

Presence of dual structure in galaxy clusters from CfA2 Redshift Survey which reveal high-energy γ -associations on Fermi/LAT 12-Year Point Source Catalog 4FGL DR3.

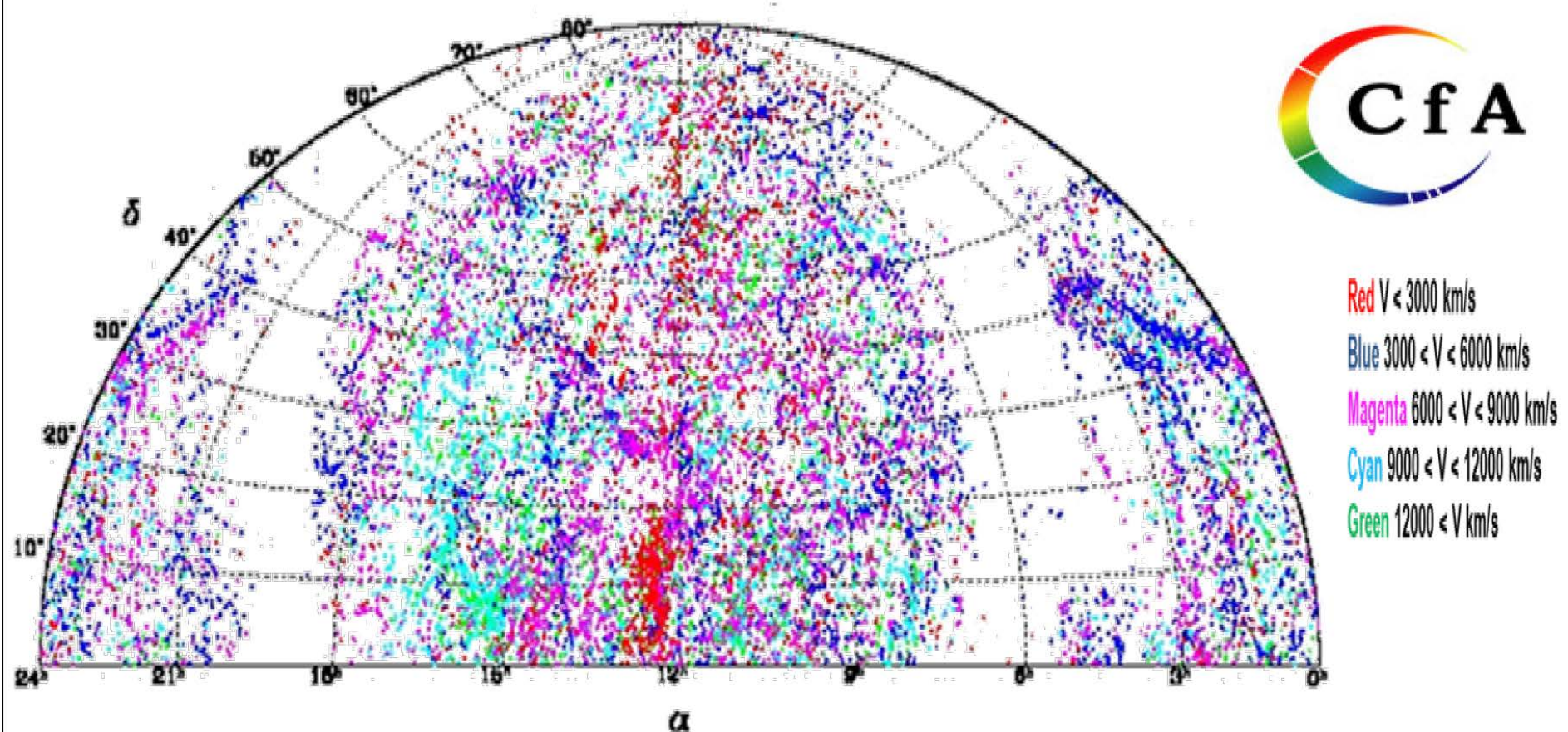
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The second CfA redshift survey (CfA2)

<http://vizier.u-strasbg.fr/viz-bin/VizieR-3?-source=VII/256/table1&-out.max=9999&-out.form=%2bH> was started by J. Huchra and M. Geller between 1985 and 1995 due measurements of relative distances via redshifts for about 18000 bright galaxies in the northern sky. Data of 1971 galaxies groups (totally 6787 members) at galactic latitudes $b \geq 20^\circ$.



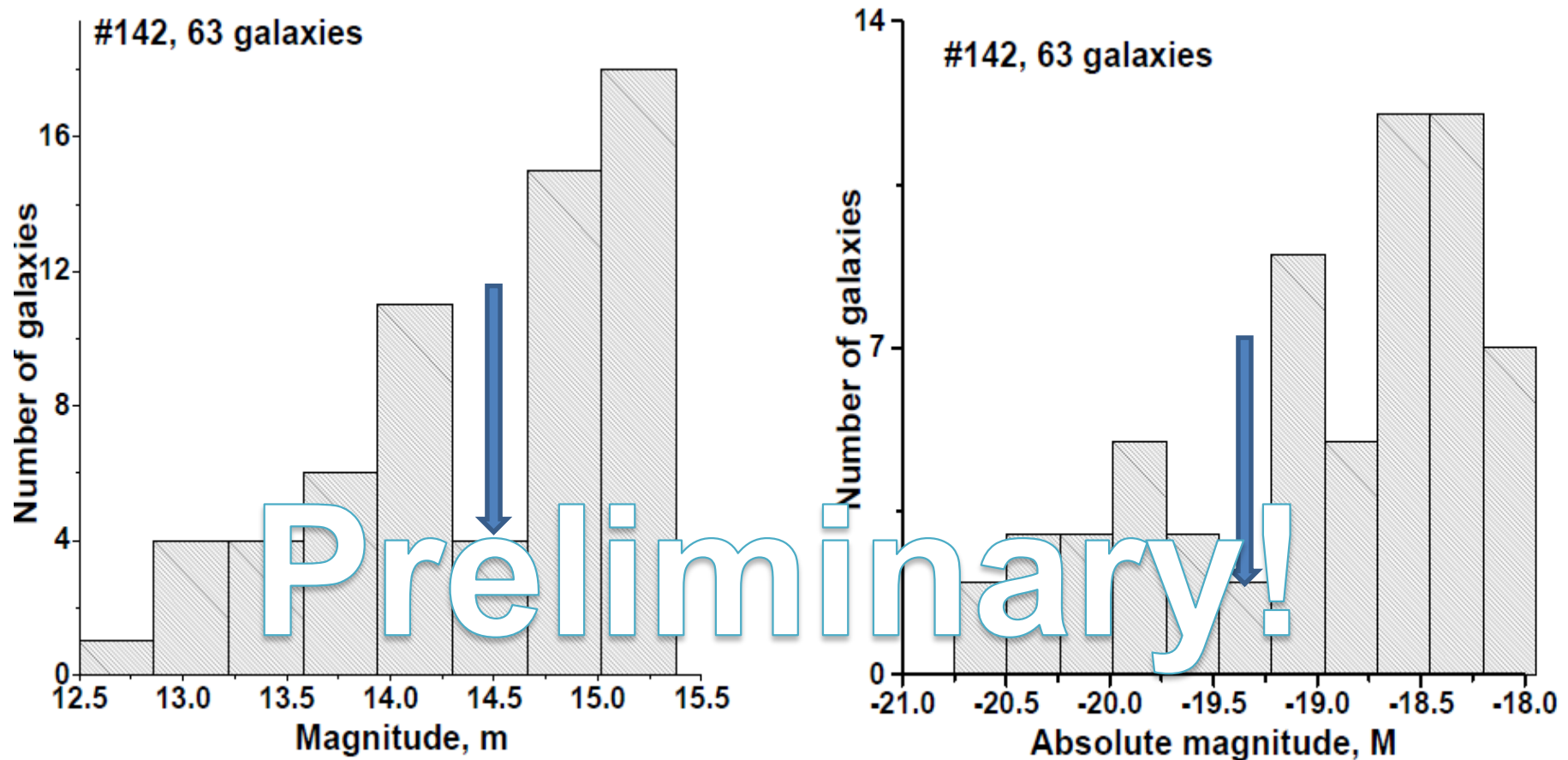
Mean parameters for several clusters of galaxies on CfA2 data.

Cluster number	Amount of galaxies	RQF – Relative quantities false (%)	Heliocentric velocity (km/s)	Mean distance of member of group from its centre (Mpc)
1046	337	2.328	1847 ± 519	1.423
1101	118	0.784	7433 ± 751	1.006
88	92	1.426	5040 ± 440	1.357
933	63	0.372	6656 ± 703	0.497
142	63	0.721	4868 ± 496	0.667
1242	26	0.406	2750 ± 190	0.384
1652	28	1.561	9324 ± 427	1.394
107	34	0.303	1530 ± 395	0.354
150	20	1.629	4964 ± 323	0.821
316	21	0.294	6068 ± 269	0.450
317	23	0.504	6152 ± 288	0.564
961	27	2.422	1264 ± 167	0.481
977	20	0.485	6288 ± 402	0.407

Several peculiarities on the distributions of galaxies inside cluster #142 on CfA2 data.

(a) In the distribution of galaxies on magnitude.

