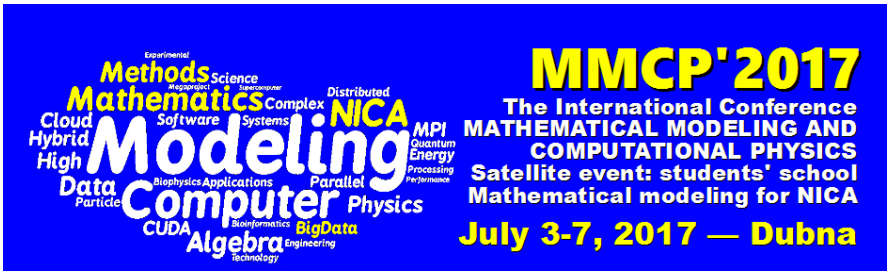

Contribution ID: **183** Type: **not specified**

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 stochastical 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 $\langle v_j\, v_i\rangle \sim (P^{\perp}_{ji} + \alpha P^{\parallel}_{ji})/k^{d+\zeta}$. Depending on the relations between the parameters ζ, α 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, ζ) 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 α
$lesssim 2.26$. Otherwise, in the case of "strong compressibility" α
$gtrsim 2.26$, the critical fluctuations of the order parameter become
relevant for tree-dimensional turbulence. Estimations of critical exponents for each scaling regimes are presented.

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Session Classification: Mathematical methods for complex systems