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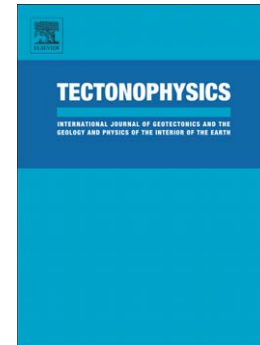
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Global catalog of earthquake rupture velocities shows anticorrelation between stress drop and rupture velocity

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Abstract

Application of the SCARDEC method (Vallée et al., 2011; Vallée and Douet, 2016) provides the apparent source time functions together with seismic moment, depth, and focal mechanism, for most of the recent earthquakes with magnitude larger than 5.6-6. Using this large dataset, we have developed a method to systematically invert for the rupture direction and average rupture velocity V_r , when unilateral rupture propagation dominates. The approach is applied to all the shallow ($z < 120$ km) earthquakes of the catalog over the 1992-2015 time period. After a careful validation process, rupture properties for a catalog of 96 earthquakes are obtained. The subsequent analysis of this catalog provides several insights about the seismic rupture process. We first report that up-dip ruptures are more abundant than down-dip ruptures for shallow subduction interface earthquakes, which can be understood as a consequence of the material contrast between the slab and the overriding crust. Rupture velocities, which are searched without any a-priori up to the maximal P wave velocity (6000-8000 m/s), are found between 1200 m/s and 4500 m/s. This observation indicates that no earthquakes propagate over long distances with rupture velocity approaching the P wave velocity. Among the 23 ruptures

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