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Solving for Earthquake Rupture Rates on a Complex Fault Network

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We present preliminary results from an inverse method that solves for the long-term rate of all ruptures on the major mapped faults in California. This method is being developed for the 3rd Uniform California Earthquake Rupture Forecast (UCERF3). Building on the work of Andrews and Schwerer (2000), we solve for the rates of ruptures that are consistent with a) slip-rate constraints, b) paleoseismic event rates, and optional constraints such as c) *a-priori* rupture rate estimates, d) smoothness constraints, and e) constraints on the magnitude distribution. These constraints are linear, and allow us to formulate the system of equations as a matrix equation. Multiple solutions to the inverse problem are then sampled via a simulated annealing algorithm, which is important in terms of characterizing epistemic uncertainties.

Using this inversion methodology, the ruptures themselves (or more specifically, the portions of the faults involved in each rupture) must be specified *a priori*. This requires generating simple rules to describe which faults or fault segments can rupture together in a single earthquake. We discuss possible criteria and their effect on the size of the solution space and the characteristics of the solution.