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(3+1)D Viscous Anisotropic Hydrodynamics for Nonconformal Fluids MICHAEL MCNELIS, ULRICH HEINZ, DENNIS BAZOW, Ohio State Univ - Columbus — Anisotropic hydrodynamics improves upon standard viscous hydrodynamics by treating certain large dissipative corrections non-perturbatively. Relativistic heavy-ion collisions feature two such large viscous effects: (i) Strongly anisotropic expansion along the beam direction generates a large shear stress, leading to very different longitudinal and transverse pressures at early times. (ii) Critical fluctuations near the quark-hadron phase transition lead to a large bulk pressure on the conversion surface between hydrodynamics and a hadronic cascade description of the final collision stage. We present a new dissipative hydrodynamic formulation for non-conformal fluids where both of these effects are treated non-perturbatively using an anisotropic leading-order distribution function with two momentum-space deformation parameters. Generalized Landau matching conditions are required to fix these parameters, accounting for the longitudinal and transverse pressures. Residual shear stresses are treated perturbatively, as in standard viscous hydrodynamics. The resulting hydrodynamic evolution equations are derived from the Boltzmann equation in 3+1 dimensions and tested in a (0+1)-dimensional Bjorken expansion. Comparisons with viscous hydrodynamical frameworks are presented.

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