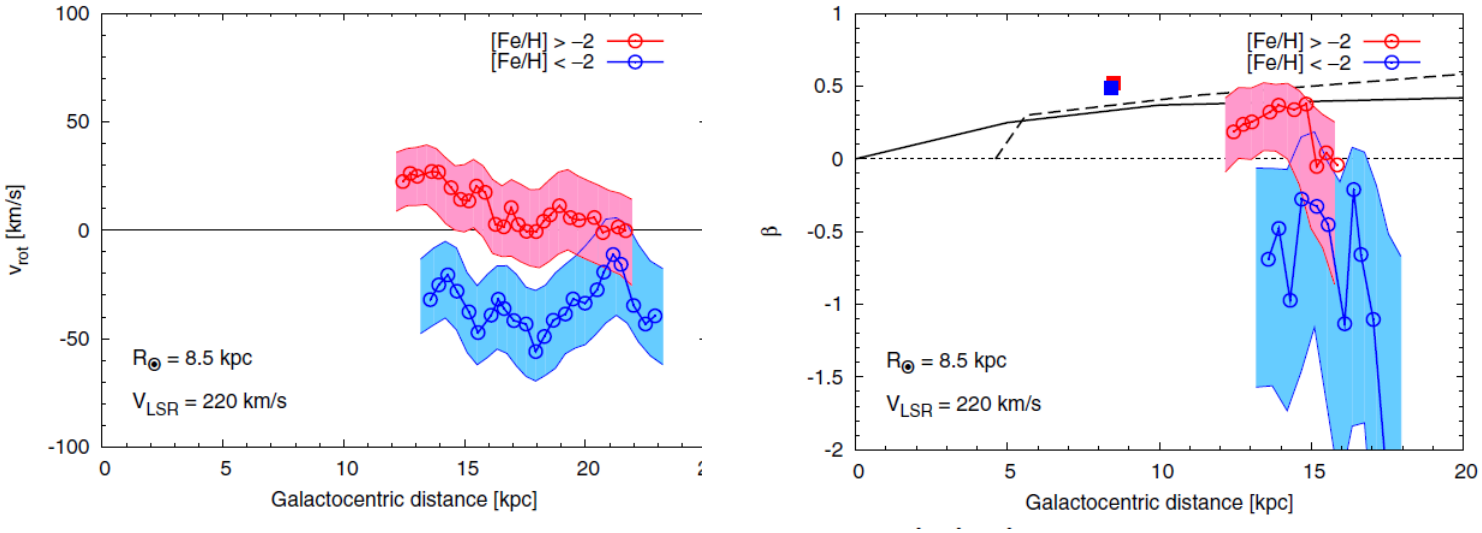
Joint Institute for Nuclear Astrophysics

Very Metal-Poor Halo Stars with Round Orbits



The orbital motions of halo stars in the Milky Way reflect the orbital motions of the progenitor systems in which they formed, making it possible to trace the mass-assembly history of the Galaxy. Direct measurement of three-dimensional velocities, based on accurate proper motions and line-of-sight velocities, has revealed that the majority of halo stars in the inner-halo region move in eccentric orbits (Carollo et al. 2007, 2010).

JINA researchers have recently explored a model-independent analysis of the line-of-sight velocities and spatial distribution of a recent sample of 1865 carefully selected halo blue horizontal-branch (BHB) stars within 30 kpc of the Galactic center. They find that the mean rotational velocity of the very metal-poor ([Fe/H] < −2.0) BHB stars significantly lags behind that of the relatively more metal-rich ([Fe/H] > −2.0) BHB stars – left panel of the above figure.

They also find that the relatively more metal-rich BHB stars are dominated by stars with eccentric orbits, as previously observed for other stellar samples in the inner-halo region – right panel of the above figure. By contrast, the very metal-poor BHB stars are dominated by stars on rounder, lower-eccentricity orbits. These results confirm and extend the existence of an inner/outer halo structure for the halo system, as advocated by Carollo et al. (2007,2010).

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