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Unveiling the Dance of Off-Center Black Hole Duets: Insights from Jacobi Capture in Dwarf Galaxies

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It is well established that massive black holes reside in the central regions of virtually all types of known galaxies. Recent observational and numerical studies however challenge this picture, suggesting that intermediate-mass black holes in dwarf galaxies may be found on orbits far from the center. In this talk, I will present my recent work on the dynamics of off-center black holes in dwarf galaxies. I introduce a new scenario to describe off-center mergers of massive black holes, starting with a Jacobi capture. I find that these captures are a complex and chaotic phenomenon and I quantify how the likelihood of capture depends on the simulation parameters. I show that Jacobi captures in cored dwarf galaxies facilitate the formation of off-center black hole binaries. While this setup only allows for temporary captures, it has been shown that dissipative forces from stellar populations can stabilize the captures, motivating further investigation into their role in forming stable binary systems within stripped nuclei or globular clusters. My work shows that off-center mergers can have a major impact on the mass growth of black holes, and therefore they can play a fundamental role for the understanding of gravitational wave signals in the context of future observatories, such as LISA.

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