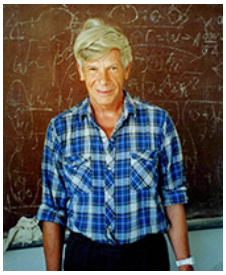

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Strongly Nonlinear Diffusion in Turbulent Environment: A Problem with Infinitely Many Couplings

Monday, 10 October 2022 16:45 (25 minutes)

The field theoretic renormalization group is applied to the strongly nonlinear stochastic advection-diffusion equation. The turbulent advection is modelled by the Kazantsev–Kraichnan "rapid-change"ensemble. As a requirement of the renormalizability, the model necessarily involves infinite number of coupling constants ("charges"). The one-loop counterterm is calculated explicitly.
The corresponding renormalization group equation demonstrates existence of a pair of two-dimensional surfaces of fixed points in the infinite-dimensional parameter space. If the surfaces contain infrared attractive regions, the problem allows for the large-scale, long-time scaling behaviour.
For the first surface (advection is irrelevant), the critical dimensions of the scalar field \Delta_{\theta}, the response field \Delta_{\theta'} and the frequency \Delta_{Omega} are nonuniversal (through the dependence on the effective couplings) but satisfy certain exact identities. For the second surface (advection is relevant), the dimensions are universal and they are found exactly.

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