Results

Carbon stars as tracers: main sequence, horizontal branch, giants, red clump, etc. We revisit carbon stars for the following reasons: 1) Since Ibata et al., many new carbon stars have been identified; and 2) a new, and (almost) all-sky variable survey, the Catalina Surveys, is available.

The lack of carbon stars in the region of the apocentre, predicted by LM10, is significant. Belokurov et al. (2014) have proposed that the Gemini Arm (seen in RR Lyrae in the region beyond the Sgr leading arm) is an extension of the Sgr dSph and its tidal arms. Radial velocities would significantly help in assigning them to not only Sgr, but also to other tracers: SMC, LMC, etc.

Variables Carbon Stars as Probes of the MW Halo

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Variable Carbon Stars as Tracers

Ibata et al. (2001) used carbon stars to find the apocentre of the tidal arms being torn from the Sagittarius (Sgr) dwarf spheroidal. The streams have since been found in a wide range of tracers: main sequence, horizontal branch, giants, red clump, etc. We revisit carbon stars for the following reasons: 1) Since Ibata et al., many new carbon stars have been identified; and 2) a new, and (almost) all-sky variable survey, the Catalina Surveys, is available.

We used Catalina to identify LPV (long-period variable) carbon stars. Period04 was employed to derive period and amplitudes, where the Catalina data is sufficient. Period-luminosity relations, from carbon stars in this LMC, are then employed to estimate absolute magnitudes and hence distances to our sample stars. Our final sample comprises 121 LPV carbon stars, shown as solid black circles in Figures 4 and 5, which we compare to the canonical Law & Majewski (2010) [LM10] simulation.

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Summary

Our data suggest that the majority of the LPV carbon stars are associated with the Sgr dSph and its tidal arms. Radial velocities would significantly help in assigning them to not only Sgr, but also to either the leading or trailing arms.

The lack of carbon stars in the region of the apocentre of trailing arm, predicted by LM10, is significant. Ibata et al. (2014) have proposed that the Gemini Arm (seen in RR Lyrae in the centre panel of Fig. 4) is the true location of the apocentre. Our results are consistent with this view. However, we might have expected to find more than two carbon stars.

We find one carbon star sitting beyond the leading arm apocentre (feature 3) located just in the LM10 arm model, on the sky. The presence of other tracers in this region, and at distances between 60 and 150 kpc, has been reported. There may be a feature beyond the Sgr leading arm apocentre. It may be associated with Sgr, or possibly related to totally different accretion events.

TriAnd is revealed in carbon stars as a narrow linear feature, within the large region outlined by Rocha-Pinto et al. (2004).

Two carbon stars sit near Sterkenburg’s group 6 ~ although recent RR Lyrae data finds no obvious feature in this region.

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