[구GC-17] Star Formation and Feedback in Nuclear Rings of Barred Galaxies

서우영, 김웅태
Seoul National University

Nuclear rings in barred galaxies are sites of active star formation (SF). We investigate SF and its feedback effects occurring in barred galaxies, for the first time, using high-resolution grid-based hydrodynamic simulations. The gaseous medium is assumed to be infinitesimally thin, isothermal, and unmagnetized. The SF recipes include a density threshold corresponding to the Jeans condition, a SF efficiency of 1%, and momentum feedback via Type II supernova events together with stellar-wind mass loss. To investigate various environments, we vary the gas sound speed as well as the efficiency of momentum injection in the in-plane direction. We find that when the sound speed is small, the surface density of a ring becomes largely independent of the azimuthal angle, resulting in star-forming regions distributed over the whole length of the ring. When the sound speed is large, on the other hand, the ring achieves the largest density at the contact points between the dust lanes and the ring where SF occurs preferentially, leading to a clear age gradient of star clusters in the azimuthal direction. Since rings shrink with time, a radial age gradient of star clusters naturally develop regardless of sound speed, consistent with observations. SF persists over 200 Myr, with an average rate of ~1.3$M_\odot$/yr similar to observed values. Rings gradually become hostile to SF as they lose gas into stars and turbulent motions dominate.

[구GC-18] A Comparison of Halo Merger History for Two Different Simulation Codes : GADGET-2 and RAMSES

Intae Jung[1] and Sukyoung K. Yi[1]
[1]*Department of Astronomy, Yonsei University, Korea*

We present our study on a comparison of dark matter halo merger history from the runs using different numerical simulation codes. To analyze the uncertainty caused by the use of different N-body calculation methods, we compare the results from two cosmological hydrodynamic simulation codes GADGET-2 and RAMSES, which use a TreePM algorithm and the Adaptive Mesh Refinement(AMR) technique respectively. We perform cosmological dark matter-only simulations with the same parameter set and initial condition for both. The dark matter halo mass functions from two simulation runs correspond well with each other, except for lower mass haloes. The discrepancy on the low-mass haloes in turn causes a notable difference in halo merger rate, especially for the case of extremely minor merger. The result from GADGET-2 predicts that most haloes undergo more number of mergers with small haloes than that from RAMSES, independent of halo mass and environment. However, in the context of the study on galaxy evolution, such extreme minor mergers generally do not have strong effects on galaxy properties such as morphology or star formation history. Hence, we suggest that this uncertainty could be quantitatively negligible, and the results from two simulations are reliable even with only minor difference in merger history.