Dwarf Galaxy Population of a Nearby Star-Forming Galaxy and Implications for Dark Matter

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Stellar Mass to DM Halo Mass Relationship

Dooley et al. 2017

$M_\ast [M_\odot]$ vs $M_{\text{halo}} [M_\odot]$ graph showing different models and their predictions for the stellar mass to dark matter halo mass relationship.
What We See

![Graph showing the relationship between satellite number density, $N_{\text{sats}} > M_*$, and host mass, $M_*$, for Milky Way sized hosts. The graph includes different models: GK16, GK14, Moster, Brook, GK14 + Reion, GK16 + Reion, Moster + Reion, Brook + Reion, and MW Satellites. The model predictions are compared against observational data.](image-url)

Dooley et al. 2017
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- Internal effects
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- Ultimately, we have a sample size of 1: Local Group
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We need more systems!
Our Survey

- “Search for Failed Supernovae with the LBT” dataset, Kochanek 2008
- 27 star-forming galaxies within 10 Mpc
- Range in luminosity from LMC to MW size
- R band magnitude limits fainter than 26 mag
- Probing 1% to 20% of virial volumes
N628/M74

\[ M_* \approx 1.3 \times 10^{10} M_\odot \]

~1/4 the stellar mass of the Milky Way

At 10 Mpc – farther and one of largest virial volumes we can probe

Very deep imagining - Fall target
The Data
First Candidates

NGC-628-dwB

NGC-628-dwA
First Candidates

Both red, non-star forming, gas poor and have small projected distances from host
Method

- Using Source Extractor software to identify objects
- Inserting and recovering fake galaxies
- Computing completeness
- Using properties of fake galaxies in data, finding new candidates
Sample of recovered galaxies

Ultra faint dwarf

R = -7, sb = 25 mag/arcsec^2

Ultra diffuse dwarf

R = -9, sb = 28 mag/arcsec^2
Conclusion

Characterizing 20 new systems down to ultra faint and ultra diffuse regimes

=> constrain the Stellar mass – DM halo relation

=> constrain DM models based on their predicted subhalo populations