The RESOLVE Survey: REsolved Spectroscopy Of a Local VolumE

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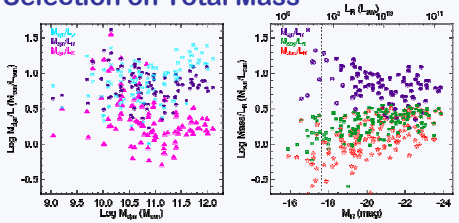
A Comprehensive Census of ~53,000 Cubic Mpc of the SDSS

- multi-scale structure: volume-limited from clusters and filaments down to dwarf galaxies with $M_{baryonic} \sim 10^{9.2}\ M_{sun}$, with a redshift campaign for completeness
- dynamical mass: redshifts and new high-res emission & absorption line spectroscopy of all ~1500 galaxies
- stellar mass: SED+spectral fitting using new spectra plus UV/optical/IR surveys
- gas mass: ALFALFA Survey 21cm data, photometric gas fractions, molecular/hot gas strategies under development
- star formation: Hα, deep GALEX UV, FIR

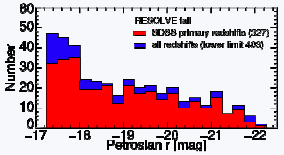
Selection on Total Mass



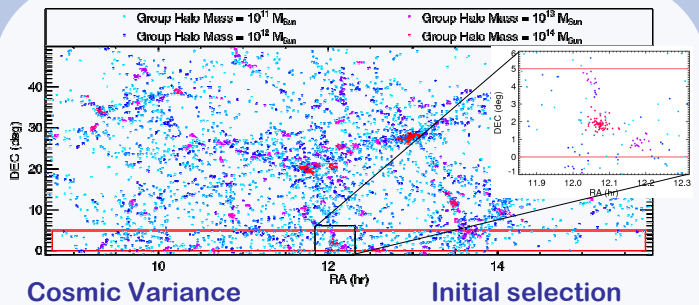
The R band minimizes scatter in M_{dyn}/L (left) due to optimal sensitivity to the combination of stellar and gas mass (right). Note that K-band scatter increases abruptly below log M_{dyn}~10.7, corresponding to the gas-richness threshold mass M_t near log M_*~9.7; this mass marks the dwarf/giant divide. On the right filled purple (green) symbols show galaxies more massive than log $M_{baryonic}$=9.2. [From Kannappan & Wei 2008]

Toward Completeness

Extra Stripe 82 + new redshifts show >20% incompleteness in the main SDSS survey, worst below the dwarf/giant threshold at M_r ~ -18.



These statistics include previously omitted targets and galaxies mistakenly placed at z~1, but *do not include* galaxies never targeted by SDSS due to fragmented photometry that placed them spuriously below the survey magnitude limit. We use sizes and SEDs of grouped fragments to recover likely RESOLVE galaxies: redshifts for the bright examples are found in older surveys, while the faint ones are targeted for new redshifts with the SOAR, SALT, and WIRO telescopes.

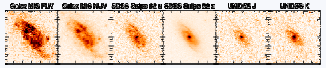


Cosmic Variance

RESOLVE is embedded in larger redshift surveys on all sides (SDSS, CfA, 6dF). We are using multiple environment metrics to relate RESOLVE to these larger surveys; see also Hendel poster 334.15.

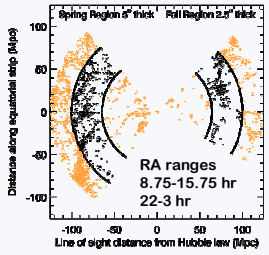
The spring RESOLVE footprint (red box above) contains a central cluster, shown here within a hybrid CfA/SDSS volume-limited group catalog (Moffett + in prep).

The fall RESOLVE footprint overlaps Stripe 82, offering deeper photometry and extra redshifts, plus many ancillary surveys.

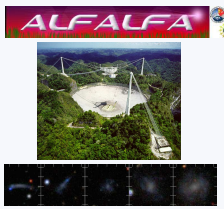


Initial selection

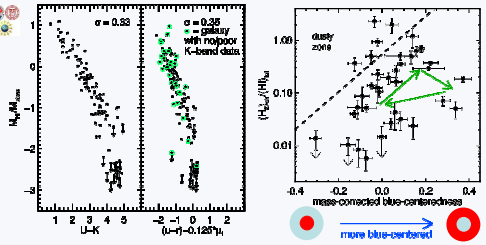
SDSS galaxies with redshifts cz = 4500-7000 km/s and brighter than M_r = -17.23 (SDSS survey limit at cz=7000)



Tracing Multi-Phase Gas



galaxies missed by SDSS and recovered by ALFALFA



direct observations

RESOLVE has partnered with the ALFALFA Survey (PIs Giovanelli & Haynes) for blind 21cm detection down to masses ~$10^9\ M_{sun}$ at Declinations > -0.2°. CO observations are planned.

photometric HI fractions

For indirect HI estimation via color, *U-K* works well but is hard to measure for dwarfs, and we find *g-r* with a surface brightness term does not predict M_{HI}/M_{stars} as well as U-K (cf. Zhang + 09). However, custom *uri* photometry performs well (Eckert + in prep).

H_2:HI ratios

We are exploring indirect techniques for H_2/HI estimation with new IRAM 30m CO data, based on a newly discovered fueling cycle (Stark + in prep).

Key Science

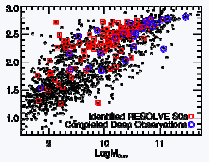
- new constraints on missing baryons & dark matter via complete accounting
- dynamical mass and velocity functions across the dwarf/giant threshold, as a function of large-scale structure (LSS)
- relationship of gas flows, consumption, merging, and disk building to LSS

Key Challenges

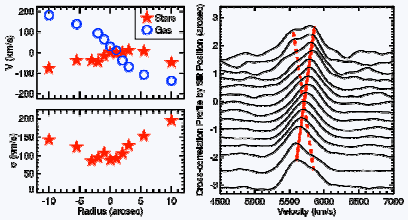
- cosmic variance
- mass-limited completeness
- tracing multi-phase gas
- S0 galaxies

S0 Galaxies

We are conducting two NOAO programs involving extra-deep observations of RESOLVE S0s.



1) To include S0s in the velocity function, we are calibrating their equivalent circular velocities as a function of bulge-to-disk ratio, velocity dispersion, and other "cheap" observables (Norris + in prep).
2) To understand disk regrowth in S0s, we are tracking stellar counterrotation as a function of mass and environment (Moffett + in prep); see also Moffett poster 335.46 & Wei talk 309.01 Wed 10am.



More Information

http://resolve.astro.unc.edu

Kannappan & Wei 2008. AIP Conf. Proc. 1035, 163

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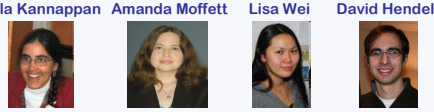

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