

# A Search For Young Stars in the Magellanic Stream

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## Introduction:

Young stars were discovered in the Magellanic InterCloud region (ICR) in 1990 by Irwin et al.<sup>2</sup> In an effort to solve the mystery of where these stars come from, we made use of SMARTS-1.5m telescope + R-C Spectrograph (RC), 6.5m telescope + MIKE spectrograph (MIKE), and GaiaDR2<sup>1</sup> data. Two of these stars have been determined to be young Magellanic Stream candidates (YMSC). These stars could aid in constraining the formation of stars in lower density and metal poor regions as well as giving a more detailed composition of the Magellanic Stream.

We make use of two datasets, B Stars and Dupont, which are two subsets of the original ICR stars. The B Stars dataset consists of 35 stars and is the initial set, while the Dupont dataset consists of 65 stars.

## Results:

Both DI1020 and DI1085 are isolated stars and do not fall into any group. The remaining stars fall into various moving groups (8 for B Stars and 12 for Dupont). The majority of these moving groups are close to the Milky Way.

DI1374, DI1466, DI1488, DI1499, DI1507, DI1577, and DI1595 have been identified as rapid rotators, where  $v \sin i > 40 \text{ km/s}$ .

The two stars that we found to be YMSC stars were DI1450, and DI1507 (also a rapid rotator). Both of these stars are considered to be “hot”, being above 7000 K. The stars are  $9428 \pm 2062 \text{ K}$  and  $19786 \pm 786 \text{ K}$  respectively.

