Accretion of a relativistic kinetic gas into a black hole

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Summary

- We study the accretion of a collisionless kinetic gas into a nonrotating black hole, assuming the self-gravity of the gas can be neglected.
- Based on standard tools from the theory of Hamiltonian systems, we derive the most general solution describing accretion of the Liouville (or collisionless Boltzmann) equation on a curved Schwarzschild background.
- In particular case, collisionless Kinetic gas implies that the distribution function solve $L[f] = 0$ (Liouville equation).
- We compute the observables (current density and stress-energy tensor), assuming a spherically symmetric and stationary distribution function f(E,L).
- Finally we assume that the distribution function represents a relativistic gas in thermodynamic equilibrium at $r \to \infty$, such that $f(E, L) = \alpha e^{-\beta E}$.
- We compute the accretion rate in the limit of low temperature and check that our results coincide with those of the literature.

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- We obtained new interesting results on the horizon where the tangential pressure is much larger than the radial one and thus diminishes the accretion process.
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