

Surrogate models and reduction methods for UQ and inference in large-scale models

Wednesday, November 29, 2017 2:00 PM (1 hour)

Uncertainty Quantification (UQ) and Global Sensitivity Analysis (GSA) in numerical models often rely on sampling approaches (either random or deterministic) that call for many resolutions of the model. Even though these computations can usually be carried out in parallel, the application of UQ and GSA methods to large-scale simulations remains challenging, both from the computational, storage and memory points of view. Similarly, Bayesian inference and assimilation problems can be favorably impacted by over-abundant observations, because of overconstrained update problems or numerical issues (overflows, complexity,...), raising the question of observations reduction.

A solution to alleviate the computational burden is to use a surrogate model of the full large scale model, that can be sampled extensively to estimate sensitivity coefficients and characterize the prediction uncertainty. However, building a surrogate for the whole large scale model solution can be extremely demanding and reduction strategies are needed. In this talk, I will introduce several techniques for the reduction of the model output and the construction of its surrogate. Some of these techniques will be illustrated on ocean circulation model simulations. For the reduction of observations, I will discuss and compare few strategies based on information theoretical considerations that have been recently proposed for the Bayesian framework.

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