R29b Confusion and Statistical Biases in the Estimation of Galaxy Evolution from IR Observations

○竹内 努 (国立天文台, 東大天文センター)、石井貴子 (京大・理・附属天文台)

Recent far-infrared (IR) and submillimeter (sub-mm) observations have provided a large amount of new information for extragalactic sources. In galaxy surveys, it often happens that multiple sources are located in a beam. Then, obtained number counts will be different from true ones, because the apparent position and flux of the sources are changed by blending of other, usually fainter sources: confusion noise. Confusion noise determines a substantial detection limit of a survey. The confusion problem is especially severe for IR observations, since the beamsize is significantly large compared with source surface density at the faintest flux regime of current instruments. First we show the confusion limits for some IR/sub-mm facilities scheduled in the near future (*SIRTF*, *ASTRO-F*, SOFIA, *NGST*, *Herschel*, and *SPICA*).

Numerous models for the observed IR/sub-mm galaxy number counts have been proposed. Such model predictions are usually tested statistically by goodness-of-fit to the data. But there is a deep pitfall in such comparison of data and models. It has ever known that if noise is not negligible compared with source flux, observed number counts will be systematically steepened. This problem is referred to as the Eddington bias. If the dominant cause of noise is the source confusion, then long integration time can never help the situation. The steepened slopes of the IR number counts masquerade as strong evolution of galaxies, therefore we must correct the bias to obtain true information of galaxy evolution. We will also propose general analytical prescriptions for treating this issue. The confusion effect may partially be the cause of the discrepancies among deep galaxy number counts in the IR–sub-mm.