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Wind from black hole hot accretion flows

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In this talk, I will review our series of papers studying winds from hot accretion flows around black holes. Pioneer works of numerical simulation of black hole accretion flows have found that the mass accretion rate decreases inward(1). To understand this result, two models have been proposed, namely convection-dominated accretion flow (CDAF)(3) and adiabatic inflow-outflow solution (ADIOS)(2). In the first two papers of our series, using hydrodynamical and magnetohydrodynamical (MHD) simulations we showed the existence of strong winds (outflow) in hot accretion flows (4,5). In the third paper, by using three-dimensional general relativity MHD numerical simulation data of hot accretion flows and adopting a "virtual particle trajectory" data analysis approach, we calculated the properties of wind, such as its mass flux, spatial distribution, and velocity (6). However, that paper focuses only on a nonspinning black hole and standard and normal accretion. In the fourth paper, we extend the third paper by including cases of a rapidly rotating black hole and magnetically arrested disk. The formulae describing the mass flux, poloidal velocity, and fluxes of momentum, kinetic energy, and total energy of the wind and jet are presented (7). We find that the momentum flux of the jet is smaller than that of the wind, while the total energy flux of the jet is larger than that of the wind by at most a factor of 10. This result suggests that the wind potentially plays a more important role than the jet, at least for some problems in active galactic nucleus feedback. The role of wind in AGN feedback will also be briefly discussed (8).

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Note: Abstract should be in (full) double-columned one page.