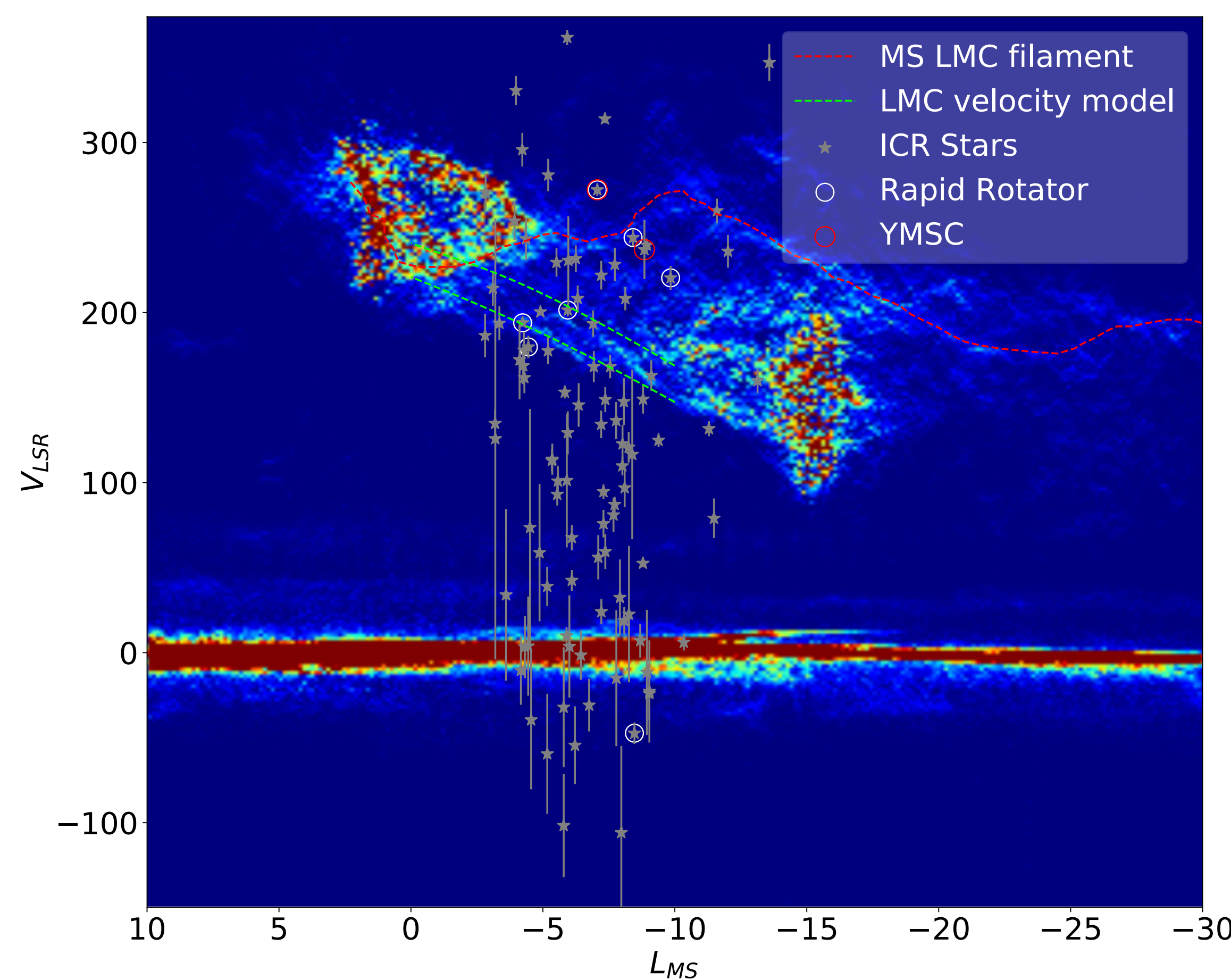


Fig 1: Position Velocity Plot

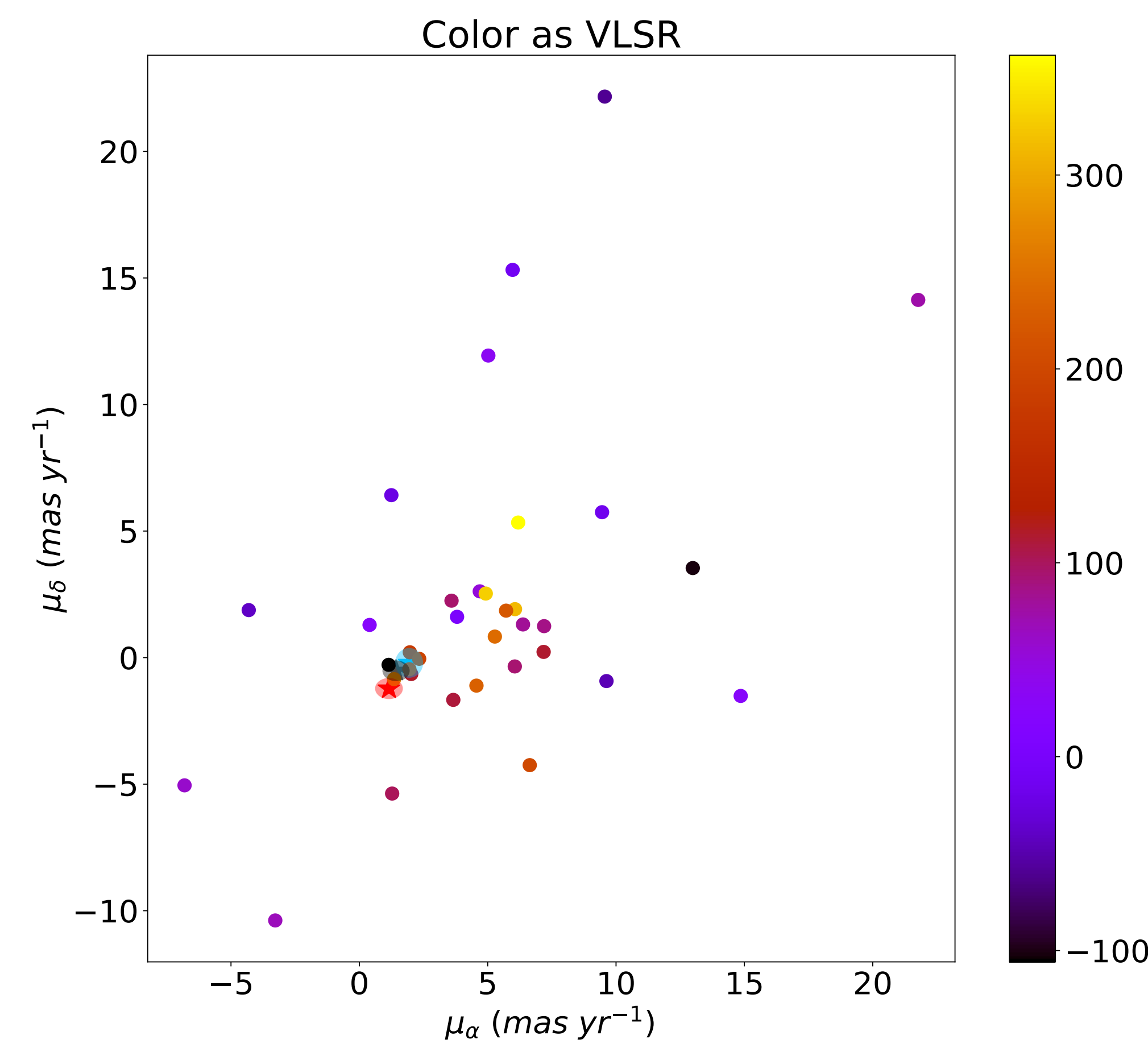


Fig 2: B Stars

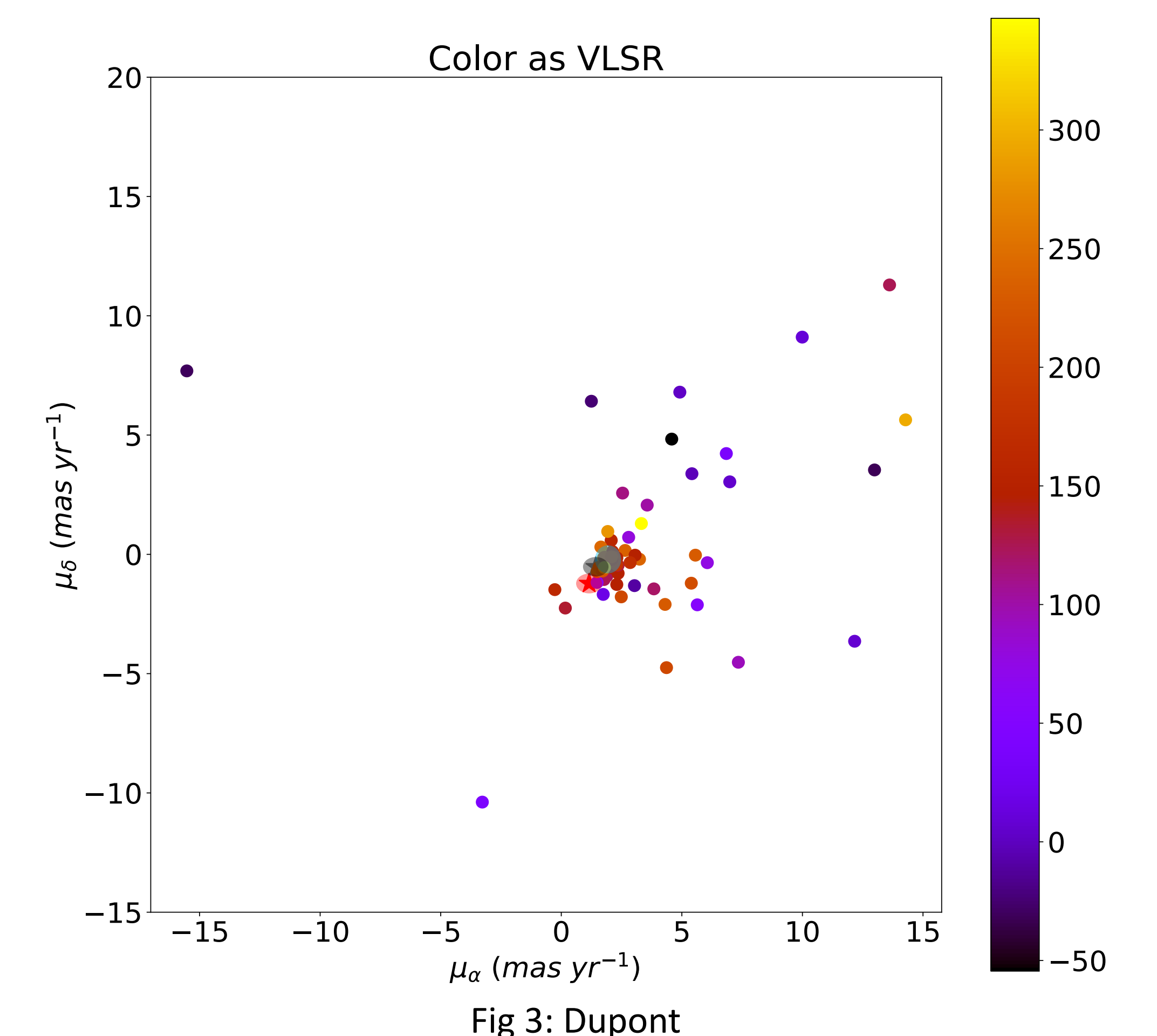


Fig 3: Dupont

## Methods:

First we needed to identify younger blue stars. For the B Stars sample, the spectra were compared to synthetic spectra to derive  $T_{eff}$ ,  $\log g$ , and  $[M/H]$  to determine if the stars were younger blue stars. This was done using the SPECIFIT<sup>3</sup> routine and  $\chi^2$  testing. Uncertainties in the parameters were derived using Monte Carlo Methods. For the Dupont sample, the stars were selected based on their positions in a CMD.

The kinematic quantities of interest are parallaxes and proper motions, which were provided by Gaia DR2. We derived the distances from the parallaxes and did not accept distances from parallaxes that did not satisfy  $\varpi > 3\delta\varpi$  or  $\varpi < 0$ . Based on the location of the stars in figure 1 with where they fall in the proper motion space, see figure 2 and 3, and distance we were able to conclude where the stars came from. These kinematic quantities can tell us if these stars originate in the LMC, SMC, MS, or foreground contamination from the Milky Way.

## References:

Gaia Collaboration, Prusti, T., et al., 2016, A&A, Volume 595, id.A1, 36 pp.

Irwin, M. J., Demers, S., & Kunkel, W. E. 1990, AJ, 99, 191

Nidever SPECIFIT reference