R11b Bar Dissolution in Three-Dimensional Disks Induced by Massive Central Black Holes

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Now, almost all nearby large galaxies are observed to harbor massive central black holes (BHs), whose masses range from $\sim 10^6 M_\odot$ to $\sim 10^{9.5} M_\odot$. The destruction of barred structures in disk galaxies caused by such large-mass BHs has been investigated so far. Recently, Shen & Sellwood (2004) have shown that for three-dimensional (3D) disks, the BH mass required for bar destruction is as large as 4 - 5% of the disk mass. This BH mass corresponds to $\sim 10^{9.5} M_\odot$ when scaled to values appropriate for the Milky Way. If this is true, bar dissolution could not occur practically in the real universe. However, their adopted disk-mass profile is a Toomre disk, and so, is different from the mass profile of real disk galaxies that is approximated by exponential profiles in surface density.

We have carried out N-body simulations to examine how massive a central BH is needed to destroy a bar within a Hubble time for a 3D disk that is represented by an exponential surface-density profile and by an isothermal sheet in the vertical direction. A bar is formed in the disk via a dynamical instability. Thereafter, a BH is adiabatically added at the center of the disk. As a preliminary result, we have found that the bar cannot be completely destroyed by a BH whose mass is 1% of the disk mass, but that it has been made rounder to a large degree at the end of the simulation. We will report the minimum BH mass required for bar dissolution and how the disk structures are changed through the bar dissolution process.