candidates to mCVs, 1 Nova in the final stages of eruption, 14 candidates to Dwarf Novae, 5 extragalactic sources (AGN), 1 object previously identified as a Black Hole Nova, 3 objects with pure absorption spectral features and 1 unidentified object with low S/N ratio. The mCVs candidates found in this work will be studied using time-resolved spectroscopic, polarimetric, and photometric observations in a follow-up project.

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# OPEN CLUSTER DETECTION IN EXTENSIVE SKY REGIONS USING ASTROMETRIC PARAMETERS

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We developed a non-parametric method for identifying open clusters in large areas of the sky using stellar position and proper motions. Two binary codes were established from the analysis of the empirical probability density functions in position and proper motion, after eliminating field stars contamination. For each star, these codes provided a parameter indicating the star belongingness to spatial and proper motion overdensities. The method was tested in a region of  $4^\circ \times 5^\circ$  where Collinder 140 and Collinder 132 are located. 1300 stars up to the magnitude  $R=11$  were obtained from UCAC2 and its supplement UCAC2 BSS catalogue. We detected six stellar groups having spatial and proper motion overdensities. A detailed analysis revealed that three of them could be open clusters. We confirmed that one of them is Collinder 140, for