STAR FORMING GALAXIES IN THE HERCULES CLUSTER

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Abstract: We present here the first results of a survey searching for star forming galaxies in the Hercules cluster, employing Hα narrowband imaging. This method had allowed us to detect 55 emiting sources.

Introduction:

The knowledge of how and why galaxies evolve and which are the physical processes that drive this evolution remains one of the fundamental problems of Astrophysics.
Galaxy clusters are suitable places to alter the normal evolution of galaxies and in particular their star formation history (SFH) and star formation rate (SFR).
The Hercules cluster is among the most massive structure in the local universe and can be still in the process of collapsing (Barmby & Huchra 1998, Dickey 1997). Moreover, it presents at least three subclusters with varying dwarf to giant galaxy ratio (Sánchez-Jansen et al. 2005).
Taking into account that the luminosity of the Hα recombination line is the best tracer of the SFR in the optical range (Kennicutt 1998), we intend to study the environmental processes that modify the SFR of the galaxies in the Hercules cluster by making use of a database of Hα imaging.

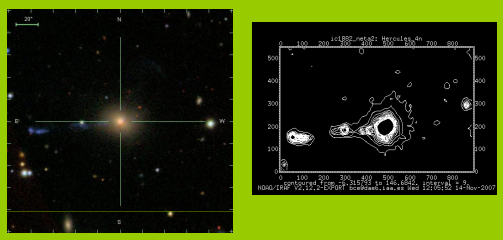
Project objectives:

- Complete Census of the Halpha emission sources of the Hercules cluster
- Calibrate the cluster luminosity function and the present day SFR
- Derive the distribution of structural/morphological parameters versus the star formation activity class of galaxies
- Constraint the role of the environmental mechanism that induce inhibition and/or triggering of the SFR
- Unveil the low mass star-forming galaxy population of the clusters.

Observations:

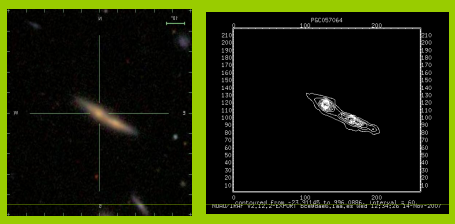
The data was obtained during two runs: from 6 to 7 May 2003 at NOT with ALFOSC in direct imaging mode and from 4 to 5 of June 2003 at WHT with prime focus imaging.
We obtained 16 pointings, covering about 473 arcmin^2 in total.
All the data was flux calibrated and corrected for the contribution of the [NII]λλ6548,84 lines and the galactic extinction.
In total, 55 galaxies with emission were detected.

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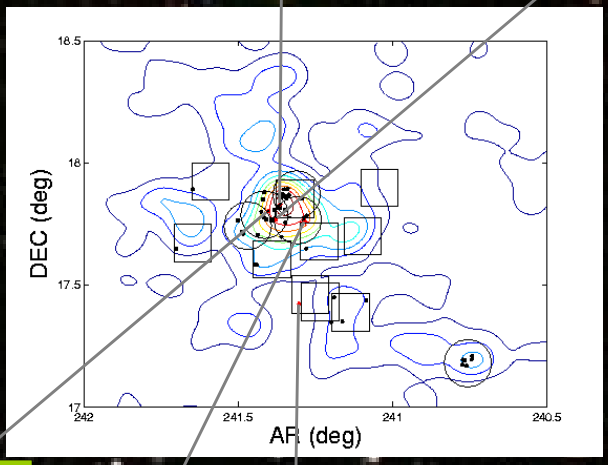


Galaxy with large SFR (≈7M$_\odot$/yr) (ongoing merger? Moles et al. 2004).
Left frame, composite image from SDSS. Right frame, contour image from our continuum subtracted Hα data.

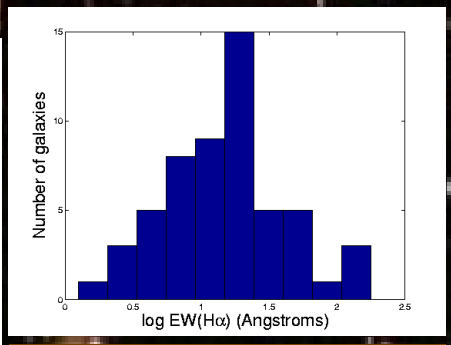
PGC 057064



Galaxy with two nuclei (merger?).
Left frame, composite image from SDSS. Right frame, contour image from our continuum subtracted Hα data.

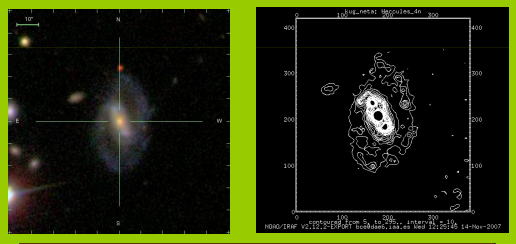


Galaxy density contours (from 2MASS), detected galaxies in the Hercules Cluster (black dots) and approximated positions and FOV (black circles for NOT and black squares for INT) for the pointings employed in the survey.
The red dots are the positions of the galaxies employed as examples.



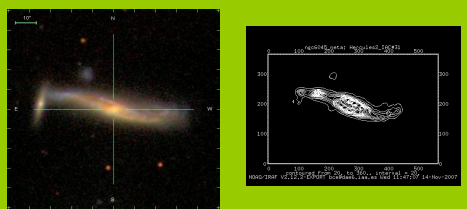
Histogram of the logarithm of the Hα equivalent width of the galaxies in our sample. The smallest values are ≈3 Angstroms and the larger are over 150 Angstroms.

KUG 1603+179A



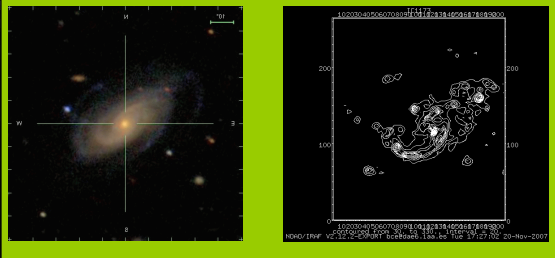
Possible interacting galaxy. The small galaxy is SDSSJ160532.06+174617.8 and shows a photometric redshift within the range of the cluster.
Left frame, composite image from SDSS. Right frame, contour image from our continuum subtracted Hα data.

NGC 6045

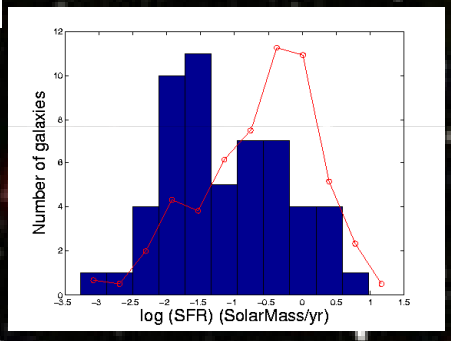


Possible interacting galaxy. The small galaxy is SDSSJ160508.81.81+174545.3 and shows a photometric redshift within the range of the cluster.
Left frame, composite image from SDSS. Right frame, contour image from our continuum subtracted Hα data.

IC 1173



Galaxy with multiple bright HII regions. Several knots are clearly visible in the contour image.
Left frame, composite image from SDSS. Right frame, contour image from our continuum subtracted Hα data.



Histogram of the logarithm of SFR derived from our galaxies (blue columns) and the logarithm of SFR derived for galaxies in the field (from James et al. 2004) (red line and red circles). The number of galaxies from the field has been normalized to the number of galaxies in our sample to make the comparison. The Hercules cluster clearly appears underpopulated of galaxies with SFR>0.1 M$_\odot$/yr when compared with isolated galaxies. This inhibition in the SFR may be due to the depletion of the gas reservoir (stripped by ram pressure exerted by the intergalactic medium) (e.g. Kennicutt 1983, Gavazzi et al. 2002).

References:

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