Session IV: Alternatives to resolving weather in climate ensembles and novel strategies to use high-resolution or observational data to develop parameterizations.

- Stochastic parameterizations (random tendencies to increase spread [Buizza et. al. 1999], backscatter schemes (Judith Berner), kinetic Monte Carlo (Ian Ross), [deterministic] cellular automata) disagreement on which method works best
- MTV (Majda, Timofeyev, Vanden-Eijnden): Stochastic mode reduction, mathematically clean, claims to be systematic but is based on unrealistic yet clear assumptions (requires scale separation between PDF of slow modes and fast modes), impractical for complex models
- use a clever mathematical combination of local analogs (e.g. from the various reanalyses) to estimate sub-grid scale dynamics in the climate model (take the climate forecast state and project onto local patches of reanalyses), inspired by Lorenz, van-den Dool, D'Andrea and Vautard (2000), echoing prashant's sentiments that the climate community should take advantage of the wealth of short range, higher res runs being done in NWP
- new ways of parameterizing (e.g. neural networks) might be computationally expensive compared with what is currently in use (Schmidt and Lipson 2009)
- use observational data to come up with a flow-dependent model error correction (Danforth et. al. 2007), a parameterization of model bias, easier for weather than climate, run climate model for 6-hours and compute 6-hour tendency errors verified against each reanalysis to estimate climate model bias
- compare vertical structure in observations & cloud resolving models (4km), different species (snow, etc.), problems with radiation balance (Pallav Ray)
- atmospheric chemistry too expensive to resolve explicitly (Anne Case Hanks)
- regional modeling: higher vertical resolution in boundary layer, availability of observational data (Richard Anyah)
- diurnal cycle improves with resolution, but problems remain (Ming Zhao)