Technische Universität Braunschweig

Vortrag im Gästeprogramm des GRK 2075

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Uncertainty Quantification with Model Error

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When a model is calibrated with respect to data, the goal, from a predictive perspective, is to improve the fidelity of model predictions, relative to the "truth" behind the data, by estimating best-fit values of model parameters, andusing these fitted parameters in subsequent predictions. Often, however, the deficiency in model structure is such, that no combination of parameter values can result in model predictions that agree with the data. In this situation, the improvement in predictive fitness of the model upon calibration can be negligible.

In the context of Bayesian model calibration, statistical models have been employed for the representation of model error, and their parameters have been inferred jointly with other model parameters. The calibration of this model error representation provides for a suitably fitted statistical correction on model predictions that bridges the gap with calibration observables. Extending these methods to physical methods has lead to the development of strategies for embedding such model error representations within the model, to ensure satisfaction of various constraints.

This talk will provide an overview of our developments in this regard. I will discuss the basics of the construction, including a number of variants relying on different simplifications, and will outline its utility in different situations including those with or without data noise. I will also present a number of demonstrations in chemical models of increasing complexity, leading up to an application in a large eddy simulation of turbulent flow.

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