SELF-GRAVITATING GAS DYMANICS IN BARRED SPIRALS AND GAS ACCUMULATION PROCESS INTO THE GALACTIC CENTER

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In central regions of many active star forming galaxies, stellar bars and massive gas disks or rings are observed and are supposed to be related with burst star formation (Scoville *et al.* 1988, Noguchi 1988). We perform the numerical hydrodynamic calculation of self-gravitating, isothermal gas motion in barred spiral galaxies, in order to investigate the effects of self-gravity of gas on the gas accumulation process into galactic center. A weak bar, isothermal gas with $T = 10^4 K$, and $f \sim 0.1-0.2$ are assumed, where $f = M_{gas}/M_{star}$. Initial gas is uniformly distributed in the galactic disk. The smoothed particle scheme is used for hydrodynamic calculation and the self-gravity of gas is calculated by FFT. We show that, in order to accumulate gas into the central region of galaxy by the bar potential and to form gaseous ring or disk in the central region, the galaxy model is needed to have the inner Lindblad resonance. Further evolution of the ring or the disk depends on mass of gas, strength of bar and pattern speed of bar. Since the self-gravity of gas ring or disk enhances its density and its elongation, and, as a result, the asphericity of gravitational potential increases, the angular momentum transfer rate and the rate of mass accretion into it increase as shown in Fig. 1. Then, the ring or the disk becomes more massive and shrinks. Finally, central small dense gas ring or disk is formed.

REFERENCES

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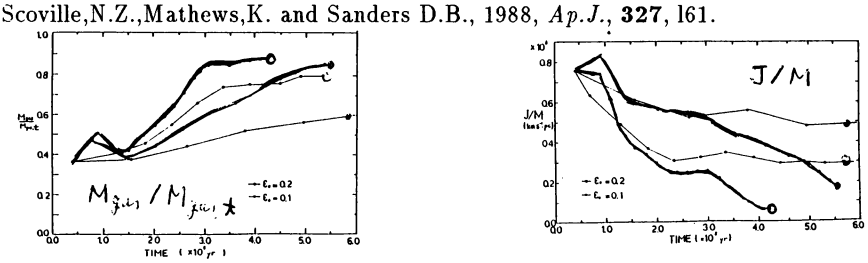

Figure 1. The time evolution of mass averaged angular momentum, J/M, and gas mass in $r < 6$kpc. Lines with open circles and Lines with closed circles correspond to the bar potential with $\epsilon_0 = 0.2$ and that with $\epsilon_0 = 0.1$, respectively. Thick lines and thin lines correspond to the models with and without the self-gravity of gas, respectively.

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