(b) In the distribution of galaxies on absolute magnitude



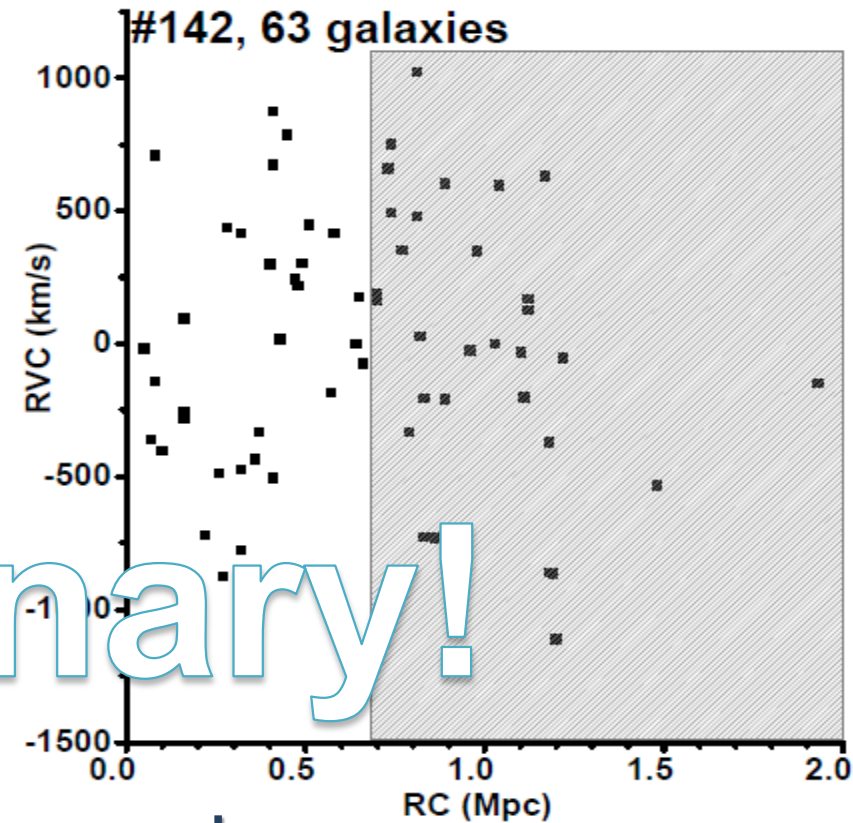
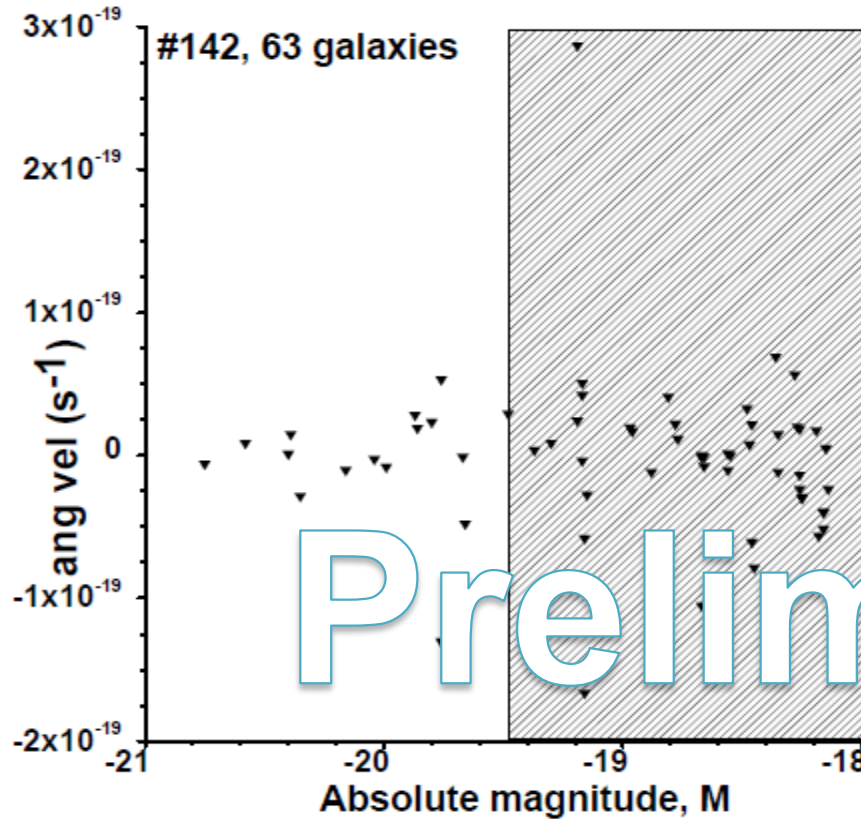
(a) Bifurcation points $m=14.5$ and $M=19.5$? (b)

Several peculiarities on the distributions of galaxies inside cluster #142 on CfA2 data.

(a) In the distribution of galaxies on angular velocity and absolute magnitude.

(b) In the distribution of galaxies on velocity and distance to cluster centre

Bifurcation points $R_c=0.7$ and $M=19.8$?



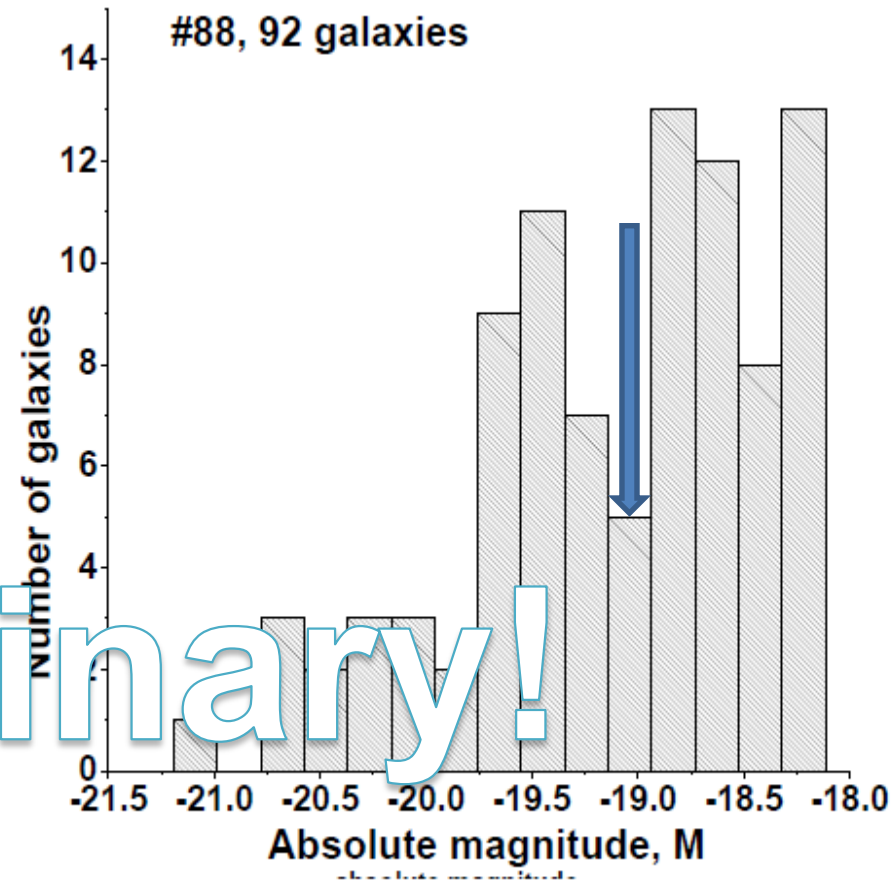
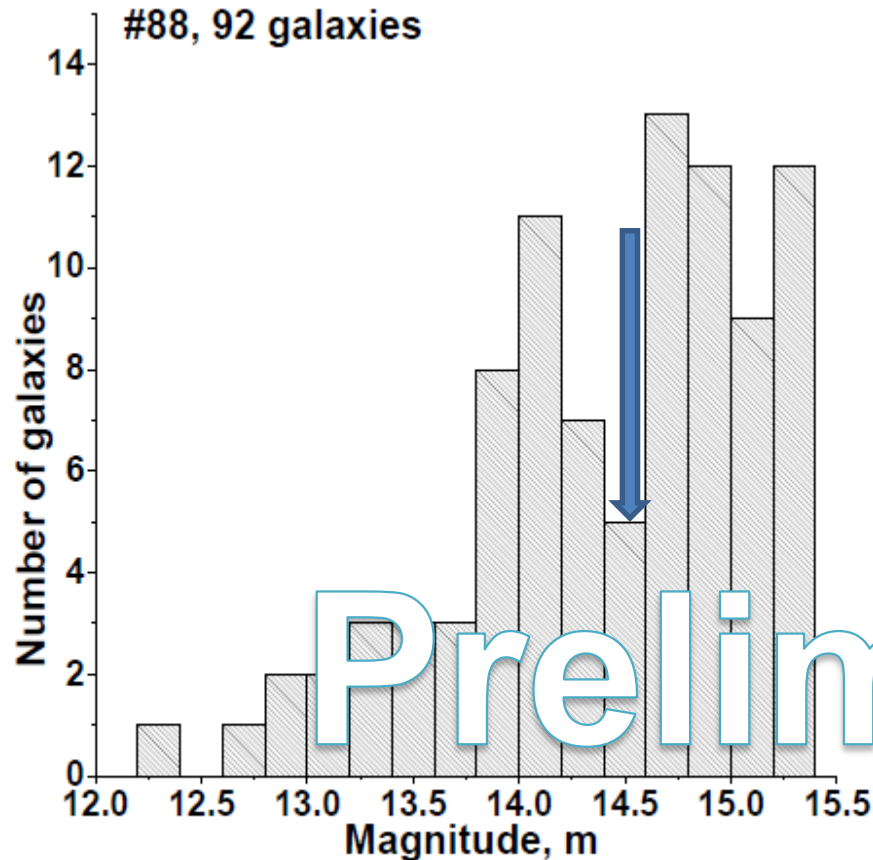
Preliminary!

(a) Shaded regions correspond areas from right side of bifurcation points (b)

Several peculiarities on the distributions of galaxies inside cluster #88 on CfA2 data.

(a) In the distribution of galaxies on magnitude.

