# The usage of kappa distributions in the context of accreting black hole modeling

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Recent advancements in radio astronomy opened the window for direct imaging of black holes by the Event Horizon Telescope (EHT). The historical images of Messier 87* (M87*) and Sagittarius A* (SgrA*) allow for tests of General Relativity but also challenge our understanding of plasma physics in these extreme environments. The observed emission is synchrotron radiation produced by a population of relativistic electrons whose exact emission properties depend on the shape of their distribution function. State-of-the-art EHT models rely on general relativistic magnetohydrodynamics, where the plasma fluid is assumed to be a single-temperature fluid. To model the emission from the electrons, post-processing is needed. Until recently, the status quo for EHT modeling was the usage of thermal Maxwell-Jüttner distribution functions (DF). However, this choice is unlikely since the mean-free path of an electron in the accretion flows of M87* and SgrA* is much larger than the system size. This results in the plasma being collisionless, and the electron population should have a non-thermal component. How these accretion flows accelerate the electrons and the exact shape of the DF is still a matter of active debate. In this talk, I will highlight my work exploring kappa-DF usage for EHT modeling. I will give an overview of recent numerical advancements in radiative transfer methods utilizing kappa-DFs. I will highlight the usage of the kappa-DF in the latest SgrA* results of the EHT. And give an overview of my “kappa-jet” models, which can explain the overall observables by the EHT and other multi-wavelength observatories.