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## On the chemical and orbital origin of Hercules

The Hercules kinematic group is an anomaly overdensity structure of stars in the  $L_Z$ - $V_R$  kinematics plane in the solar neighbourhood, characterised by lower galactocentric cylindrical  $L_Z$  and an asymmetric bias towards positive  $V_R$ . The chemical data from GALAH DR4 show enhancement in Fe-peak elements (Fe, Mn, Ni), deficiency in alpha elements (O, Ti), and enhancement in Odd-Z elements (Na, Al) in the thin disc ( $[Mg/Fe] < 0.1$ ) population of the low  $L_Z$  Hercules subgroups. These chemical features indicate an inner Galactic origin of Hercules stars. We then consider orbits in a slow-long bar model of the Galaxy to seek the mechanism that transports stars born in the inner Galaxy out to the solar neighbourhood and form the Hercules group. We found that the extended quasi-periodic Trojan orbits surrounding the L4 Lagrange point of the bar are the few that can transport orbits from the inner Galaxy into the solar neighbourhood and include the kinematics of Hercules. We therefore support these orbits as the dynamical origin of Hercules.

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