Large Scale Structure at z~1

- **M. Demianski, A.Doroshkevich**
- **ASC FIAN, Aprile, 2008**

Composition of the Universe – standard cosmological model

- Eucledian space $\Omega_{tot} = 1. \pm 0.05$
- Hubble $h = 0.7 \pm 0.04$
- Dark energy $\Omega_{\Lambda} = 0.7 \pm 0.1$
- Dark matter $\Omega_{m} = 0.24 \pm 0.02$
- Baryonic matter $\Omega_{b} = 0.044 \pm 0.004$
- Galaxies $\Omega_{gal} \sim 0.004 \sim \Omega_{m}/50$
- Relict CMB $T_{rad} = 2.726$ K
- **Strong bias between DM & Luminous matter**

Ly-ά forest

$$T_b \sim 7000K(1+z)^{6/7}[1-(1+z)^2/(1+z_i)^2]\Theta_\gamma$$

observed $3\ 10^3 K < T_b < 10^5 K$

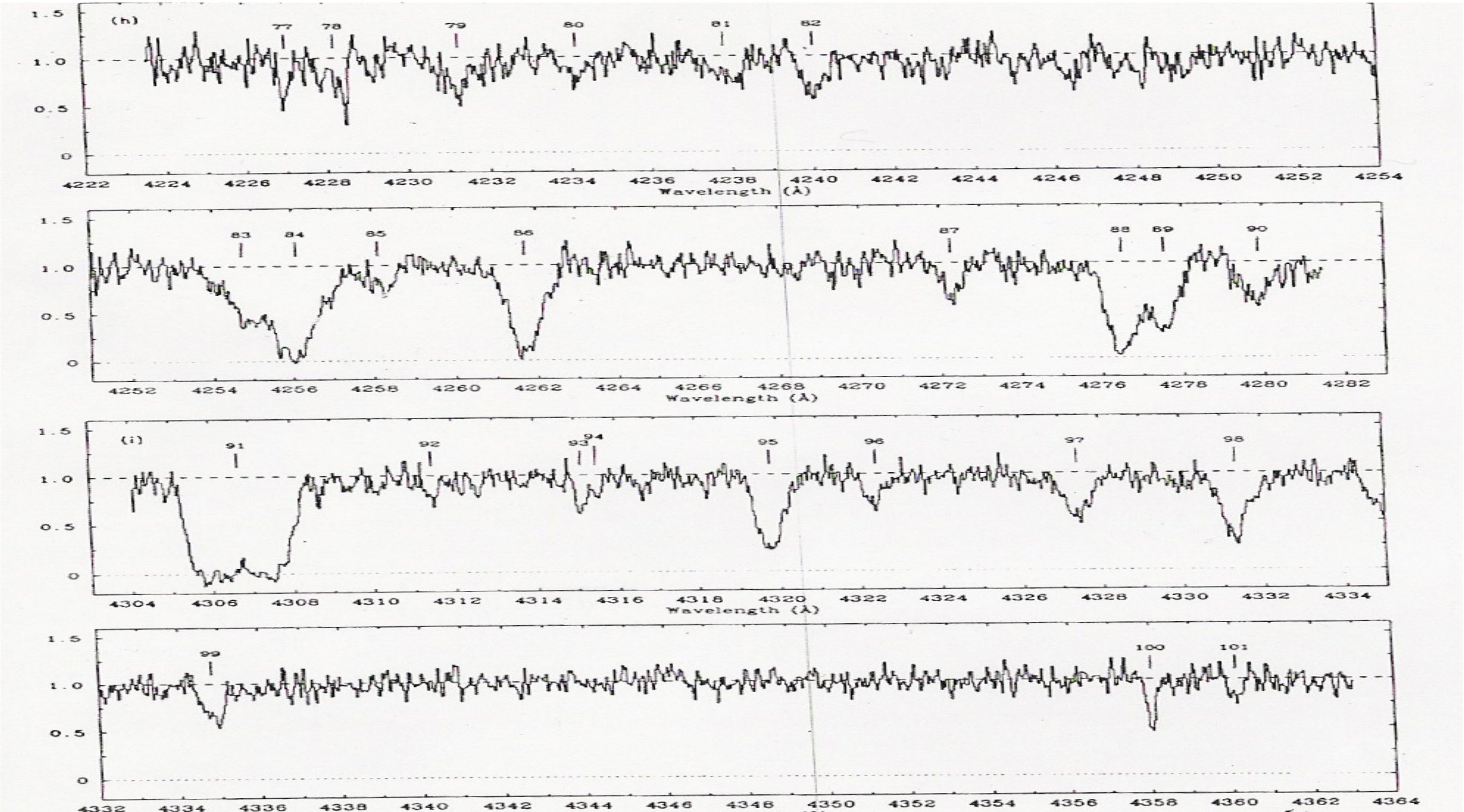


Figure 1 – *continued*

SDSS

41 340

galaxies

$\langle n \rangle \sim 0.01\,\mathrm{Mpc}^{-3}$

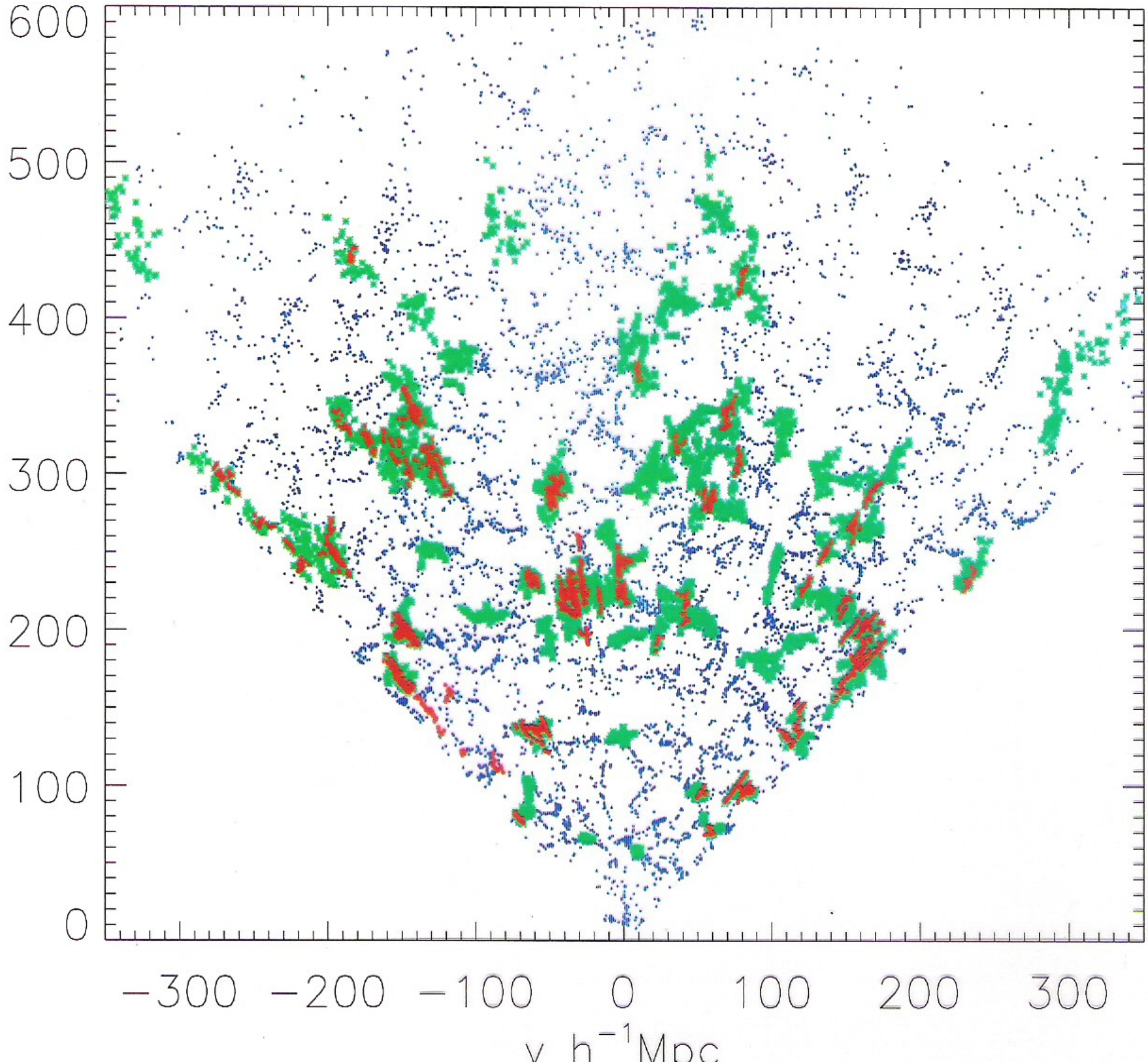


Figure 17. Spatial distribution of all galaxies in the northern sample (blue points), galaxies within the HDRs (green points), and within probable clusters of galaxies (red points).

