The density maps of the HS47.5-22 field

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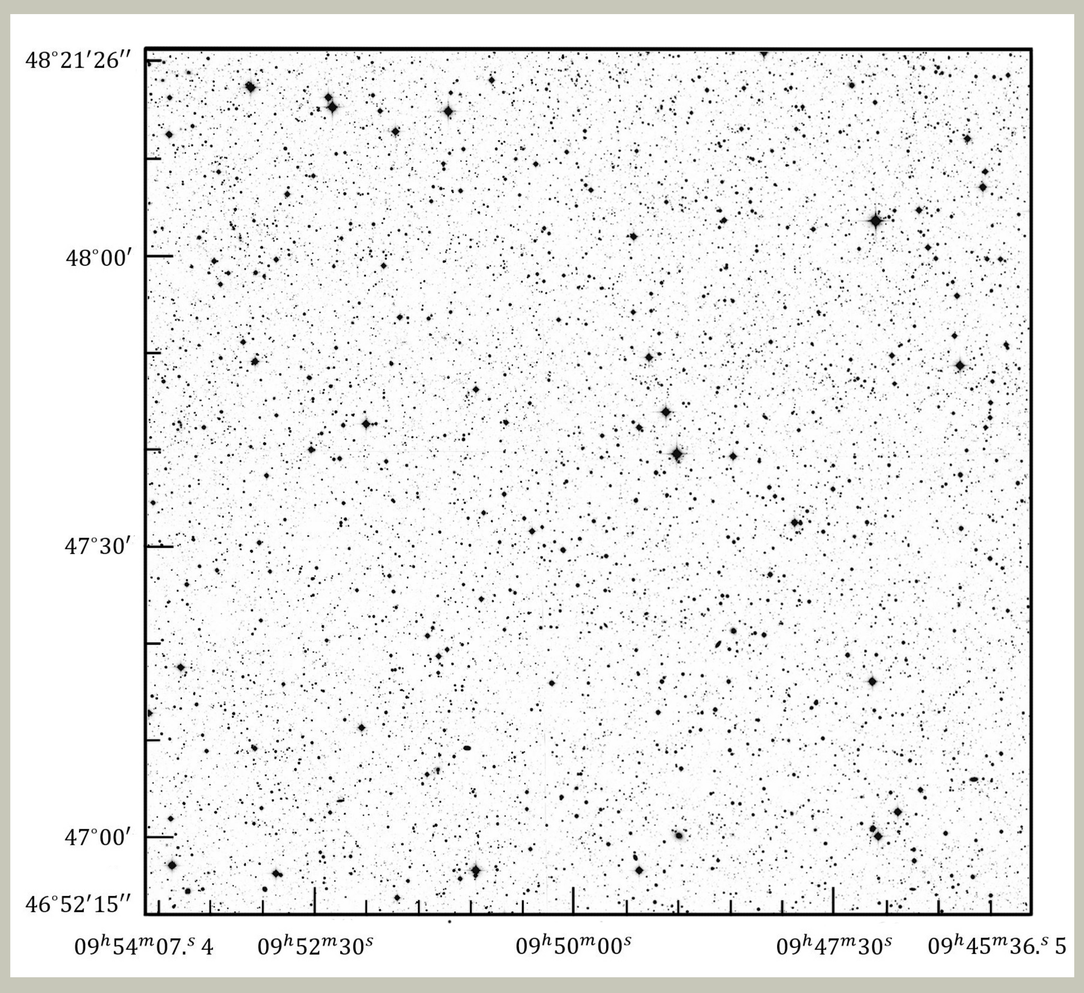
In the article [1] it was shown that more massive galaxies were formed in the most dense areas earlier than galaxies with a smaller mass and the evolution of less massive galaxies occurs under the influence of complex physical processes determinated by their enviroment. In this poster the first steps in large statistical study environmental dependence of galaxy properties in the wide deep field are presented.

