

Data Adjustment Tools for Improved Covariance Data

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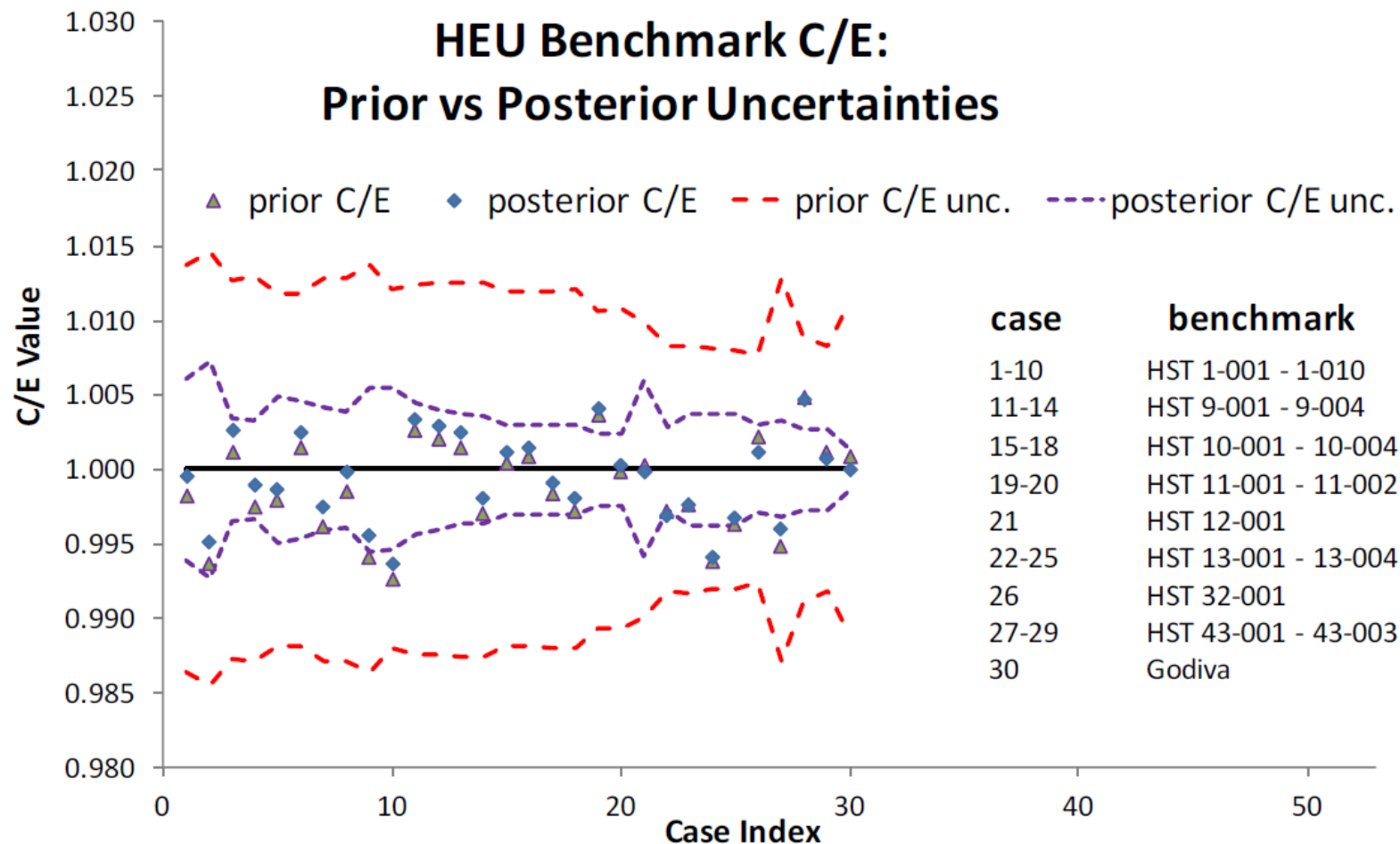
Purpose

- Present adjustment tools for developing more appropriate, application-specific covariance libraries
- Adjustment tools are necessary since ENDF/B-VIII.0 covariance is not endorsed by CSEWG for application
 - “The use of this covariance to calculate uncertainties for integral quantities such as k_{eff} will usually result in an overestimate of the uncertainty...”
 - “The recommended methodology to overcome this problem is to adjust the covariance...”
- This is a very high-level overview
 - Some additional details are available in published papers and reports

Data adjustment methods

- Generalized linear least squares technique can be used to adjust data and measured responses to generate consistent results
 - Implemented in TSURFER within SCALE and Whisper with MCNP
- Adjusted covariances are also generated reflecting more knowledge of the uncertainties and correlations among the data
- Adjusted covariances can be propagated with sensitivities to estimate data-induced uncertainty in measured quantities
 - Demonstration has used k_{eff} for HEU benchmarks

Sample results: Mark Williams presentation at 2017 CSEWG



- 100% of the 30 cases were within the unadjusted covariance band
- 77% are within the adjusted band – much more reasonable result
- Other correlations introduced in the evaluation process have not been accounted for in this analysis
- No general purpose tool exists to allow this sort of analysis for many application spaces

Future expansion

- Incorporate additional types of responses in adjustment process
 - Reactivity responses from substitution experiments next logical step
 - Other sensitivity profiles
 - Other constraints – physical constants etc.
- Reliable correlation coefficients among experiments
 - Constrain adjustments of measured values

References

- M. L. Williams, D. Wiarda, and W. J. Marshall, “Consistency Between ENDF/B Cross Sections and Covariances,” presentation at CSEWG, Upton, NY (2017).
- V. Sobes, W. J. Marshall, D. Wiarda, F. Bostelmann, A. M. Holcomb, and B. T. Rearden, “ENDF/B-VIII.0 Augmented Covariance Data, the first iteration,” *Trans. Am. Nucl. Soc.* **121**, 1365-1368 (2019).

Questions?

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