QUARK MATTER 2015
Sep. 27 – Oct. 3, 2015 Kobe, Japan

Contribution ID: **1** Type: **Poster**

Is the ideal fluid limit stable against microscopic perturbations?

Tuesday 29 September 2015 16:30 (2 hours)

We discuss the zero-viscosity limit of fluid dynamics in the presence of microscopic thermal fluctuations. The interplay between these fluctuations and the generally non-linear evolution of fluid flow makes the existence of a well-defined hydrostatic limit ambiguous.
We investigate these issues taking microscopic thermal perturbations into account non-perturbatively via lattice field theory techniques, where their effect is absorbed into the functional integral.

We find intriguing evidence, that the vacuum of such a theory is non-trivial, casting doubts on whether the gradient expansion can provide a good effective field theory for this type of system. The non-trivial vacuum looks like a "turbulent" state where some of the entropy is carried by macroscopic degrees of freedom. We describe further steps to strengthen or falsify this evidence, and conclude with a discussion of the role of these issues in the "perfect fluid" phenomenology of heavy ion collisions.

Based on http://arxiv.org/abs/1502.05421

On behalf of collaboration:

NONE

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Session Classification: Poster Session

Track Classification: New Theoretical Developments