

Dynamical Systems
and
Statistical Mechanics

Themes

- Stat mech and averaging:**
- closure from stat mech arguments
 - large scale models with stochastic terms
 - discrete vs continuous, superbrownian processes
 - non-convex analysis and catastrophic events

link to dynamical systems/ergodic theory:

- partial ergodicity
- Kolmogorov/Kraichnan vs attractors

- Asymptotics:**
- homogenization with boundaries, complex processes,
 - averaging using variational principles
 - eddy diffusivity approaches (vs. amplitude eqns)
 - shear instability with continuous spectra
 - linear noise-driven dynamics

- Dynamical systems:**
- model comparison and evaluation
 - geometry vs statistics
 - aperiodic dynamical systems and finite-time barriers to mixing
 - Lagrangian vs Eulerian
 - coupled random/deterministic dynamical systems
e.g ocean/atmosphere interface
 - singularities in 3-D
 - the curse of dimensionality (model reduction)
 - numerical simulation (parallel computing, systems with stochastic forcing, structure-preserving codes, code acceleration)

Statistics:

- horrible eigenvalue problems
(continuous spectrum, perturbation theory,
2-D PDE eigenvalue problems)
- multiresolution statistics
- wavelets (coherent structures, power laws)
- extreme events and fluctuations
- multifractal clustering (DLA)
- heavy tail distributions and higher moments
- identification of linear systems with multiplicative noise
- dynamical systems and statistics
- nonlinear recursive estimation of
multiscale processes