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Quantifying the typical scale of star formation in the Milky Way spiral arms through their young star clusters

Alexis L. Quintana[1], Ignacio Negueruela[1], and Sara R. Berlanas[2,3]

[1] Departamento de Física Aplicada, Facultad de Ciencias, Universidad de Alicante, Carretera de San Vicente s/n, 03690 San Vicente del Raspeig, Spain
[2] Instituto de Astrofísica de Canarias, E-38 200 La Laguna, Tenerife, Spain
[3] Departamento de Astrofísica, Universidad de La Laguna, E-38 205 La Laguna, Tenerife, Spain

Abstract

Star formation is a vital phenomenon in astronomy, yet there are still many unknowns surrounding it because of its complexity. In particular, spiral arms are important sites of star formation, but the spatial scale in which it occurs still needs to be fully quantified. As typical tracers of the spiral arms, young stellar clusters and associations constitute suitable probes towards solving this question. On the one hand, they stay close to their birth environment; on the other hand, it is easier to determine accurate distances for them rather than individual stars. We identify stellar groups within the Galactic spiral arms, that are consistent both in velocity and age, in order to estimate their size and thus the spatial scale of star formation. This requires a reliable determination of their membership, which is possible thanks to the combination of recent photometric, kinematic and spectroscopic data with modern computing tools, allowing us to better define their members and use them as probes. We selected the association Cas OB5 as our first target. Recent investigations have placed its members at distances between 2.5 and 3 kpc, thereby intercepting the Perseus arm. We redefine the membership of Cas OB5 and its surrounding open clusters, especially their brightest and most massive stars, and analyse them. The moderate extinction ($A_V \sim$ 2-3 mag) of Cas OB5 facilitates its analysis and lays out the foundations to explore more distant and extinguished regions. It is particularly true for the Perseus arm, for which few tracers are known at $l > 140°$, and l between 70° and 90° where the Perseus arm is thought to be located as far as $\sim$ 4 kpc away. SED fitting and clustering algorithms, complemented with robust spectroscopic analysis, allow us to identify obscured star clusters in this area and determine their size and membership.

My poster in zenodo.org can be found here