MAGNETIC FIELDS AND STAR FORMATION FOR THE ANS SAMPLE OF GALAXIES

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ABSTRACT. From the literature we collected radio and magnetic field data for the ANS spiral galaxies. We suggest that the groups of objects, as revealed in the UV range, do not differ in magnetic field strength, although statistics of the sample are very poor.

1. Introduction

Magnetic fields influence the process of star formation apparently at all its stages. It is possible that regular (triggered by spiral shock waves) and stochastic star formation processes coexist in spiral galaxies: the former determines a global structure of spiral pattern, while the latter produces its smaller-scale peculiarities, branchings, breaks, etc.

The study of galaxies from the Astronomical Netherlands Satellite (ANS) catalogue (Wesselius et al., 1982) was presented by Stryczynski (1987). The distribution of the values of UV colour indices led to the conclusion that two groups existing among the spiral galaxies differ in a history of star formation.

2. Magnetic fields

The dominance of synchrotron radiation at frequencies below 10 GHz has led to its use as a tracer of relativistic electrons and magnetic fields in galactic disks. The separation of synchrotron and thermal emission in the radio spectra of studied galaxies has been carried out according to the approach of Duric (1988). Assuming equipartition balance condition (Moffet, 1975) we used the synchrotron component of radio spectra to compute the magnetic field strength $B(U_{min})$. For few galaxies the magnetic field strength based on radio polarization observations were published. We used these values for comparison with the results of our computations (Figure 1).

The nonthermal component is intimately connected with the birth rate of massive stars (Wunderlich and Klein, 1988) which emit Lyman continuum photons, heating the dust, and terminate as supernovae. So from the

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nonthermal component we can compute the supernova production rate which is correlated with the star formation rate. We used the formula as in Klein (1988).

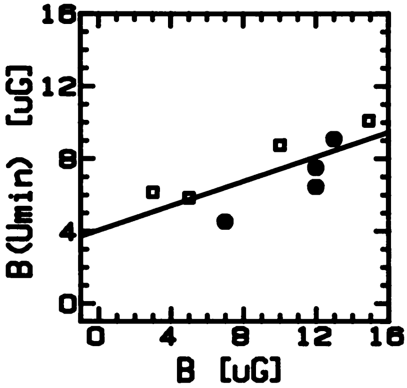

Figure 1. The comparison of measured magnetic field strengths with equipartition field strengths. □: the A−1 group (see Stryczynski, 1987), o: the A−2 group; solid line = linear fit to all points.

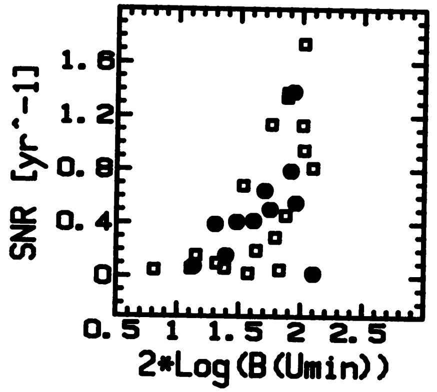

Figure 2. Relation between equipartition field strengths and supernova production rate as an indicator of star formation in the ANS spiral galaxies. Symbols as in Figure 1.

3. Conclusions

The lack of correlation between UV colour index (between 1800 Å and 3300 Å) and $B(U_{min})$ indicates that the physical conditions in disks of studied galaxies are similar despite differences in their star formation histories. This conclusion is supported by the correlation between $B(U_{min})$ and the supernova production rate (Fig. 2) suggesting that current star formation is similar in both groups of galaxies. The weak statistics of the sample force us to treat the conclusion as preliminary only.

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