[구GC-13] Effects of Spiral Arms on the Gaseous Features of Barred Spiral Galaxies

Yonghwi Kim[1,2], Woong-Tae Kim[1,2,3]
[1]*CEOU, Astronomy Program, Dept. of Physics & Astronomy, Seoul National University*
[2]*FPRD, Dept. of Physics & Astronomy, Seoul National University*
[3]*Institute for Advanced Study, USA*

Using high-resolution numerical simulations, we investigate the formation of gaseous substructures and mass inflow rates in barred spiral galaxies in the presence of both bar and spiral potentials. The gaseous medium is assumed to be infinitesimally-thin, isothermal, unmagnetized, and non-self-gravitating. To consider various galactic situations, we vary the pattern speed and strength of spiral arms as well as the black hole mass. We find that spiral arms with pattern speed smaller than that of the bar remove angular momentum from the gas outside corotation which transports to the bar region, making the dust lanes strong and live long. When the arm pattern speed is identical to that of the bar, on the other hand, the gas outside corotation gains angular momentum and thus moves outward, without affecting the bar region. Overall gaseous morphologies in simulations match well with observed IR images of barred spiral galaxies such as NGC 1097, when the arms and bar are in phase at the corotation radius. The presence of spiral arms increases the mass inflow rate as well, making it larger than $0.01 M_{\odot}/yr$ when MBH is $4\times10^{7} M_{\odot}$, possibly explaining AGN activities in Seyfert galaxies.

[구GC-14] A study of sub-galactic scale structure formation with a cosmological hydro code

Jihye Shin[1], Juhan Kim[2], Sungsoo S. Kim[1,3]& Suk-Jin Yoon[4]
[1]*Department of Astronomy & Space Science, Kyung Hee University,*
[2]*Korea Institute for Advanced Study,*
[3]*School of Space Research, Kyung Hee University,*
[4]*Center for Space Astrophysics and Department of Astronomy, Yonsei University*

To study the formation and evolution of sub-galactic scale structures, we have added SPH (Smoothed Particle Hydrodynamics) method into an existing cosmological PMTree code, GOTPM. To follow the evolution of gas particles, we consider heating/cooling processes, star formation, and energy & metal feedback by supernova explosion. We have performed various tests for the new code and found that the results reproduce observed quantities or follow the known analytic solutions. We present a test simulation of isolated disk galaxy with a focus on whether the star formation reproduces the observed features.