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Numerical studies of relativistic jets from black holes

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Relativistic jets are powerful collimated outflows from accreting compact objects, especially spinning black holes. Jets, as well as their associated mechanisms of energy dissipation and particle acceleration, can be investigated by global or local numerical simulations using methods like general-relativistic magneto-hydrodynamics (GRMHD), particle-in-cell (PIC), etc. This presentation shall highlight selected results from 3 projects related to relativistic jets.

1. GRMHD investigation on the initiation of magnetic flux eruptions in magnetically saturated accretion flows ("MAD") onto Kerr black holes (with Mateusz Kapusta & Agnieszka Janiuk; 2024, A&A, 692, A37).
2. PIC simulations of relativistic reconnection plasmoids, focused on energy density enhancement due to magnetic tension (A&A, submitted).
3. Analysis of extreme-resolution GRMHD simulation of relativistic jets (with Mateusz Kapusta, Bart Ripperda & Alexander Philippov).

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