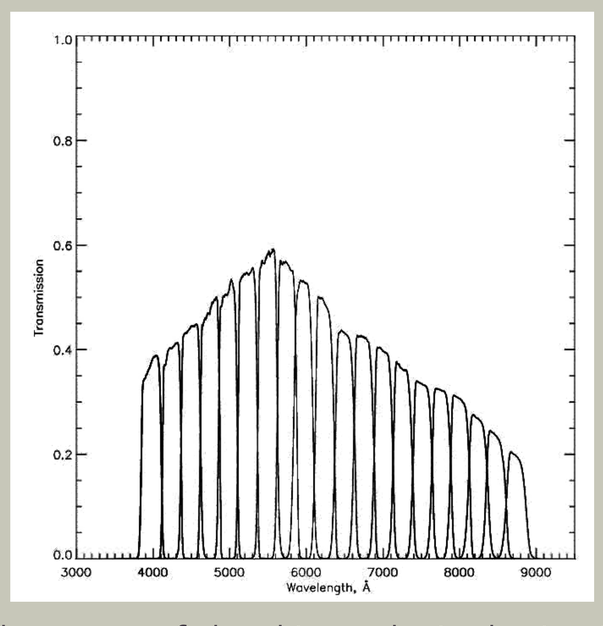
Observations

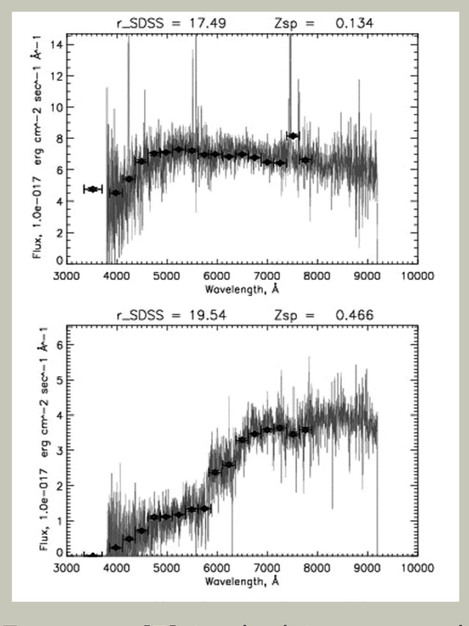
Observations of the field HS47.5-22 are carry out with 1-m Schmidt Telescope of the Byurakan Observatory (Armenia) during several sets in 2017 and 2018 years.

We observed the HS47.5-22 ROSAT field [2] which is about 2.39 sq. degree with coordinates of center $09^h50^m00^s$ $+47^d35^m00^s$ and including 574 X-ray sources up to level $3.5*10^{-14}$ erg $cm^{-2}s^{-1}$ (ROSAT survey), 362 radio sources (FIRST), 293 QSO (SDSS).

