Title: Isotropic source terms of San Jacinto fault zone earthquakes based on waveform inversions with a generalized CAP method

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Abstract

We analyze source tensor properties of seven M_w > 4.2 earthquakes in the complex trifurcation area of the San Jacinto Fault Zone, CA, with a focus on isotropic radiation that may be produced by rock damage in the source volumes. The earthquake mechanisms are derived with generalized 'Cut and Paste' (gCAP) inversions of 3-component waveforms typically recorded by >100 stations at regional distances. The gCAP method includes parameters ζ and χ representing, respectively, the relative strength of the isotropic and CLVD source terms. The results indicate statistically significant explosive isotropic components for at least six of the events, corresponding to ~0.2-5% of the total potency/moment of the sources. In contrast, the CLVD components for the majority of events are not found to be statistically significant. The possible error in the isotropic components due to station variability is quantified with bootstrap resampling for each event. Tradeoff and correlation between the isotropic and CLVD components are studied using synthetic tests with realistic station configurations. The associated uncertainties are found to be generally smaller than the observed isotropic components. Two different tests with velocity model perturbation are conducted to quantify the uncertainty due to inaccuracies in the Green's functions. Applications of the Mann-Whitney U test indicate statistically significant explosive isotropic terms for most events consistent with brittle damage production at the source.