1049-76-124 **Joel Avrin*** (jdavrin@uncc.edu), Department of Mathematics and Statistics, Universty of North Carolina at Charlotte, 9201 University City Blvd, Charlotte, NC 28223-0001. *Attractor and inertial-manifold results for the 3-D spectrally-hyperviscous Navier-Stokes equations.*

Let P_m project onto the first m eigenmodes of $A = -\Delta$, and let $Q_m = I - P_m$, then we add to the 3-D incompressible Navier-Stokes equations the term $\mu A_\varphi u$ where the operator A_φ satisfies $A_\varphi \geq Q_m A^\alpha$ ($\alpha \geq 2$) in the sense of quadratic forms. A distinguished class of A_φ is zero on the first m_0 eigenmodes for $m_0 \leq m$. We obtain global regularity and a compact global attractor $\mathcal{A}$ with Hausdorff and fractal dimensions bounded by $Km^a\kappa^b$ where κ is the Kolmogorov wavenumber, K is generally within an order of magnitude of unity, a is a fractional power, and $b < 3$. In particular $m^a\kappa^b \leq \kappa^3$ for $m \leq \kappa^3$, i.e. for m so large as to suggest machine-indistinguishability from NSE solutions. This robust conformance with the Landau-Lifschitz estimates appears to be unique among NSE closure models, and b is significantly lower for more realistic choices of m. We also obtain the existence of inertial manifolds which imply in the distinguished-class case that for m large enough eigenmodes free of hyperviscosity control the essential dynamics. (Received February 28, 2009)