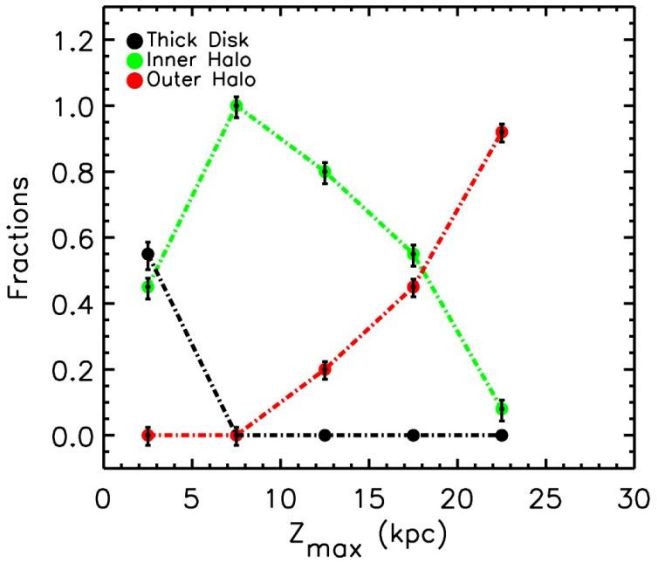
The Halos of the Milky Way

Over the course of the past several years, JINA researchers and their colleagues have been making use of stellar spectra obtained by the Sloan Digital Sky Survey (SDSS), in which JINA is an institutional partner, to analyze the stellar components of the Milky Way. Already, this work led to the discovery of a dual inner/outer halo structure of the Galaxy (Carollo et al. 2007, Nature 450, 1020).

Frequent JINA-sponsored visitor Daniela Carollo has been working with her colleagues at JINA and elsewhere to continue to explore the nature of the stellar populations revealed by the SDSS. A new analysis, recently completed, has derived estimates of the asymmetric drift and velocity ellipsoids of four separate components – the canonical thick disk, the metal-weak thick disk, the inner halo, and the outer halo. Such information is crucial for comparing with models of galaxy formation and evolution, as well as for determining the order in which the various components of our Galaxy formed. In the next analyses, photometric estimates of metallicity will be used to determine the relative normalizations of the various components, as well as their spatial density profiles, which will enable predictions of the expected absolute fractions of stars from each component along any given line of sight.



Estimated fractions of stars in the thick-disk, inner-halo, and outer-halo components of the Milky Way, as derived from analysis of the orbital rotation properties of the stars. Note that the outer halo dominates beyond 20 kpc , while the inner halo dominates within 15 kpc.

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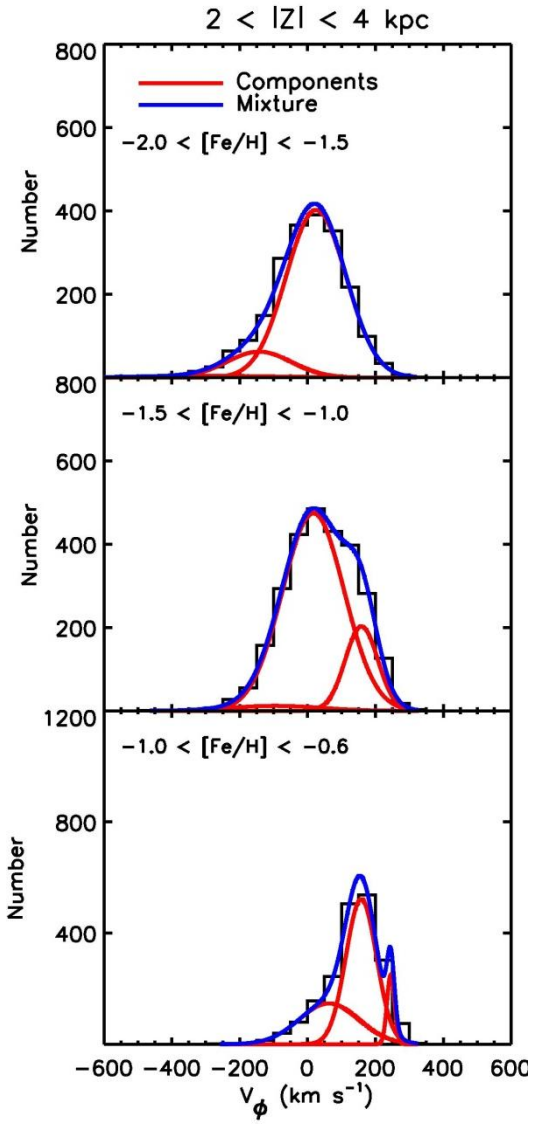

Mixture models for the contribution of various components to the observed rotational velocity distributions of stars in several metallicity intervals above the plane of the Galaxy.

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See the published work: Carollo et al. (2009); ArXiv: 0909.3019