# Christine Shoemaker

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Presenting on:

## "Application of New Surrogate Algorithms for Global Optimization for Computationally Expensive Simulation Models with Application to Multi-Phase Subsurface Flow Management and Global Climate Models"

March 22, 2013

12 noon

(Lunch served at 11:50am)

Wean 3701

Department of Engineering and Public Policy

**Seminar Abstract:** This talk will discuss applications of our new global optimization algorithms to computationally expensive nonlinear simulations models for parameter estimation and design optimization. The applications include multiphase, multi-constituent carbon sequestration models, groundwater remediation and global climate models (CLM4.5). Our new open source algorithms (in Matlab and Python) are very efficient for these applications and other multi-modal computationally expensive simulation models because the optimization is designed to reduce significantly the number of simulations required for an accurate optimization solution. Our approach is to iteratively approximate the objective function or likelihood function f(x) with Radial Basis Functions (RBF) or other surrogate response surfaces to guide the search process. Our methods are derivative-free and can find local and global minima. The applications incorporate issues related to monitoring, forecasting, uncertainty quantification, and risk analysis as well parameter estimation and design.

**Speaker Bio:** Prof. Shoemaker received a PhD in (pure) Mathematics supervised by Richard Bellman on dynamic programming. She is interested in environmental applications as well as in developing new computationally efficient distributed (HPC) optimization and control methods. Her papers appear both in environmental/water resources journals and in optimization journals. Topics she has worked on that are not discussed in this talk include: watershed analysis, optimization of stochastic reservoir systems, stochastic dynamic programming, differential dynamic programming, multi objective optimization. She supervises PhD students in Civil and Environmental Eng., in Operations Research, and in Applied Mathematics. She is a member of the National Academy of Engineering and a Distinguished Member in ASCE. She is also a Fellow in INFORMS (Operations Research) and in AGU (hydrology).

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