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A novel constraint on the Milky Way's inner dark matter halo's shape using phase-mixed streams

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Stellar streams are promising tools to study the mass distribution of galaxies. In particular, they have been used to constrain the shape and mass of the Milky Way's dark matter halo. Narrow distant streams are commonly used to this end, but I will instead focus on the nearby Helmi Streams' stars with full 6D phase-space information. These streams, the remnants of an accreted dwarf galaxy, are phase-mixed and depict peculiar dynamical properties. Specifically, they appear to be separated into two clumps in angular momentum space, they depict different degrees of phase-mixing and are located close to orbital resonances. To explain these dynamical peculiarities we explore Galactic potential models with a triaxial NFW halo. I find that a mildly triaxial halo is required to explain these phenomena. Because the orbital structure and presence of resonances are very sensitive to the specific configuration of the Galactic potential, the dynamics of these streams places very strong constraints on the characteristics of the Galactic dark matter halo in the inner 20 kpc, the region probed by the Helmi stream stars.

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