Interacting Void Galaxies in the SDSS

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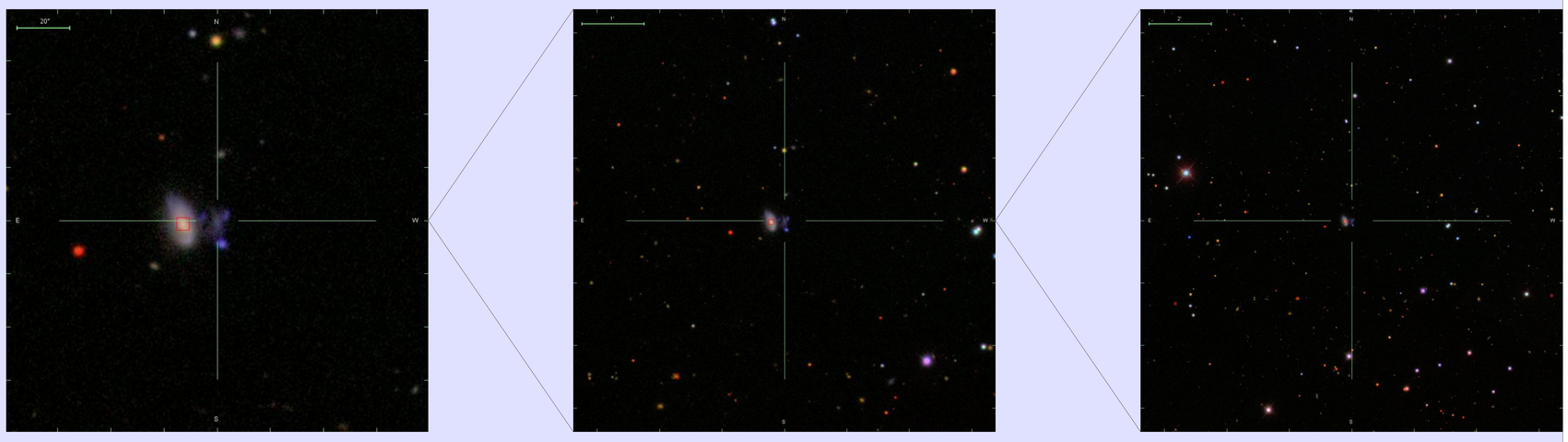
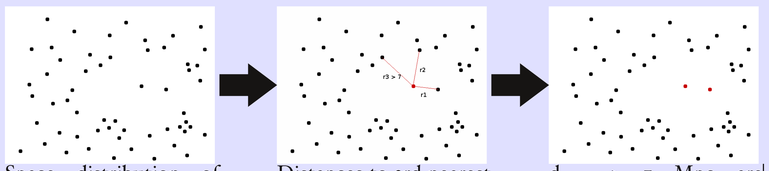
Galaxies in the most underdense regions of the universe, the voids, have quite different evolutionary histories than those in more dense regions. In particular, the frequency of interactions and their histories (major and minor mergers) are strongly affected by this low density environment. Void galaxies thus represent a comparison sample of galaxies with few interactions, and likely little AGN feedback during their growth. We present new optical spectroscopic observations of merger-driven AGN activity in void galaxies. Our sample is derived from a catalog of void galaxies constructed from the Sloan Digital Sky Survey galaxy sample, and includes both existing SDSS spectra and new spectroscopy of companion galaxies from the 2.1m telescope at Kitt Peak. It will eventually include ~all interacting void galaxies brighter than L*.



Finding Void Galaxies

VoidFinder finds galaxy voids using a nearest neighbor algorithm (Hoyle & Vogeley 2002; El-Ad & Piran 1996).



Space distribution of galaxies.

Distances to 3rd nearest neighbors found.

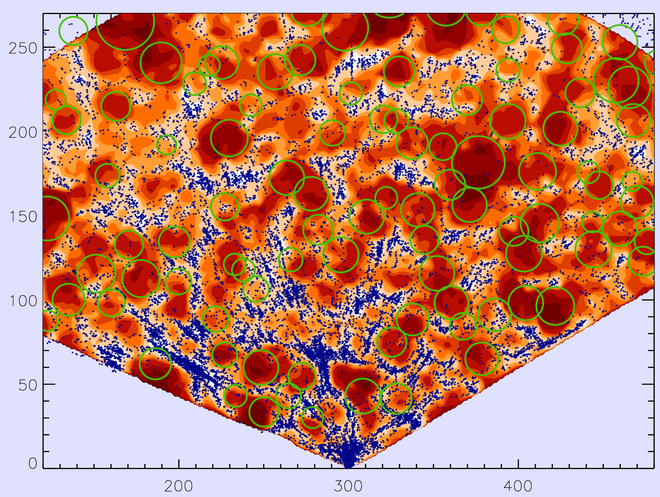
d_{3NN} > 7 Mpc are potential void galaxies.

