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Continuum Shell Models of Turbulence

Shell models are ad hoc models which mimic the behaviour of the spectral Navier–Stokes equations, and can be very useful as test-beds for ideas about physical turbulence. The Sabra, GOY, and DN models evolve single complex value $u_n(t)$ which represent an average of all the velocity modes u_k with $k \in (k_0\lambda^n, k_0\lambda^{n+1})$, where λ is the geometric shell spacing parameter. By taking the limit as $\lambda \to 1$, one arrives at a continuum limit. In this talk, we prove that the steady-state of this continuum limit exhibits Kolmogorov-scaling for moments of the velocity and non-zero dissipation in the limit of vanishing viscosity.