

ABUNDANCE GRADIENTS AND PHYSICAL PROPERTIES OF SPIRAL GALAXIES

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The study of abundances in HII regions along the disc of spiral galaxies has shown the existence of negative gradients with higher abundance towards the centre (e.g. Pagel & Edmunds 1981; McCall, Rybski & Shields 1985; Garnett & Shields 1987; Edmunds 1989). The origin of these gradients is unclear but various chemical models with inflow, radial flows or star-formation cut-offs can produce them (e.g. Pagel & Edmunds 1981; Güsten & Mezger 1982; Díaz & Tosi 1984; Mayor & Vigroux 1981; Pitts & Tayler 1989; Clarke 1989). In the present study we have collected the chemical data available in the literature for some 30 spiral galaxies and we have calculated the abundances in a consistent way. The purpose is to carry out a thorough study of possible correlations or trends of abundance with many other galaxian properties, that can be followed up with further observations until a clearer picture for the origin of the gradients emerges. We summarize here some of the main results, which are fully included in Vila & Edmunds (1991). There is no preferred scale length (e.g. R25, disc effective radius, etc) which reduces the apparent variation of gradients between galaxies. The central abundances of spirals are correlated with their mass, barred spirals have shallower gradients and non-barred spirals show a correlation of gradient slope with morphological type. The correlation of abundance with mass surface density is confirmed and a weaker correlation is found with surface brightness. For those 9 galaxies where information on their HI, H₂, photometry and rotation curves is available, the gas fraction along the disc has been estimated. The initial results show an empirical yield uniformly decreasing with radius, possibly varying as a function of metallicity.

References

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