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**Environmental effects on the star formation:
the gas content (HI+H₂) versus the scale-length of the star forming regions**

Fabello Silvia

The H α emission arising from HII regions is the most direct indicator of the recent ($< 4 \cdot 10^6$ yrs), massive ($> 8 M_{\odot}$) star formation activity in galaxies (Kennicutt, 1998). Extensive H α surveys of galaxies have been undertaken by several investigators, among others: Sakai, Kennicutt & Moss, 2001; Koopmann et al. 2001, James et al. 2004. All these works compared the extent of the H α with the optical data, in order to find a relation between the star formation and other physical characteristic of galaxies, for example the Hubble type or R-luminosity.

This work addresses the issue of the morphology of the star forming regions in galaxies, aiming at disentangling between two evolutionary scenario that have been proposed to hold in the environment of rich clusters of galaxies. Tidal interactions models (including harassment, Moore et al. 1996, 1998, 1999) predict that a significant sinking of gas occurs toward the galaxies central regions and that the ongoing star formation is accordingly centrally enhanced. Conversely, the ram-pressure model (Gunn & Gott 1972, Abadi et al. 1999) predicts that gas ablation would occur outside-in, leading to a marked deficiency of young stars in the outer regions, without central condensation of gas or stars.

Disentangling between the two models requires a detailed mapping of the gas (HI + H₂) and of the ongoing star formation of a sample of galaxies.

Claims that cluster galaxies have preferentially circumnuclear starburst activity are found in Moss & Whittle, 2000, supporting the tidal interaction scenario. On the contrary Koopmann et al. 2004a,b, in their H α imaging survey of 55 Virgo cluster galaxies, found that a reduction of the star formation activity takes place only in the outer disks, producing truncated H α profiles with normal or marginally increased activity in the inner disks. Moreover Gavazzi et al. 2002 showed that the global star formation rate decreases with increasing HI deficiency, both results arguing against the tidal interaction scenario.

This work

The aim of this thesis work (still in progress) is to determine the relations between the scale-length of the current star formation, the global HI gas content and the scale-length of the old stars in a representative sample of cluster (Virgo cluster) and isolated galaxies.

Starting with an HI selected sample taken from the ALFALFA survey (Giovanelli et al. 2005), we selected the late type objects for the follow-up in the H α as follows:

- their right ascension lies in the interval $8^h \leq R.A. \leq 16^h$ (ca. $182^\circ \leq R.A. \leq 192^\circ$) (J2000), including the Virgo Cluster, and have $08^\circ \leq \delta \leq 16^\circ$ (J2000) (the declination strip that has been fully mapped by ALFALFA);
- they have recessional velocity in the range $-1000 < cz < 3000 \text{ km s}^{-1}$, bracketing the Virgo cluster in its full depth (see Gavazzi et al. 1999);
- they have a statistical significance higher than $S/N=6.5$.

The H α data were taken at the observatory of San Pedro Martir (Baja California, Mexico) of the Observatorio Astronómico Nacional (OAN), Univesidad Autonoma de Mexico (UNAM) in the year 2006 and 2007. I took part to the 2007 observations, and the completion of the campaign is scheduled in April 2008.

Our sample consist of 244 objects; among these, about 18% has no H α component, or a too low content to be measured.

Starting from this HI-selected sample and taking advantage of the multi-band GOLD-MINE database, we measure the scale-length of the H α and optical (R filter) distributions, the *isophotal radii*. Using a procedure based on IRAF tasks, we measured these radii at a fixed value of surface brightness chosen to be of $10^{-16.5}$ erg cm $^{-2}$ sec $^{-1}$ arcsec $^{-2}$ Å $^{-1}$ for the H α and of 24 mag arcsec $^{-2}$ for the R component.

We define *truncation* parameter the ratio $R_{iso}(r)/R_{iso}(H\alpha)$, providing a tracer of the extension of the H α component with respect to the stellar continuum.

Another parameter used is the global *HI deficiency* parameter, defined as the logarithmic difference between the HI mass observed and the HI mass expected in isolated (unperturbed) galaxies of similar Hubble type and size (Haynes and Giovanelli, 1984). This quantity is available for many cluster objects and in particular for all late-type systems in the Virgo cluster, including Im+BCD (Gavazzi et al. 2004a).

A second topic of this work is to study the distribution of the CO, HI and H α , and their mutual relationships. This analysis is based on high angular resolution data found in literature (Young et al. 1995 (CO), Chung 2007 (HI)).

The aim is to determine if the gas and H α distribution (truncation) correlate with environmental parameters, like the HI deficiency.