

## SPHERICALLY SYMMETRIC STATIC SOLUTIONS OF EINSTEIN-VLASOV AND THEIR PERTURBATION SPECTRUM

Spherically symmetric spacetimes with collisionless matter (Einstein-Vlasov) are governed by integral-differential equations: derivatives in time and radius and integrals over momentum space. We recast them so that the limit of massless particles is regular. 1) With massless particles, one can take any static spherical spacetime and obtain the Vlasov distribution in momentum space that generates it by integration, and vice versa. So they are one-to-one related. 2) Time-dependent perturbations (with massive or massless particles) obey a single integral-differential equation whose differential part is just a wave equation. 3) Based on this, we conjecture that all static solutions with massless particles have precisely one unstable mode, and comment on type-I critical collapse.