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BAYESIAN NEAR REAL-TIME EARTHQUAKE SOURCE INVERSION

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Uncertainty quantification is inherently interdisciplinary. In this presentation we will discuss interdisciplinary research on the systematic and quantitative Bayesian inversion of earthquake source models for ground-motion simulation under uncertainty. Our **long term goals are** to:

- Specify the level of complexity needed in ground-motion source modeling for satisfying observational constraints and engineering requirements for seismic safety;
- Improve our understanding of source-related mechanisms responsible for ground motion complexity;
- advance state-of-the-art robust and scalable parallel statistical algorithms.

These very ambitious objectives have been broken down into several sub-objectives, ones in which we can make immediate impact on the earthquake modeling community over the course of this two-year research project:

- Assess model inadequacies, deal with limited and noisy observational data at small and local scales, predict quantities of interest (QoI, e.g. seismic quantities and structural responses) for initially simple earthquake source models;
- Apply parallel computing in all project stages.

The first phase of the project involves building confidence in our in-house developed earthquake code. This will entail a convergence study to show that the numerical code we have implemented correctly approximates the underlying system of mathematical equations.

The second phase of the project involves generating synthetic data with the developed earthquake code and then using this data to invert for the physical input parameters of the simulation. In doing this, we gain confidence in our stochastic representations and our methodology for inversion.

Lastly, the use of substantive data from seismometers in the inversion for the earthquake source parameters will help determine inadequacies in the underlying partial differential equations that our numerical code approximates.

In this talk, we will discuss the process by which we constrain kinematic earthquake rupture parameters, the underlying statistical models and software needed to predict locations as well as prospects for future research directions.

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