ON THE ORIGIN OF DENSITY CUSP IN GALACTIC NUCLEI WITH CENTRAL BLACK HOLE

T. NAKANO, T. FUKUSHIGE AND J. MAKINO
Department of General Systems Studies
College of Arts and Sciences, University of Tokyo
3-8-1 Komaba, Meguro-ku, Tokyo 153, Japan

We investigated the dynamical reaction of the central region of galaxies to a falling massive black hole by N-body simulations. As the initial galaxy model, we used an isothermal King model and placed a massive black hole at around the half-mass radius of the galaxy. We found that the central core of the galaxy is destroyed by the heating due to the black hole and a very weak density cusp ($\rho \propto r^{-\alpha}$, with $\alpha \sim 0.5$) is formed around the center. This result is consistent with recent observations of large elliptical galaxies by *Hubble Space Telescope* (Lauer et al. 1995; Byun et al. 1996; Gebhardt et al. 1996; Faber et al. 1996; Kormendy et al. 1996). The radius of the weak cusp region is large for large black hole mass. The velocity of the stars become tangentially anisotropic in the inner region, while in the outer region the stars have radially anisotropic velocity dispersion. Our result naturally explains the mechanism of the formation of the weak cusp found in the previous simulations of galaxy merging, and implies that the weak cusp observed in large elliptical galaxies may be formed by the heating process by sinking black holes during merging events.

References

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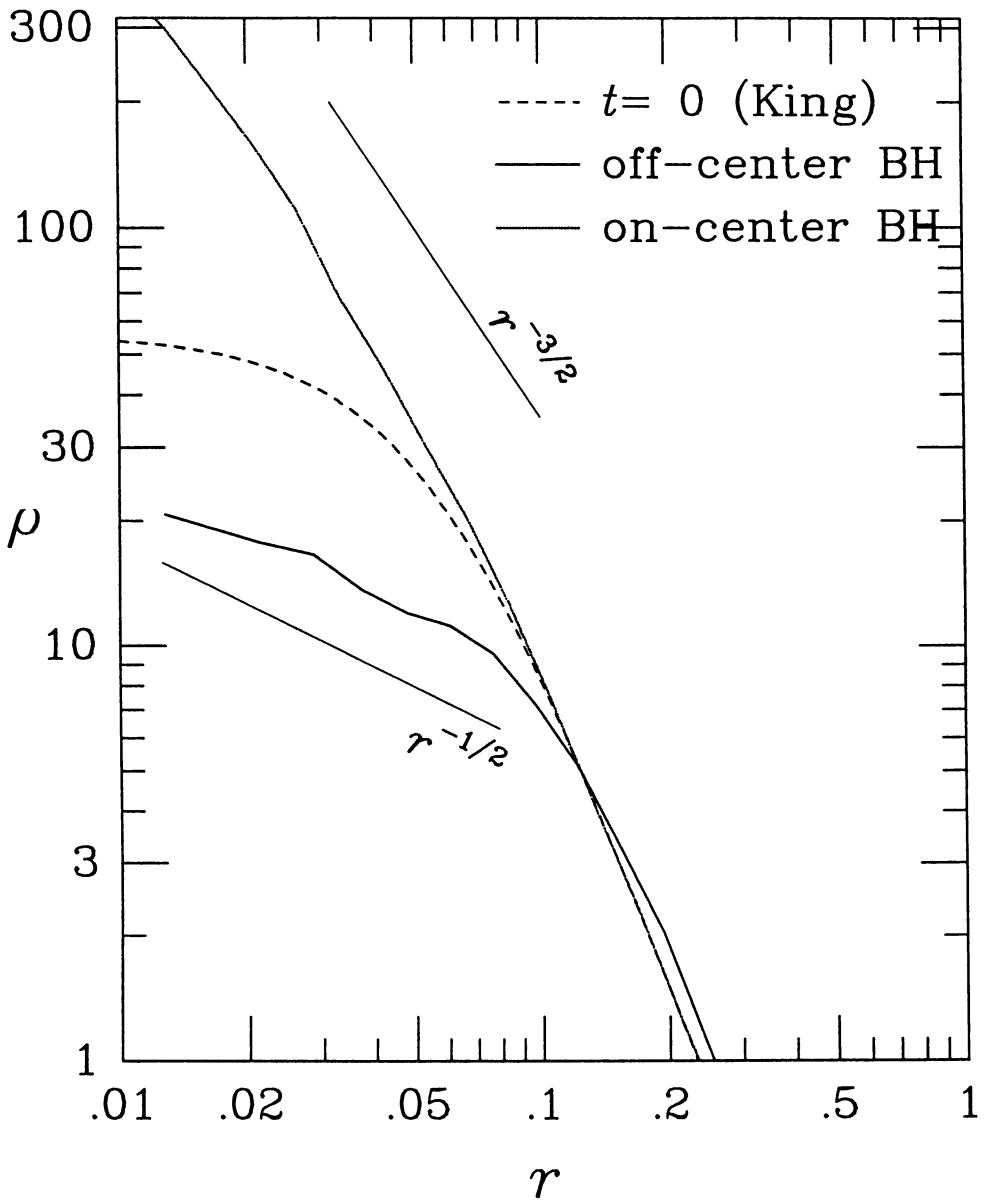

Figure 1. The time-averaged density profiles of the galaxy for $t = 6-10$. (The half-mass crossing time of the galaxy is $2\sqrt{2}$.)

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