

STUDYING OF THE VOID 2320+1339¹

G. Petrov, A. Strigatchev, B. Kovachev

(Submitted by Academician M. Borissov on March 22, 1994)

Early surveys of galaxies over large solid angles of the sky indicated to a super-clustering of galaxies, i.e. predominant occurrence of galaxies, groups, and clusters within larger structures now called super clusters [1-4].

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

1. The structure and content of the contiguous shell of super clusters surrounding the void can be studied.

2. The void can be probed with **telescopic** sensors in attempts to detect something within it.

The second way had been **chosed** for the program of studying voids started two years ago as a joint work between Max Plank Institute of Astronomy, Heidelberg, Germany and the Department of Astronomy of the Bulgarian Academy of Sciences. The chosen voids and details of observational **technique** are described in [5]. The first results about voids 1600 + 18, 1042 - 00 and 1306 + 34 using plates taken with the **3.5-m** telescope of **Caral Alto observatory** in Spain and **2-m RCC** telescope **National Astronomical Observatory "Rozhen"** in Bulgaria were reported already [5-7]. Photographic plates **Kodak IIIa-J** and **ZU21** and filter **Shott GG 385** had been used. The Kodak plates were **hypersensibilised** for 4 hours in forming gas. This paper summarize the data for the void 2320 + 1339. The plate was taken on the 2-m telescope with 3 hours exposure time. All the reductions were taken in the Max Plank Institute of Astronomy, Heidelberg. The **OVERLAY** program had been used to connect the plate and **POSS**. **SAO** standard stars were used to determine the coordinates of the measured objects. The measurement of plates had been done at **GLAREX X-Y** measuring machine and the **polinomial** of power 3 was used to fit the coordinates. As a result 278 objects

Table 1: New galaxies in the Void 2320+1339

Alpha(1950)	Delta(1950)	Remarks	Alpha(1950)	Delta(1950)	Remarks
23 18 06.6	+14 00 17.6	4,n,l,120	23 20 34.9	+13 23 26.9	5,n,l,050,P
23 18 07.0	+13 21 59.6	4,b,r	23 20 36.9	+13 39 14.1	3,n,l,150,P
23 18 07.2	+13 47 12.3	3,l,r	23 20 37.9	+13 59 55.7	4,l,r
23 18 07.9	+13 44 29.7	2,l,r	23 20 40.4	+13 47 09.5	5,b,l,150,P
23 18 08.0	+13 54 57.3	3,l,r,d	23 20 40.7	+13 34 41.0	3,b,r
23 18 08.3	+14 00 16.5	3,n,l,020	23 20 41.2	+13 15 22.7	5,n,l,150,P
23 18 08.7	+13 50 24.6	2,n,r	23 20 43.4	+13 45 33.1	3,n,r
23 18 09.0	+13 51 06.0	2,n,r	23 20 43.6	+14 01 43.6	5,n,l,160
23 18 11.7	+13 35 46.5	5,l,i,hot	23 20 43.7	+13 52 46.0	3,l,r
23 18 12.3	+13 23 34.9	3,b,i	23 20 44.2	+13 45 41.1	2,n,r
23 18 13.7	+13 32 42.7	3,l,r	23 20 45.1	+13 52 18.7	4,l,r
23 18 16.1	+13 46 38.9	3,n,l,170	23 20 45.7	+13 56 45.5	5,n,l,140
23 18 16.3	+13 49 21.0	2,l,r	23 20 47.3	+13 58 12.5	3,b,r
23 18 16.6	+13 22 26.3	4,n,r	23 20 48.6	+13 37 10.1	3,l,r
23 18 17.1	+13 19 21.9	3,l,r	23 20 48.8	+14 04 03.5	5,n,l,170
23 18 18.5	+13 40 38.5	3,n,r	23 20 49.0	+14 04 38.1	4,l,r
23 18 19.8	+14 01 56.6	3,n,r	23 20 49.0	+13 22 37.7	4,l,r
23 18 19.9	+13 45 39.1	2,l,r	23 20 49.2	+13 46 12.2	3,n,l,150
23 18 19.9	+13 25 44.0	3,n,r	23 20 49.8	+13 46 11.1	3,l,i
23 18 26.4	+14 04 45.9	3,n,l,040	23 20 49.9	+14 00 29.9	5,n,l,150
23 18 28.7	+13 56 57.7	2,n,l,030	23 20 50.1	+14 05 28.1	3,n,r
23 18 29.6	+13 47 56.5	3,l,r	23 20 50.4	+13 26 14.3	4,n,r,P
23 18 31.0	+13 47 52.9	3,l,r	23 20 52.2	+13 44 39.3	2,l,r
23 18 33.5	+13 26 29.4		23 20 52.3	+13 44 39.5	3,l,r

