“New Frontiers in Simulating Black Hole Accretion and Jets”

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Black holes are responsible for a wide variety of astrophysical phenomena. They devour stars, eject relativistic jets, affect star formation and galaxy evolution, and enrich the Universe with heavy elements. In the next several years, the Event Horizon Telescope will produce resolved images of infalling gas and jets on the event horizon scale that promise to revolutionize our understanding of black hole physics. However, until recently, no first-principles models to quantitatively interpret these observations existed. I will present the first such models, the simulated spectra and images, and the constraints on the near event horizon physics coming from the comparison to the observations of the supermassive black hole at the center of our galaxy. I will then use simulations to constrain black hole physics in several other astrophysical contexts. I will finish by making connections to my future research plans.