The MUNICS Project: Galaxy Assembly at $0 < z < 1$

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1 The MUNICS Survey and its Results

MUNICS is a wide-area, medium-deep, photometric and spectroscopic survey selected in the K band, targeting randomly-selected high Galactic latitude fields. It covers an area of roughly one square degree in the K and J bands with complementary optical follow-up imaging in the I, R, V, and B bands in 0.5 square degrees.

The limiting magnitudes of this main part of the survey are 19.5 in K, 21.5 in J, 22.5 in I, and 23.5 in R (50 % completeness for point-like sources). This multicolor catalog probes field galaxies in a large volume out to redshifts of roughly 1.5 (for massive galaxies) and is by far the largest catalog of near-infrared selected distant galaxies published so far. It thus comprises a suitable and highly competitive multi-color field galaxy survey. The photometric survey is described and characterized in [11] and [21]. The survey spans the redshift range $0 < z < 1.5$ and selects typically L^* and brighter objects.

The MUNICS photometric survey is complemented by spectroscopic follow-up observations at 4m-class telescopes of all galaxies down to $K \leq 17.5$ in 0.25 square degrees. This survey is complete down to $K \leq 16.5$ and 80% complete at $16.5 < K < 17.5$ to the present date. Furthermore, a sparsely selected deeper sample down to $K \leq 19$ was observed with the ESO VLT, covering a much smaller area of 100 square arcmin. The whole spectroscopic sample contains 593 secured redshifts thus far. The spectra cover a wide wavelength range $4000 - 8500$Å at 13.2Å resolution, and sample galaxies at $0 < z < 1$. Details of the spectroscopic survey are given in [12].

Since it is impossible to obtain spectroscopic redshifts for the whole MUNICS sample (most galaxies in the sample are too faint to be observed currently with optical spectrographs) one must rely on photometric redshift techniques to obtain distance estimates for the complete sample of almost 6000 galaxies. Comparing to > 500 spectroscopic redshifts, the scatter in the relative redshift error $\Delta z/(1+z)$ is 0.055. The distribution of photometric redshifts peaks around $z \approx 0.5$. and has a tail extending to $z \approx 3$.

Given these limits, MUNICS contains mostly massive (stellar mass $M > 10^{10} M_\odot$) field galaxies, spanning a significant fraction of cosmic time and is

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ideal for studying their formation and evolution, specifically their mass assembly history.

2 The Rest-Frame K-Band Luminosity Function to z ∼ 1.2

Fig. 1 shows the rest-frame K–band luminosity function (LF) derived from the MUNICS data in four redshift bins spanning $0.4 < z < 1.2$ [8]. Absolute magnitudes were derived using the photometric redshifts, extrapolating the best fitting SED to the rest-frame K band. Errors due to this extrapolation are expected to be small in the redshift range we probe, since the near-IR slopes of the SEDs differ only very little over the galaxy types probed by our survey (the K–band k-corrections are small and almost type-independent).

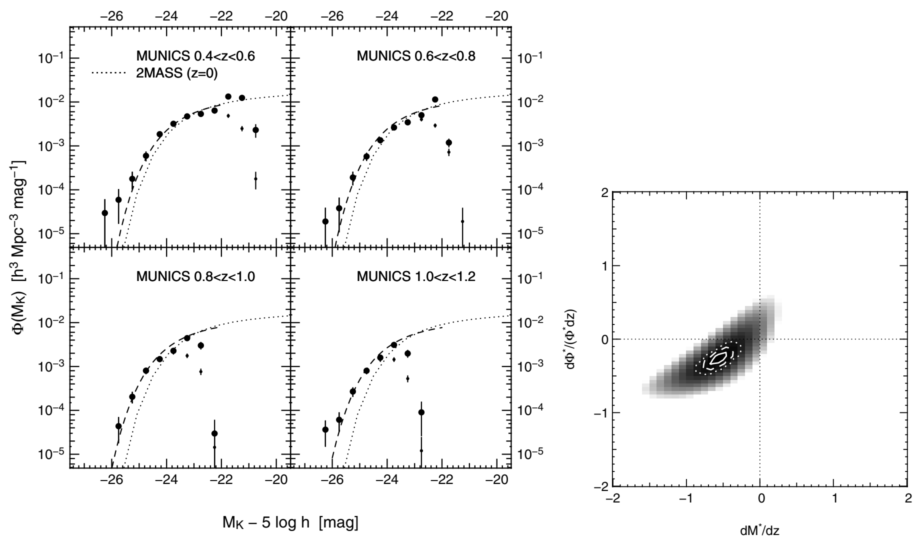

Fig. 1. Left panel: The rest-frame K–band luminosity function derived from the MUNICS data in four redshift bins spanning $0.4 < z < 1.2$. The dotted curve is the $z = 0$ LF [16]. The dashed lines are parameterized fits to the data. **Right panel:** Likelihood map for the change in the Schechter parameters, $d\Phi^*/(\Phi^*\,dz)$ and dM^*/dz, with redshift.

Quantitative analysis of the evolution of the LF yields a mild decrease in number density by $\sim 25\%$ to $z = 1$ accompanied by brightening of the galaxy population by ~ 0.5 mag. These results are fully consistent with an analogous analysis using only the spectroscopic MUNICS sample [12], which is shown in Fig. 2.

To interpret these results in terms of a picture of galaxy evolution is not straight–forward, though. Since the K–band light traces stellar mass, we may