

Bayesian Modeling and Computation in Complex Geophysical Problems

Mark Berliner
Ohio State University

Bayesian statistical analysis enables the quantitative combination of various datasets and physical modeling in a fashion that maintains uncertainty management. Until relatively recently, computational difficulties limited application of the Bayesian approach. Since the 1980's, the use Bayesian analysis has exploded in many disciplines due to advances in hardware and development of algorithms for Bayesian computation.

The most crucial of these developments is Markov chain Monte Carlo (MCMC).

I will review the basic notions and techniques, including Gibbs Sampling, Metropolis-Hastings algorithms, hybrids, and Langevin MCMC.

A very brief review of Bayesian sequential Monte Carlo (particle filtering) is given. I will discuss approaches to and examples of Bayesian multi-scale modeling and computation. The talk concludes with discussion of opportunities and challenges in parallel Bayesian computation.