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DYNAMICAL PROPERTIES OF BLUE STRAGGLER STARS IN GALACTIC GLOBULAR CLUSTERS: NGC3201, ωCEN AND NGC6218

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We present the first dynamical study of Blue Straggler Stars (BSSs) in three Galactic globular clusters, NGC 3201, NGC 5139 (ωCen), and NGC 6218, based on medium-resolution spectroscopy ($R \approx 10000$) obtained with the IMACS spectrograph. Our BSS candidate selection technique uses photometric data out to $> 4.5\,r_c$. We use radial velocity measurements to discard non-members and achieve a success rate of $\sim 93\%$, which yields a sample of 116 confirmed BSSs. Using the penalized pixel fitting method (pPXF) we measure the $v\sin(i)$ values of the sample BSSs and find their distribution functions peaked at slow velocities with a long tail towards fast velocities in each globular cluster (see Figure 1a). About 90% of the BSS population in NGC 3201 and NGC 6218 exhibit values in the range 10–50 km s^{-1}, while about 80% of the BSSs in ωCen show $v\sin(i)$ values between 20 and 70 km s^{-1}.

We find that the BSSs in NGC 3201 and NGC 6218 which show $v\sin(i) > 50$ km s^{-1} are all found in the central cluster regions, inside a projected $2\,r_c$, of their parent clusters. We find a similar result in ωCen for BSSs with $v\sin(i) > 70$ km s^{-1} which are all, except for two, concentrated inside $2\,r_c$ (see Figure 1b). In all globular clusters we find rapidly rotating BSSs that have relatively high differential radial velocities (A5 and C1 being the most interesting cases, see Figure 1a, 1b and 1c.) which likely put them on hyperbolic orbits, suggestive of strong dynamical interactions in the past.

Using dereddened colors of our photometric selection we show that blue BSSs in ωCen with $(V-I)_0 \lesssim 0.25$ mag show a significantly increased $v\sin(i)$ dispersion compared with their red counterparts and all other BSSs in our sample (see Figure 1c), therefore strongly implying that fast rotating BSSs in ωCen are preferentially bluer, i.e. more massive. This may indicate that this particular blue BSS population was formed in an unique formation event and/or through an unique mechanism. The interested reader is strongly referred to Simunovic & Puzia (2013, arXiv:1312.2545), where a further detailed analysis and interpretation of these results can be found.

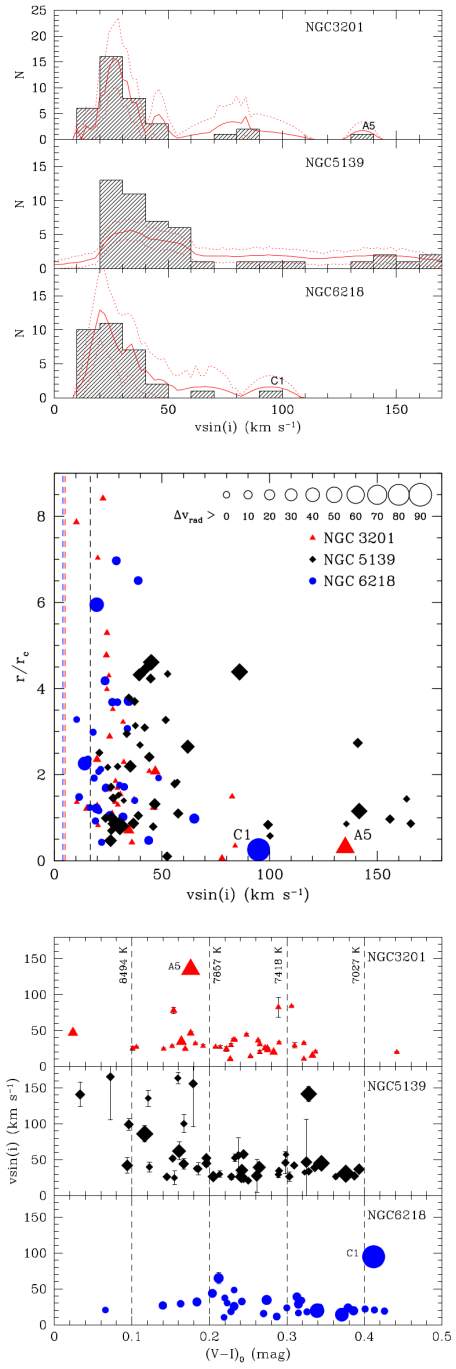

Fig. 1. *a*: top panel, *b*: middle panel, *c*: bottom panel.

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