Automatic 3D Moment-tensor Inversions for Southern California Earthquakes

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We present a new source mechanism (moment-tensor and depth) catalog for about 200 recent southern California earthquake with $M_w \geq 3.5$. We carefully select the initial solutions from a few available earthquake catalogs as well as our preliminary 3D moment tensor inversion results. We pick useful data windows by assessing the quality of fits between data and synthetics using an automatic windowing scheme FLEXWIN (Maggi et al., 2008). We compute the source Fréchet derivatives of moment-tensor elements and depth for a recent 3D southern California velocity model inverted based upon finite-frequency event kernels calculted by the adjoint methods and a nonlinear conjugate gradient technique with subspace preconditioning (Tape et al., 2009). We then invert for the source mechanisms and event depths with the 3D CMT inversion techniques introduced by Liu et al. (2004). We assess the quality of this new catalog, as well as other existing ones by computing the 3D synthetics for the updated 3D southern California model. We also plan to implement the moment-tensor inversion methods to automatically determine the source mechanisms for earthquakes with $M_w \geq 3.5$ in southern California.

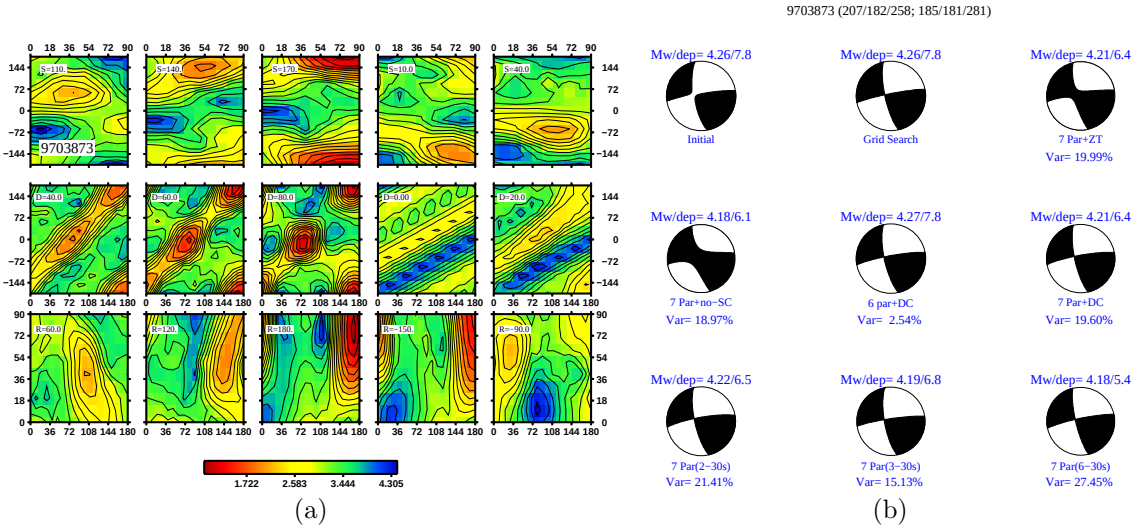

Figure 1: (a) Grid-search the full range of strike, dip and rake for the 2001 Hollywood earthquake to obtain the source mechanism corresponding to the minimum misfit function value, as well as the uncertainties associated with these parameters. (b) Moment-tensor solutions obtained by combinations of different inversion control parameters, including number of source parameters, moment-tensor type, different filter bands, station corrections, etc.

References

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