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High-soft to low-hard state transition in black hole X-ray binaries with GRMHD simulations

To understand the decaying phase of outbursts in black hole (BH) X-ray binaries (BH-XRBs), we performed very long general relativistic magneto-hydrodynamic (GRMHD) simulations of a geometrically thin accretion disk around a Kerr BH with slowly rotating matter injected from outside. We thoroughly studied the flow properties, dynamical behavior of the accretion rate, magnetic flux rate, and jet properties during the temporal evolution. Due to the interaction between the thin disk and injected matter, the accretion flow near the BH goes through different phases. The sequence of phases is: soft state \rightarrow soft-intermediate state \rightarrow hard-intermediate state \rightarrow hard state \rightarrow quiescent state. The talk will discuss the process of transition in detail. Throughout the evolution, we also observed low-frequency QPOs (\sim 10Hz) and high-frequency QPOs (\sim 200Hz). The talk will also discuss the features of QPOs in detail.

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