(b) In the distribution of galaxies on absolute magnitude



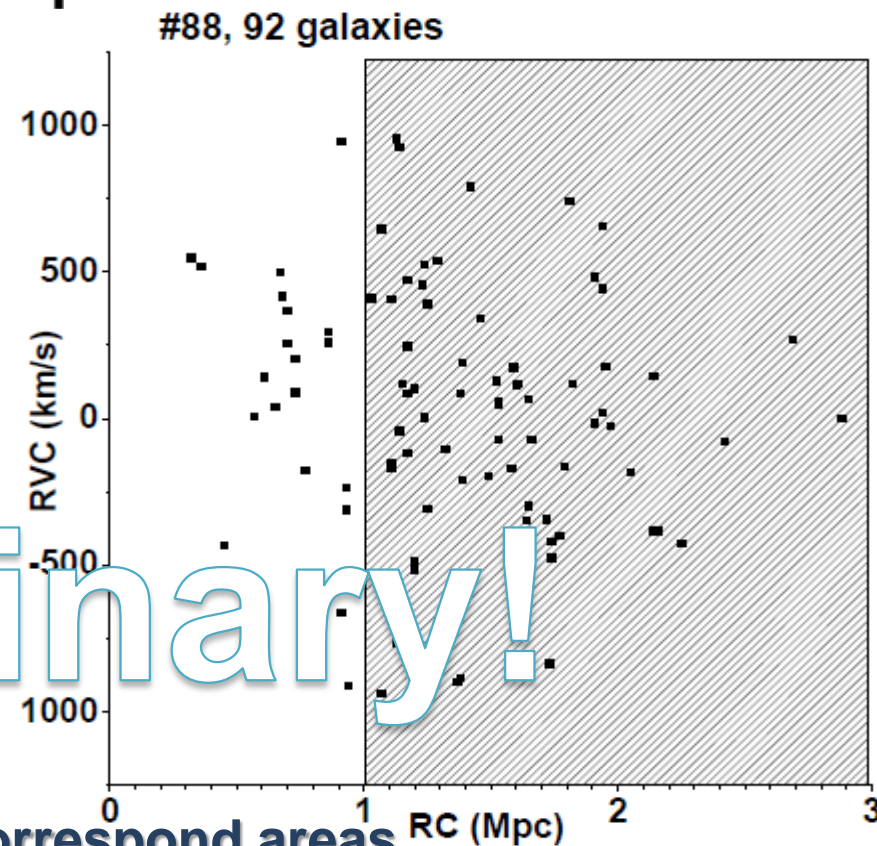
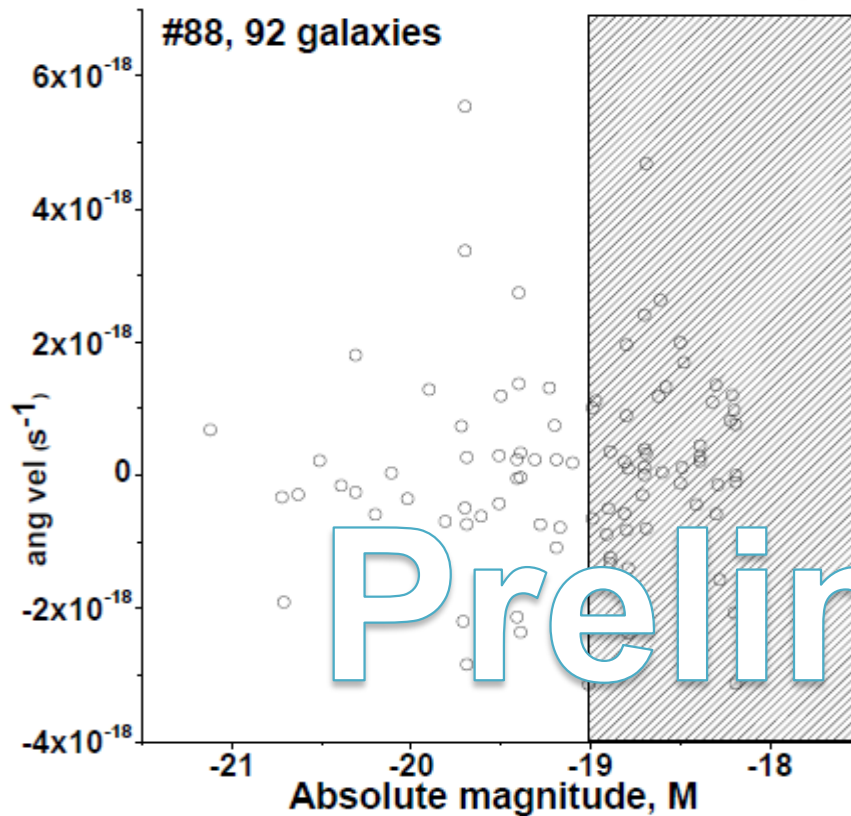
(a) Bifurcation points $m=14.5$ and $M=19.0$? (b)

Several peculiarities on the distributions of galaxies inside cluster #88 on CfA2 data.

(a) In the distribution of galaxies on angular velocity and absolute magnitude.

(b) In the distribution of galaxies on velocity and distance to cluster centre

Bifurcation point $M=19.0$?



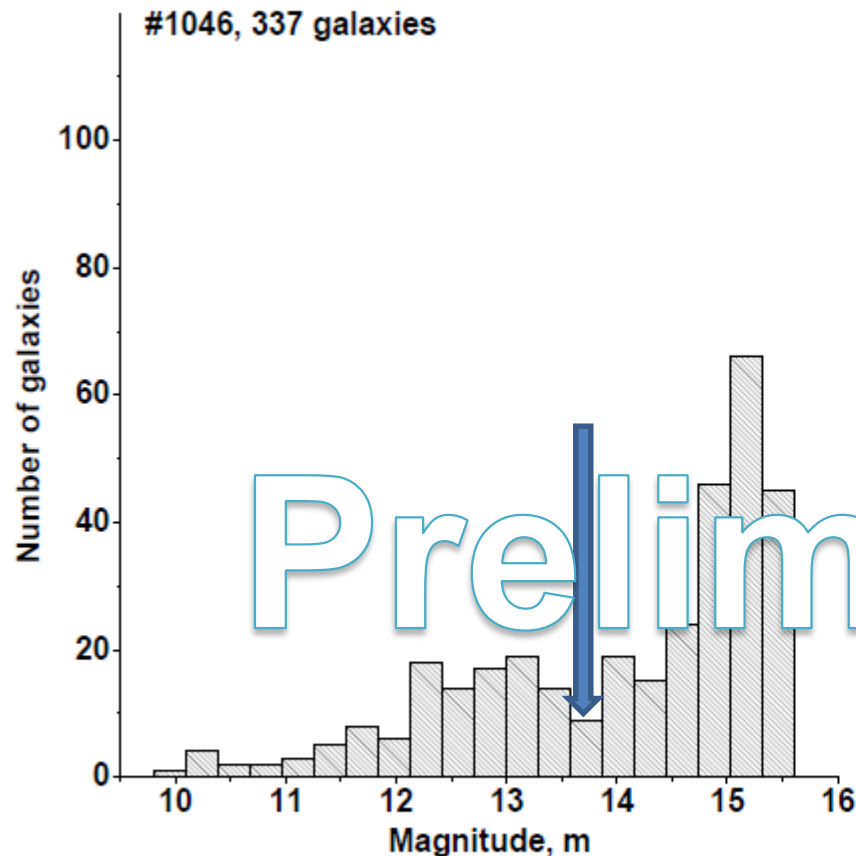
Preliminary!

Shaded regions correspond areas
(a) from right side of bifurcation points (b)

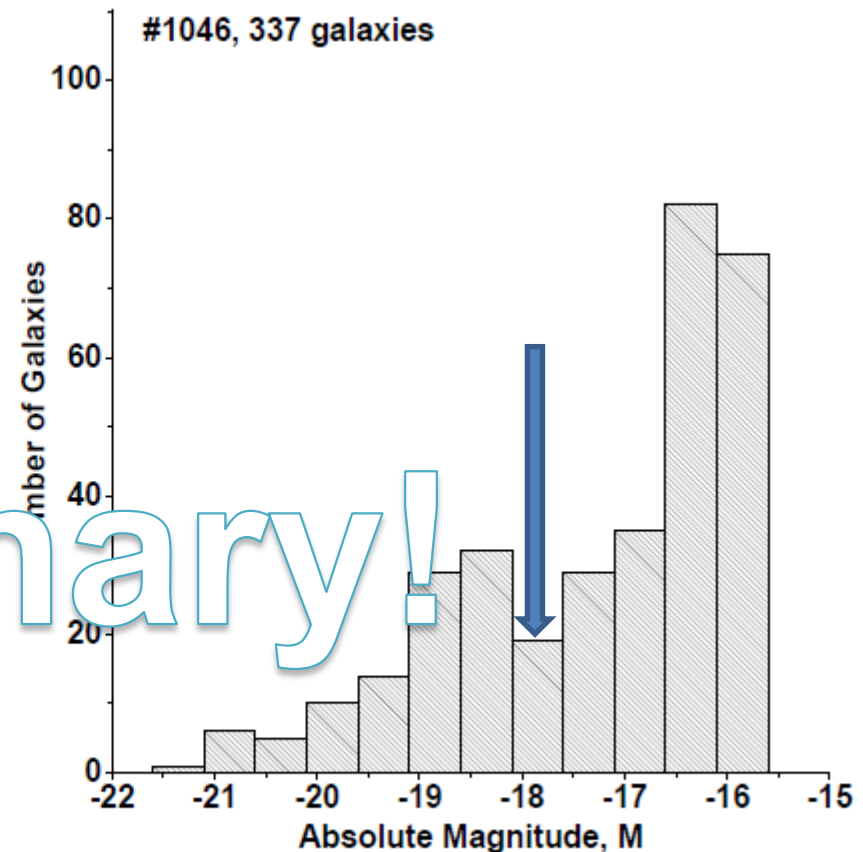
Several peculiarities on the distributions of galaxies inside cluster #1046 on CfA2 data.

(a) In the distribution of galaxies on magnitude.

