

Forecasts for Galaxy Formation and Dark Matter Constraints from Dwarf Galaxy Surveys

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Dwarf galaxies are essential probes of dark matter (DM) microphysics. Here, we assess potential DM constraints from future dwarf galaxy surveys. We find that observations of all satellites around one (two) Milky Way-mass host can rule out warm DM models with $m_{\text{WDM}} = 10 \text{ keV}$ (20 keV). We show that the same data constrain the subhalo mass function in a model-independent manner, and thus simultaneously test a wide variety of fundamental physics that affects the small-scale power spectrum. These results strongly motivate searches for faint dwarf galaxies beyond the Milky Way, which photometric surveys including Rubin LSST will significantly advance. Finally, we highlight the key role of spectroscopic surveys in this context, both to confirm the DM-dominated nature of dwarf galaxy candidates and to measure their mass profiles.

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