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Latest results on the massive black holes' dynamics in OpenGadget3

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The dynamics of Massive Black Holes (MBHs) is primarily driven by the dynamical friction force, the drag induced by the surrounding "sea" of matter. This force anchors MBHs in the core of massive galaxies and leads to the formation of a close-pair binary BH system during mergers. Despite its fundamental role in governing the BH dynamics, the complexity of its description still represents a challenge for both analytical and numerical calculations. Recently, we have developed and extensively tested a new dynamical friction correction in OpenGADGET3 that proved to be an efficient way to control the dynamics of MBH in various environments.

Looking forward to exploiting the impact of an improved tracing of MBH on the galaxy evolution, we started to stress the dynamical friction technique within the context of idealised simulations of dark matter halo and galaxies. These tests provide informations on the sensitivity of BH dynamics and dynamical friction correction to mass resolution and its response to the BH's softening. Moreover, these studies help to establish the MBHs' sinking timescale for dynamical friction, the primary uncertainty in the MBHs'merger rate estimation and resulting gravitational waves emission.

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