- SDSS
- 13 240 galaxies

$\langle n \rangle \sim 0.01 \text{Mpc}^{-3}$

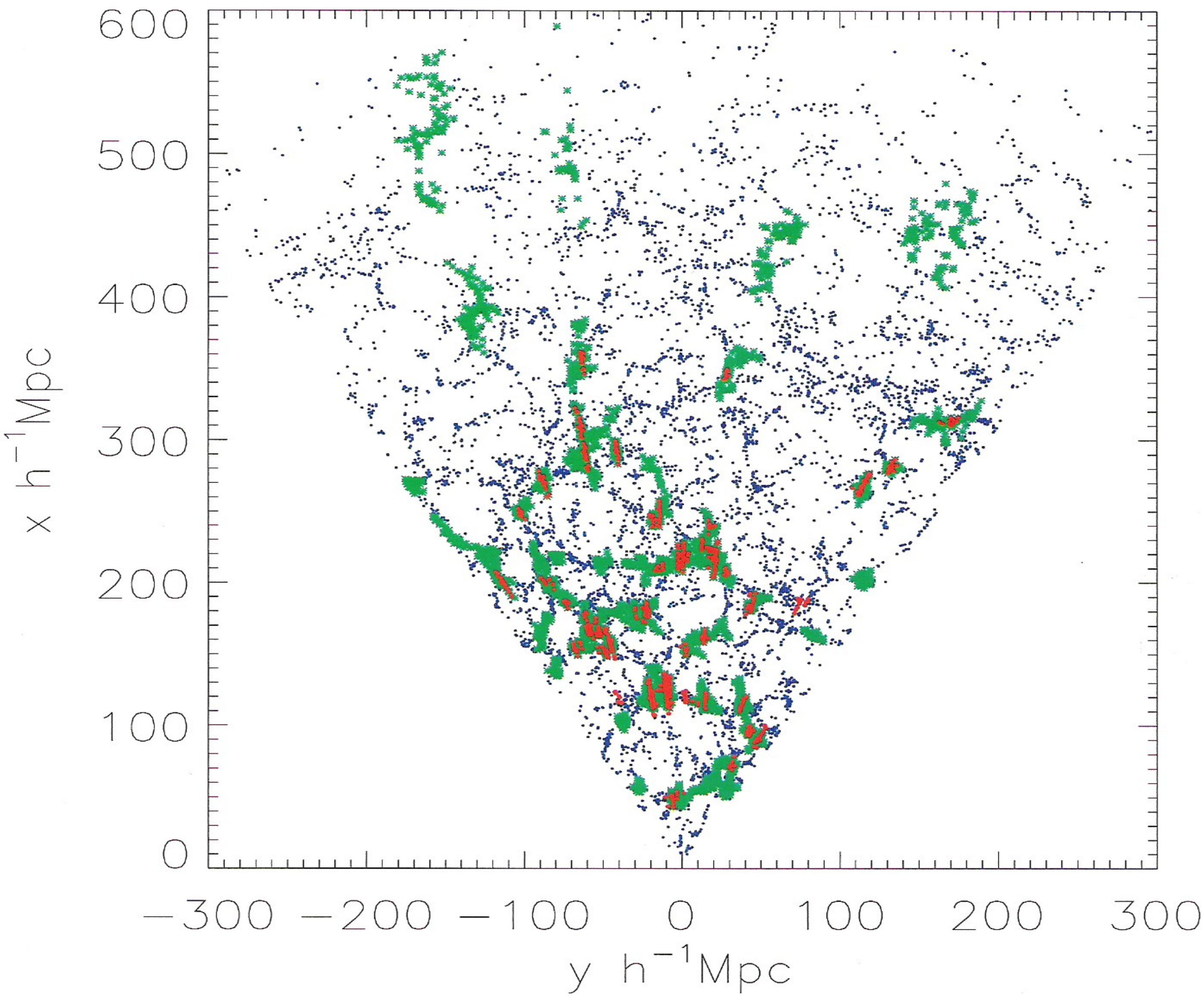
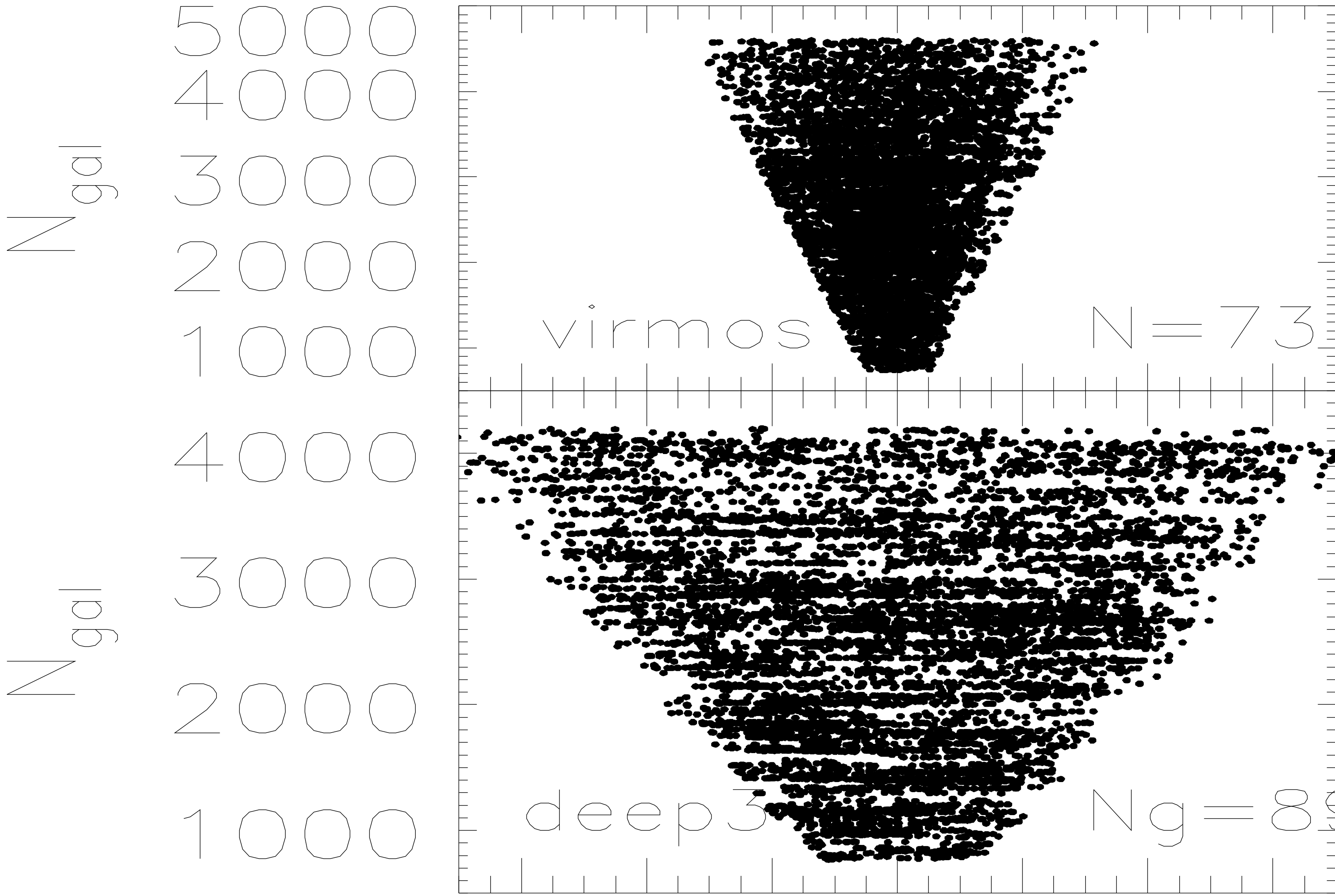


