The Morphology of Disk Galaxies in Galaxy Clusters with Dark Matter Self-Interactions

LUCAS SECCO, AMANDA FARAH, BHUVNESH JAIN, Univ of Pennsylvania, SUSMITA ADHIKARI, ARKA BANERJEE, Stanford University, NEAL DALAL, Perimeter Institute for Theoretical Physics — We use numerical simulations to study the effect of self-interacting dark matter (SIDM) on the morphology of disk galaxies falling into galaxy clusters. An effective drag force on dark matter leads to offsets of the stellar disk with respect to the surrounding halo, causing distortions in the disk. For anisotropic scattering cross-sections of 0.5 and 1.0 cm$^2$ g$^{-1}$, we show that potentially observable warps, asymmetries, and thickening of the disk occur in simulations. With further analysis of the potential systematic uncertainties of these novel probes, galaxy morphologies could impose tight constraints on SIDM cross-sections with current and future observations.

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