TO Brownbag Seminar
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Plate Rigidity Inversion in Southern California Using Interseismic GPS Velocity Field: implications for earthquake hazard

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I will present an inversion method using the interseismic velocity field in order to determine effective rigidity of the lithosphere. The method is based on the minimization of a cost function defined as the quadratic measure of the difference between measured and modeled velocity fields on a discrete set of points. The continuous mapping of the rigidity is fulfilled with a limited set of parameters and the forward solution is achieved using a plane stress finite element code. The computation of the cost function gradient in the parameters' space allows one to iteratively find the best parameters set through a suitable optimization algorithm. We first design a benchmark including an abrupt rigidity variation that cannot be described by a continuous function. For such a case, we show that increasing the number of parameters is a way to accurately describe sharp variations of the rigidity map. Then, we use a dense GPS velocity field over the southwestern US to estimate the corresponding rigidity variations for different spatial resolutions of the parameters' grid. We analyze the conceptual and practical difficulties associated with our methodology. Finally, rigidity maps obtained by our inversion method in southwestern US and particularly across the San Andreas Fault System are reviewed and compared to current plate rigidity estimates and geophysical data over this area.