PROBING NEAR-HORIZON SCALES IN GENERAL RELATIVISTIC MAGNETOHYDRODYNAMIC SIMULATIONS

Richard Anantua[1,2], Sean Ressler[2] and Eliot Quataert[2]

[1]*Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA*
[2]*Department of Astronomy, University of California Berkeley, Berkeley, CA 94720, USA*

Abstract

Plasma emission models are self-consistently input into general relativistic magnetohydrodynamic (GRMHD) simulations [1][2] of jet (or outflow)/accretion flow/black hole (JAB) systems in order to infer mechanisms governing signatures such as helical outflows, radio-to-X-ray spectra and photon rings that may be observed by very long baseline interferometers such as the Event Horizon Telescope (EHT). Inspired by physical processes in active galactic nuclei (AGN) such as turbulent electron heating and equipartition of particle and electromagnetic energies, the simple parametric models relate electron temperature or energy density to GRMHD variables and are input in postprocessing to produce ray-traced intensity maps and spectra using IBOTHROS [3] and GRMONTY [4]. The methodology is applied to Sgr A* at the Galactic Center, where the observationally favored model preferentially heats electrons over protons for plasma beta up to the critical value 1, resulting in a compact, asymmetric intensity map with spectrum characteristic of emission from an adiabatically expanding coronal outflow. The methodology is readily generalizable to the near-horizon regions of any AGN.

References

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