Figure 13. Spatial distribution of all galaxies in the southern sample (blue points), galaxies within the HDRs (green points), and within probable clusters of galaxies (red points).

VIRMOS 8270 galaxies <n>~0.001Mpc^{-3}

DEEP3 9400 galaxies <n>~0.001Mpc^{-3}



Galaxy walls in SDSS

$f_{gal} \sim D^2 \exp[-(D/R_{sel})^{3/2}]$, R_{sel}=190Mpc

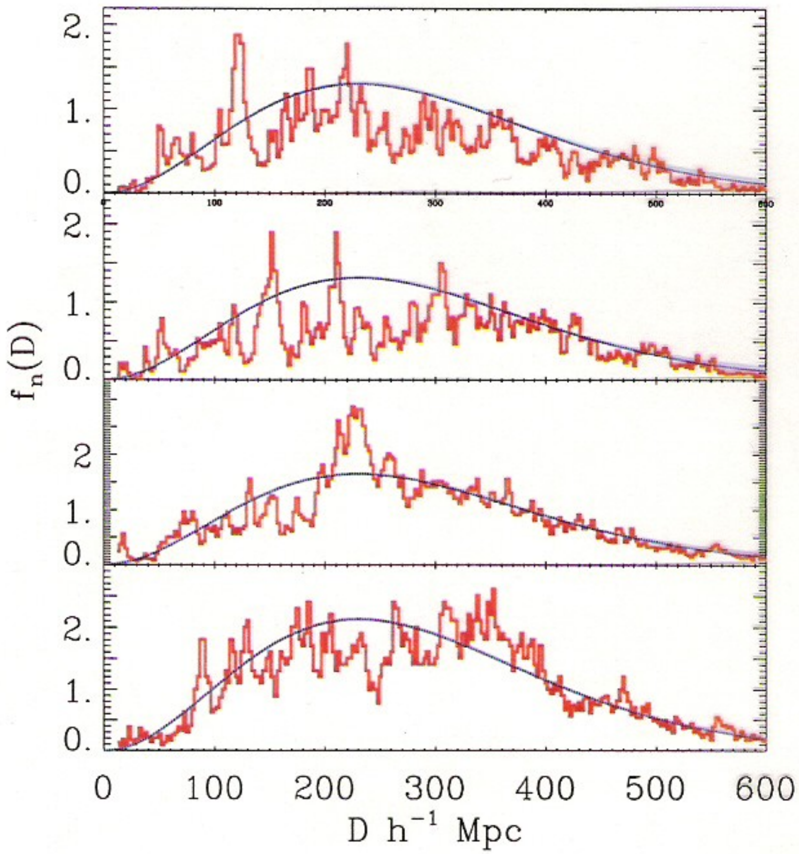


Figure 1. The radial galaxies distributions in the two southern and two northern SDSS galaxy samples. The selection function $f \propto D^2 \exp(-(D/R_{sel})^{3/2}$Mpc is plotted by solid lines for R_{sel} =

