

Quantifying the Uncertainty in Large-Scale Simulations

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Abstract

In addition to providing the most accurate predictions for complex systems, scientists must quantify the uncertainty in these predictions and correlate how the prediction depends upon the assumptions made in the model. Although these questions are natural to ask, they can be hard to formulate and answer in a mathematically well-founded and useful way. I will review some of the approaches used to determine how well a model represents the underlying physical phenomena and to quantify the confidence one can have in the model predictions. I will describe how local sensitivity and global uncertainty analyses can be combined to address situations where the model parameters, initial conditions, and possibly even the mathematical model, are only known approximately.