RevMexAA (Serie de Conferencias), **17**, 247–247 (2003)

EVOLUTION OF THE GALAXY LUMINOSITY FUNCTION FROM THE COMBO-17 SURVEY

C. Wolf[1,2] K. Meisenheimer[2], H.-W. Rix[2]

We use a catalogue of 25,000 galaxies with $R < 24$ taken from the COMBO-17 survey to investigate the galaxy luminosity function (GLF) at redshifts from $z = 0.2$ to $z = 1.2$ and binned into SED-types. These galaxies are selected from the COMBO-17 catalogue and cover a total area of 0.78 deg^2, half of the final COMBO-17 sample.

The COMBO-17 survey is carried out entirely with the Wide Field Imager (WFI) and the MPG/ESO-2.2-m-telescope at La Silla, Chile. First, a deep R-band image ($R_{5-\sigma} \approx 26$, PSF $\approx 0''.8$) provides the basic photometric catalogue. Second, we performed a "poor man's spectroscopic survey" with very low spectral resolution by observing with 17 filters spread over the wavelength range accessible to CCDs, from 350 nm to 930 nm. These data are sufficient to classify almost all objects of $R < 24$ safely into stars, galaxies and quasars, and to measure redshifts within $\sigma_z \sim 0.03$ and ~ 0.1 for galaxies and quasars, respectively. The well-calibrated SED data allow subclassification and remove the need for generic K-corrections, since luminosities at suitable restframe bands can be measured directly from the SED (Wolf, Meisenheimer, & Röser 2001).

We study the GLF at restframe passbands of Johnson-B, SDSS-r and a continuum band at 280 nm. We find that the GLF depends strongly on SED-type at all redshifts covered. The shape of the GLF, i.e. the faint-end power-law slope, depends on SED type, but not on redshift. Overall, however, the redshift evolution of the GLF is strongly dependent on SED-type:

(1) Early-type galaxies (redder than a present-day Sa spectrum, here *type 1*) become drastically more abundant towards low redshift: by a factor of 10 in the number density $n(M_r < -18)$ from z=1.1 to now, and by a factor of 5 in their contribution to the co-moving r-band luminosity density, j_r.

(2) Galaxies with present-day Sa to Sc spectra (*type 2*), show a co-moving number density and contribution to j_r that does not vary with redshift.

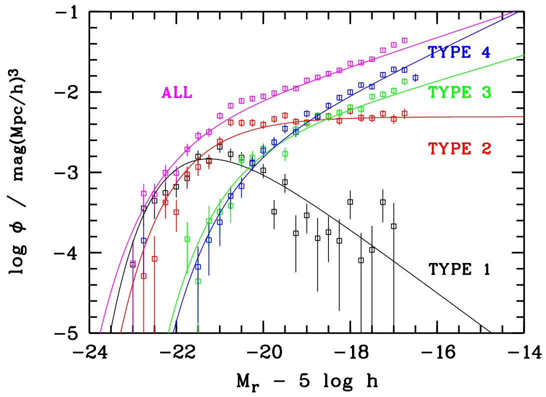

Fig. 1. The galaxy luminosity function measured by COMBO-17 in the redshift interval $z = 0.2 - 0.4$ and split by SED type (1=old population, 4=starburst).

(3) Galaxies with starburst SEDs (*type 3/4*) strongly decrease towards low redshift, by a factor of 4 in number density and a factor of 6 in j_r.

These evolutionary effects become stronger when considering shorter rest-frame wavelengths, e.g. the contributions of star-bursts to the λ_{rest}=280 nm luminosity density decrases by a factor of ten from z=1 to now. Galaxies brighter and fainter than $M_r = -18$ with a given SED show this redshift evolution in a similar fashion.

Summed over all SED types and galaxy luminosities, the comoving luminosity density decreases towards low redshift, between z=1.1 and now by a factor of 1.8, 2.2 and 4.5 in rest-frame r, b_J and 280 nm, respectively. At z=1.1, galaxies with spectra of Sc galaxies or redder contribute 35% to the j_r, their contribution increasing to 75% by z=0. For λ_{rest} =280 nm this increase is from 10% to 50% over the same redshift interval.

Our lowest redshift bin at $z = [0.2 - 0.4]$ largely agrees with the recent assessment of the present-day galaxy population by SDSS and 2dF and deviates only by an excess of "faint blue galaxies" in our $\langle z \rangle = 0.3$ range compared to their samples at $\langle z \rangle < 0.05$.

REFERENCES

Wolf, C., Meisenheimer, K., & Röser, H.-J. 2001, A&A, 365, 660

[1]Dept. of Physics, Keble Road, University of Oxford, Oxford, OX1 3RH, United Kingdom.

[2]Max-Planck-Institut für Astronomie, Königstuhl 17, D-69117 Heidelberg, Germany.

Galaxy Evolution: Theory and Observations (Cozumel, Quintana Roo, México, 8-12 April 2002)
Editors: Vladimir Avila-Reese, Claudio Firmani, Carlos S. Frenk & Christine Allen