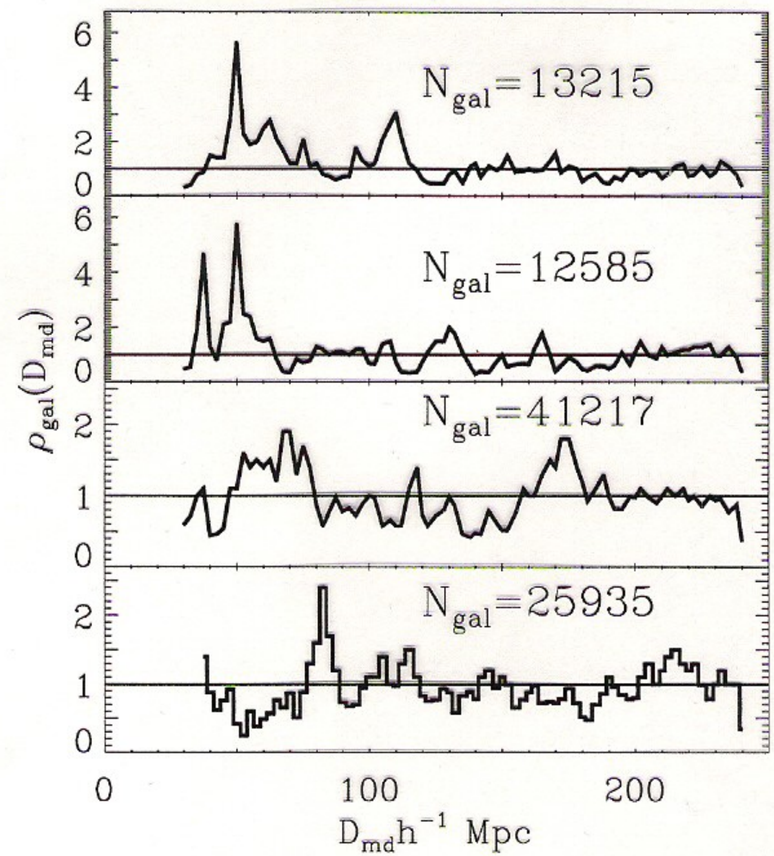
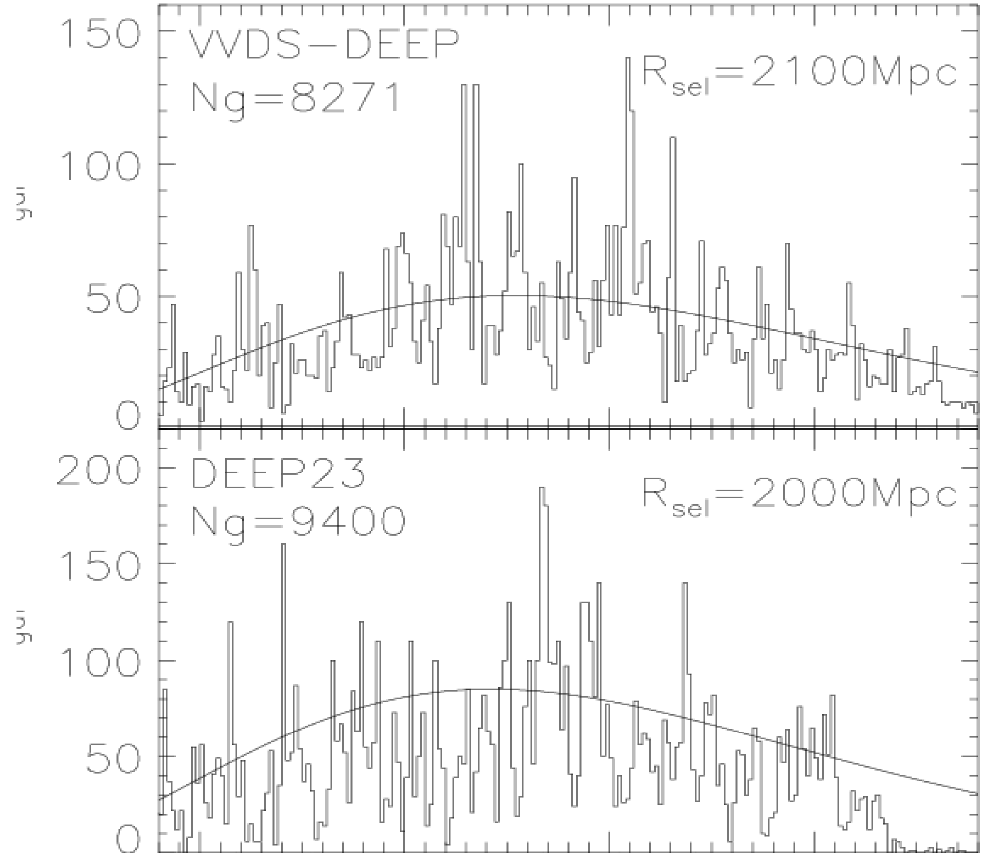


Figure 3. The normalized mean galaxy density in the modified southern (top panel) and northern (bottom panel) SDSS galaxy samples.



