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Anisotropic hydrodynamics for conformal Gubser flow

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We derive the equations of motion for a system undergoing boost-invariant longitudinal and azimuthally-symmetric transverse "Gubser flow" using leading-order anisotropic hydrodynamics. This is accomplished by assuming that the one-particle distribution function is ellipsoidally-symmetric in the momenta conjugate to the de Sitter coordinates used to parameterize the Gubser flow. We then demonstrate that the SO(3)_q symmetry in de Sitter space further constrains the anisotropy tensor to be of spheroidal form. The resulting system of two coupled ordinary differential equations for the de Sitter-space momentum scale and anisotropy parameter are solved numerically and compared to a recently obtained exact solution of the relaxation-time-approximation Boltzmann equation subject to the same flow. We show that anisotropic hydrodynamics describes the spatio-temporal evolution of the system better than all currently known dissipative hydrodynamics approaches. In addition, we prove that anisotropic hydrodynamics gives the exact solution of the relaxation-time approximation Boltzmann equation in the ideal, eta/s -> 0, and free-streaming, eta/s -> infinity, limits.

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