Galactic Dynamics in the Era of Large Surveys
Proceedings IAU Symposium No. 353, 2019
M. Valluri & J. A. Sellwood, eds.
© International Astronomical Union 2020
doi:10.1017/S1743921319008482

Something about Red Supergiants

Maria Messineo

Key Laboratory for Researches in Galaxies and Cosmology, University of Science and Technology of China, Chinese Academy of Sciences, Hefei, Anhui, 230026, China

Abstract. I would like to present an overview of red supergiants (RSGs) in the Milky Way. There are only about 1400 objects listed as RSGs in the spectroscopic catalog by Skiff (2014); moreover, we are not sure yet about how they formed and where they formed. Indeed, most of them are strangely found in isolation, while extraordinary massive clusters of RSGs are observed at the near-end of the Galactic Bar. This intriguing overdensity poses some questions about the continuity of star formation in the Galactic Disk.

Keywords. stars: late-type, supergiants, stars: distances

1. Introduction

In this presentation, I provide you with an overview of the large-scale distribution of Galactic Red supergiants (RSGs). RSGs are the brightest stars at infrared wavelengths, easily detectable at a distance of a few megaparsecs. Their evolution is dominated by their large envelopes and associated phenomena (mass-loss, convection, rotation, and magnetic fields) that strongly affect their final fate. They eventually explode as supernovae leaving a neutron star or a black hole. They are tracers of stellar populations from 4 to 30 Myr.

When I started wondering about Galactic RSGs, I realized, that databasing and clear luminosity classifications were missing, we were searching for RSGs in the unexplored inner Galaxy, but we were missing to classify those under our nose. More than hundred RSGs have been recently discovered in massive clusters (e.g. RSGC1, RSGC1, RSGC3) located between 25° and 30° of Galactic longitude, where the near-side of the Bar ends and meets the spiral arms. Starburst clusters of RSGs are easily detectable, but rare (e.g., Figer *et al.* 2006; Davies *et al.* 2007). There is likely a sea of sparse RSGs in the inner Galaxy in apparent isolation. Indeed, we located a set of infrared colours for a sample dominated by RSGs (Messineo *et al.* 2012). With this sample of RSGs from the GLIMPSE I North catalog, selected in colours and magnitudes, but not spatially/environmentally, we demonstrated that only a small percentage (2%) is associated with stellar clusters (Messineo *et al.* 2017).

Only about 1400 candidate Galactic RSGs are currently known (Skiff 2014). Their classification is difficult because of our location on the Disk, dust observation, and uncertain distances. Recently, we have compiled a catalog of 889 good quality GAIA parallaxes of known K-M class I stars, with 30% being giants below the luminosity of the tip of red giants, and 60% being highly-probably RSGs (Messineo & Brown 2019).

Huge progress has been made thanks to the availability of multi-wavelength surveys, spectroscopic surveys, and parallaxes, and a tremendous step forward will soon arrive with the Gaia DR3 release which will include spectral types. Figure 1 suggests that most RSGs are located along the spiral arms, as expected.

https://doi.org/10.1017/S1743921319008482 Published online by Cambridge University Press

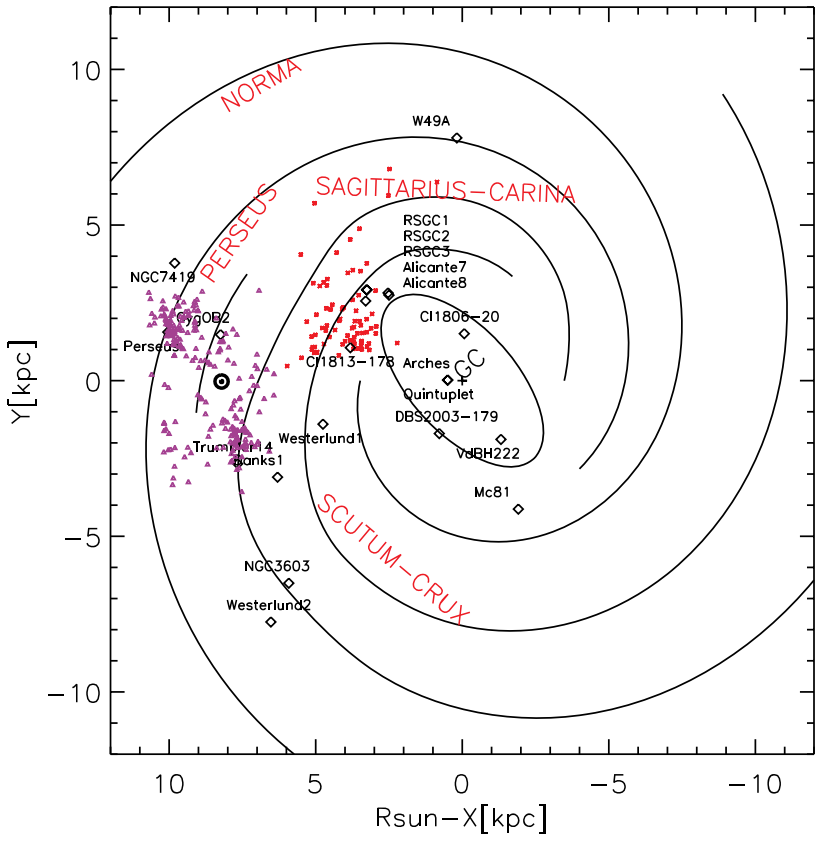

Figure 1. *XY* view. Updated version of Figure 3 of Messineo *et al.* (2016a), where the RSGs from the work of Messineo *et al.* (2016b) are marked with red asterisks and, for comparison, known massive stellar clusters ($> 10^4$ $M_\odot$) are indicated with diamonds. Spiral arms are from Cordes & Lazio (2002). The new magenta triangles are highly-probable RSGs detected by Gaia DR2, i.e. K-M I stars with Mbol < -5.5 mag (see also Fig. 7 in Messineo & Brown 2019).

Acknowledgment

This work was partially supported by the National Natural Science Foundation of China (NSFC-11773025,11421303), and USTC grant KY2030000054.

References

Cordes, J. M. & Lazio, T. J. W. 2002, eprint arXiv:astro-ph/0207156
Davies, B., Figer, D. F., Kudritzki, R.-P., *et al.* 2007, *AJ*, 671, 781
Figer, D. F., MacKenty, J. W., Robberto, M., *et al.* 2006, *AJ*, 643, 1166
Messineo, M. & Brown, A. G. A. 2019, *AJ*, 158, 20
Messineo, M., Menten, K. M., Churchwell, E., & Habing, H. 2012, *A&A*, 537, A10
Messineo, M., Zhu, Q., Menten, K. M., *et al.* 2016a, in 19th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun (CS19), Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, 120
Messineo, M., Zhu, Q., Menten, K. M., *et al.* 2016b, *AJ*, 822, L5
Messineo, M., Zhu, Q., Menten, K. M., *et al.* 2017, *AJ*, 836, 65
Skiff, B. A. 2014, *VizieR Online Data Catalog*, B/mk

https://doi.org/10.1017/S1743921319008482 Published online by Cambridge University Press