MRSP - THE MUENSTER REDSHIFT PROJECT

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ESO/SRC-J-Atlas plates (film copies) and film copies of UK-Schmidt objective prism J-plates (dispersion 246nm/mm at Hγ) were scanned with the microdensitometer PDS 2020 GM and reduced automatically with the software package ADAS developed at the Astronomical Institute of Muenster University. In a single field (30 square degrees) near the South Galactic Pole 150 000 objects are found up to the limiting magnitude $21^{m}5$. Stars and galaxies are separated. Algorithms for quasar search among the star-like objects are applied and radial velocities determined from the identified emission lines. Follow-up observations with the ESO 3.6m telescope show fair agreement between the redshifts determined from the objective prism plate and from the slit spectra.

More than 40 000 galaxies from field No. 411 are used to construct isoplethal maps. Galaxies from two adjoining fields have been catalogued, six more fields are presently under investigation. Up to magnitude $20^{m}5$ 12 000 galaxies were measured on the objective prism plate of field No. 411. For 7 000 galaxies redshifts were determined. Three different methods are applied for redshift measurements (the colour method - Baum 1962, the break-measurement method - Cooke et al. 1977, the cross-correlation method - Tonry and Davis 1979). The combination of methods yields a mean internal error dz = 0.01. Due to the lack of redshift data presently available in the field, external errors could be determined only for redshifts near z = 0.1 and for galaxies of magnitude 15 to 16. They also amount to dz = 0.01.

The preparation of the data (intensity calibration, wavelength calibration, definition of the continuum using fuzzy set algorithms), the comparison of results by the different methods, in short, every step from the scan to the tabular or graphical presentation of cluster properties and cluster distributions is fully automatic and does not involve any interactive step.

The three-dimensional data, represented by histograms and successive plots of small z-intervals (three-dimensional plots are in preparation)

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are used to trace large-scale structures and to separate clusters of galaxies disturbed by superpositions of background and foreground objects. Considerable confusion and/or subclustering was also found recently from the statistical investigations of Struble and Rood (1987). Galaxy distributions in clusters and luminosity functions of clusters are derived for statistical studies and the selection of interesting objects for more detailed work.

Among the results found so far are:

- a large structure of galaxy clusters extending over atlas field No. 411 and probably over several degrees beyond ($\geq$ 28 h^{-1} Mpc). The same structure is seen in depth between z = 0.02 to z = 0.17, possibly 0.2 (beyond this, statistics becomes too scarce). This corresponds to a size of $\geq$450 h^{-1} Mpc. At least 12 rich clusters are found in the structure near z = 0.1. Only 5 of them are not confused by superpositions. Two prominent clusters are found near z = 0.16. They appear to be the nucleus of another supercluster. The total feature is comparable to the local supercluster and its extensions (Tully 1986) both in size and in the nature of subclustering.

- four cluster luminosity functions derived from 12 to 30 redshifts per cluster and from galaxy counts on the direct plate. One cluster shows a large surplus of bright galaxies. The distributions of bright and faint galaxies in the clusters indicate mass segregations of clearly different degrees in different clusters. Using the luminosity functions and assuming a mass to light ratio of 200, masses for the bright clusters of at least 10^{14} h^{-2} $M_\odot$ are obtained. They lead to a conservative lower mass limit for the large-scale structure of 10^{15} h^{-2} $M_\odot$.

- a region completely void of rich clusters of galaxies to the south of the supercluster ridge. It can be traced to a depth of at least 450 h^{-1} Mpc.

References

Baum, W.A. 1962, IAU Symposium No. 15, Problems in extragalactic research, ed. G.C. McVittie, McMillan, New York, p.390.
Cooke, J.A., Emerson, D., Nandy, K., Reddish, V.C., Smith, M.G. 1977, Mon. Not. R. astr. Soc. 178, 687.
Tonry, J., Davis, M. 1979, Astr. J. 84, 1511.
Struble, M.F., Rood, H.J. 1987, Astr. J. 93, 1035.
Tully, R.B. 1986, Astrophys. J. 303, 25.