GALAXY LUMINOSITY FUNCTION BASED ON THE PRESS–SCHECHTER THEORY

H. YOSHIDA
Fukushima Medical College, Fukushima City, Japan
M. UMEMURA
Univ. of Tsukuba, Tsukuba, Japan
AND
Y. YOSHII
Univ. of Tokyo, Mitaka, Japan

We investigate the cosmological model dependence of galaxy luminosity function (GLF) obtained by the Press–Schechter (PS) prescription. We consider the power–law spectra as well as a CDM spectrum for primordial density fluctuations, assuming a variety of cosmological models. We do not consider any galaxy luminosity (chemical) evolution in this report.

The PS prescription gives a mass function of collapsed objects. The mass function contains not only galaxies but also larger/smaller mass objects. To obtain a galaxy mass function, contribution from non–galaxy objects must be subtracted from the original mass function. We use as the primary condition the cooling criterion that collapsed objects with its cooling time smaller than the dynamical time evolve into galaxies. We assume appropriate mass-luminosity ratios for each type of galaxies to obtain our GLF's and normalize them so as to produce observed luminosity density.

We find that our GLF's strongly depend on assumed cosmological models and spectra of primordial density fluctuations. In a low Ω_0 model with $\lambda_0 = 0$, our GLF looks like a double power–law Schechter function. In the Einstein–de Sitter model, our GLF is very steep.

We also compare the $B-$ and $K-$band galaxy counts predicted for each cosmological model with recent observations. It follows from this comparison that the Einstein–de Sitter model is strongly denied and that, even in low Ω_0 model, there is some excess of observation in faint part of $B-$band galaxy counts. The last indicates that some correction of luminosity evolution is needed in our GLF's and predicted galaxy counts.

K. Sato (ed.), Cosmological Parameters and the Evolution of the Universe, 275.