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Rupture Histories of Strong Earthquakes

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Digital teleseismic records of P and SH waves are used to invert rupture histories which are slip histories as a function of position and time on the fault. The data include a broad bandwidth, usually filtered between 0.01 to 1 Hz, to facilitate recovery of source details. The advantage of using broadband records at teleseismic distances is that strong motion data are not always easily provided or are frequently absent. The focal mechanism and the focal depth are the parameters which are used as input for the finite-fault inversion technique. The multiple time window inversion approach is used permitting the same subfault to rupture multiple times. A linear least squares approach provides a similar solution to a global search algorithm, where the velocity can change relative to the position on the fault. The inversion approach followed permits the rake of the earthquake to vary upon the fault. The referred procedure is usually applied twice using both nodal planes of the focal mechanism in cases where it is not known which one of the two represent the ruptured fault. The nodal plane which is also the rupture plane permits better fit between data and synthetics. The procedure is applied for different events, as the Kythira 2006 and the Chile 2007 earthquakes. The rupture histories show the source complexity and the source directivity of the studied earthquakes. The calculated slip models were used to compute detailed static stress changes and synthetic peak ground velocity maps.