23 18 35.5	+14 04 54.9	2,l,r		23 20 52.4	+13 45 39.5	4,n,l,040
23 18 35.5	+14 04 55.0	2,n,r		23 20 53.2	+13 42 16.3	3,l,r
23 18 36.1	+13 26 29.1			23 20 53.2	+13 42 16.4	3,l,r
23 18 40.1	+13 54 56.8	4,l,r		23 20 53.5	+13 46 18.7	3,l,r
23 18 40.8	+13 50 46.2			23 20 54.3	+13 10 35.0	3,l,r
23 18 43.0	+13 43 12.3	3,n,r		23 20 54.8	+14 04 44.9	5,b,l,030
23 18 43.7	+13 38 36.4	3,n,r		23 20 55.0	+14 02 51.0	2,n,r
23 18 47.2	+14 05 09.4	2,n,r		23 20 55.6	+14 02 59.2	5,b,l,045
23 18 47.2	+13 57 48.4	3,l,r		23 20 55.7	+13 51 27.2	
23 18 48.0	+13 26 12.6	3,l,r		23 20 56.6	+13 55 17.6	3,n,r
23 18 48.2	+13 45 43.6	3,l,r		23 20 56.7	+13 48 56.2	4,n,l,100,P
23 18 48.3	+14 00 29.9	4,l,1,160		23 20 56.7	+13 57 12.0	2,l,r,?
23 18 52.5	+13 46 50.1			23 20 56.9	+13 34 38.4	4,l,r
23 18 53.3	+13 55 17.9	5,n,l,120,P		23 20 57.0	+13 42 04.6	5,n,l,170,P
23 18 53.6	+13 19 20.2	4,l,r		23 20 57.8	+13 57 29.4	3,l,r
23 18 53.6	+13 43 54.0	3,b,l,030		23 20 58.1	+13 51 20.0	4,l,i
23 18 53.9	+13 57 34.8	3,n,r		23 20 58.1	+14 03 45.5	5,n,l,090
23 18 54.6	+14 01 48.4	4,l,i		23 20 58.3	+14 08 30.5	4,l,r
23 18 54.8	+13 28 29.8			23 20 58.4	+13 27 48.9	4,l,r
23 18 55.6	+14 08 55.7	2,n,i		23 20 58.7	+15 55 50.5	5,n,l,040,P
23 18 56.1	+13 32 00.9	4,n,i		23 20 59.0	+13 16 38.5	3,l,r,P
23 18 57.8	+14 03 18.1	4,n,l,090		23 20 59.2	+13 27 42.5	2,l,r,?
23 18 57.9	+13 55 09.6			23 20 59.4	+13 46 59.3	2,n,r,?
23 18 58.3	+14 07 41.8	2,n,l,030		23 21 01.4	+13 15 05.8	2,l,r
23 18 58.5	+13 54 49.8	3,n,r,P		23 21 01.8	+13 17 24.2	3,l,r
23 18 59.4	+13 54 40.4			23 21 02.3	+13 28 47.3	5,b,r,P
23 19 00.0	+13 57 10.4	4,l,1,050		23 21 03.5	+13 49 18.3	4,n,l,040
23 19 00.8	+14 07 56.9	4,l,r		23 21 04.5	+13 44 08.3	4,l,1,100
23 19 03.7	+13 53 16.5			23 21 04.9	+13 20 31.0	5,n,l,140
23 19 03.9	+13 12 36.3	3,l,1,060		23 21 04.9	+14 08 58.0	3,l,r
23 19 05.5	+13 18 10.8	4,l,r,P		23 21 06.1	+13 22 33.4	5,b,r,P
