V&V II
VALIDATION AND UNCERTAINTY QUANTIFICATION OF THERMOCHEMICAL MODELS USING SHOCK TUBE RADIATION MEASUREMENTS

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ABSTRACT

The PECOS Center is working on the development of systematic methodologies for verification and validation of physical models under uncertainty. The proposed methodology is based on a statistical approach [1] for the calibration of uncertain model parameters, the validation of the model itself, and the quantification of uncertainty associated with specific model predictions. For predictability, experimental data are necessary for two fundamental purposes: 1) to determine (or, at least, to reduce uncertainty in) the parameters of the models for the specic physical environment in which the events of interest take place and 2) to determine, if only subjectively, if models are capable of faithfully predicting quantities of interest with sufficient accuracy. The first of these is referred to as calibration. In general, it involves solving an inverse problem as it determines model parameters indirectly by correlating model predictions with observable data measured in laboratory tests. The second is the so-called validation. In general, validation also involves a comparison of model predictions with experimental observations, but the observations are usually conducted on more complex problem domains than those for the calibration process, and are designed to depict as clearly as possible features similar to the target quantities of interest to be predicted. The comparison of validation experiments with model predictions can never actually validate the model as new experiments may lead to results in conflict with validation predictions. In this work, we develop a physico-mathematical model to simulate atomic radiation in shock-heated air plasmas and use volumetric radiance data collected at the Electric Arc Shock Tube (EAST) [2,3], located at the NASA Ames Research Center (ARC), to illustrate our validation process. We will present advantages and current limitations of the proposed approach.

REFERENCES

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