Small representativity, n_{gal}~0.001Mpc^{-3}

$f_{gal} \sim D^2 \exp[-(D/R_{sel})^{3/2}]$

MST – PDFs of edges

2dF & 2dFr

$W \sim \exp[-l/\langle l \rangle]$

$W \sim l \exp[-l^2/\langle l^2 \rangle]$

1D & 2D Poisson distributions, for VD catalogue we have two Gauss functions

2

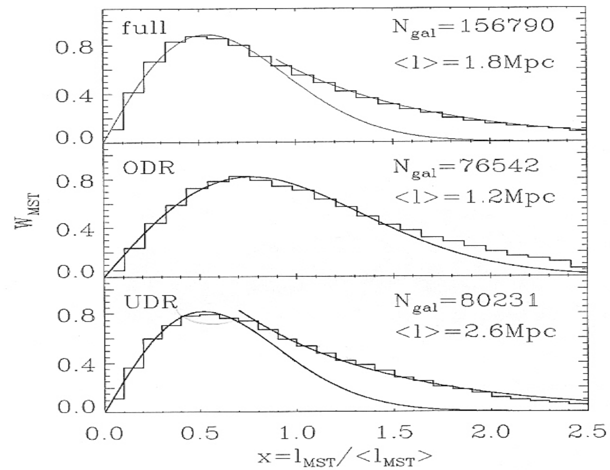


Figure 5. Distribution functions of MST edge lengths in 2dF catalogue for the full sample, HDRs and LDRs. Exponential and Rayleigh fits are plotted by solid and dashed lines.

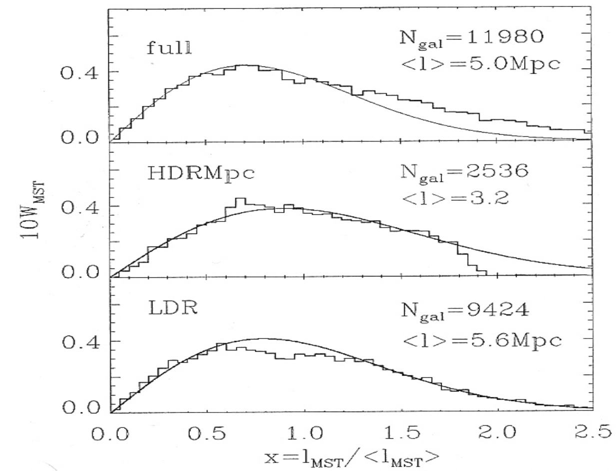


Figure 7. Distribution functions of MST edge lengths in the reduced 2dF catalogue for the full sample, HDRs and LDRs. Exponential and Rayleigh fits are plotted by solid and dashed lines.

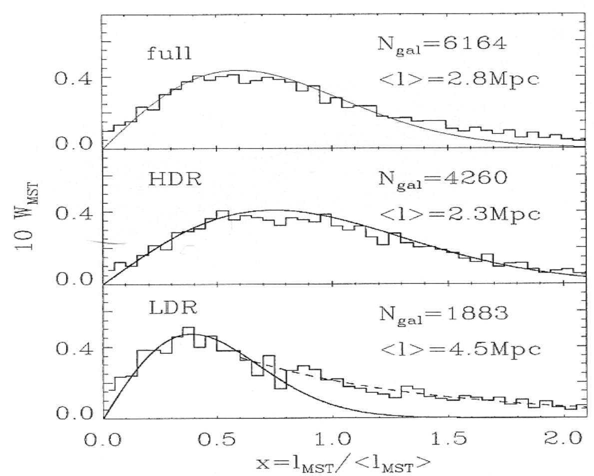


Figure 6. Distribution functions of MST edge lengths in DEEP23 catalogue for the full sample, HDRs and LDRs. Exponential and Rayleigh fits are plotted by solid and dashed lines.

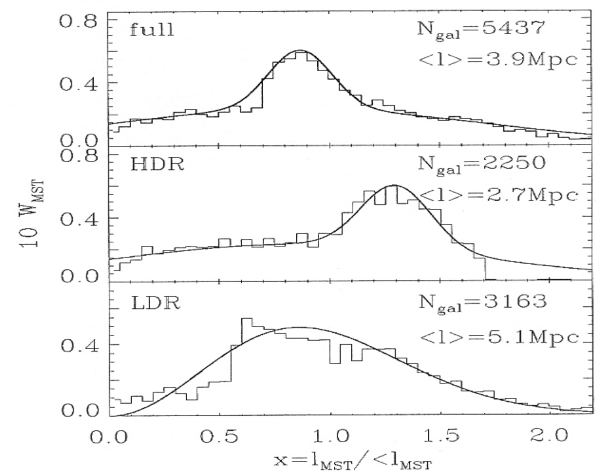


Figure 8. Distribution functions of MST edge lengths in VIRMOS-DEEP catalogue for the full sample, HDRs and LDRs. Exponential and Rayleigh fits are plotted by solid and dashed lines.

