

Texas Tech University. Applied Mathematics Seminar.

# A Hierarchical Approach to Quantify Uncertainty in Mechanistic Models for Stochastic Data

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**ABSTRACT.** Two broad sources of uncertainty can arise while specifying a model for a physical process. One of them, the aleatory uncertainty, can be quantified by estimating the parameters and their associated uncertainty intervals. But these estimates are obtained assuming the model is valid and the only unknown are the parameters driving the process. If, however, the model does not properly reflect the data generation process, we need to ascertain the model uncertainty in addition to the uncertainty associated with the parameters. The probability distribution associated with an ensemble of models quantifies the other type of uncertainty, the epistemic uncertainty. The Bayesian hierarchical methodology provides a coherent technique for quantifying both these uncertainties. The methodology is illustrated by proposing a dynamic hierarchical model for soil moisture data obtained from different sources.