Generalized diffusion and precursors to fingering

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(i) Non-Gaussian distributions for diffusion type processes are obtained, in a generic manner, from a generalization of classical statistical mechanical linear response theory leading to a generalized diffusion equation; (ii) Statistical properties of hydrodynamic field fluctuations in fingering processes reveal the existence of precursors which are found to exhibit power law distributions; (iii) These power laws are shown to follow from spatial q-Gaussian structures which are solutions to the generalized diffusion equation; (iv) These results provide insight to the physical mechanism of the fingering dynamics, and suggest a physical interpretation of "nonextensivity" from the structure of the precursors.