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**Intermittency in small-scale turbulence: a velocity gradient approach**[1] CHARLES MENEVEAU, PERRY JOHNSON, Johns Hopkins University — Intermittency of small-scale motions is an ubiquitous facet of turbulent flows, and predicting this phenomenon based on reduced models derived from first principles remains an important open problem. Here, a multiple-time scale stochastic model is introduced for the Lagrangian evolution of the full velocity gradient tensor in fluid turbulence at arbitrarily high Reynolds numbers. This low-dimensional model differs fundamentally from prior shell models and other empirically-motivated models of intermittency because the nonlinear gradient self-stretching and rotation $\mathbf{A^2}$ term vital to the energy cascade and intermittency development is represented exactly from the Navier-Stokes equations. With only one adjustable parameter needed to determine the model's effective Reynolds number, numerical solutions of the resulting set of stochastic differential equations show that the model predicts anomalous scaling for moments of the velocity gradient components and negative derivative skewness. It also predicts signature topological features of the velocity gradient tensor such as vorticity alignment trends with the eigen-directions of the strain-rate.

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