

The formation of black holes in spherically symmetric gravitational collapse of Vlasov matter

The spherically symmetric, asymptotically flat Einstein-Vlasov system is considered. Explicit conditions on the initial data, with ADM mass M , are found such that the resulting spacetime has the following properties: there is a family of radially outgoing null geodesics where the area radius r along each geodesic is bounded by $2M$, the timelike lines $r = c \in [0, 2M]$ are incomplete, and for $r > 2M$ the metric converges asymptotically to the Schwarzschild metric with mass M . The constructed initial data guarantee the formation of a black hole in the evolution. An example of such initial data is given with the additional property that the solutions exist for all $r \geq 0$ and all Schwarzschild time, i.e., global existence in Schwarzschild coordinates in situations where the initial data are not small is obtained.