23 19 05.9	+13 44 26.9	3,l,1,090,P		23 21 06.6	+14 02 28.9	4,n,r
23 19 06.8	+13 54 18.2	3,l,r		23 21 07.6	+13 46 46.4	2,n,r
23 19 07.2	+13 40 35.4	3,n,l,040		23 21 08.0	+13 09 35.3	5,n,l,130
23 19 08.7	+13 45 26.9			23 21 08.4	+13 16 25.3	3,n,r
23 19 09.6	+13 42 04.3	4,l,r,P		23 21 10.0	+13 47 18.4	5,l,r,P
23 19 09.6	+13 57 44.6	3,n,r		23 21 10.9	+13 21 21.5	3,n,r
23 19 10.1	+13 34 51.0	3,l,r		23 21 10.9	+14 05 28.4	4,n,r
23 19 10.3	+13 54 55.8	3,n,l,150,P		23 21 11.0	+13 24 05.5	4,n,l,010
23 19 10.8	+13 45 13.9	3,l,r,P		23 21 11.3	+13 51 05.9	4,b,r,P
23 19 11.4	+13 43 59.4	3,l,r		23 21 13.8	+13 11 04.3	3,n,r
23 19 11.5	+13 25 25.7	3,l,r,P		23 21 14.5	+14 02 58.6	2,n,r
23 19 11.5	+13 09 54.1	3,l,r		23 21 15.1	+13 11 20.6	3,l,r
23 19 11.9	+13 45 28.2	3,l,r,P		23 21 15.4	+14 06 51.1	2,n,l,140
23 19 11.9	+14 00 37.5	3,n,r		23 21 15.6	+14 02 38.0	4,n,r
23 19 12.0	+13 43 37.1	3,l,r		23 21 16.1	+13 35 31.4	3,n,l,040
23 19 14.3	+13 33 12.9	3,l,r		23 21 16.7	+13 11 34.5	3,l,r
23 19 14.6	+13 35 29.4	5,l,1,070,P		23 21 17.5	+13 44 03.6	5,n,r
23 19 14.8	+13 56 55.4	3,n,i		23 21 18.6	+13 20 26.5	3,n,r
23 19 15.1	+13 18 52.9	2,n,l,060		23 21 18.8	+14 08 32.7	4,l,r
23 19 15.3	+13 36 51.0	3,n,l,150		23 21 19.2	+13 36 52.5	5,n,l,130,P
23 19 16.4	+13 56 23.1	5,n,l,090		23 21 20.0	+13 37 23.6	2,n,r
23 19 17.2	+13 42 11.3	5,l,1,070,P		23 21 20.1	+13 58 15.5	3,l,r
23 19 18.0	+13 53 15.7	5,l,r,P		23 21 20.9	+13 12 16.6	3,l,r,?
23 19 18.4	+13 22 51.5			23 21 21.5	+13 31 50.8	2,n,r
23 19 18.7	+13 36 19.7	5,n,l,090,P		23 21 21.9	+13 25 39.5	3,l,r
23 19 19.1	+13 46 10.5	2,l,r		23 21 21.9	+13 59 48.2	3,l,r
23 19 20.1	+13 22 15.2			23 21 22.4	+13 25 54.8	4,b,r,P
23 19 21.2	+13 55 02.3	3,b,l,045,do		23 21 22.6	+14 01 47.1	4,n,i, strang
23 19 22.4	+13 21 11.8			23 21 22.7	+14 00 57.3	5,n,l,045
23 19 23.3	+13 22 11.6			23 21 23.8	+13 51 19.8	2,l,r

