Conference Poster

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Gas content in galaxies: peculiar vs. normal
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Objective: to define the global gas content in galaxies of every morphological type, normal and peculiar.

Type of galaxies already studied:
10 Ellipticals with polar ring or disk
36 Polar rings S0 or Spirals
58 Galaxies with gas or star counterrotation
148 Galaxies hosting AGN
23 Galaxies with faint outer shells
1769 Galaxies with none of the above features

We started a study of the interstellar medium in 275 galaxies showing several types of peculiarities and of 1769 galaxies, considered to be a fair representation of 'normality'. The definition of 'normal' galaxy adopted in this work implies that we have purposely excluded from the catalogue galaxies having distorted morphology (such as interaction bridges, tails or lopsidedness) and any signature of peculiar kinematics (such as polar rings, counterrotating disks or other decoupled components). Systems hosting active galactic nuclei (AGN) or faint external shells have been also considered.

Masses for warm dust, atomic and molecular gas, as well as X-ray luminosities have been converted to a uniform distance scale taken from the Catalogue of Principal Galaxies (PGC). We have used two different normalization factors to explore the variation of the gas content along the Hubble sequence: the blue luminosity (LB) and the square of linear diameter (only the first one is shown here in the figures). The data for non-interacting objects can be used in future studies to define a template ISM content for 'normal' galaxies along the Hubble sequence. They are in a catalogue (Bettoni et al. 2003) that can be accessed online at the Centre des Données Stellaires (CDS) or at http://diastro.pd.astro.it/galletta/oscatt/.

The data have been statistically analysed by means of survival analysis methods that properly take into account both detections and upper limits, in order to derive representative averages. The mean values so determined are presented in the figures as a continuum line.

Apart from X-ray luminosities, galaxies hosting AGN show no differences of ISM content with respect to normal ones.

Polar ring galaxies on the contrary show a normalised content of cold gas one order of magnitude higher than the reference value derived for normal galaxies. The inferred gas masses are sufficient to stabilise polar rings through self-gravity.

Shell galaxies and galaxies with counterrotation are similar to normal galaxies and probably represent events that have been already evolved. Although counterrotators and polar rings probably share a common origin, the gas masses estimated here confirm that light gas rings secreted by future counterrotators may have evolved faster than the self-gravitating structures of polar rings.

Coming soon: the ISM content of Arp and Vorontsov-Velyaminov galaxies

Sources of data:

References:

Boselli et al. (1999) X CO
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NASA/IPAC Extragalactic Database (NED) XIK
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Van den Bosch et al. (2000) XIK
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Young et al. (1992) XIK

+ Of various papers at our observatories

Data outputs:

Warm dust content:

Galaxies hosting AGN, shells and counterrotation have warm dust content normalised to the blue luminosity similar to that of normal galaxies. Polar ring galaxies have higher dust content.

HI content:

Galaxies hosting AGN, shells and counterrotation have HI content normalised to the blue luminosity similar to that of normal galaxies. Polar ring galaxies have about one order of magnitude more atomic gas.

Molecular gas content:

Galaxies hosting AGN and counterrotation have molecular gas content normalised to the blue luminosity similar to that of normal galaxies. Polar ring galaxies have about one order of magnitude more molecular gas.

X-ray luminosity:

Most part of early-type galaxies have X-ray luminosities normalised to blue luminosity coming from diffuse gas (line L_x) while later type galaxies have emissions typical of a sum of discrete sources (L_x). Some galaxies hosting AGN (red symbols) are oxygenised with respect to normal galaxies (black symbols). Their points are over the line expected from steady-state cooling-flow models (model S0 rate 0.18, L_x). Their L_x/L_B is one order of magnitude higher than the normal galaxies (left figure).

References: