The Joint Institute for Nuclear Astrophysics

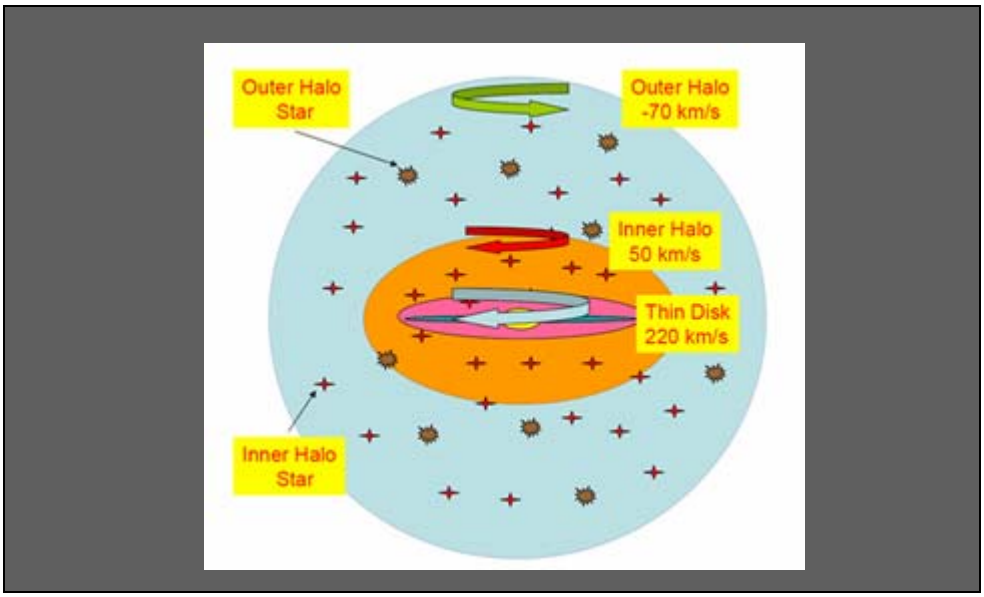
Discovery of the Inner/Outer Halo Structure of the Milky Way

JINA visitor Daniela Carollo, along with JINA co-PI Beers, and JINA-supported Postdoctoral fellow Sivarani and graduate students Lee and Marsteller, have used spectroscopic observations from SDSS/SEGUE to identify a new structural complexity of the Milky Way. In a recent paper in Nature, these researchers have demonstrated that the halo of our galaxy comprises two distinct structures, the inner and the outer halo.

The halo of the Milky Way provides unique elemental abundance and kinematic information on the first objects to form in the Universe, and this information can be used to tightly constrain models of galaxy formation and evolution. The inner and outer halo components exhibit different spatial density profiles, stellar orbits, and stellar metallicities.

The inner halo has a modest net prograde rotation, whereas the outer halo exhibits a net retrograde rotation and a peak metallicity one-third that of the inner halo. These properties indicate that the individual halo components probably formed in fundamentally different ways, through successive dissipational (inner) and dissipationless (outer) mergers and tidal disruption of proto-Galactic clumps.

The discovery is of special significance, because it reveals that the outer halo may well be the repository of the lowest metallicity stars in the Milky Way, which can be targeted in future surveys based on their apparently strong retrograde orbits.



The figure shows a schematic representation of the inner/outer structure of the halo. The inner halo (indicated in orange) slowly rotates in the same direction the disk of the Milky Way, while the outer halo (indicated in blue) rotates in the opposite direction.

This is the first time that the rotation of the outer halo has been shown to differ from the inner halo with a high degree of statistical significance.

Reference:

Carollo, D.,
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Lee, Y.S.,
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Wilhelm, R.,
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