LMCs in the SDSS and LCDM: A ”Found” Satellites Problem?

Erik Tollerud
(Team) UC Irvine

Betsy Barton (Irvine), James Bullock (Irvine), Michael Boylan-Kolchin (MPIA), Chris Trinh (Irvine/Sydney)
Motivation

Klypin+99

Moore+99

Strigari+07

Bullock+00
Motivation

- Moore+ 99
- Klypin+ 99
- Strigari+ 07
- Bullock+ 00

---

UCSC GFW '10  Intro → SDSS Sample → Simulations → Results → Conclusions
LMC ↔ LCDM

- LMC (analogs) → LCDM
  - Boylan-Kolchin+ 10
    4-20% of ~L* hosts have LMCs
  - ”Found Satellite Problem”?
LMC ↔ LCDM

- LMC (analogs) → LCDM
  - Boylan-Kolchin+ 10 : 4-20% of ~L* hosts have MCs
  - ”Found Satellite Problem”?
- LCDM → LMC
  - Is the LMC, specifically, weird?
Method

UCSC GFW '10 Intro → SDSS Sample → Simulations → Results → Conclusions
SDSS Sample

- NYU VAGC (Blanton+ 05) DR7 (spectroscopic)
- Volume-Limited to SDSS spec limit for faintest satellites (z<.034)
- Hosts $r_{h=1} < -20$, Sats $-17.5 > r_{h=1} > -20$
- Isolated/low-density hosts
  - Nearest host $> 250$ kpc/h
  - $N_{host} \leq 1$ within 700 kpc/h
- Nearest sat with $\Delta v < 500$ km/s
Simulations

- Hybrid Model
- Berrier+ 2006: N-body host halos
- Zentner+ 2005 SAM: Subhalos/satellites

- Millenium II
- Boylan-Kolchin+ 2010

"Observe" simulations (e.g. Barton+ 07) w/ SDSS criteria

Abundance matching for halo mass cuts
Sample Validation

Tollerud+ in prep.

$\frac{f_{\text{actual}}}{d_{\text{proj}}/(\text{kpc/h})}$

$\frac{f_{\text{iso}}}{d_{\text{proj}}/(\text{kpc/h})}$

UCSC GFW '10  Intro → SDSS Sample → Simulations → Results → Conclusions
- SDSS sample matches LCDM prediction
- LMCs ~ 10%
- Hosts
- Satellites
- Density: Possible Host/Sat
- LMC Colors:
  - RC3
  - SSP+SFH (Zaritsky private comm.)
  - Bothun '88

UCSC GFW '10 Intro → SDSS Sample → Simulations → Results → Conclusions
First Infall?

- PMs: Kallivayalil+ 06, Piatek+ 08
- Implies quiescent MW: Hammer+ 07, Stewart+ 08 Purcell+ 09, Shen+ 10

Can test this with simulation orbital histories.
Summary

- LCDM matches LMC-like satellites: No Found Satellites Problem!
- MW/LMC pairing not terribly unusual in luminosity.
- LMC is remarkably blue.
  - First Infall?
- Stay tuned for detailed SDSS sats to subhalo comparison...
Backup Slides
Fiber Collision

![Graph]

- **SDSS Projected, $\Delta z < 500\text{km/s}$**
- **SDSS Projected, no $\Delta z$**
- **Fiber radius at $z=0.0342$**