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The distribution and morphologies of Fornax Cluster dwarf galaxies suggest they lack dark matter

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Due to their low surface brightness, dwarf galaxies are particularly susceptible to tidal forces. The expected degree of disturbance depends on the assumed gravity law and whether they have a dominant dark halo. This makes dwarf galaxies useful for testing different gravity models. In this project, we use the Fornax Deep Survey (FDS) dwarf galaxy catalogue to compare the properties of dwarf galaxies in the Fornax Cluster with those predicted by the Lambda cold dark matter (\LambdaCDM) standard model of cosmology and Milgromian dynamics (MOND). We construct a test particle simulation of the Fornax system. We then use the MCMC method to fit this to the FDS distribution of tidal susceptibility \eta (half-mass radius divided by theoretical tidal radius), the fraction of dwarfs that visually appear disturbed as a function of \eta, and the distribution of projected separation from the cluster centre. This allows us to constrain the \eta value at which dwarfs should get destroyed by tides. Accounting for an r-band surface brightness limit of 27.8 magnitudes per square arcsec, the required stability threshold is \eta destruction = 0.25+0.07-0.03 in \LambdaCDM and 1.88+0.85-0.53 in MOND. The \LambdaCDM value is in tension with previous N -body dwarf galaxy simulations, which indicate that \eta destruction is about 1. Our MOND N-body simulations indicate that \eta destruction= 1.70 \pm 0.30, which agrees well with our MCMC analysis of the FDS. We therefore conclude that the observed deformations of dwarf galaxies in the Fornax Cluster and the lack of low surface brightness dwarfs towards its centre are incompatible with \LambdaCDM expectations but well consistent with MOND. Monthly Notices of the Royal Astronomical Society, Volume 515, Issue 2, September 2022, Pages 2981, 3013, https //doi.org/10.1093/mnras/stac1765

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