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## INTRODUCTION

The Arecibo Galaxy Environment Survey (AGES, Auld et al. 2006) will map ~200 square degrees over the next years using the ALFA feed array at the 305-m Arecibo Telescope. AGES is specifically designed to investigate various galactic environments from local voids to interacting groups and cluster of galaxies. AGES will map 20 square degrees in the Coma-Abell1367 supercluster including the Abell cluster 1367 and its outskirts (up to ~2 virial radii). In Spring 2006 & 2007 we completed the observations of 5x1 square degrees in the range 11:34<RA<11:54, 19:20<Dec<20:20 covering all the cluster core and part of its infalling region reaching a 6.5 sigma detection limit of  $M(\text{HI}) \sim 6 \times 10^8 M_{\odot}$  (assuming a velocity width ~200km/s) at the distance of Abell1367 (~92.8 Mpc).

### AGES-A1367 Observations

Area covered: 5x1 sq. deg.  
 Velocity range: -1800-19500 km/s  
 Integration time: 300 sec/beam  
 Beam: 3.5 arcmin  
 Velocity resolution: 10 km/s  
 rms (@ 10 km/s resolution): 0.8439 +/- 0.0003 mJy  
 Number of HI sources detected: 100

Source extraction is performed using both by eye detection and an automatic extractor (Polyfind, based on peak flux threshold). Follow-up observations using L-wide at Arecibo have been used to confirm or discard dubious detections.

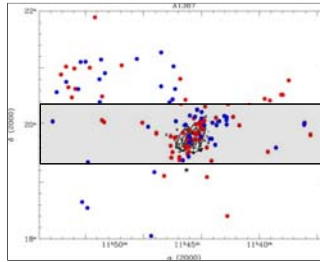
#### Optical counterparts

**Confirmed optical counterparts** (galaxies within the beam and with an optical redshift within +/- 200 km/s from the radio velocity): 55 sources

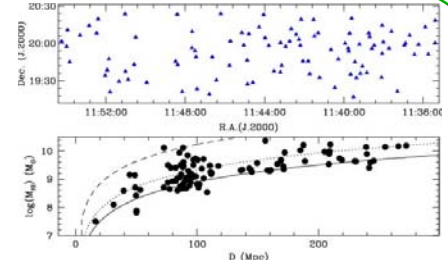
**Candidate optical counterparts** (galaxies within the beam but without an estimate of their optical redshift): 41 sources

**No optical counterparts:** 4 sources (associated with interacting objects, see below)

The AGES cube, spectra and extracted parameters are available under request and will be published on the web after the acceptance of this paper.



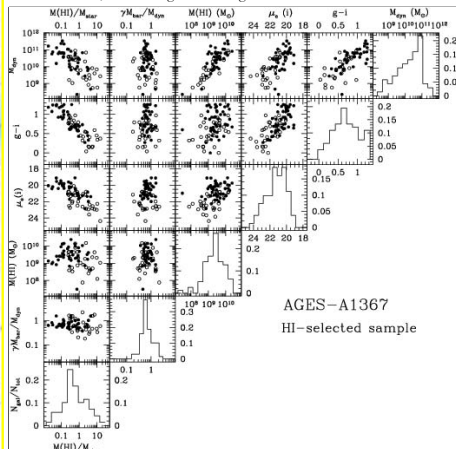
The Abell1367 region that will be covered by AGES. The grey box indicates the area completed and presented in this poster. The circles indicate the position of the CGCG galaxies (Zwicky et al. 1968). Red circles are type earlier than S0 while blue circles are type later than S0.



The sky (upper panel) and HI mass vs distance (lower panel) distribution for the 100 HI sources in our sample. Distances are obtained from the recession velocities assuming that all galaxies are in the Hubble flow. The AGES (solid line), ALFALFA (Giovannelli et al. 2005, dotted line) and HIPASS (Barnes et al. 2001, dashed line) sensitivity limits for a  $S/N_{\text{int}} \sim 6.5$  source having a velocity width of 200 km/s are shown.

### Properties of the AGES-A1367 Sample

More massive galaxies appear to be redder, have higher surface brightness and lower gas content than dwarf systems, as found in optically selected samples. Interestingly all galaxies in our sample appear to have nearly the same baryon fraction independently from their mass, surface brightness and gas content.



Distributions and correlations between HI and optical properties for the 69 galaxies in our sample having 1 optical counterpart and ellipticity < 0.1. From left to right the ratio of the gas to stellar mass, the baryons fraction, the total HI mass, the effective surface brightness in i band, the g-i colour and the dynamical mass are presented. Filled dots are objects with confirmed optical counterparts while empty dots indicates objects with optical counterpart candidates.

