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Kinematics of Multiple Stellar Populations in Globular Clusters with JWST

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An intriguing phenomenon in globular clusters is the presence of multiple stellar populations with different light element compositions. The origin of this phenomenon is still unclear, but a key piece of information to solve this enigma resides in the structural and kinematic differences of the stellar populations. Globular clusters are, in general, very old stellar populations, but simulations indicate that while dynamical interaction in the clusters centers could have washed away information regarding the clusters'initial conditions, the outer regions can still preserve this information. In the context of multiple stellar populations, differences in kinematics can reveal aspects of the history of star formation of the cluster, constraining models for the formation of multiple populations. Data from previous studies regarding dynamics of multiple populations in globular clusters, due to instrumental limitations, were mainly focused on giant stars. In this work, we use NIRCam/JWST data to investigate the dynamics of first- and second-generation very low-mass stars in the globular cluster 47 Tucanae. We analyze, over large radial and mass ranges, differences in energy equipartition, anisotropy, and radial distribution for the multiple stellar populations in the cluster. Our results favor formation scenarios where a second generation of stars were formed more centrally concentrated in the clusters shortly after the first generation was formed.

Affliation

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