Globular Cluster Formation in Hierarchical Paradigm

Seong-Hee Kim[1], Sadegh Khochfar[2], Ena Choi[1], and Sukyoung K. Yi[1]
[1]Dept. of Astronomy, Yonsei University
[2]Dept. of Physics, Univ. of Oxford, Oxford OX1 3RH, United Kingdom

We investigate the formation and evolution of globular cluster (GC) systems in early-type galaxies in dense environments in the hierarchical merger paradigm. We use semi-analytic prescriptions that include chemical evolution. GC formation may have preferred conditions; e.g., dynamically-hot environments such as major mergers or initial collapse. It would be an eventual goal to find them. We have simulated the GC systems of early-type (bulge to total ratio $\geq$ 0.7) galaxies of mass $\geq 1.0 \times 10^{10}$ $M_{\odot}$. We consider the evolution of GC mass function because GCs are thought to be disrupted due to the stellar mass loss, two-body relaxation and gravitational shock, to name a few. Comparing to the observed specific frequencies of GCs in early types to our models, we have found that roughly 20% of the star formation results in GCs if GCs form in all star formation activities. If GCs form only during major mergers, this fraction becomes as large as 50%. Metallicity distribution function (MDF) appears to depend on the star formation history of galaxy. Considering the feedback effect of active galactic nucleus shows a notable effect in central galaxies. We present theoretical MDFs of GCs for varieties in galaxy mass and in dark matter halo mass. When compared to the empirical MDFs currently pursued by many observational projects, they will be useful for unveiling the formation history of early-type galaxies. We discuss the strengths and weaknesses of our models.