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Limiting attractors in heavy-ion collisions — the interplay between bottom-up and hydrodynamical attractors

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We study the hydrodynamization process in the aftermath of ultrarelativistic heavy-ion collisions using effective kinetic theory simulations and different observables. For the pressure ratio P_T/P_L, we observe that its late-time evolution becomes universal in units of the kinetic relaxation time for sufficiently large couplings signaling the onset of a hydrodynamical attractor. In contrast, at weak couplings, it converges earlier to a bottom-up attractor in terms of the thermalization time scale $\tau_{\mathrm{BMSS}} = \alpha_s^{-13/5}/Q_s$. We interpret these as two limiting attractors. The dynamics of the occupancy of hard modes, the heavy-quark diffusion coefficient, and the jet quenching parameter are better described by a bottom-up limiting attractor even for moderate couplings. Therefore, the previous conjecture that the hydrodynamical attractor governs the late-time approach toward hydrodynamization is not complete. Our results rather indicate that a weak coupling attractor emerges additionally in the coupling regime relevant for heavy-ion collisions for certain observables.

Category

Theory

Collaboration (if applicable)

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