

THE BYURAKAN CLASSIFICATION AND THE COLOURS OF THE CENTRAL PARTS OF SPIRAL GALAXIES

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ABSTRACT. The statistical study of the U-B, B-V colours of the central regions of galaxies of different Byurakan classes show the presence of UV-excess emission in the nuclear regions of the majority of galaxies of types 5 and 2s.

1. INTRODUCTION

The classification of the central parts of spiral galaxies carried out at the Byurakan Observatory (Byurakan classification of the central parts of 711 galaxies, 1975) showed that so called starlike (of type 5) or split (2s) nuclei exist in some of them, while in some others (of types 1 and 3) there are no definite signs of the presence of any visible nuclei. The galaxies of type 2 and 4 are intermediate between galaxies with prominent nuclei and those without them. The study of radio emission of spiral galaxies showed (H.M.Tovmassian, 1967; 1972; 1982) that galaxies with prominent optical nuclei of types 5 and 2s more often have measurable radio emission than galaxies without such nuclei, thus proving the suggestion made earlier that galaxies with starlike and split nuclei are in active stage of their evolution.

If some of the nuclei of spiral galaxies are really in an active stage of their evolution then one could expect some dependence of the colours of the nuclei on the appearance of them.

2. OBSERVATIONAL DATA AND DISCUSSION.

We present here the results of the study of the colours of the central regions of spiral galaxies (up to 4 kps) of different Byurakan classes.

The obtained distribution of colours refer to a greater degree to the central parts of galaxies than in earlier papers (V.H.Malumian, 1985; H.M.Tovmassian, 1976). It means

that the colours of the central parts of galaxies considered here are definitely less affected by stellar population of the disks and spiral arms of the corresponding galaxies.

The normalized distributions of colours U-B, B-V of the central parts of galaxies of different Byurakan types show that in comparison with galaxies of type 3 the colours of galaxies of other types are in the mean definitely more blue. The noted differences of U-B colours of galaxies of type 3 are statistically significant with the confidential probability equal to 0.99. The differences of colours B-V of galaxies of types 2s and 5 from the corresponding colours of standard galaxies of type 3 are statistically significant with the confidential probability. Since the numbers of galaxies in the considered samples are small (in some cases < 10) the statistical calculations were made using Student's t-distribution and Fisher's criterion and quantiles of t-distribution.

The differences of the colours of the central regions of galaxies of different Byurakan types are apparent in Fig. 1.

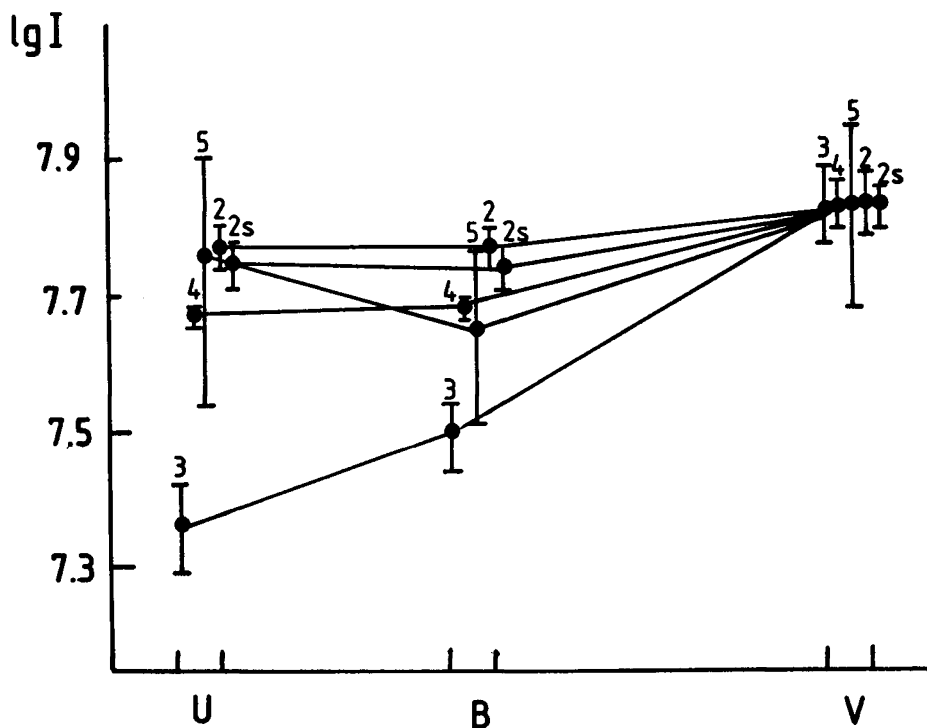


Figure 1. The distributions of the mean values of intensities of emission of galaxies of different groups in U, B and V bands.

For calculation of the mean values of intensities of the central parts in each of the considered bands the absolute magnitude of each galaxy was estimated by its visual stellar magnitude and known distance (accepting $H=75$ km Mpc). For the comparison of the distribution of energy in the spectra of galaxies of different groups the mean value of intensities of all groups in V are equaled to the corresponding mean value of intensities of galaxies of type 3. The standard deviations are also shown in the Figure.

The mean distribution of energy of galaxies of type 3 in U, B, V reminds of the stars of KO-K5 spectral types. This is in agreement with the ideas that the stars of later spectral types are the main population of the bulges of spiral galaxies. Fig. 1 shows that in the mean distribution of energy of the central parts of all groups of galaxies of types 2, 2s, 4 and 5 with suspected nuclear activity some additional UV-emission is obviously present.

3. CONCLUSION

Thus, the consideration of the U-B and B-V colours of the central parts of spiral galaxies of different Byurakan types showed that an excess UV-emission is present in the central parts of galaxies with suspected nuclear activity (of types 5 and 2s) which is not affected by the population of spiral arms. The additional UV-emission is probably due to a larger number of early type stars in the nuclear regions of these galaxies which evidences of higher rates of star formation processes in them or it may partly be due to a presence of nonthermal emission in them.

REFERENCES

- Byurakan Classification of the central parts of 711 galaxies, Comm.Byurakan Observatory, 1975, 47, 43..
Malumian V.H., *Astrofisika*, 1985, 22, 31.
Tovmassian H.M., *Astrofisika*, 1967, 3, 555.
Tovmassian H.M., *Ap.J.Lett.*, 1972, 178, L 47.
Tovmassian H.M., *Astrofisika*, 1976, 12, 555.
Tovmassian H.M., *Astrofisika*, 1982, 18, 25.