Remove potential void galaxies from the sample.

Grow spheres (requiring r>10). Merge spheres with overlap > 50%.

Galaxies within those voids are "void galaxies."

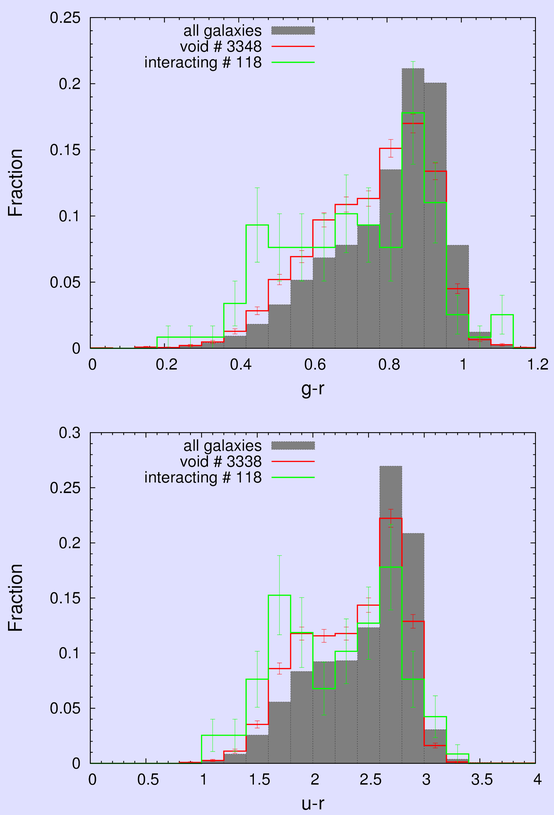
A Slice of SDSS



This plot shows a 10 Mpc thick slice of the Universe. The voids found by VoidFinder (green) are overplotted on the density field found by Delaunay Tesselation Field Estimator (color gradient), with SDSS galaxies as blue dots.

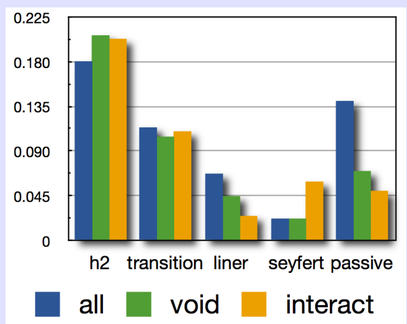
Identifying Interactions

- Find all galaxies within 150kpc (projected distance) of each void galaxy.
- Look at each potential interacting system by eye for signs of disturbance.
- List all large galaxies in the system with SDSS spectra.
- If some of the galaxies do not have SDSS spectra, count them as potential Kitt Peak targets.
- (Eventually) Release a public catalog of all interacting void galaxies in the SDSS volume (z~<0.1).



Some Numbers

- Currently based on SDSS DR4
- Void galaxies: 3348
- Interacting systems: 74
- Interacting galaxies w/SDSS spectra: 118



- Significantly lower fraction of LINER and Passive (no emission) galaxies in voids compared to walls.
- Even lower fraction of LINER and Passive galaxies among interacting void galaxies.
- Slightly higher H II fraction among void galaxies in general.
- Void galaxies are bluer than wall galaxies (both g-r and u-r colors) (also see Rojas et al. 2004 and Ceccarelli et al. 2008).
- Interacting void galaxies are bluer than void galaxies or wall galaxies (compare with the Galaxy Zoo Merger catalog of Darg et al. 2008).

In progress:

Morphologies and star formation rates for our merger sample.

Spectroscopic analysis of our KPNO observations.

Local-density weighted comparison samples.

References

- Ceccarelli L., Padilla, N., Lambas, D. G., MNRAS: Letters, 2008, vol. 390, pp. L9
- Darg et al., astro-ph:0903.5957
- Rojas R. R., Vogeley M. S., Hoyle F., Brinkmann, J., ApJ, 2004, vol. 617 pp. 50