23 19 23.7	+14 05 21.4	3,n,i		23 21 23.8	+13 55 31.0	3,1,1,130
23 19 24.0	+13 35 43.3			23 21 24.3	+13 38 09.5	
23 19 25.2	+13 41 10.5	5,l,r,P		23 21 24.5	+13 51 44.3	5,b,r,P
23 19 26.9	+13 31 38.4			23 21 24.6	+14 05 04.6	2,n,r,?
23 19 27.9	+13 58 44.6	5,n,r		23 21 25.2	+13 12 46.8	4,n,l,020,P
23 19 29.0	+13 30 36.2			23 21 26.7	+13 26 29.8	3,I,r
23 19 29.8	+13 16 31.3			23 21 27.0	+13 18 59.4	
23 19 31.4	+13 28 51.8			23 21 27.2	+14 04 03.9	3,n,r
23 19 37.9	+13 28 12.1	3,l,r,P		23 21 28.0	+14 05 41.7	4,n,l,090
23 19 38.0	+13 49 25.2	4,n,r		23 21 32.0	+13 40 17.3	5,b,r,P
23 19 41.9	+13 49 38.4	4,b,r,P		23 21 32.7	+14 02 28.8	4,l,i
23 19 44.2	+13 48 16.6	5,n,l,080,P		23 21 32.7	+13 20 30.7	2,n,r,P
23 19 44.6	+13 58 50.5	2,n,r		23 21 32.8	+13 52 44.7	2,n,l,050
23 19 45.8	+14 03 09.8	3,l,r		23 21 33.0	+13 43 06.7	3,n,r
23 19 45.9	+13 17 32.4	3,l,r		23 21 33.2	+13 53 02.7	4,l,r
23 19 46.0	+13 52 55.3	4,l,r		23 21 33.2	+13 53 44.1	2,n,r,P
23 19 47.3	+14 03 27.9	3,n,r		23 21 33.3	+13 39 39.8	3,l,r
23 19 49.6	+13 16 12.4	3,l,r,P		23 21 33.4	+13 34 14.2	5,n,r,P
23 19 50.5	+13 20 14.3	4,1,1		23 21 33.8	+13 49 41.2	3,l,r
23 19 50.8	+13 56 32.0	2,n,r		23 21 34.2	+13 34 35.3	4,l,i
23 19 51.0	+13 35 47.7			23 21 34.3	+13 20 19.3	3,l,r,P
23 19 51.7	+13 43 04.8	4,n,r,P		23 21 34.5	+13 39 54.2	4,b,r,P
23 19 52.6	+13 28 44.9			23 21 35.6	+13 53 41.0	3,b,l,140
23 19 54.4	+13 41 11.2			23 21 37.4	+13 56 22.9	3,n,l,130
23 19 56.3	+13 32 22.0	5,n,l,080,P		23 21 37.4	+14 02 24.8	3,n,l,000
23 20 03.2	+13 55 16.4	3,l,i		23 21 37.8	+13 53 51.2	3,l,r
23 20 09.7	+13 24 09.0	4,n,l,140		23 21 39.5	+13 54 42.7	2,n,r,dou
23 20 13.4	+13 39 32.3			23 21 39.5	+13 54 42.	3,n,r
23 20 13.6	+13 11 21.4	3,n,r		23 21 40.5	+13 21 25.5	
23 20 14.9	+13 49 36.8	3,n,l,130		23 21 41.0	+14 02 29.3	2,n,r
23 20 16.7	+13 11 20.7	3,n,r		23 21 41.2	+13 55 41.1	5,1,1,130
23 20 16.7	+13 21 09.2	2,n,r		23 21 41.2	+13 56 28.6	3,1,1,090
23 20 16.8	+13 26 34.2	3,n,l,170		23 21 41.3	+13 14 12.8	
23 20 18.6	+13 12 07.4	3,l,r		23 21 42.7	+13 31 24.3	4,n,l,040,P
23 20 21.9	+13 12 29.4	4,n,l,020		23 21 43.4	+14 03 28.8	4,n,l,120
23 20 22.1	+13 24 31.5	3,b,i,det		23 21 43.8	+14 03 14.8	3,n,l,020
23 20 22.7	+13 42 27.2	4,1,1,010		23 21 44.8	+13 40 50.1	
23 20 22.8	+13 22 20.9	3,n,r		23 21 45.0	+13 41 22.9	5,b,l,150,P
23 20 24.3	+13 47 01.0			23 21 45.6	+13 48 41.3	3,1,1,040
23 20 25.5	+13 46 08.7	3,n,r,P		23 21 46.1	+13 42 20.8	2,n,r,P
23 20 26.0	+13 20 47.7	5,n,l,160,P		23 21 46.5	+13 38 14.3	4,l,i
23 20 27.0	+13 11 25.0	4,n,r		23 21 46.6	+13 56 45.1	5,l,r,P
23 20 27.6	+13 45 24.9	3,l,r,P		23 21 46.7	+13 43 00.2	5,b,l,150,P
23 20 28.6	+14 01 57.4	4,l,r		23 21 46.9	+13 38 22.0	
23 20 29.0	+14 02 07.5	4ml,r		23 21 46.9	+14 01 07.6	2,n,i
23 20 29.0	+13 56 16.9	5,n,l,010,P		23 21 47.6	+13 47 14.7	3,n,i
23 20 29.9	+14 04 32.6	4,n,l,040		23 21 47.7	+13 47 22.3	2,n,r
23 20 30.7	+13 33 17.2	5,l,r		23 21 48.3	+13 39 56.2	4,n,r,P
23 20 31.2	+13 26 52.6	4,n,r,P		23 21 48.5	+13 56 44.5	3,n,r,P
23 20 31.7	+13 57 06.5	2,l,r		23 21 50.2	+13 38 43.4	4,n,r,P
23 20 31.9	+13 46 16.1	2,l,r		23 21 54.0	+13 41 23.8	5,b,r
23 20 32.2	+14 07 52.2	4,b,r		23 21 54.4	+13 41 43.4	5,b,r
23 20 34.7	+13 53 35.4	3,l,r		23 22 00.0	+13 59 43.0	5,b,r
23 20 34.8	+13 19 38.8	3,l,r		23 22 01.0	+13 42 17.3	5,b,l,045