Size of the LSS elements, L_{trunk}/L_{tree}

L * W* H* ~L /M W/M H/M

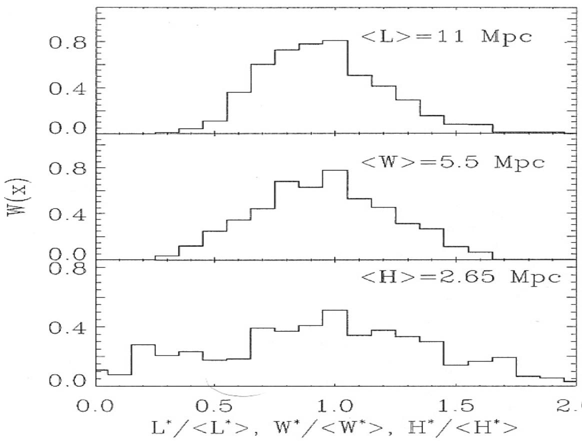


Figure 9. Distribution functions of larger, L^* (top panel), middle W^* (middle panel), and shorter H^* (botoom panel), sizes of the LSS elements in reduced 2dF catalogue.

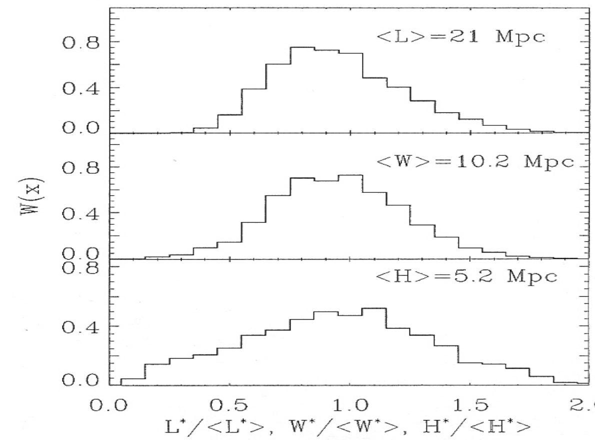


Figure 11. Distribution functions of larger, L^* (top panel), middle W^* (middle panel), and shorter H^* (botoom panel), sizes of the LSS elements in the 2dF catalogue.

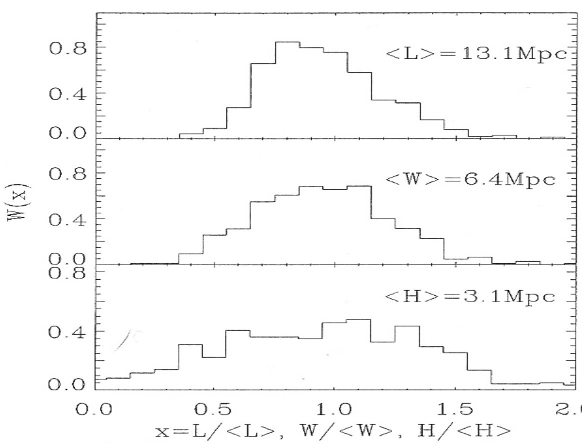


Figure 10. Distribution functions of larger, L^* (top panel), middle W^* (middle panel), and shorter H^* (botoom panel), sizes of the LSS elements in virmos catalogues.

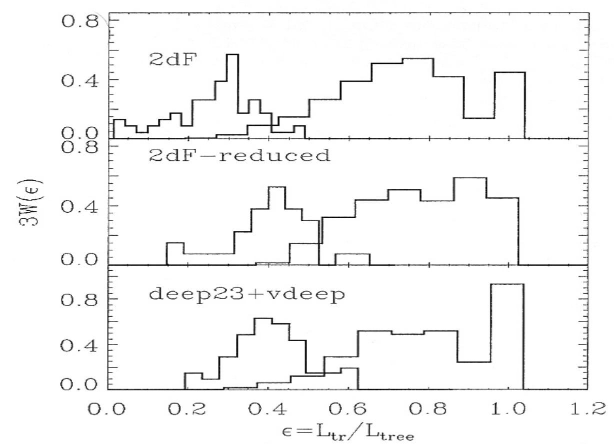


Figure 12. For three catalogues the distribution functions of ratio $\epsilon = L_{trunk}/L_{tree}$ are plotted for HDRs and LDRs.

