GALAXIES IN VOIDS WITH THE 2_M RCC TELESCOPE OF NAO „ROZHEN"

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The superclustering of galaxies and the presence of voids are now accepted as fact, a paradigm among workers on large-scale structure. Amongst the famous known voids are Coma, Hercules, Bootes and Perseus-Pisces.

The structure of superclusters, the material entities that make up the contiguous shell, was revue by Oort (Ann.Rev.A&AP. 21, 373). The last revue concerning voids was one of Rood (Ann.Rev.A&Ap. 26, 631).

There are two ways that an individual void can be studied observationally:

a) the structure and content of the contiguous shell of superclusters surrounding the void

b) the void can be probed with telescopic sensors in attempts to detect something within it

The latter had been chosed for the program of studying voids started in 1990, as a joint work between Max Plank Institute of Astronomy, Heidelberg, Germany and the Department of Astronomy of the Bulgarian Academy of Sciences. The main task of the program was to check the lack of galaxies in some VOIDS and to look for a dwarf galaxies within. The idea is to use the 2 - m telescope of the National Astronomical Observatory "ROZCHEN" with its large field of 1° x 1° and scale ca.13"/mm. The program list contains one comparison field - the well known cluster of galaxies A 1376 and about 20 voids. (Petrov & Kovachev, C.r.Acad.Bulg.Sci. 45, No.6). Using the exposure time ca. 3 hours we had hope to reach a limiting magnitude bigger than the POSS limit - i.e. to detect fainter objects. As an independent source we had used a POSS glass copy. All the plates (except one) have been measured using " GLAREX " XY - measuring machine of the MPIA, Heidelberg. The SAO stars were used as first standards taken with " OVERLAY " program, running on VAX. As secondary standards, SAO stars were measured in the 1° x 1° around the center of each void. Program " AMETRY " and 3-th order fit were used to determine the parameters of our plates and the coordinates of measured objects. As a result, the differences of the coordinates of the objects on the plates became 1 - 2 arcs.

Some qualitative evaluations have been made for the objects measured on the plates:

a) Diameters in conditional scale: 1 < 1.9", 1.9<2 <3.6", 3.6<3<5.7", 4 >5.7" and 5 >>5.7".

b) Brightness: B- Bright, N- Normal and L- Low brightness objects.

c) Morphology: R- Ring, L- Lenticular, Prolongate and I- Irregular. For the objects marked as " L " the position angle in degree has been added.

- *Astrometry and basic parameters for galaxies in voids*

Alltogether 19 plates covered 10 of the voids choosen were taken during the 1991 -1993 and 8 of them had been measured. Five POSS plates had been measered too as control plates. As a result more than 8300 galaxies were measured and classified. Only 73 of them are presentin the Huchra´s CfA redshift catalogue (Kovachev+, AG Abstr.Ser. 9, 46; Kovachev & Petrov,

C.r.Acad.Bulg.Sci. 45, No.9; Strigachev & Petrov, C.r.Acad.Bulg.Sci. 48). For example, in the direction of the Hercules void, only 225 galaxies were measured on the blue POSS plate and 1728 galaxies on our plates. Similary, in the direction of the void 2320 + 1339 we had found 90 galaxies on the blue POSS plates and 225 on our plate (Petrov et al., C.r.Acad.Sci.Bulg. 47, No.6). In all the fields the surface dencitie of the galaxies is several times highes compared to one after the Lick´s counts (Shane, in „Galaxies and the Universe", 647).

- *Automatic selection and classification*

    The void 0049+00 had been studied in two ways - manually, as described above, and using the MIDAS context INVENTORY. 2257 galaxies were measured and classified manually and 2304 were selected by INVENTORY. Simple cluster analisys, using coordinates and magnitudes, pointed out to existing of subsistems in this direction (Petrov+, in press).

- *Steps to the structure of the Hercules void*

    Monte Carlo simulations of the coordinates of 1728 points and Kolmogoroff-Smirnoff test for the real and simulated coordinates shows the galaxies are randomly and uniformly distributed. Lee-function for the position angles of real galaxies and Monte Carlo simulation of their orientation gave us no evidence for preferable orientation (Petrov &Petrov, C.r.Acad.Bulg.Sci. 49).

- *Aperture photometry of galaies in a direction of the void 1312+35*

    444 galaxies were measured in the direction of the void 1312+35. Aperture photometry for 82 of them were established. These are predominantly faint galaxies - max of the distribution is 19 mag. Simple cluster analisys for the magnitudes and diameters shows some evidences for substructures and gave us a tool to devide Low Surface Brightness Galaxies. The light distribution across the major axes of the galaxies split the profiles in tree groups - one with smooth profiles following the Vaucouleur´s law, second - disk and bulge galaxies and third - composite nuclei or mergers (Petrov & Strigachev, C.r.Acad.Bulg.Sci. 46, No.7; Strigachev & Petrov, C.r.Acad.Bulg.Sci. 47; Petrov et al., in press).

- *Surface photometry of galaxies in the direction of voids*

    CCD frames in two colours, taken with 2.2 and 3.5-m telecsopes of the Calar Alto observatory, were used to make a detailed surface photometry - ca. 100 galaxies altogether. In fact this sample is a mixture of intrinsically bright and faint galaxies. The first shows mean characteristics of typical Freeman´s disk and the latter - for Low Surface Brightness galaxies.
Ca. 40 % of the surface brightness profiles can be described by single exponential disk and 20 % show some peculiarities (Vennik et al., A&ApS 117, 261; Kovachev et al., C.r.Acad.Bulg.Sci. 47, No.6; Hopp et al., A&ApS 109, 537).

    <u>Rem :</u> All the data are available on request via E_mail: *petrov@astro.bas.bg*.