Remarks: Figure - diameters in condition scale; Letter - evaluation of the surface brightness; Letter - morphological evaluation; Figure (if any) - position angle; Other information - see the text;

were measured on the plate No 1861 and 90 ones on POSS plate all with diameters > 3.5". Table 1 contains the data for the all 279 galaxies. The galaxies founded on the POSS plate are marked. The rest symbols are like in [5], and some qualitative

evaluations have been made for the objects measured on the plate:

a) Diameters in conditional scale: 1- 1.9", 2- 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.

Only 8 galaxies are included in **HUCHRA'S, CfA** survey [8]. In Figure 1 one can see the distribution of the galaxies measured in the void. The mean surface density is ca. 350 galaxies per sq deg. **SHANE** [9] reported 50 galaxies per sq deg up to *IS.L* magnitude according the Licks counts.

As a result, studying the void 2320 + 1339 as well as 1600 + 18, 1042 - 00 and 1306 + 42 with long exposure on the 2- and 3.5-m telescopes, one would suppose that the voids are highly populated with faint galaxies. However, the real picture will be clear enough only after spectra of most of these objects will be taken, in order to understand their three-dimensional distribution. Our general conclusions will be made after finishing the program VOIDS.

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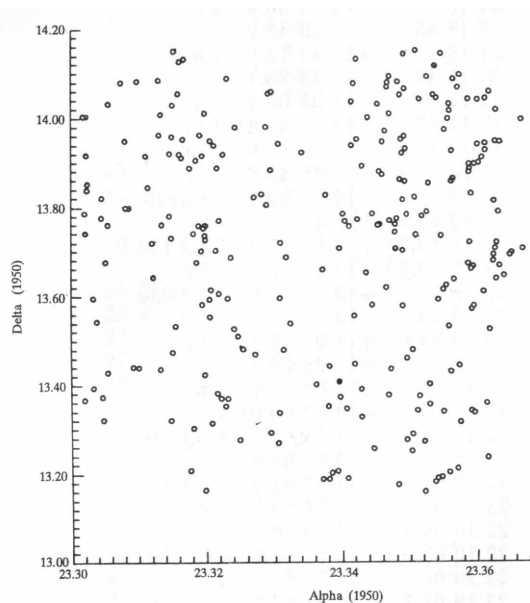


Fig. 1

Department of Astronomy and National Astronomical Observatory Bulgarian Academy of Sciences, 72 Tsarigradsko chaussee blvd. 1784 Sofia, Bulgaria

This work was partially supported by the Bulgarian National Research Foundation of the Ministry of Science and Education under grant F-237/1992.