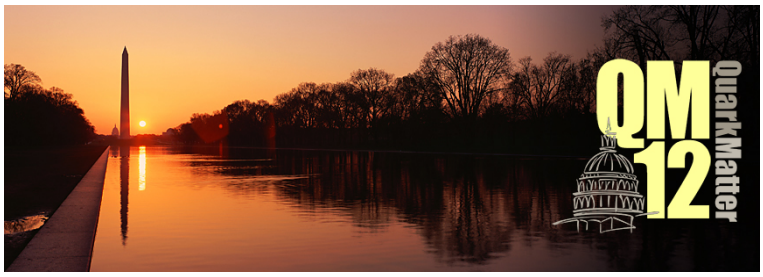

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Transient Fluid Dynamics of a Strongly Coupled N = 4 SYM Plasma

Thursday, 16 August 2012 16:00 (2 hours)

We argue, using the AdS/CFT correspondence, that the transient dynamics of the shear stress tensor in a strongly coupled N = 4 SYM plasma is not described by relaxation-type, fluid dynamical equations: at long times the equations of motion should contain a second-order comoving derivative of the shear stress tensor. This occurs because in this strongly-coupled system the lowest "non-hydrodynamical" quasinormal modes associated with shear stress possess a nonzero real part at zero wavenumber. We use Weyl invariance to obtain the most general equations of motion containing 2 comoving derivatives of the shear stress tensor that are compatible with the symmetries. We show that the asymptotic solution of this theory valid at times much larger than the timescale associated with the "non-hydrodynamical" modes reproduces the well-known results previously obtained directly from the AdS/CFT correspondence. If the QGP formed in heavy ion collisions can be at least qualitatively understood in terms of strongly-coupled N = 4 SYM theory, the second time derivative present in the equations of motion of the fluid may lead to an unexpected dependence on the initial conditions for the shear stress tensor needed in numerical hydrodynamic simulations.

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