Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Hyperviscosity and bottlenecks in the Taylor-Green vortex RAHUL AGRAWAL, IIT-Bombay, ALEXANDROS ALEXAKIS, MARC BRACHET, LPS-ENS, LAURETTE TUCKERMAN, PMMH-CNRS-ESPCI-Sorbonne — Direct numerical simulations of turbulence are sometimes performed with hyperviscosity, in which the standard viscous term is replaced by a higher power p of the Laplacian, in order to increase the dissipation at high wavenumbers and thus to widen the computationally accessible inertial range. It is essential to determine the effect of hyperviscosity on various features of the turbulent energy spectrum, such as the bottleneck, an increase in energy for wavenumbers just below the dissipation range. Here, we use the symmetries of decaying Taylor-Green flow to study the effect of hyperviscosity on the bottleneck in high-resolution direct numerical simulations for resolutions up to 1024^3 and for hyperviscosity up to order $p = 100$, using simulations with 2048^3 and $p = 1$ as a reference case. We also investigate numerical issues that must be addressed for these high parameter values, in particular the timestepping scheme, the timestep, and the evaluation of the dissipation.

Laurette Tuckerman
PMMH-CNRS-ESPCI-Sorbonne

Date submitted: 23 Jul 2019 Electronic form version 1.4