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Data enabled approaches to sensitivity analysis, calibration and risk visualization in general circulation models

This talk discusses the exploitation of large databases of model realizations for assessing model sensitivities to uncertain inputs and for calibrating physical parameters. Attention is focused on databases of individual realizations of ocean general circulation model, built through efficient sampling approaches. Attention is then focused on the use of sampling schemes to build suitable representations of the dependence of the model response on uncertain input data. Non-intrusive spectral projections and regularized regressions are used for this purpose. Bayesian inference formalism is then applied to update the uncertain inputs based on available measurements or observations. We illustrate the implementation of these techniques through extreme-scale applications, including inference physical parametrizations and quantitative assessment and visualization of forecast uncertainties.

Biography

Omar M Knio completed his PhD from MIT in 1990. He held a Post-doctoral position at MIT, before joining the Mechanical Engineering Faculty at Johns Hopkins University in 1991. In 2011, he joined Mechanical Engineering and Materials Science Department at Duke University. In 2013, he joined AMCS Program at KAUST, where he served as Deputy Director of the SRI Center for Uncertainty Quantification in Computational Science and Engineering. He has co-authored over 100 journal papers and two books.

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Page 51