UCCS Department of Mathematics

Math Colloquium Series

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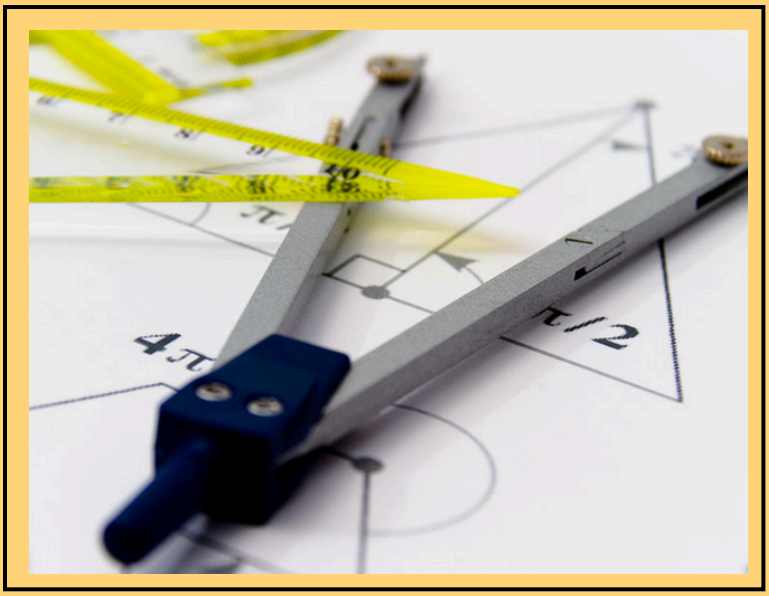

DATE:
OCTOBER 22, 2015

TIME:
12:30PM-1:30PM
(REFRESHMENTS AT 12:15PM)

LOCATION:
OSBORNE CENTER
ROOM# A327

End-to-End Quantification of Uncertainty Using Measure Theory

Computational models of complex physical phenomena and systems are often used to make predictions that policy makers rely upon to make informed decisions. This decision making process is often complicated by the presence of uncertainties in the model including, but not limited to, uncertainties in critically important parameters, initial/boundary conditions, and/or forcing terms. Probability measures (often written as probability densities) are typically used to describe these uncertainties. The predicted output data of the model are then treated as random variables. Over the past several decades, many methods have been developed to efficiently propagate these uncertainties through the computational model in order to analyze and quantify uncertainties in predicted output data. Determining the correct probability measures on model input spaces that are consistent with experimentally observed and/or validated data often requires solving some form of a stochastic inverse problem. In this talk, we use measure theory to define a mathematical framework in which minimal assumptions are required to both formulate and solve the stochastic inverse problem. A brief review of measure theory is provided along with a high level overview of the extensive mathematical theory and computational algorithms developed over the past five years. We also discuss examples involving the quantification of uncertainty in storm surge and subsurface contaminant transport models.