(b) In the distribution of galaxies on absolute magnitude



(a)

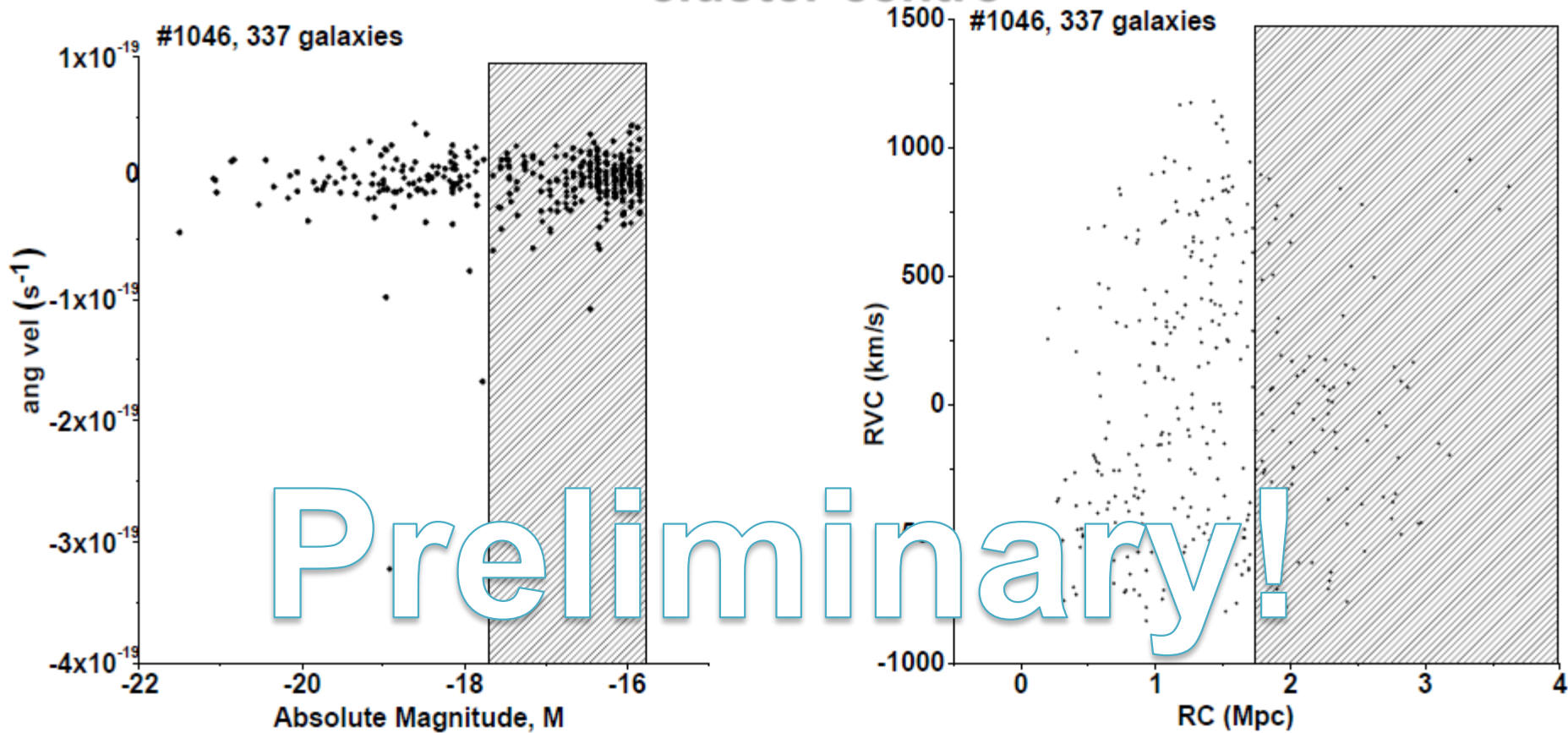


(b)

Several peculiarities on the distributions of galaxies inside cluster #1046 on CfA2 data.

(a) In the distribution of galaxies on angular velocity and absolute magnitude.

(b) In the distribution of galaxies on velocity and distance to cluster centre



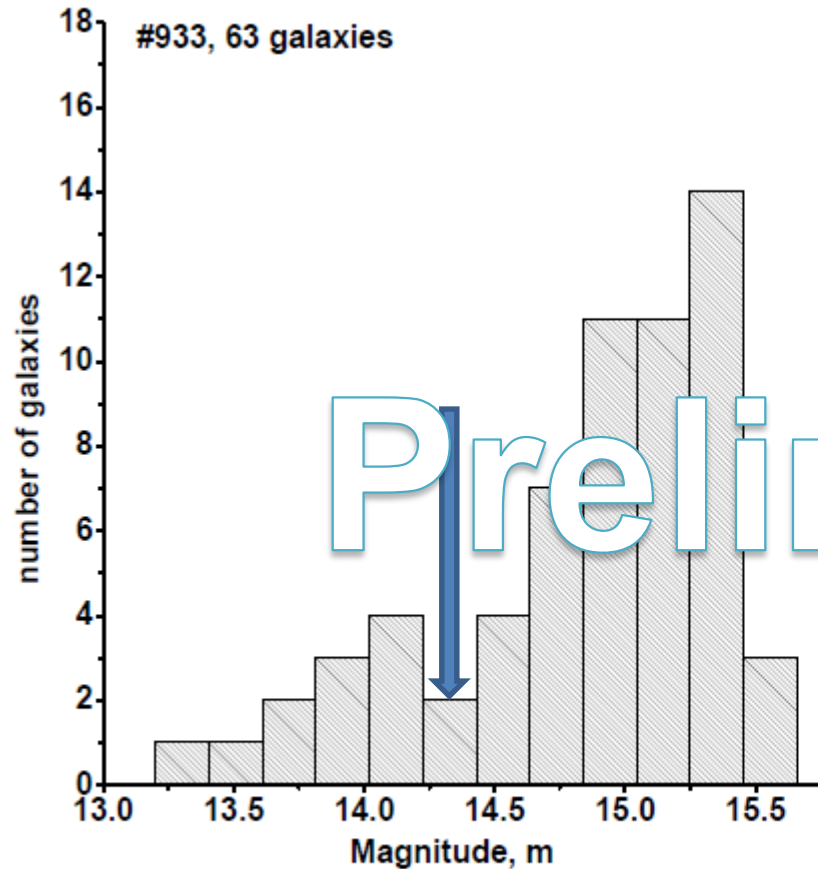
Preliminary!

Shaded regions correspond areas from right side of bifurcation points

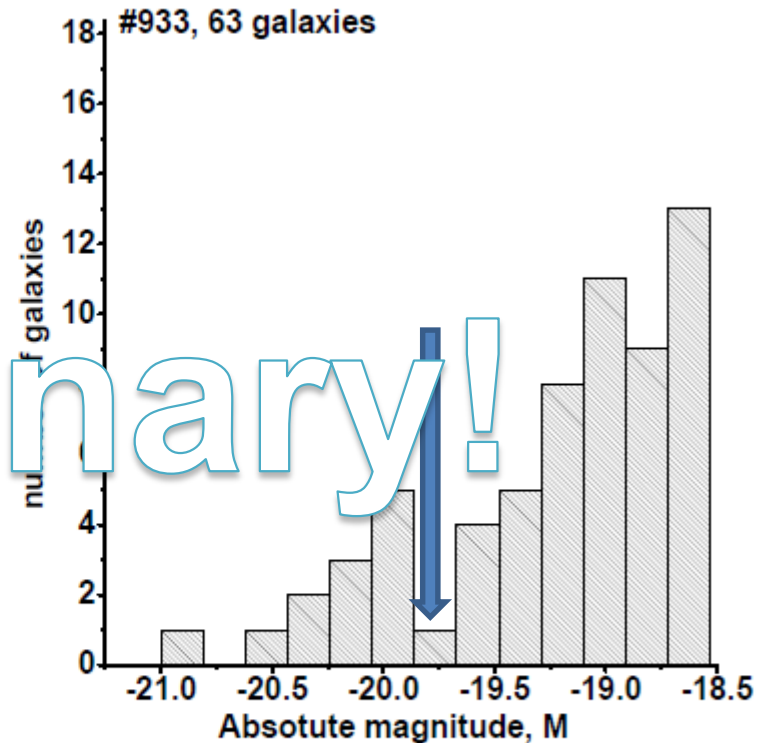
Several peculiarities on the distributions of galaxies inside cluster #933 on CfA2 data.

(a) In the distribution of galaxies on magnitude.

(b) In the distribution of galaxies on absolute magnitude



(a)

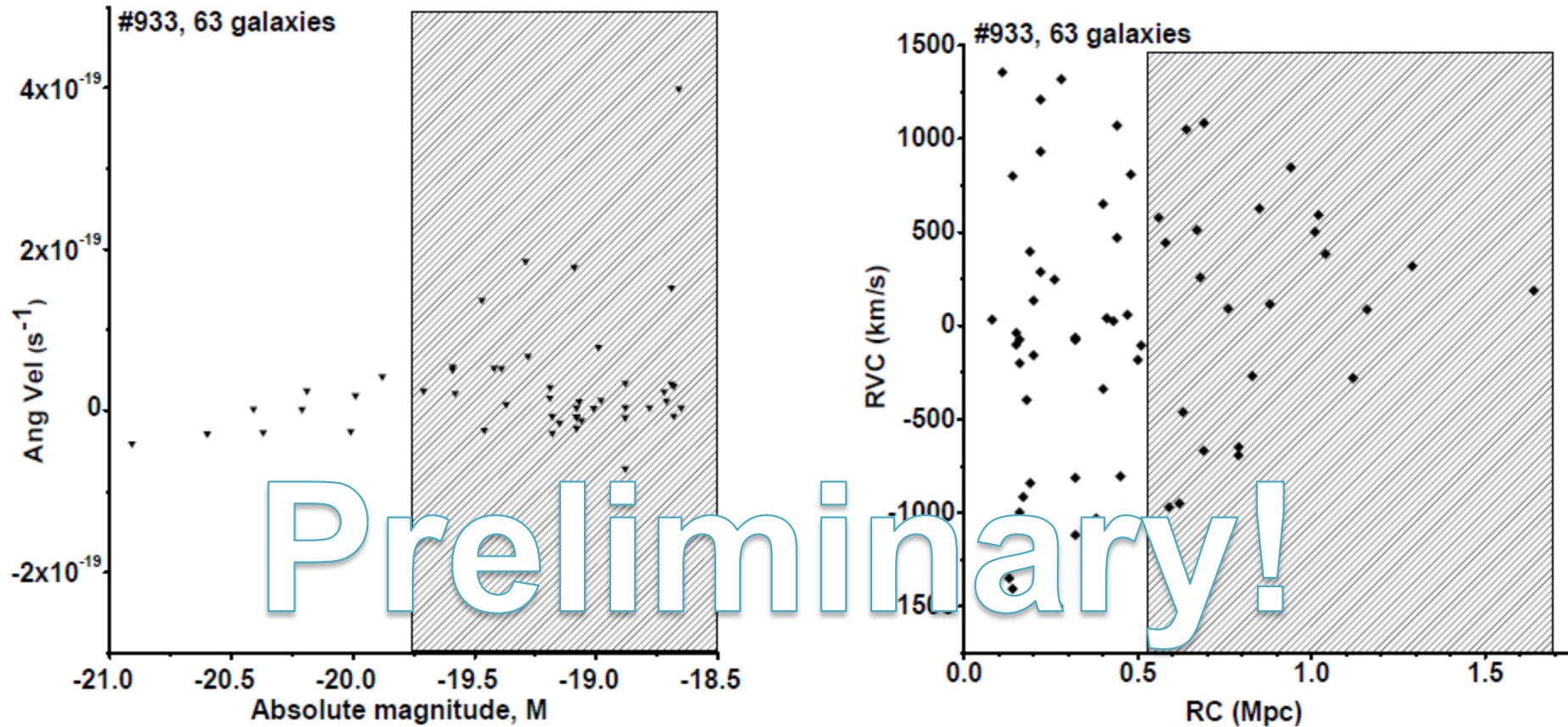


(b)

Several peculiarities on the distributions of galaxies inside cluster #933 on CfA2 data.

