NEAR-IR PERIOD-LUMINOSITY RELATIONS FOR VARIABLE STARS IN ω CENTAURI

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We report on an extensive time-series study of the globular cluster ω 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 Phoenicis) 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 $4° \times 5°$ 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

which mean coordinates $(\bar{\alpha},\bar{\delta})$=(110.8°,-32.0°), a radius of about 12' and mean proper motion components $(\bar{\mu}_{\alpha}cos\delta,\bar{\mu}_{\delta})$=(9,4) mas/yr were obtained, in good agreement with the literature. The other two possible clusters have members fainter than magnitude 10.0 and they are not found in the literature. Related to Collinder 132, the low density of the data used in the area did not allow to detect it.

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ΔA OBSERVATIONS OF THREE GLOBULAR CLUSTERS: NGC 104, NGC 6205, AND NGC 7099

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Globular clusters are main astrophysical laboratories to test and modify evolutionary models. Thought to be rather homogeneous in their local elemental distribution of members, new results suggest a wide variety of chemical peculiarities. The preselection of apparent peculiar stars for a detailed spectroscopic analysis is very important for globular cluster fields. Most regions are very dense and the target stars are, normally, very faint. Photometry could be one way out of the dilemma since it is very efficient. Up to now, only observations in the Johnson $UBV(RI)$ and Strömgren $uvby\beta$ systems are able The tool of Δa photometry is employed in order to detect chemically peculiar Population II stars. This three filter narrow band system measures the flux distribution in the region from 4900 to 5600Å in order to find any peculiarities around 5200Å. The first Δa observations for 3 globular clusters: NGC 104, NGC 6205 and NGC 7099, give very promising results, which will serve as a solid basis for follow-up observations including photometric as well as spectroscopic studies.

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GALACTIC EMBEDDED CLUSTERS WITH 2MASS INFRARED PHOTOMETRY

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Star clusters and associations are born in general embedded within giant molecular clouds. Because of this, during their formation and early evolution they are often only visible at infrared wavelengths, being heavily obscured by dust. In this work we employed the 2MASS photometric database together with WISE (NASA) images to analyze, for the first time, 10 Galactic embedded cluster candidates. WISE is fundamental owing to its sensitivity to dust emission, especially in the 12 μm and 22 μm bands. We followed the revised list of Dolidze clusters by M. Kronberger which was communicated to the DAML02 database (Dias et al. 2002). We selected interesting Dolidze objects from this list with additional inspections by one of us (E. B.). In the present study we show results for 4 candidates in view of determining their astrophysical parameters. We produced colour-magnitude diagrams (CMDs) and radial density profiles (RDPs). We employed the field decontamination method by Bonatto & Bica (2007, 2010) to obtain clean CMDs. We fit isochrones from PARSEC models (Bressan et al. 2012). This method has been systematically used in our publications and have shown how effective it is. All objects present a central concentration and extensions in RDPs. In certain cases, e.g. Dolidze 25, the profile distribution and central density are significant. The RDPs were important to define the extraction regions for the objects and their field decontamination areas. The isochrone fittings for Dolidze 5 show a clear Main Sequence (MS), while for Dolidze 25 a MS and Pre Main Sequence (PMS) are present. Dolidze 5 and Dolidze 25 appear to be physical systems, considering only the photometric data, while Dolidze 47 and Dolidze 55 resulted as field fluctuation.

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GALACTIC DYNAMICS: ORIGIN, HISTORY, PRESENT AND PROSPECT

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I present a travel through the history and main contributions to astrophysical development of the galac-