Título: Field theoretical approach to intermittency in lagrangian turbulence

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Resumo:

The Lagrangian picture of Navier-Stokes equations is a natural framework to understand intermittency, since it decouples velocity fluctuations from large eddy Galilean-breaking perturbations. However, effective Lagrangian models require closure assumptions for the dynamics of the velocity gradient tensor. The simplest of Lagrangian models is the Restricted Euler Equation, which leads to finite-time singularities. Among the several models discussed in the literature for the study of Lagrangian intermittency, the Recent Fluid Deformation (RFD) model considers the pressure Hessian and viscous dissipation terms as local closures, including contributions from advected smooth velocity gradient fields. As a result, this model does not display finite time singularities, and has non-Gaussian stationary statistics. We perform a detailed analytical study of the RFD model under the Martin-Siggia-Rose (MSR) path integral language, with a detailed power counting hierarchical classification of the several perturbative contributions associated to fluctuations around the stationary action. The most relevant Feynman diagrams are integrated into the renormalized effective action. We observe that the general shape of the velocity gradient probability distribution functions (vgPDFs) is discreetly modified by additional subleading corrections, and, furthermore, find that there are significant improvements in the evaluation of the local stretching exponents that describe asymptotic properties of the vgPDF tails.