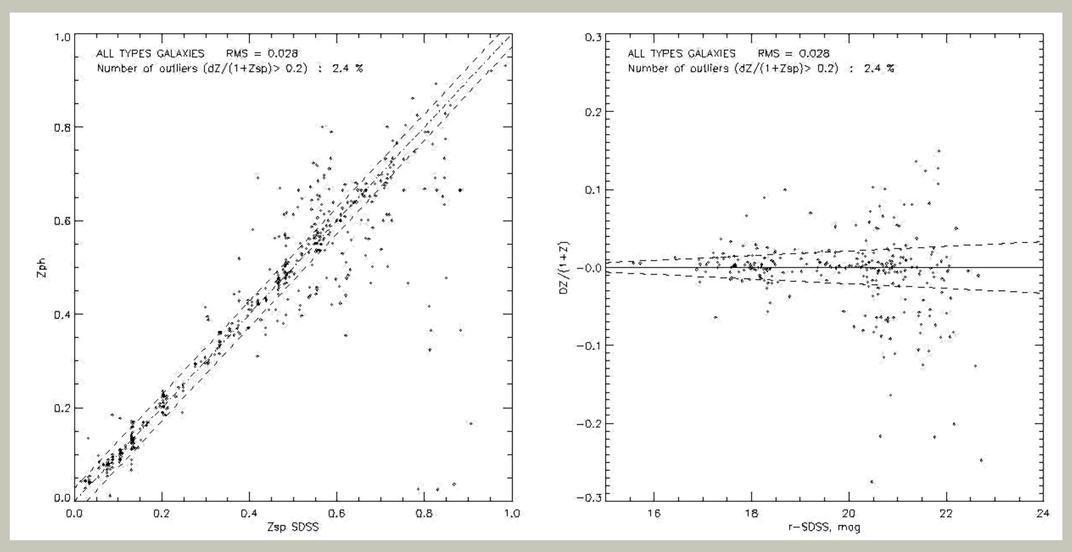


To get data near all pointings of HS47.5-22 ROSAT field we observe four positions with 10 arcmin overlaps in 4 broad band (u, g, r and i SDSS) and 16 medium band (FWHM=250 Å) filters with homogeneous covering optical spectral range 4000Å - 8000Å (set of filters with CCD spectral response are presented). From these observations we create mosaic with total area of 2.386 sq. degree in each filter.





Photometry of the objects obtained using SExtractor [3] in dual image mode. Photometric measurements from 17 filters (u_SDSS + 16 medium band filters) provide low resolution spectra (at the top right fig. comparison object SEDs /dot with bar /scaled to 3 arcsec SDSS fiber diameter with SDSS spectra /solid grey line/ are shown) for each object which are analyzed by a statistical technique for classification and redshift estimation based on spectral template matching.



Obtained accuracy σz < 0.028 and fraction of catastrophic outliers Δz/(1+z) > 0.2) ~2.4%. Accuracy σz changes from 0.011 in magnitude range r_SDSS = 16^m - 20^m till 0.066 in magnitude range r_SDSS = 21^m – 23^m.

Data analysis

Filtering algorithm with adaptive kernal

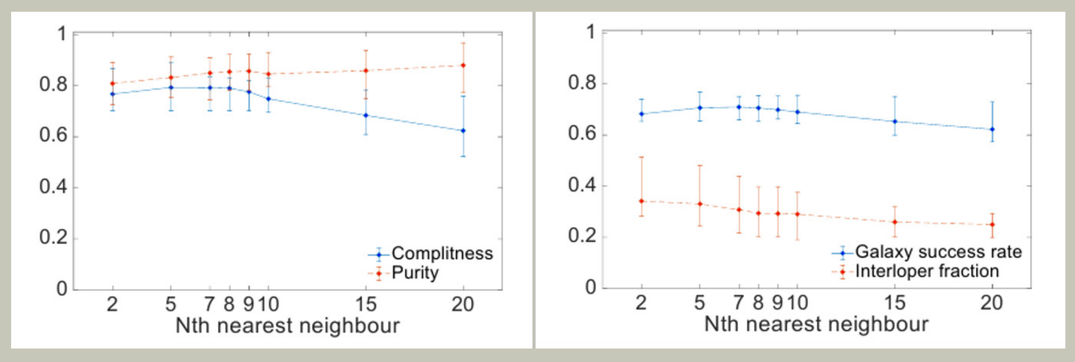
We use the algorithm with adaptive kernel to reconstruct the 3D density contrast field. The density contrast for each galaxy position is calculated as

$$\sigma_i + 1 = \frac{\left(\delta_i - \overline{\delta}\right)}{\overline{\delta}} + 1$$

where δ_i is the density value in the vicinity of each galaxy and $\overline{\delta}$ is the mean density in each redshift slice. The width of slices is based on $1\sigma = 0.028$ photometric redshift error for all type galaxies.

