R25b Galaxy Number Counts from Infrared to Radio Wavelength: Implication and Optimal Strategy for Future Surveys

竹内 努、石井 貴子、平下 博之、吉川 耕司、松峯 公二 (京大・理・宇宙物理)

Recent infrared and sub-mm surveys revealed a steep slope of galaxy number count compared with no evolution predictions, and provided a new impetus to the related field. The excess of galaxy number count is generally understood as a consequence of strong galaxy evolution. Now Japanese infrared satellite project Astro-F is in progress, and we calculated the expected number count by a simple empirical method (Takeuchi et al. 1999; Hirashita et al. 1999). The applied model was based on the *IRAS* surveys, and we need more realistic one to study the detailed observational plans and follow-up strategies. In previous studies, the some patterns of evolution or star formation history of galaxies have been assumed, and number counts have been calculated. In this study, on the contrary, we treat the evolutionary change of galaxy luminosities with nonparametric form, in order to explore the most suitable evolutionary history. It is thought that the information with z is not available by galaxy number count. We, however, found that the degeneracy can be solved by treating the multiband observations at the same time. Mid-infrared count is almost independent of the high-z status of galaxies, and far-infrared result depends on the evolution amplitude at $z = 1 \sim 2$, and insensitive to that at $z \gtrsim 2$. Thus, number counts based on narrowband photometry will help our understanding at mid-infrared, because the behavior with wavelength is complicated. At far infrared, we need large-area surveys to fix the evolutionary status at $z \sim 1-2$. Sub-mm and millimeter results are independent of the low-z galaxy evolution, but a very strong function of the evolutionary factor at $z \gtrsim 2$. Large-area surveys targeted at bright sources are necessary to constrain the evolution at $z \gtrsim 2$ at these wavelengths. Further, we also discuss the implication for the dust formation history inferred from the above results.