(a) In the distribution of galaxies on angular velocity and absolute magnitude.

(b) In the distribution of galaxies on velocity and distance to cluster centre



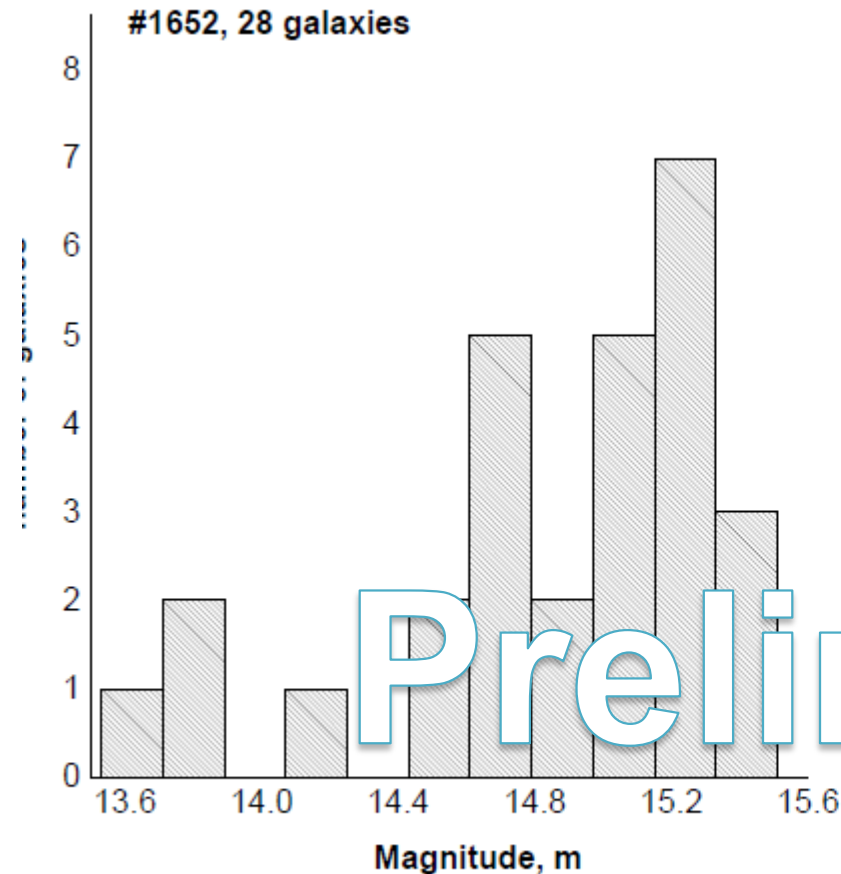
Preliminary!

Shaded regions correspond areas from right side of bifurcation points

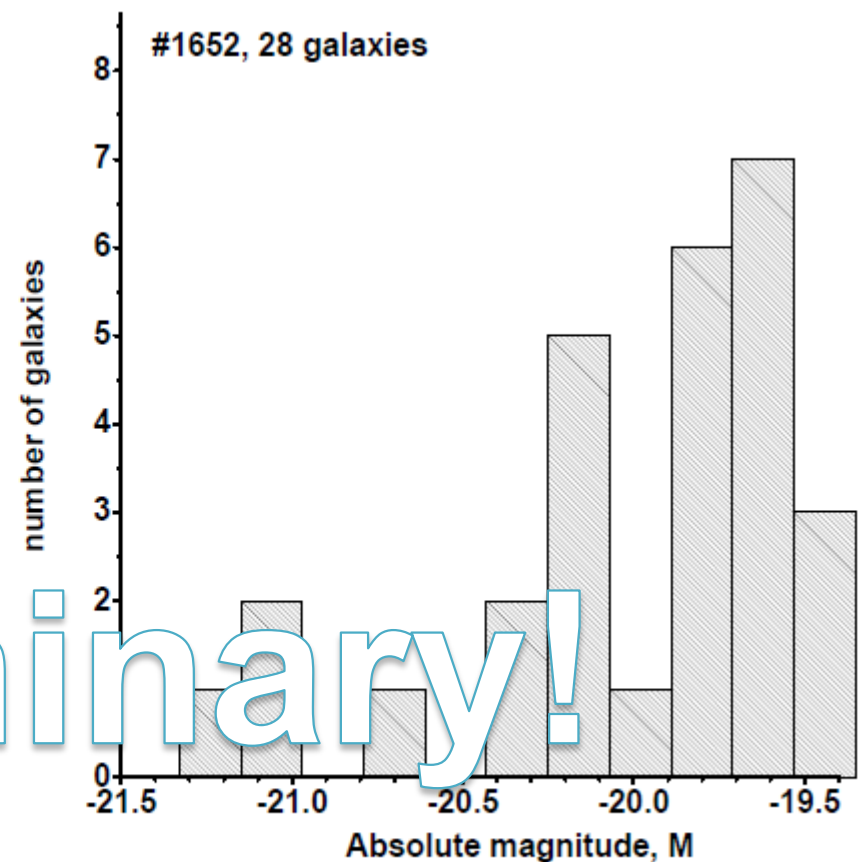
Several peculiarities on the distributions of galaxies inside cluster #1654 on CfA2 data.

(a) In the distribution of galaxies on magnitude.

(b) In the distribution of galaxies on absolute magnitude



(a)

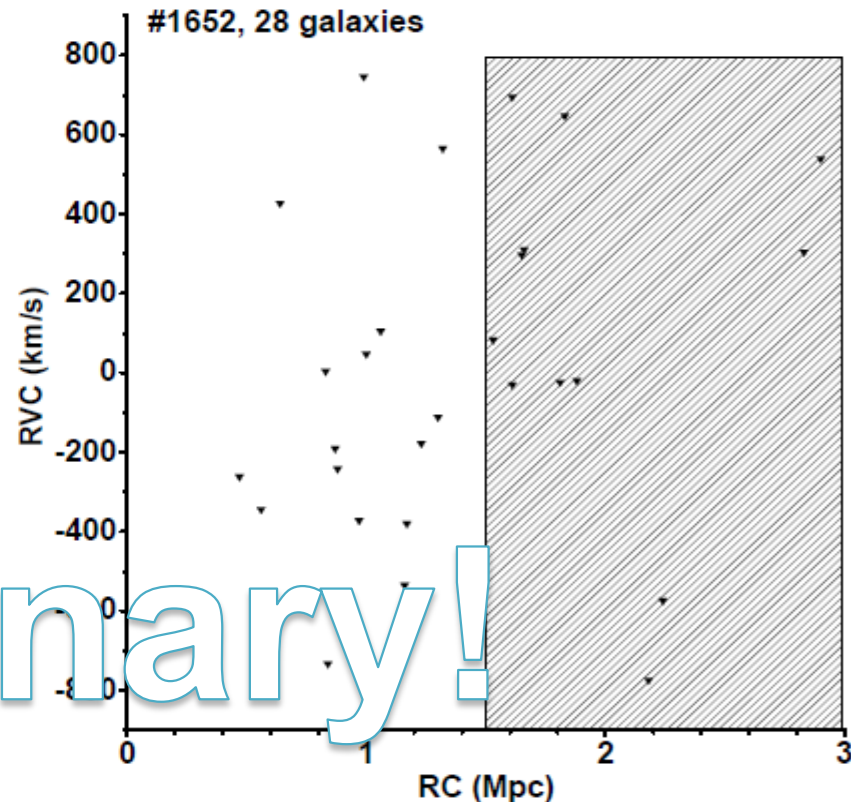
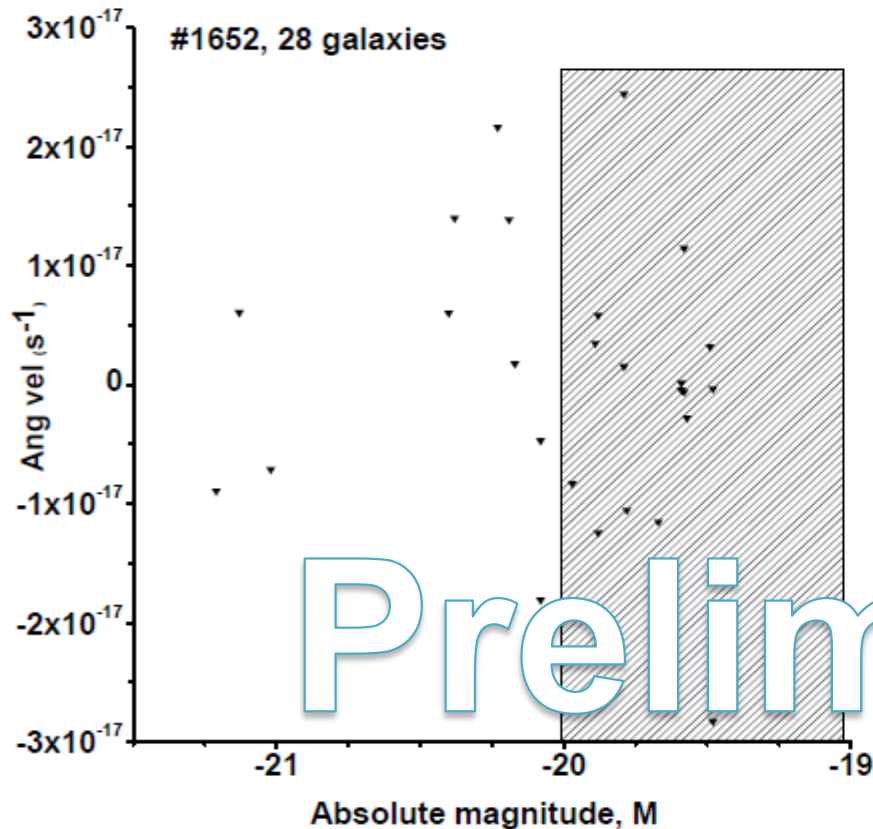


(b)

Several peculiarities on the distributions of galaxies inside cluster #88 on CfA2 data.

