

Evidence for a Morphological Evolution of Spiral Galaxies

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Abstract. A detailed analysis of the oxygen abundance profile has been carried out on a sample of spiral galaxies from which very good data was available. The early-type galaxies of our sample display gradients that are flatter, and overall levels of O/H abundances that are higher, than those of normal late-type galaxies. Early-type galaxies show an identical trend in the behavior of extrapolated central abundance versus morphological type to that shown by late-type galaxies with strong bars, even in the absence of a bar. On a diagram showing extrapolated central abundances versus morphological types, two clearly separated sequences appear: late-type barred galaxies and early-type (barred or unbarred) galaxies clearly fall on a sequence 0.5 dex in abundance below that of normal late-type galaxies. This behavior is consistent with theoretical models of morphological evolution of disk galaxies by the formation and dissolution of a bar over a period of a few 10^9 yr, where later type galaxies (Sd, Sc, SBc) evolve into earlier-type disk galaxies (Sb, Sa) through transitory SBc and SBb phases.

Discussion

Charley Lineweaver: This morning, Cowie told us that as the column density of neutral hydrogen goes down so does the metallicity. Here you are showing a decrease in metallicity with galactic radius. Can you say anything about the relation of these two?

Yvan Dutil: It is not clear. I would have to do a calculation based on the variation of the HI column density with radius. However, low-mass galaxies have lower abundances. This may partly answer the question.