Contribution ID: **600** Type: **Poster**

Non-linear dynamical systems approach to out of equilibrium hydrodynamical attractors: the Gubser flow case

Tuesday, 15 May 2018 19:35 (5 minutes)

Attractors for relativistic hydrodynamics have been found recently in weakly and strong coupling physical systems. The existence of hydrodynamical attractor provides a firm theoretical foundation for the applicability of hydrodynamics in far-from-equilibrium conditions. In this work we explain how the non-equilibrium attractors of systems undergoing Gubser flow within relativistic kinetic theory can be established on general grounds by using methods of nonlinear dynamical systems. Namely we find the fixed points and investigate the structure of flow diagrams of the evolution equations and characterize the basin of attraction using a Lyapunov function near the stable fixed point. We obtain the attractors of anisotropic hydrodynamics, Israel-Stewart (IS) and transient fluid (DNMR) theories and show that they are indeed non-planar and the basin of attraction is essentially three dimensional. The attractors of each hydrodynamical model are compared with the one obtained from the exact Gubser solution of the Boltzmann equation within the relaxation time approximation. We observe that the anisotropic hydrodynamics is able to match up to high numerical accuracy the attractor of the exact solution while the second order hydrodynamical theories fail to describe it. Our findings indicate that anisotropic hydrodynamics is an effective theory for far-from-equilibrium fluid dynamics which resums the Knudsen and inverse Reynolds numbers to all orders.

Content type

Theory

Collaboration

Centralised submission by Collaboration

Presenter name already specified

Primary authors: MARTINEZ GUERRERO, Mauricio (North Caroline State University); Mr BEHTASH, Alireza (North Carolina State University); Mr CRUZ CAMACHO, Nikolás (Universidad Nacional de Colombia)

Presenter: Mr CRUZ CAMACHO, Nikolás (Universidad Nacional de Colombia)

Session Classification: Poster Session

Track Classification: New theoretical developments