(a) In the distribution of galaxies on angular velocity and absolute magnitude.

(b) In the distribution of galaxies on velocity and distance to cluster centre

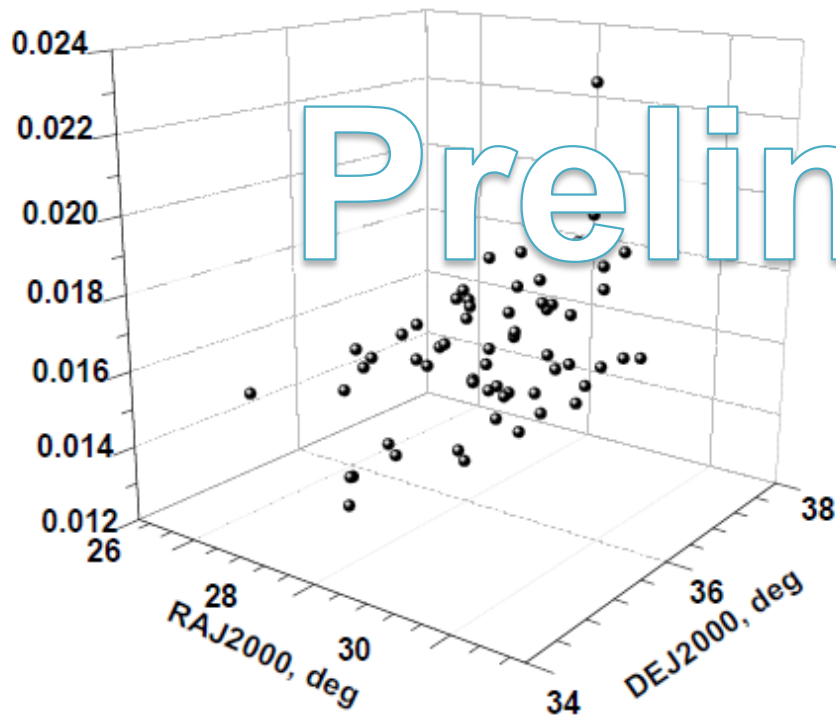


Preliminary!

(a) Shaded regions correspond areas from right side of bifurcation points (b)

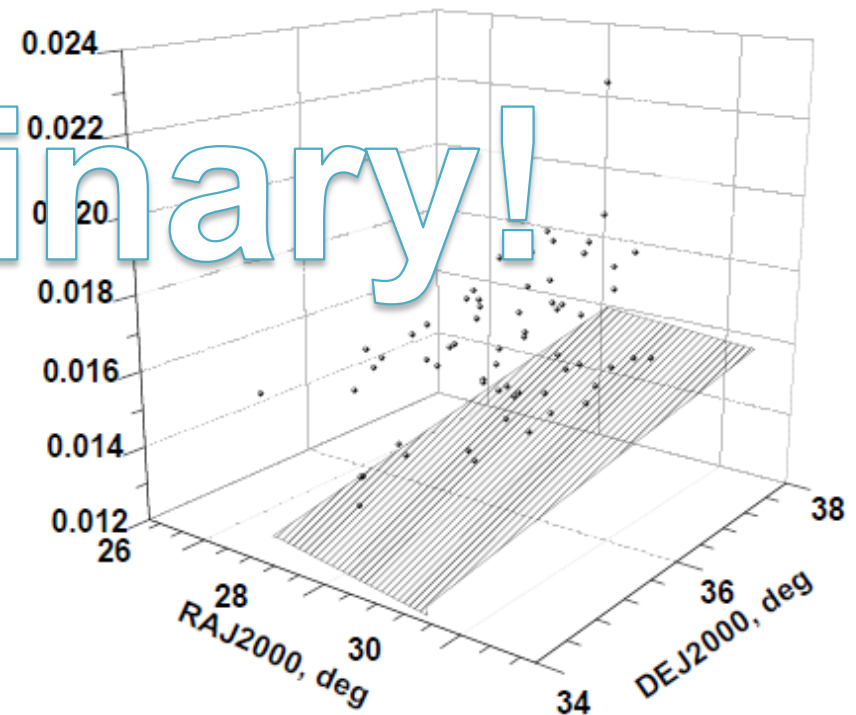
The spatial distributions of galaxies for cluster #142 on CfA2 data (a) and dual structure appearance on this distribution (b)

#142, 63 galaxies



(a)

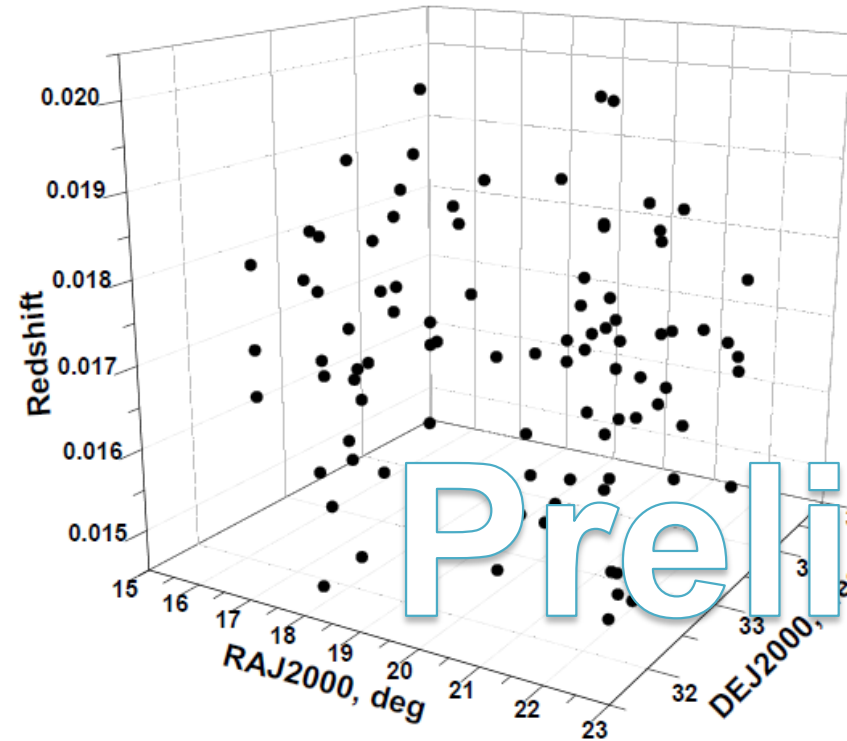
#142, 63 galaxies



(b)

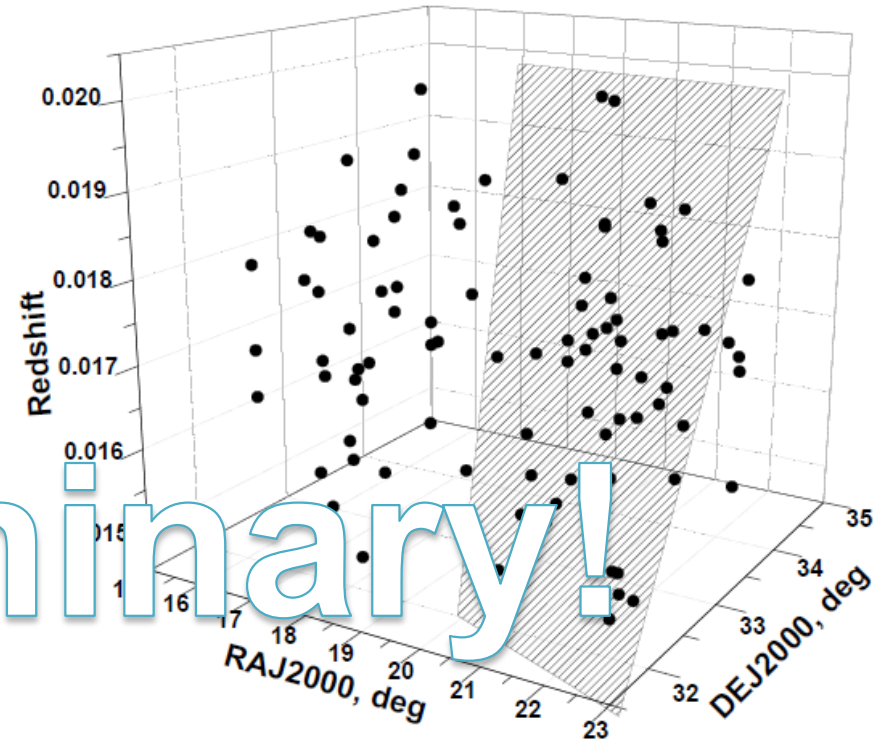
The spatial distributions of galaxies for cluster #88 on CfA2 data (a) and dual structure appearance on this distribution (b)

#88, 92 galaxies



(a)

#88, 92 galaxies



(b)

Preliminary!

The distributions on groups members position, absolute magnitude and luminosity **represent two areas** for clusters ##88, 1101, 1046, 142, 933, 1242, 1652, 107, 150, 316, 317, 961 and 977.

Redshifts of these clusters are in the region 0.002 – 0.022.

