

# Various aspects of exact accelerating hydrodynamical solutions

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Collective properties of particles produced in relativistic high-energy collisions are well understood in terms of models based on hydrodynamics. A hot topic is how to determine the viscosity of this new form of matter. Exact (or parametric) solution of these equations make the connection between initial and final state transparent. We present exact, analytic and accelerating solutions of relativistic perfect fluid hydrodynamics. Found more than 50 years after the previous similar result (the Landau-Khalatnikov solution), these new solutions have a simple form, that also generalizes the renowned Hwa-Bjorken solution. We present exact solutions of nonrelativistic viscous hydrodynamics as well. Both the Navier-Stokes equations and the relativistic equations of perfect fluid dynamics are extremely nonlinear, thus every new exact result deepens our understanding on the nature of them. These new solutions lead to an advanced estimate of the initial energy density and life-time of high energy heavy ion reactions. We will also show that scaling properties of final state observables based on perfect fluid hydrodynamics are retained even if dissipation effects become relevant.