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Phenomenology of irreversible processes from gravity

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We argue, using inputs from both field theory and gravity, that all non-equilibrium phenomena holographically dual to solutions of pure gravity, are determined completely by a closed set of equations of motion of the energy-momentum tensor. These phenomenological equations include energy-momentum conservation, but additional equations for evolution of the shear-stress tensor also. A class of solutions is purely hydrodynamic. These equations should capture all asymptotically AdS solutions of pure gravity with regular future horizons for the right values of phenomenological coefficients, like the shear viscosity. We prove this for homogeneous relaxation explicitly. This also provides us new analytical means of systematically studying the transition to the hydrodynamic regime in boost invariant flows.

Auteur principal: Dr MUKHOPADHYAY, Ayan (LPTHE, University of Paris VI, France)

Co-auteur: IYER, Ramakrishnan (Department of Physics and Astronomy, University of Southern California, USA)

Orateur: Dr MUKHOPADHYAY, Ayan (LPTHE, University of Paris VI, France)

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