Galaxies from these areas **are paired** accordingly its spectral characteristics and position.

Real dual structure or it seems to us?

Try to construct phase space using values of redshift, coordinates, absolute magnitude and distance to center. We use velocity as time similar variable.

Try to investigate dynamic of system in this phase space – simple attractor construction. Let's separate basins of attractors correspondingly to bifurcation points at analyzable distributions

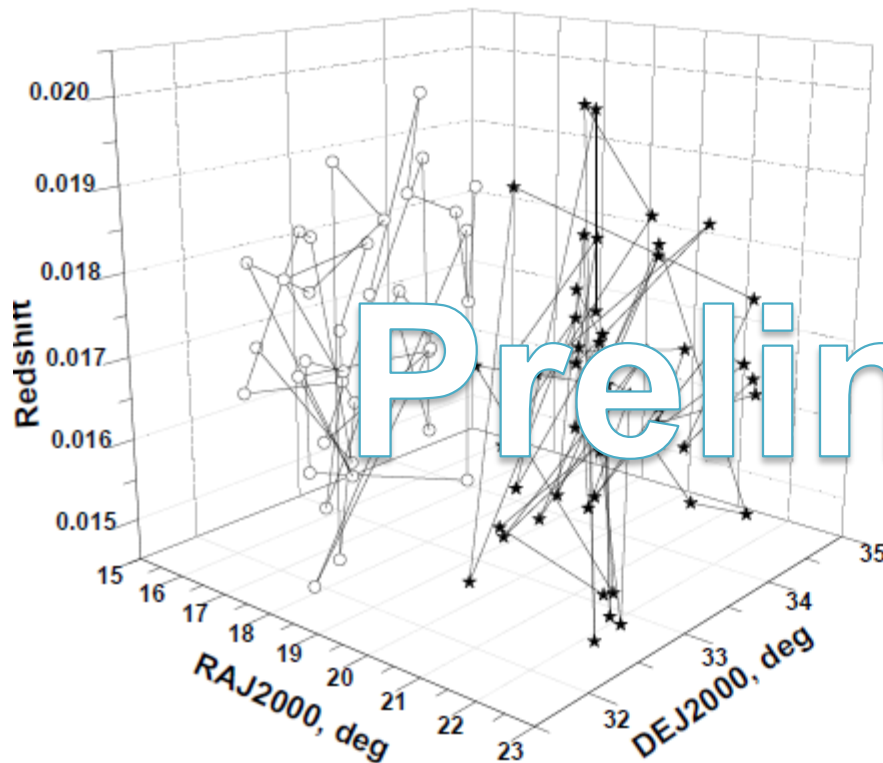
The projections of six-dimensional system of attractors for cluster #88.

(a) Projection in three-dimension space with axes corresponds to coordinates and redshift.

(b) Two dimension

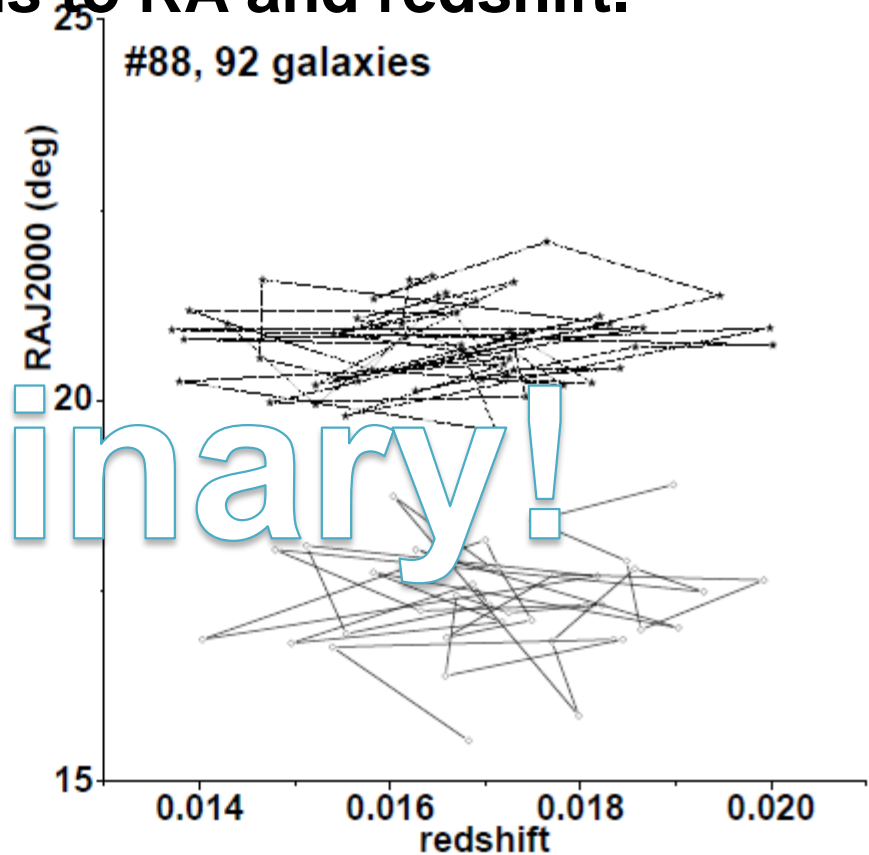
projection with axes corresponds to RA and redshift.

#88, 92 galaxies



(a)

