ACCRETION IN A DYNAMICAL KERR SPACETIME AND SPINNING UP OF THE BLACK HOLE IN COLLAPSAR

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We compute the evolution of a quasi-spherical, slowly rotating accretion flow around a black hole, whose mass and spin evolve adequately to transfer of mass and energy through the horizon (see Gammie et al. (2004)). Our model is relevant for a central engine driving a long gamma-ray burst (GRB) that originates from the collapse of a massive star. They are important specifically due to the transient nature of the event, in which a huge amount of mass is accreted and changes the fundamental black hole parameters—its mass and spin—during the process (Janiuk et al., 2008). We discuss the results in the context of the angular momentum magnitude of the collapsing star (see López-Cámara et al. (2010)). We also study the possible formation and evolution of shocks in the envelope, which may temporarily affect accretion, as shown by Suková et al. (2017). Our results are important for the limitations on the mass and spin range of black holes detected independently by electromagnetic observations of GRBs and gravitational waves. We speculate on the possible constraints for the final masses and spins of these astrophysical black holes. We conclude that the most massive black holes are not formed in a powerful GRB explosion if the cores of their progenitors were only weakly rotating (Janiuk et al., 2018).

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