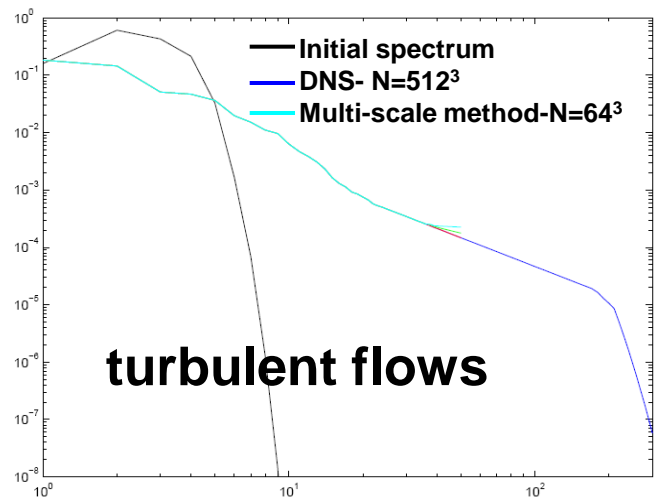


Model Reduction via Systematic Multi-Scale Formulation

The objective is to develop effective stochastic multi-scale methods that can be used to quantify uncertainty propagation across scales with complexity comparable to that of solving the large scale problem on a coarse grid.

- An effective parameterization technique to represent a multi-scale solution with infinitely many non-separable scales into a formal two-scale function.
- Derivation of a new multi-scale formulation for nonlinear nonlocal equations with dynamic coupling of large and small scale solutions.



- A systematic derivation of the large scale equation without formal closure assumption.
- Coupling of the large and small scales is computed on-the-fly adaptively.
- Complexity of the multi-scale model is comparable to that of a dynamic Smagorinsky LES model.
- Extension to multi-scale modeling of energetic materials and fluid-structure interactions.