#88, 92 galaxies

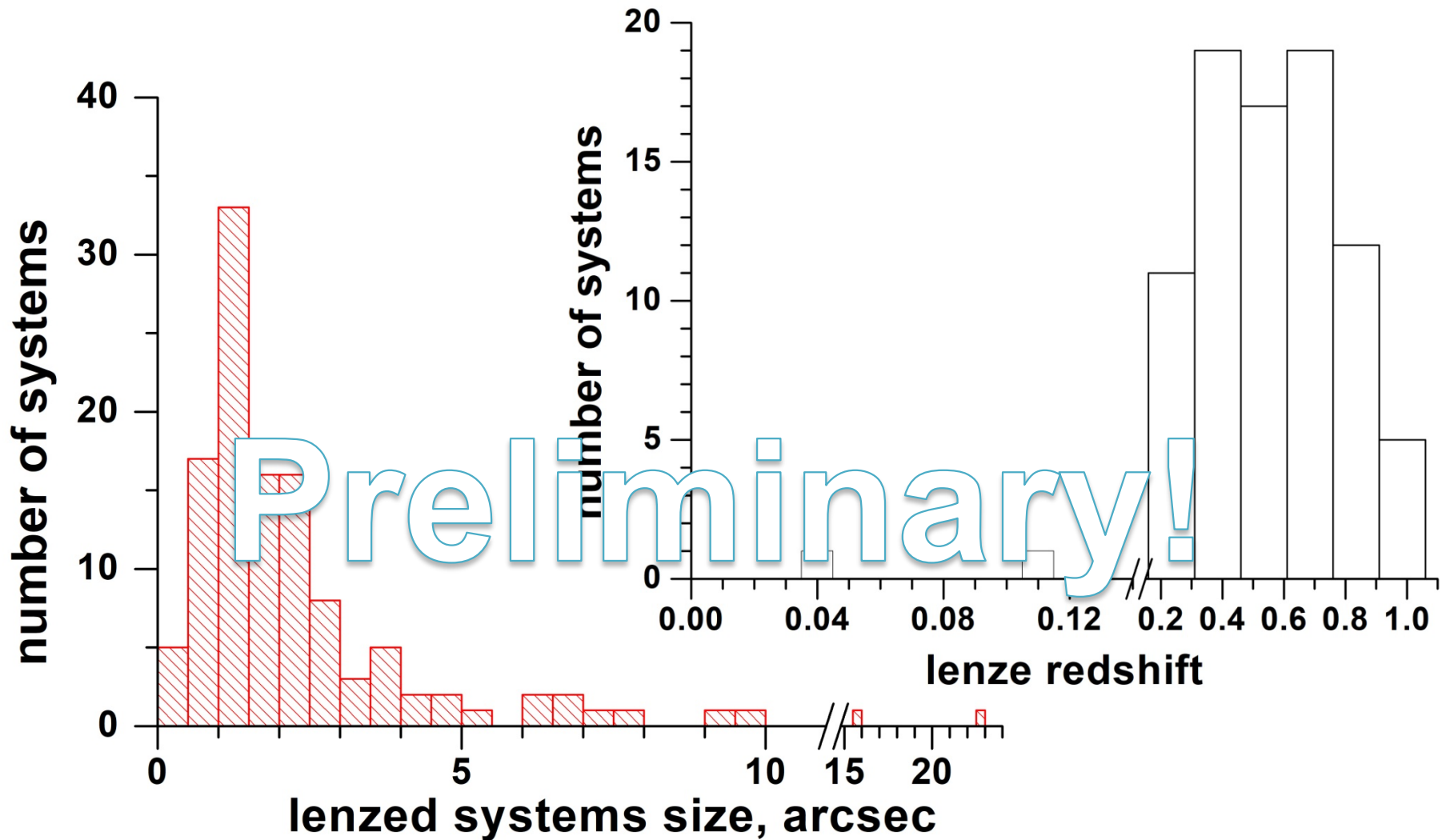


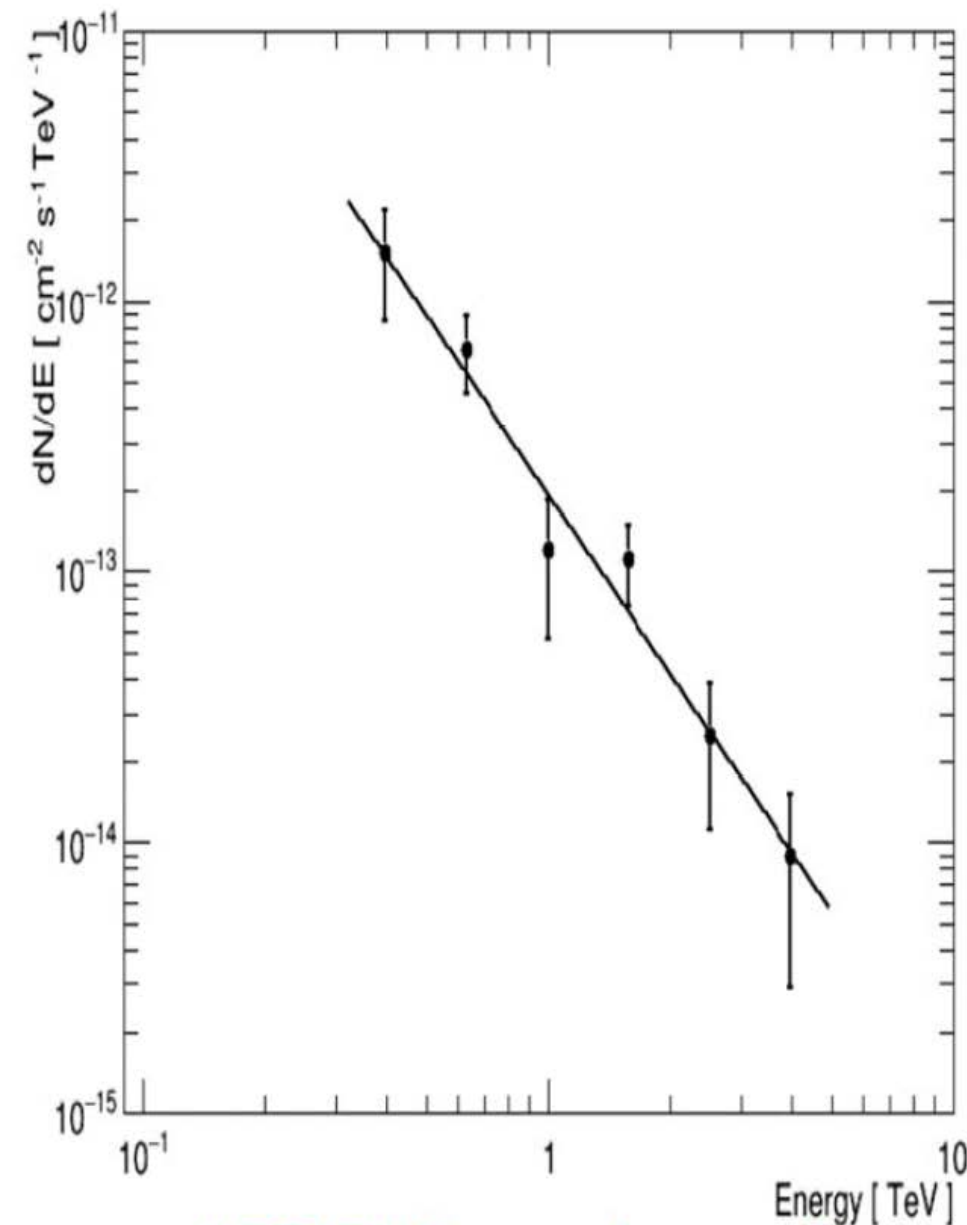
(b)

CfA-Arizona Space Telescope LEns

Survey of gravitational lenses

Summary of Multiply Imaged Systems: 101 galaxy systems and 17 QSO





**VERITAS spectrum of
4FGLJ1144.9+1937 (2018).**

**Does dual structure
followers by object with
high energy emission?**

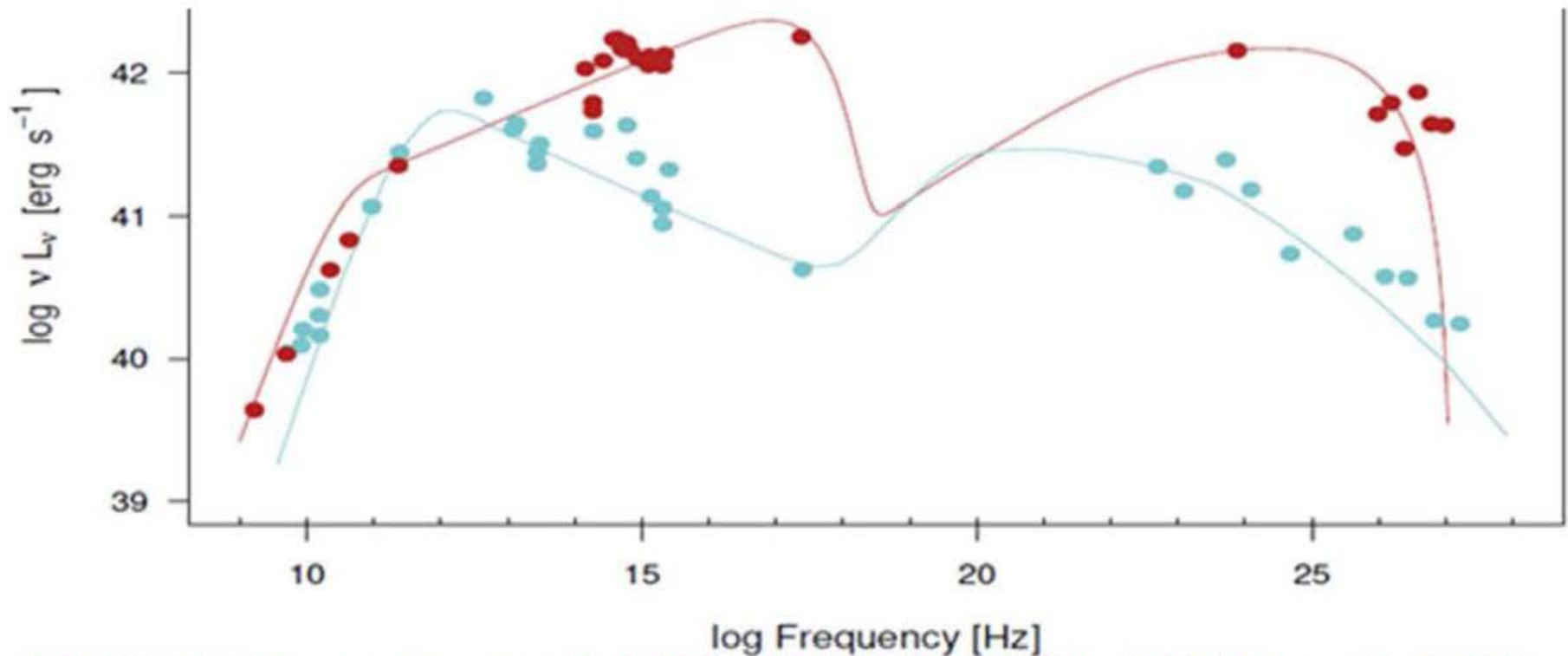
**#933 → 4FGLJ1144.9+1937
(3C 264) observed in energy
band $E > 1$ TeV,
spectral index
 $\Gamma = 2.2 \pm 0.27$.**

1–100 GeV

**FLAT = $(7.1 \pm 3.7) \times 10^{-9} \text{ph sm}^{-1} \text{s}^{-2}$
More intensive than on
VERITAS data**

**it is possible to include
cluster #933 in the program
of observations of the
planned gamma-telescope
GAMMA-400**

Does dual structure followers by object with high energy emission?



VERITAS spectrum of **4FGLJ1144.9+1937** (2018) and **4FGL J1230.8+1223**

#1046→4FGL J1230.8+1223 observed in energy band $E > 0.7\text{TeV}$, spectral index $\Gamma = 2.6 \pm 0.3$.

1–100 GeV FLAT = $(2.6 \pm 0.36) \times 10^{-8} \text{ph sm}^{-1} \text{s}^{-2}$

it is possible to include cluster #1046 in the program of observations of the planned gamma-telescope **GAMMA-400**

CONCLUSIONS

The investigation of the properties of 13 clusters of galaxies from CfA2 redshift survey (##88, 1101, 1046, 142, 933, 1242, 1652, 107, 150, 316, 317, 961, 977) with redshifts are in the region $0.002 - 0.022$



The distributions on magnitude, absolute magnitude, absolute magnitude and angular velocity, etc represent two areas for these clusters.

Galaxies from these areas are paired accordingly its spectral characteristics and position.

Also several anomalies of spatial dynamic of galaxies in these clusters were separated.

Such structure: ?? dark matter presence inside cluster in configuration similar to Zeldovich pancake
?? gravitational lensing on compact object or dark matter blob located between galaxy cluster and observer.

Also several peculiarities have found on the spatial distributions of galaxies in clusters ##933, 142, 1046, and 1652.

CONCLUSIONS

Moreover, groups #933, 142, 1046, and 1652 reveals associations with high-energy gamma-emission sources on Fermi/LAT 10-Year Point Source Catalog 4FGL DR2 data (4FGLJ1144.9+1937, 4FGLJ0152.2+3714, 4FGLJ1230.8+1223 and 4FGLJ1653.8+3945 correspondingly). Furthermore, 4FGLJ1144.9+1937 and 4FGLJ1230.8+1223 observed in subTeV energy band by VERITAS data.

Joint observations of such clusters by orbital gamma-ray observatories with high angular resolution and ground-based Cherenkov air-shower experiments could possibly clarify the type of influence to groups characteristics (gravitational lensing or object inside cluster) and processes of particle acceleration in these objects especially highest energy of emitted gammas.

Thus we propose including these and similar clusters in the programs of observations of the planned experiment GAMMA-400 (Gamma Astronomical Multifunctional Modular Apparatus) with angular resolution $\sim 0.01^\circ$ at $E_\gamma = 100$ GeV and several TeV upper energy band. Also now it is discussed coordination of multiwavelength observations program of Cherenkov Telescope Array (CTA) and GAMMA-400 objects list for observations.

CONCLUSIONS

The preliminary results of data analysis shows that several peculiarities are presented in Ia supernovae redshift distribution at $z > 0.4$.



Different scenarios of Type Ia SNe explosions
(Single Degenerate, Double Degenerate)????

Absorption in the Galaxy, in host galaxies?????

Appearance of H_0 or S_8 tensions?

Deviations that occur over
redshift ranges as small as about 0.05 and as large as the full
observed redshift range of about 2.3 ?????

Really changing| of the parameters of our Metagalaxy???

Next: Dark Energy Survey Supernova Program and The
Combined Pantheon SAMPLE data analysis...

Thank you for attention!