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Kinematic rupture parameters of deep south-american earthquakes determined with a higher order moment tensor inversion technique

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Standard moment tensor inversion schemes cannot directly retrieve kinematic rupture parameters. Higher order moments contain information on parameters such as source duration, source extent, the direction of rupture propagation or the discrimination between true and auxiliary fault plane. We used higher order terms within the framework of simple Haskell type models to invert the kinematic rupture parameters for all deep earthquakes in the Nazca slab since 1981 deeper than 500 km and moment magnitudes between Mw=5.8 and 8.3 (33 events). Both amplitude spectra and time domain waveforms have been considered. The inverted mechanisms and scalar moments deviate only slightly from the Harvard catalogue solutions, with strike directions following the slab directions and dip/slip directions indicating down-dip compression. About half of the events can be modelled reasonably well as unilateral Haskell type ruptures with rupture velocities between 50 and 95 percent of the shear velocity at the depth of the event. Only a few events are better modelled as bilateral Haskell type ruptures. Rupture propagation is generally along the strike direction of the true fault planes. We find a preferred orientation of true fault planes with the upper fault normal pointing towards the East. For well resolved events the ratio between rupture plane length and width is about two. For these events the average slip can be calculated. Inferred stress drops and seismic efficiencies will be presented. For those events which can not adequately be modelled in the framework of Haskell-type models, we find indications that the source time function was more complex with a most strong release of moment at the beginning.