

Radiative and Dynamical Processes: Mini-problem 1 (due Friday)

Suppose that spherically symmetric gas is inflowing toward a black hole of mass M at a speed, v_r , that is given by the free-fall velocity. Radiation within the gas is scattering in a random walk fashion with mean free path l_0 (a constant). By estimating the time scale for gas to fall in from radius r , and comparing it to the time scale for radiation to random walk outward, find an expression for the *trapping radius* r_{trap} within which radiation will be dragged inward faster than it can escape.

[This problem was originally studied by Mitch Begelman (1978, 1979).]