$\varepsilon = L_{trunk}/L_{tree}$,

σ_f – linear density of galaxies along the trunk

σ_{sh} – surface density of galaxies in walls

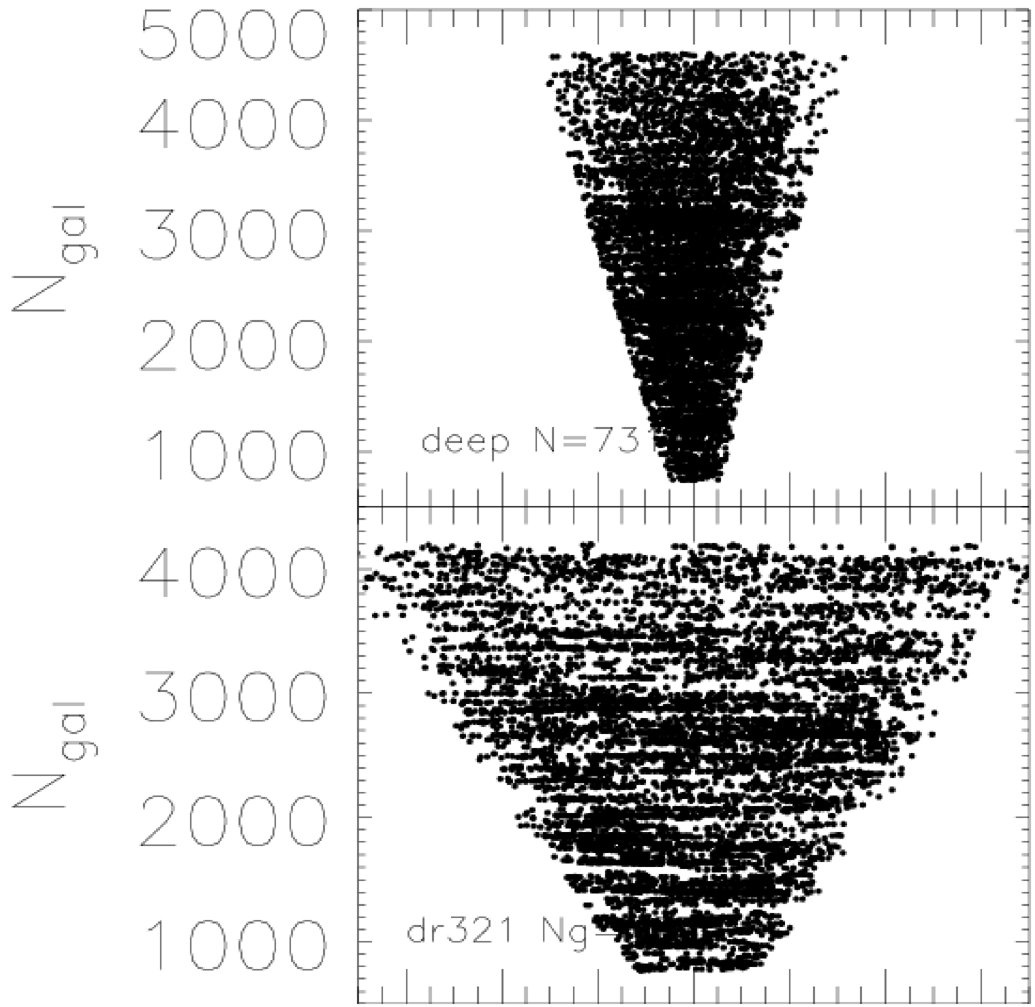
D_{sep} – wall separation

	N_{cls}	$\langle M \rangle$	pm	$\langle L^* \rangle$ Mpc	$\langle W^* \rangle$ Mpc	$\langle H^* \rangle$ Mpc	$\langle \epsilon \rangle$	$\langle \sigma_{f1} \rangle$ Mpc^{-1}	$\langle \sigma_{f2} \rangle$ Mpc^{-1}	$\langle \sigma_{sh} \rangle$ Mpc^{-2}	$\langle D_{sep} \rangle$ Mpc
high density											
vd	31	73	1.2	19 ± 4.0	10 ± 3.0	5.9 ± 1.1	0.43 ± 0.09	0.38 ± 0.03	0.37 ± 0.03	0.45 ± 0.15	83
D3	34	130	0.8	26 ± 8.0	12 ± 3.0	5.1 ± 2.0	0.43 ± 0.10	0.47 ± 0.10	0.45 ± 0.08	0.47 ± 0.25	66
2dFr	31	85		23 ± 5.6	15 ± 2.5	8.7 ± 1.4	0.42 ± 0.10	0.31 ± 0.03	0.31 ± 0.03	0.28 ± 0.08	
2dF	69	1100		85 ± 21	47 ± 10	29 ± 8.3	0.28 ± 0.10	0.72 ± 0.09	0.72 ± 0.03	0.31 ± 0.10	57
low density											
vd	98	8.8	1.2	7.5 ± 1.5	3.6 ± 0.8	1.8 ± 0.8	0.83 ± 0.15	0.40 ± 0.07	0.40 ± 0.07	0.36 ± 0.12	26
D3	111	12.0	0.8	8.3 ± 2.3	3.8 ± 1.4	1.8 ± 1.0	0.83 ± 0.15	0.47 ± 0.13	0.45 ± 0.14	0.48 ± 0.30	20
2dFr	423	10		9.2 ± 2.3	4.5 ± 1.2	2.1 ± 1.0	0.83 ± 0.15	0.35 ± 0.11	0.35 ± 0.09	0.24 ± 0.14	
2dF	2631	15		12 ± 3.3	6.1 ± 1.7	3.0 ± 1.2	0.77 ± 0.16	0.76 ± 0.16	0.72 ± 0.16	0.29 ± 0.17	-

$L^*, W^*, H^* \propto M^{-pm} L, W, H, \quad \langle n_{gal} \rangle = 10^{-2} \& 10^{-3} Mpc^{-3}$

Conclusions

- 1. Parameters of the LSS at z~1 are the same as at z=0 after corresponding selection of galaxies.
- 2. The PDF of the MST edge lengths in one field differs from our expectations. Probably, it is owing to the small representativity of our samples.
- 3. Results are consistent with the standard cosmological model



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