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Spherical accretion and AGN feedback

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For a supermassive black hole accreting from a hot, quasi-spherical atmosphere, it is almost inevitable that the fluid approximation fails because particle mean free paths exceed the radius well outside the black hole event horizon. Within this region, the flow needs to be modeled using the Fokker-Planck equation. In the absence of magnetic fields, the flow is analogous to the “loss cone” problem for consumption of stars by a black hole. The accretion rate is suppressed well below the Bondi accretion rate and a significant power must be conveyed outward for the flow to proceed. This situation is complicated significantly by the presence of a magnetic field, but I will argue that the main outcomes are similar. I will also argue that the power emerging from such a flow, although generally far too small to suppress cooling on large scales, is an important ingredient of the AGN feedback cycle on scales comparable to the Bondi radius.

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