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Stable estimation of extended fault properties for medium-sized earthquakes using teleseismic waveform data

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Slip inversions using waveform data, as currently done by many research groups, heavily suffer from ambiguities due to the overparameterization of the fault model and uncertainties and oversimplifications in the earth models involved. We try to circumvent these problems by describing the rupture process using a very small number of inversion parameters. Classical examples of such parameterizations are the Haskell rupture models and circular crack models. To overcome the practical problems of these models with natural boundaries, we here discuss a new kinematic model. Our model presents a similar number of degrees of freedom, but is much more flexible in dealing with constraints in geometry. Furthermore, we made our model better fitting with physical findings on the rupture process, without going into real dynamic rupture modelling. Using a Green's function database, we systematically calculate full waveform seismograms for possible source mechanisms during inversion. We present test applications on medium-sized earthquakes, in order to estimate robustness and stability of the inversion. Additionally we indicate a way to quantify the occurrence of errors in a numerical and physical sense, respectively.