

Z137a Hunting of the hidden wandering massive black hole population

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Galaxy mergers play an important role in the assembly of massive galaxies, in fueling gas to nuclear SMBHs, and in the formation of binary SMBHs that would merge within a Hubble time due to GW emission. A natural outcome of these processes, a larger number of intermediate-massive BHs (IMBHs) and SMBHs are kicked through binary interaction from the galactic centers, and some of them are orbiting at the outskirts of massive galaxies in the local universe. The existence of the wandering BH population is a missing piece of the standard hierarchical structure formation. Here, we study the gas accretion dynamics of orbiting BHs in low-density plasma at kiloparsec scales from the centers of massive ellipticals, performing 3D hydrodynamical simulations with radiative cooling/heating processes. Combined with a semi-analytical model of radiation spectra from a radiatively inefficient accretion disk, we find that the wandering BH population, supposed to be 1% of the nuclear SMBHs in mass, is bright in the radio band at $\sim 100\text{GHz}$. Assuming their existence in nearby massive ellipticals within a distance of $\sim 20\text{ Mpc}$ from us, they could be detectable with ALMA for M87 galaxy and NGC4472 and with the future facility such as ngVLA for several more nearby massive ellipticals. This will be an important proof of the cosmological coevolution of SMBHs with galaxies.