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An Uncertainty Quantification System for Tabular Equations of State JOHN H. CARPENTER, ALLEN C. ROBINSON, BERT DEBUSSCHERE, ANN E. MATTSSON, RICHARD R. DRAKE, WILLIAM J. RIDER, Sandia National Laboratories* — Providing analysts with information regarding the accuracy of computational models is key for enabling predictive design and engineering. Uncertainty in material models can make significant contributions to the overall uncertainty in calculations. As a first step toward tackling this large problem, we present an uncertainty quantification system for tabular equations of state (EOS). First a posterior distribution of EOS model parameters is inferred using Bayes rule and a set of experimental and computational data. EOS tables are generated for parameter states sampled from the posterior distribution. A new unstructured triangular table format allows for capturing multi-phase model behavior. A principal component analysis then reduces this set of tables to a mean table and most significant perturbations. This final set of tables is provided to hydrocodes for performing simulations using standard non-intrusive uncertainty propagation methods. A multi-phase aluminum model is used to demonstrate the system.

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