The SAGA Project: Satellites Around Milky Way-like Galaxies

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Satellites Around a Milky Way-mass Halo



Satellites Around Galactic Analogs (SAGA) Survey goal:

Characterize satellite populations around ~100 MW analogs to $M_r \sim -12.3$ ($M_{stellar} \sim 10^7 M_{sun}$).

The SAGA Survey: Survey Design

To observe ~100 MWs, need to survey a volume out to ~30 Mpc.



At 30 Mpc, a virial radius (300 kpc) is equivalent to ~ 1 degree

At 30 Mpc, $M_r = -12$ is equivalent to r = 21

Within 1°, there are a few thousand galaxies down to r = 21

The SAGA Survey: Phase I Results



8 Milky Way-like hosts with complete satellite luminosity function down to Leo I to the viral radius.

Phase I: Geha et al. (2017)

The SAGA Survey: Phase I versus Phase II



The SAGA Survey: Phase II Deeper Imaging

Deeper imaging improves target selection.



The SAGA Survey: Phase II Improved Selection Cuts



SAGA Results: Radial Distribution of Satellites

A 'satellite' is defined as a galaxy within the projected virial radius and ± 250 km s⁻¹



Literature

(preliminary numbers!)

SAGA Results: Satellites Properties

Spectra are high S/N. Able to detect absorption or emission line spectra.



SAGA Results: Radial Distribution and SFR

We define a 'quenched' satellite as having Halpha EW less than 2Å



SAGA Results: Radial Distribution and SFR



SAGA Results: Radial Distribution of Satellites



SAGA satellites more extended that MW classical satellites?

SAGA Results: Plane of Satellites?

SAGA will provide significant data to test plane-of-satellite predictions.



If a co-rotating plane exists, there should be more orange within dashed lines and more blue outside.

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SAGA Results: Luminosity Functions and N_{sat}



The SAGA Project: Towards 100 Milky Ways

With improved targeting scheme,

35 additional nights of AAT/MMT time is required to complete 100 MW analogs.



With good weather, SAGA survey will be completed by early 2021.

The SAGA Project: Towards 100 Milky Ways

SAGA Observational Goal:

Characterize the satellite populations down to $M_r = -12$ around 100 Milky Way-like galaxies.

Phase 1: Build complete sample of a few MW analogs using gri color cuts.

Phase 2: Use data from Phase I to design an efficient targeting strategy.

Phase 3: Efficiently measure satellite LF for 100 MW analog to Mr = -12. Do science.

Paper I	Paper II	Current Progress
8 hosts	21 hosts	49 hosts
27 satellites	77 satellites	157 satellites
14 newly discovered	41 newly discovered	70 newly discovered
(13,000 redshifts)	(19,000 redshifts)	(29,000 redshifts)

Full SAGA redshift catalog from Paper I is available at <u>sagasurvey.org</u>, or by request.