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Uncertainty quantification of experimentally-derived quantities[1]

M.A. CHILENSKI, M. GREENWALD, N.T. HOWARD, A.E. WHITE, MIT PSFC

— Uncertainty quantification (UQ) is an essential step in both the interpretation of experimental data and the validation of simulations. Use of rigorous UQ techniques can reduce the number of code runs needed while at the same time increasing confidence in the uncertainties computed. To this end, work is underway on UQ of experimental impurity transport coefficients in Alcator C-Mod plasmas. The transport coefficients are obtained by fitting the output from the impurity transport code STRAHL to the signal from an x-ray imaging crystal spectrometer. In previous work, naive Monte Carlo sampling was implemented by randomly perturbing the observed n_e, T_e profiles within error bars then fitting each perturbed dataset with a spline. In the new approach, the profiles are smoothed using Gaussian process (GP) regression. The GP posterior can then be sampled using a variety of techniques. Further harnessing of UQ techniques should enable improved error estimates for experimentally-derived quantities and simulation validation.

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Mark Chilenski
MIT PSFC

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