



Simulating Relativistic Astroplasmas from Microphysics to Global Dynamics

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January 17, 2019 • 4 pm – 5 pm

M416 (ESAM Conference Room), Tech

The most extreme and surprising behaviors of black holes and neutron stars are driven by their surrounding magnetic fields and ionized gases, or plasmas. Numerical simulations of the governing nonlinear systems are complicated by the exotic physical conditions, requiring new approaches. I will present a range of mathematical models and computational methods which are well adapted to challenges such as strongly curved spacetime, energetically dominant electromagnetic fields, and pathological magnetic discontinuities. In particular, I will describe how a new technique for general-relativistic plasma kinetics will aid in understanding black holes' particle acceleration and jet launching, and in interpreting future observations with the Earth-spanning Event Horizon Telescope.