R42a A Unified Formation Mechanism of Nuclear Starbursts

Yoshiaki Taniguchi (Tohoku University), Keiichi Wada (Hokkaido University)

We propose a new formation mechanism of the nuclear starburst and hot-spot nuclei: a supermassive black hole binary formed by a merger with a nucleated satellite galaxy triggers intense star formation in the central regions of spiral galaxies in which the nuclear gas disk has been formed already by the dynamical effect of the merger itself. As the secondary black hole approaches the nuclear gas disk, the gas disk responds to the gravitational perturbation caused by the nonaxisymmetric potential of the black hole binary, forming asymmetrical spiral patterns. When the mass of the secondary black hole is only one tenth of the primary's, the gas response is so mild that only pseudo-ring features or tightly wound spiral arms are formed in the circumnuclear region. These features are expected to evolve into several HII-region clumps, leading to the formation of hot-spot nuclei. On the other hand, when the mass of the secondary black hole is comparable to half the primary one, a very strong one-arm spiral shock appears after the close passage of the secondary in each orbital period. The gas clouds are forced to move rapidly into the central region owing to frequent collisions of gas clouds. Since the gas density is high enough to form dense gas core in the nuclear region, it is considered that the starburst is triggered near the nucleus. Our new scenario is consistent with the recent high-resolution imaging of starburst and poststarburst galactic nuclei obtained with the *Hubble Space Telescope*. We show also that the expected frequency of the nuclear starbursts driven by minor mergers is almost consistent with the observation ($\simeq 1$ %).