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Title:
Environmental applications of particle Markov chain Monte Carlo methods

Abstract:
I'll report on progress in applying particle Markov chain Monte Carlo (PMCMC) methods for state and parameter estimation in environmental domains, including marine biogeochemistry, soil carbon modelling and hurricane tracking. State-space models in these areas often derive from a tradition of deterministic process modelling to capture the physical, chemical and biological understanding of the system under study. They are then augmented with stochastic components to capture uncertainty in the process model itself, its parameters, inputs, initial conditions and observation. PMCMC has some advantages for inference in such a context: it imposes few constraints on model development, it remains true to a model specification without introducing approximations, and is highly amenable to parallelisation on modern computing hardware such as graphics processing units (GPUs). The talk will introduce PMCMC methods and demonstrate the LibBi software for applying them to state-space models, with a number of examples throughout.