

(the primary) via an accretion disc. In this poster we report the first results of long-term project to study cyclical period variations in CVs. The observations were done from 2008 to 2013 at Observatório do Pico dos Dias (OPD/LNA, Brazil). Time series of high speed CCD photometry were obtained using the 0.6 m and 1.6 m telescopes at OPD. We measured new white-dwarf mid-eclipse timings and combined them with published measurements to construct updated observed-minus-calculated (O-C) diagrams. The UU Aqr O-C diagram covers 24 years of observations and presents a 26 yr modulation with semi-amplitude of 47 s. The V2051 Oph data cover 35 years of observations and the new timings show significant deviations from the published linear plus sinusoidal ephemeris (22 yr modulation with a semi-amplitude of 17 s), indicating that the variation is not strictly periodic. We discuss the observed modulations in context of the two current explanations for the phenomenon: magnetic activity in the secondary star and the presence of a third body in the system.

¹ Universidade Federal de Santa Catarina, Campus Araranguá, Rua Pedro João Pereira, 150, CEP88905-120, Araranguá, Brasil (bernardo.borges@ufsc.br).

² Departamento de Física, Universidade Federal de Santa Catarina, Campus Trindade, Florianópolis, Brasil.

³ Instituto de Pesquisa & Desenvolvimento, Universidade do Vale do Paraíba, São José dos Campos, Brasil.

NEWLY DISCOVERED OLD OPEN CLUSTERS IN THE VVV SURVEY

J. Borissova¹, S. Ramírez Alegría¹, A. N. Chené²,
R. Kurtev¹, and VVV star cluster team

We report the discovery and fundamental parameters of 20 infrared open clusters projected in the inner disk and bulge area covered by the ESO public survey VISTA Variables in the Via Láctea (VVV). The most interesting candidates are as follow: The color-magnitude diagrams of VVV CL119, VVV CL143 and VVV CL150 show well defined red giant branch, some red clump and main sequence stars. They are projected at 6.8; 9.2 and 6.98 kpc respectively, are 5-10 Gyr old, intermediate metal poor, and could be classified as old open clusters. However, these objects in the inner few kpc from the Galactic center are quite unusual, because they should be rare in the inner Galaxy. Thus, these are promising candidates for new globular clusters in the galactic bulge. The open cluster candidates VVV CL124,

VVV CL160 and VVV CL161 show well defined sequence of evolved and main sequence stars and are classified as old open clusters. They are projected at 5.0; 5.5 and 8.7 kpc respectively. The cluster candidates VVV CL139 and VVV CL140, are projected very close each to other, show similar radial velocities and distance modulus of 3.8 kpc. The age of CL139 is estimated around 80 Myr, while CL140 is older (1.3 Gyr). Both clusters are relatively metal rich, and are good new cluster pair candidate. And finally, two cluster candidates from our sample, namely VVV CL117 and VVV CL130 show typical color-magnitude diagrams of red supergiant clusters, but more data are necessary to confirm their nature. In summary, 15% of new cluster candidates from our sample have ages between 100 Myr and 1 Gyr and 50% are older than 1 Gyr. All clusters are very reddened, reaching $A_V=28$ mag in some of the cases.

¹ Departamento de Física y Astronomía, Universidad de Valparaíso, Av. Gran Bretaña 1111, Playa Ancha, Casilla 5030, Chile (jura.borissova@uv.cl.)

² Gemini Observatory, Northern Operations Center, 670 N. A'ohoku Place Hilo, HI 96720, USA.

UNVEILING TYPE IIB SUPERNOVA PROGENITORS: SN 2011HS FROM A SUPERGIANT STAR

F. Bufano¹

Type IIB Supernovae are the final evolutionary stage of massive stars that were able to retain only a thin ($\lesssim 1 M_\odot$) H/He external envelope at the time of the explosion. The mechanism of mass-loss that made such final structure possible and the nature of such progenitor stars are still open issues. We present the results obtained from the study of a sample of Type IIB SNe, in particular, of SN 2011hs (Bufano et al., 2013, MNRAS submitted). SN 2011hs was a relatively faint ($M_B = -15.6$ mag) and red Type IIB SN, characterized by a narrow light curve shape. Its spectral evolution showed the metamorphosis typical of this class of SN, from spectra dominated by H I lines to spectra where He I features dominate, but with broad absorption line profiles indicating high expansion velocities. Modeling the light curve of SN 2011hs and its velocity evolution with hydrodynamical calculations, we estimated that the SN is consistent with the explosion of a 3–4 M_\odot He-core star, from a main sequence mass of 12–15 M_\odot , ejecting a ^{56}Ni mass equal to 0.04 M_\odot and characterized by an explosion energy of $E \approx 8.5 \times 10^{50}$ erg s⁻¹.