



Contribution ID: 183

Type: not specified

## Turbulent mixing of a critical fluid: the exact renormalization

Monday, 3 July 2017 16:45 (15 minutes)

Non-perturbative Renormalization Group (NPRG) technique is applied to a stochastic model of non-conserved scalar order parameter near its critical point, subject to turbulent advection.

The compressible advecting flow is modelled by a random Gaussian velocity field with zero mean and correlation function  $\langle v_j v_i \rangle \sim (P_{ji}^\perp + \alpha P_{ji}^{\parallel})/k^{d+\zeta}$ . Depending on the relations between the parameters  $\zeta$ ,  $\alpha$  and the space dimensionality  $d$ , the model reveals several types of scaling regimes. Some of them are well known (model A of equilibrium critical dynamics and

linear passive scalar field advected by a random turbulent flow), but there is a new nonequilibrium regime (universality class) associated with new nontrivial fixed points of the renormalization group equations. We have obtained the phase diagram  $(d, \zeta)$  of possible scaling regimes in system. The physical point  $d = 3, \zeta = 4/3$  corresponding to three-dimensional fully developed Kolmogorov's turbulence where critical fluctuations are irrelevant, is stable for  $\alpha$

*less*  $\sim 2.26$ . Otherwise, in the case of “strong compressibility”  $\alpha$

*gr*  $\sim 2.26$ , the critical fluctuations of the order parameter become

relevant for three-dimensional turbulence. Estimations of critical exponents for each scaling regimes are presented.

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**Session Classification:** Mathematical methods for complex systems