GALILEAN AND SPECIAL RELATIVISTIC FLUIDS

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ABSTRACT

Kinetic energy in classical physics is a reference frame dependent, relative concept. Entropy production, the usual measure of dissipation in nonrelativistic fluids is relative, too. Recently it was shown, that with a reference frame independent space-time model [1] energy can be objective, that is reference frame independent. In this framework kinetic energy is the part of the transformation rule between the energies of two inertial observers [2]. The central notion of this approach is the third-order energy-momentum-mass density-flux tensor, whose relative components give the energy, mass, momentum and their fluxes relative to an observer. The four-divergence of this tensor gives the balances of mass, momentum and energy, respectively. Then the divergence of the entropy four-vector can be calculated and one can show that the entropy production is independent of the reference frame, too. It is also shown that the usual transformation rule based approach leads to the same result, if four-covectors and four-vectors are properly distinguished [3]. Moreover, the connection of the conductive part of the current density of the mass, the mass flow, and the center of mass conservation, and the concept of *booster* was analysed in detail in [4].

In special relativistic dissipative fluids the objective, reference frame independent treatment is an easier requirement. However, the simplest local equilibrium concept leads to a theory with instable homogeneous equilibrium [5], and the suggested extensions and improvements are not completely satisfactory [6; 7].

In this presentation the basic notion of the Galilean relativistic theory, the third order four-tensor is generalised in a special relativistic framework and the corresponding fluid theory is compared to the non-relativistic versions, and also to analogous divergence type special relativistic theories [**?**; 9].

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