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Finite-dimensional Asymptotics and Degrees-of-Freedom Estimation for Turbulence Models Incorporating Spectral Subgrid-scale Viscosity JOEL AVRIN[1], University of North Carolina at Charlotte — We study the finite-dimensional large-time behavior of three-dimensional forced turbulence as modeled by a modified Navier-Stokes equation. Subgrid-scale viscous effects are modeled by adding a hyperviscous term, but only to the high frequencies past a cutoff wavenumber m. We theoretically establish for arbitrarily large Reynolds numbers that the asymptotic (i.e. large-time) behavior of the system is finite-dimensional with an estimate on the number of degrees of freedom well within the Landau-Lifschitz estimates. We also verify in the case that m is large enough that the overall large-time dynamics are controlled by the large-time dynamics of the inertial range. Given these promising results, we now would like to explore the physicality of the model by modifying the arguments underlying the Chapman-Enskog expansion.

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