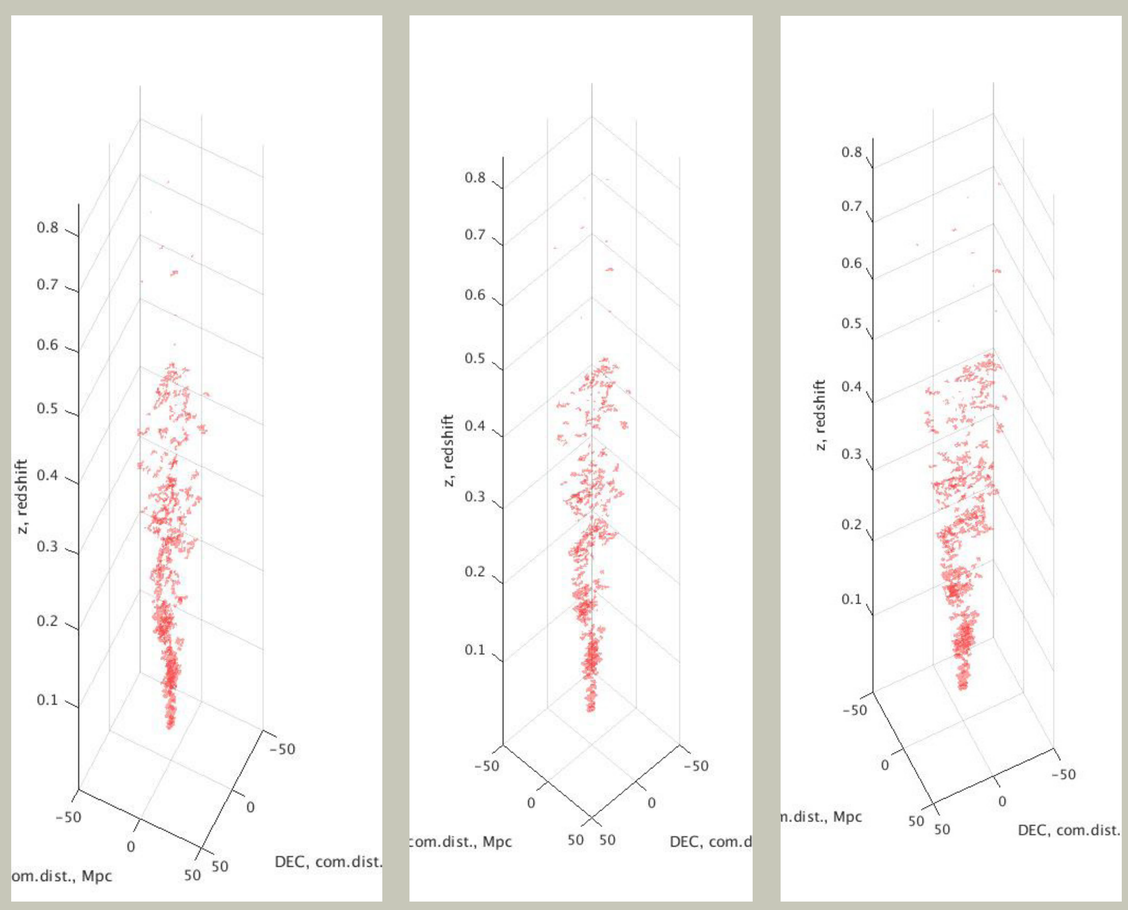
Basic statistics

For testing algorithm we use galaxy mock-catalog MICECAT v2 [4]. Mock catalog consist information about dark halo id so it is possible to estimate statistical parameters of detecting clusters sample over mock sample. For this tast 10 mock samples with the same physical properties like observation data (2 sq. degree field, redshift up to 0.8 and magnitude threshold is 23 in R-filter) were used. We estimated compliteness, purity, galaxy success rate and interloper fraction of reconstructed clusters.



The HS47.5-22 overdensity field

We reconstructed 3D overdensity fields for observational data. The figure shows isosurfaces for a density contrast of 2 above mean density (groups and clusters of galaxies).



The obtained results will help us to further evaluate the influence of the environment on the physical parameters of the galaxies of the HS 47.5-22 field.

References

1. Kauffman+, MNRAS, **353**, 713 (2004)
2. Molthagen+, A&A supplement series, **126**, 509 (1997)
3. Bertin & Arnouts, A&A Supplement, **117**, 393 (1996)
4. Carretero+, PoS, **EPS-HEP2017**, 488