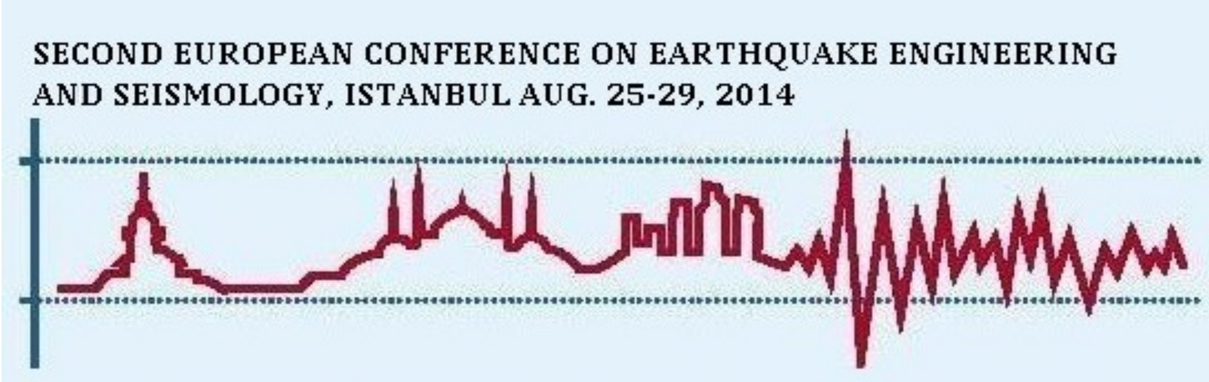

LINEAR SOURCE INVERSION WITH THE FULL COMPLEXITY OF EARTHQUAKE RUPTURE, INCLUDING BOTH SUPERSHEAR RUPTURE AND SLIP REACTIVATION

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Recent studies in dynamic source modeling and kinematic source inversion show that earthquake rupture may contain greater complexity than we anticipated previously, including multiple slipping at a given point on the fault. Classical nonlinear source inversion methods have difficulties in dealing with the complex rupture models since they assume single slipping in advance in the inversion. We perform synthetic inversion tests with dynamically generated complex source models, including both supershear rupture and slip reactivation, in order to understand whether we can resolve complex rupture processes by inverting seismic waveform data. We adopt the linear source inversion method with multiple windows, allowing slipping from the nucleation of rupture to the termination everywhere on the fault. We regularize model space effectively in the Bayesian framework. Our results show that both supershear rupture front and reactivated secondary slipping can be well resolved by the new linear inversion method as long as they are separated distinctively in space and time. Since linear source inversion has several advantages over nonlinear inversion such as computational efficiency and greater flexibility in model parameterization, it is desirable to apply the linear inversion method to earthquakes, in particular, for which complex rupture processes are expected, before more intensive nonlinear inversion analyses.

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