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ICF Mix Model Calibration and Prediction with Quantified Uncertainty[1] KYLE MACKAY, JESSE PINO, Lawrence Livermore Natl Lab — The mixing of fuel and shell material in ICF implosions can affect implosion dynamics and even prevent ignition. Computational models for mixing have many free parameters that require calibration. Manufacturing defects and measurement errors complicate the calibration process. We present a framework for mix model calibration that accounts for uncertainty in the underlying system. We calibrate and assess the validity of a diffusion and a turbulence model for mix in a series of separated reactant experiments performed at the National Ignition Facility. We perform an ensemble of 1D simulations and account for manufacturing defects by varying the stoichiometry of the capsule shell. Uncertainty in the radiation drive is accounted for by varying the energy and spectrum of the simulated source. Mix model parameters are varied over a wide range, representing a lack of prior knowledge of their values. A surrogate model is constructed using data from simulations. Experimental measurements are used to infer a distribution for mix model parameters and the calibrated computational models are used to find predictive distributions of additional "hidden" experimental data.

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Kyle Mackay
Lawrence Livermore Natl Lab

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