$M(\text{HI}) = \text{HI mass}$

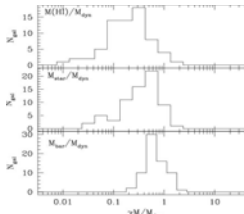
$M_{\text{star}} = \text{stellar mass}$

(computed from i band luminosity and g-r colour following Bell et al. 2003)

$M_{\text{bar}} ("Baryon mass") = M(\text{HI}) + M_{\text{star}}$

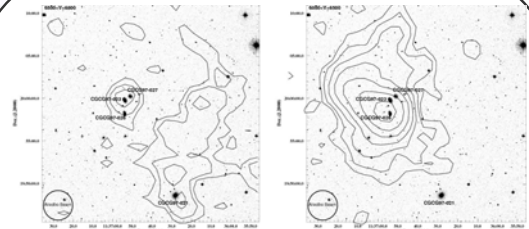
$M_{\text{dyn}} ("dynamical mass") = \gamma R_{75} W^2 / 2G$

where  $R_{75}$  is the radius containing 75% of the light in i band,  $W$  is the HI velocity width and  $\gamma$  is the ratio between the HI radius and  $R_{75}$ .

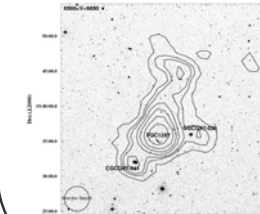


The distribution of the gas to dynamical mass (top), star to dynamical mass (middle) and baryon to dynamical mass (bottom) ratios for our sample.

### Interacting Systems in the outskirts of A1367



The CGCG97027 group is located at a projected distance of ~2 degrees (~3.2 Mpc) from the centre of Abell1367. Our data show the presence of diffuse HI emission all over this region, not clearly associated with any optical galaxy. The two figures above show the CGCG97-027 group as seen on the DSS-blue plates. Radio contours obtained from moment maps of the AGES cube in the velocity range 6500 < V < 6850 km/s (left) and 6000 < V < 6500 km/s (right) are superposed.

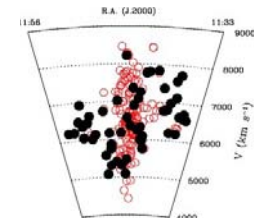
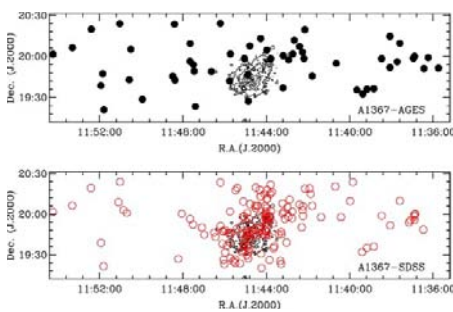


The CGCG97041 group is located at a projected distance of ~1 degrees (~1.6 Mpc) from the centre of Abell1367 and it is composed of two spirals CGCG97036 (V~6595 km/s) and AGC210559 (V~6825 km/s) and one lenticular CGCG97041 (V~6778 km/s). We detect HI emission extended over ~200 kpc north of the three group members, apparently not associated with either of them.

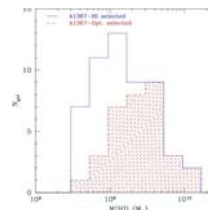
### Comparing the 21cm and optical view of the A1367 cluster volume

All galaxies in the Abell1367 volume (A1367+Great Wall, 4000 < V < 8000 km/s) lie approximately at the same distance from us as Abell1367, implying that the system A1367+Great Wall constitutes a volume limited sample. We use the Abell1367 cluster volume (4000 < V < 8000 km/s) to compare the properties of our HI selected sample ( $M > 6 \times 10^8 M_{\odot}$ ) with a complete ( $g < 17, L > 10^{10} L_{\odot}$ ) optically selected sample extracted from SDSS-DR5.

Our view of Abell1367 is strongly wavelength dependent: the spatial, velocity and HI distributions as well as the optical luminosity function of the HI and optically selected sample differ significantly.



Spatial distribution (left) and wedge diagram (upper) for the HI selected (filled circles) and optically selected (empty circles) A1367 cluster galaxies. At 21cm no galaxy overdensity is present in correspondence of the X-ray cluster contours and no "finger of God" is observed.



Left: The HI mass distribution for galaxies in the A1367 volume. The solid histogram indicates the HI selected sample ( $M > 6 \times 10^8 M_{\odot}$ ) and the shaded histogram the optically selected sample ( $g < 17, L > 10^{10} L_{\odot}$ ) extracted from SDSS-DR5. Right: Each panel shows the g band luminosity function for the optically (empty circles) and HI (histogram) selected sample. All galaxies in the two samples are shown in the bottom panel, while only blue ( $g-i < 0.9$ ) and red galaxies ( $g-i > 0.9$ ) are shown in the middle and upper panel respectively.

### References

- Auld R., Minchin R., Davies J., et al., 2006, MNRAS, 371, 1617
- Barnes D., Staveley-Smith L., de Blok W., et al. 2001, MNRAS, 322, 486
- Bell E., McIntosh D., Katz N., Weinberg M., 2003, ApJ, 149, 289
- Giovannelli R., Haynes M., Kent B., et al. 2005, AJ, 130, 2598
- Zwicky, F., Herzog, E., & Wild, P. 1961-1968, in Catalogue of Galaxies and of Clusters of Galaxies

### For additional info:

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